

Compensating Southern Landowners for Ecosystem Services:  
An Interview Series and Case Study

By

Katie Blake Thomas

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Approved by advisory committee:

Bob Abt, Chair  
George Hess  
Walter Thurman

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## **Abstract**

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Ecosystem services are benefits people experience from the use of natural land including water purification, timber, food production, and outdoor recreation. These benefits are frequently not included in the economic value of undeveloped land. This makes them seem less important to decision makers when compared to economic development, but people depend on ecosystem services for survival and well-being and these services are difficult to replace without significant expense once lost. As the global population continues to grow, tradeoffs between natural and manufactured services must be considered to best address the needs of society. One approach to protecting the supply of ecosystem services is payment to landowners for the ecosystem services the land provides in its natural state. However, navigation of market options can be complicated and some landowners sell their land for development simply because they do not have enough information concerning other, more environmentally centered options. This study sought to examine and document the relationship between property attributes and available opportunities for participation in carbon banking, wetland mitigation banking, conservation easements, and recreation using results from an interview series in order to assist landowners in their decision making process. Additionally, a case study of a large property near Wilmington, North Carolina was used to illustrate the complexities of participation in ecosystem service markets. Results showed rural location, large size, and private ownership are the most favored property characteristics, but objectives of the markets are varied enough to create opportunity for many kinds of properties to utilize at least one of the aforementioned markets.

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## **Introduction**

World population is currently increasing at an annual rate of 1.178% (The World Bank, 2016). At this rate the population will double approximately every 59 years. This rapid growth heightens the demand for infrastructure to provide necessary and wanted services to people. However, this development often reduces or fragments the habitat of other species (Richards, 1993; Swingland, 2013) and strains natural services such as water purification, timber, food production, and outdoor recreation (Chapin et al., 1997; Chapin, Zavaleta, & Eviner, 2000; Millennium Ecosystem Assessment 2005). These benefits, sometimes referred to as ecosystem services, are often not included in the value of undeveloped land. This makes them seem less important to decision makers when compared to economic development (Costanza et al., 1997; Mercer, Cooley, & Hamilton, 2011). As a result, natural environments are often altered to provide different ecosystem services or manufactured goods. Continued lack of consideration of beneficial ecosystem services in development decisions promotes the loss of these varied services which can be difficult to replace without significant expense (Brown, Bergstrom, & Loomis, 2007; Blanchard, Vira, & Briefer, 2015).

One approach to preventing the sale of natural land for development is payment to landowners for the ecosystem services the land provides in its natural state (Engel, Pagiola, & Wunder, 2008; Jack, Kousky, & Sims, 2008; Cooley & Olander, 2012). Payment for these services opens a market for landowners that could provide an increase in income from undeveloped land. Because private landowners own approximately 70% of land in the United States (Vincent, Hanson, & Argueta, 2017) their participation in these markets is important to the overall success of conservation. Navigation of market options can be complicated however, and

some landowners sell their land for development simply because they do not have enough information on other, more environmentally centered options.

My study had two major objectives: (1) to examine and document for landowners the relationship between property attributes and available opportunities for ecosystem service markets and (2) to illustrate the complexities of ecosystem service markets using a case study in Wilmington, North Carolina. The first objective was accomplished by interviewing employees of environmentally minded organizations who have experience with different markets for ecosystem services. In order to make the natural environment, available markets for ecosystem services, and environmental regulations similar to those of the case study property in Wilmington, North Carolina, the interview participants were limited to individuals in North Carolina, South Carolina, and Virginia. These similarities makes comparisons between the interview results and the results of the case study easier, strengthening the usefulness of the case study as an application of the interview series results. The information gained from the interview series was used to produce an information pamphlet for private landowners to aid their selection processes when deciding which market is best suited to their unique property and situation (Appendix III). The results of the interviews and the case study are discussed below and some common relationships between property attributes and market participation are highlighted.

While general relationships can be described, the opportunities for a specific property involve a unique combination of land attributes, market opportunities, and the evolving values of the landowners and their heirs. These complexities are illustrated in this report through the case study, providing a better understanding of the process needed to assess ecosystem opportunities for a specific landowner.

## **Background**

### Ecosystem Services

The Millennium Ecosystem Assessment (2005) simply defines ecosystem services as the benefits people receive from ecosystems. The assessment further classifies each service into one of four categories: provisioning, regulating, supporting, and cultural. Provisioning services are products people receive from ecosystems such as food and water. Regulating services are the benefits people receive from the regulation of ecosystem processes and include flood regulation and air quality maintenance. Cultural services are the non-material uses people receive from ecosystems including recreational activities and spiritual bonds. Finally, supporting services are those that are necessary for all other ecosystem services to exist such as soil formation or oxygen production (Millennium Ecosystem Assessment, 2005). People depend on ecosystem services almost entirely for health and wellbeing and generally lack the capability to replace the functions that create them (Daily, 1997; Mooney & Ehrlich, 1997; Asah et al., 2014; Sandifer, Sutton-Grier, & Ward, 2015).

As population growth continues, tradeoffs between services must be considered to best address the needs of society; however, not all services are easily included in our current economic markets. According to Brown et al. (2007), a marketable service must be scarce, have non-attenuated property rights, and have low transaction costs. Scarcity means a product is limited and confines a consumer to a few options for obtaining the product. Something that has non-attenuated property rights has clearly defined, consistently enforceable property rights that can be transferred between owners and excluded from other users. Finally, low transaction costs mean a product can change hands easily and in a way that makes the transaction worthwhile financially. A good example of a product that has these characteristics is food. Farmers grow and

thus own the food, which is in limited supply. Farmers can exclude others from consuming the food easily, but the high demand makes it easy to find consumers who are willing to pay to own the food themselves. These factors naturally create a market for food to be exchanged, making the benefits of providing food more obvious.

In some cases, one of the three criteria are not met, making it difficult for a natural market (one without government encouragement) to form. A good example of this is a forest providing clean air. Trees and other vegetation provide oxygen, so any individual growing a forest is a contributor of cleaner air; however, they cannot exclude this product from other people. Non-owners benefit from the landowner's provision of clean air without paying for the service. Without this compensation, the landowner may convert their forest into timber, a marketable service, leading to increases in air pollution. If services that do not form a market without outside assistance are to be better protected and provided in greater amounts, individuals must be given compensation for the service they supply and individuals who benefit without ownership must provide some payment.

### Markets for Ecosystem Services

Recently there have been calls for increased management of ecosystem services and the inclusion of that management into decision making (Mooney & Ehrlich, 1997; Cowling et al., 2008; Young, 2013). I examined several markets in the interview series and during the case study (Table 1). These markets have been established, either by government regulation or by private entities who saw a demand, to help ensure the benefits of various ecosystem services are included in the decision making process.

Table 1: Key Characteristics and Requirements of Covered Markets for Ecosystem Services

Market	Key Characteristics
Conservation Easements	<ul style="list-style-type: none"> <li>• Legal agreement between property owner and a land trust</li> <li>• Potential tax benefits</li> <li>• Loss of development rights</li> <li>• Agreement is perpetual</li> </ul>
Carbon Banking	<ul style="list-style-type: none"> <li>• Main market is in California</li> <li>• Can do Avoided Conversion, Improved Forest Management, or Reforestation to generate credits for carbon sequestration</li> <li>• Property must be managed for sequestration for 100 years</li> </ul>
Wetland Mitigation Banking	<ul style="list-style-type: none"> <li>• Regulated by The Clean Water Act of 1972</li> <li>• Four ways to generate credits: preservation, restoration, enhancement, and creation</li> <li>• Each method has a different credit ratio determined on a case by case method</li> </ul>
Conservation Banking	<ul style="list-style-type: none"> <li>• Turns liability of endangered species into an asset</li> <li>• Different actions that support an endangered species can generate credits to be sold to those negatively impacting the species</li> </ul>
Recreation	<ul style="list-style-type: none"> <li>• Many different activities are possible</li> <li>• Few offer significant payments to the landowner</li> </ul>

### *Conservation Easements*

Conservation easements work to protect natural land by creating a legal agreement between a private landowner and a land trust. Landowners can donate or sell their land to a land trust, or they can sell only the development rights to the land. The latter allows the landowner to maintain overall ownership of the land, continue certain activities, and pass the property onto heirs. If land or rights are donated it often counts as a tax-deductible charitable donation, lowering the landowner's federal or state income taxes and property taxes in some states. A conservation easement where only the development rights are donated can also lower estate taxes for heirs to the property because the property value of the land is lower without those rights. Once land has been sold or donated, various activities are restricted to protect the natural integrity of the land. Conservation easements are often used within the other markets describe in this study because they ensure services will be protected in perpetuity by prohibiting threatening activities.

### *Carbon Banking*

In 2012, the California Environmental Protection Agency Air Resources Board ruled that industry in California must take steps to lower their Carbon footprint. The overall goal is to reduce greenhouse gas emissions to 1990 levels by 2020, and to achieve an additional 80% reduction by 2050 (California Air Resources Board, 2017). Reductions are regulated through a cap and trade program which allows investing in technology to achieve set goals, or by mitigating emissions following rules set by certain protocols. The protocol examined in this study is the Forest Protocol (California Air Resources Board, 2015), where management actions work to increase the amount of carbon sequestered by forests. This allows for creation of credits

to sell in the California market in three ways: Reforestation, Improved Forest Management, and Avoided Conversion. Reforestation works by growing trees in a cleared area (such as an old farm field). Improved Forest Management is done in a current forested area and management actions are altered to maximize the amount of carbon stored by the trees currently in that location. Management actions include longer timber rotations, higher stocking, and fertilization. The final option is Avoided Conversion. This option protects land that would otherwise be cleared for development or an alternative land use. For each option payments for credits can be received annually, but projects must be enrolled and managed for 100 years and have a backup bank in case something negatively affects the sequestration of the main location. Enrollment and monitoring costs are also very high across the life of the projects. Enrollment is considered financially impractical unless the property is at least 5,000 acres.

### *Wetland Mitigation Banking*

Wetland mitigation banking is a response to the Clean Water Act of 1972 (33 U.S.C. §1251 et seq.). Section 404 of the Clean Water Act (33 U.S.C. 1344) regulates the discharge of dredge or fill materials into navigable waters (including wetlands) of the United States. This prevents avoidable damage to established wetlands that provide important ecosystem services and creates a demand for methods of mitigating negative wetland impacts. The 2008 Mitigation Rule established the regulations for compensatory mitigation and reworks the mitigation process so that purchase of credits from mitigation banks are the preferred method for organizations to offset their unavoidable damages to water resources (Compensatory Mitigation for Losses of Aquatic Resources, 33 C.F.R. § 332). For this reason, establishment of mitigation banks is the method examined in this report. Credits from mitigation banks are generated by restoring,

creating, enhancing, or preserving wetlands. Organizations that have caused any unavoidable impacts to water resources can purchase credits in the same watershed to mitigate the losses.

For each project, a ratio of project acres to credits produced is determined based on the typical success of the mitigation method in replacing the functions lost and the quality of the impacted wetland. The typical ratios of each are as follows:

- Preservation- 5-10 acres preserved : 1 credit
- Enhancement- 3-5 : 1
- Restoration- 1-2 : 1
- Creation- 1-2 : 1

Preservation simply helps to prevent further loss of wetlands in the watershed. The other three methods involve establishing certain criteria that define wetlands: hydrophytic vegetation, hydric soils, and wetland hydrology. Restoration involves wetlands that are missing two of the three criteria for wetlands and restores those two functions. Enhancement means restoring or improving one of the three functions in an area where two of the criteria are present. Creation requires establishing all three criteria in an area where there were none before. Restoration, creation and enhancement are preferred over preservation because these methods re-establish the services that were lost.

### *Conservation Banking*

Structured similarly to wetland mitigation banking, conservation banking is appealing to landowners because it turns the liability of having threatened and endangered species into an asset. According to The Endangered Species Act of 1973 (16 U.S.C. ch. 35 § 1531 et seq.) individuals cannot “take” threatened or endangered species. “Taking” is any direct harm to any

individuals of the species. The Supreme Court also established an additional interpretation of “take” as any indirect harm to the species from damage to any parts of its habitat in *Babbitt v. Sweet Home Chapter of Communities for Great Oregon et al.* (94-859), 515 U.S. 687 (1995). Entities wishing to conduct activities that would be legal if not for the presence of a listed species can file for an Incidental Take Permit, which will allow for a taking of the species if the holder mitigates for their impacts. One method of mitigation is the purchase of credits from a conservation bank. According to the U.S. Fish and Wildlife Service (2012) a bank can be created in several ways:

- Acquisition of existing habitat
- Protection of existing habitat through conservation easements
- Restoration or enhancements of disturbed habitat
- Creation of new habitat in some situations
- Prescriptive management of habitats for specified biological characteristics

Once established, values of these additional natural resources in the bank are quantified into “credits” which can be sold to outside entities (U.S. Fish and Wildlife Service, 2003). When organizations cause unavoidable impacts to the species in another location, they can buy mitigation credits from those who have developed a bank. This provides some compensation for landowners who have endangered species on their land and have lost value due to the restrictions from the Endangered Species Act.

Another method for protecting landowners from Endangered Species Act restrictions are Safe Harbor Agreements. Safe Harbor Agreements are voluntary agreements between non-federal property holders and the U.S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Association (NOAA) (U.S. Fish and Wildlife Service, 2018). If

property owners contribute to the recovery of a listed species on their land and follow the conditions established in the agreement, then they have a formal assurance from the USFWS or NOAA that no additional management activities will be required of them without prior consent. Additionally, at the end of the agreement term property holders may return their property to the baseline conditions established before the term began without penalty from the USFWS (U.S. Fish and Wildlife Service, 2018). This agreement gives landowners peace of mind that increasing populations of the species of conservation concern on their property will not limit future management practices, as long as the population does not decrease below the levels determined at the time of the agreement.

### *Recreation*

The recreation market consists of cultural services. This market has a wide range of opportunities catering to different consumers, but very few offer significant payment. Common recreation opportunities include hunting, camping, hiking, fishing, bird watching, and various water activities. Leasing property for hunting purposes is a common recreation option that brings in revenue to the owner. Property can also occasionally be leased to the county or state to provide some other recreation uses, but this depends on available funds.

### Case Study Property

The case study focuses on a piece of property near Wilmington, North Carolina that is owned and managed by a large, multi-generational family. The property is approximately 10,000 acres and includes both upland pine and bottomland hardwood forests. The upland pine forests are mostly longleaf pine (*Pinus palustris*) that are home to a large population of red-cockaded

woodpeckers (*Picoides borealis*), a federally endangered species. Current management activities include hand pine straw raking, hardwood logging, and a hunting lease. An initial conversation with the family revealed conflicts of interest for the property's future. Some of the heirs wish to sell the land for development, while the older generation has a stronger attachment to the land and wishes to see it conserved. Interest in ecosystem service markets was expressed as a way to accomplish a middle ground because participation could increase revenue from the land while maintaining its natural integrity. The case study documents their options in various markets. The results were presented to the family during one of their annual meetings to discuss management for the property. This report uses the results to provide an illustration of the relationships between property types and market participation determined from the interview series.

## Methods

### Interview Series

The two separate objectives for this study required two different processes. The first objective of examining and documenting the relationship between property attributes and available opportunities for ecosystem service markets for landowners was accomplished by interviewing employees of conservation and environmental organizations in North Carolina, South Carolina, and Virginia. These individuals have experience enrolling and managing property for different ecosystem markets. An interview protocol was reviewed and approved by North Carolina State University's Institutional Review Board and given protocol number 12093. The protocol included a series of questions that was asked of each participant to determine the relationships of interest (Appendix I). Participants answered based on past experiences dealing with a variety of landowners and different properties. Each interview was conducted over the phone, and the interviewee and I both had access to the questions and script of the interview. The questions aimed to gain information about property attributes that affect success in different markets, market openness to private landowners, and ideal property attributes. There were five different attribute areas that were asked about specifically in the interviews: ownership type, size of tract, vegetation type, location, and the presence of endangered species. The values of each category and their definitions are as follows:

1. Ownership
  - a. Owned by an industry or company (Industrial)
  - b. Owned by an individual or family (Private)
  - c. Owned by the State or Federal government (Public)
2. Size
  - a. Above 5,000 acres (Large)
  - b. Between 1,000 and 5,000 acres (Medium)
  - c. Below 1,000 acres (Small)
3. Vegetation Type
  - a. Pine Forest

- b. Hardwood Forest
  - c. Mixed Forest
  - d. Agricultural (cropland)
  - e. Wetland
4. Location
- a. Greater than three housing units per acre, city or metropolitan area (Urban)
  - b. Between one and three housing units per acre, residential area (Suburban)
  - c. Less than one housing unit per acre, highly agricultural/forested (Rural)
5. Endangered Species (strictly listed species)
- a. Present
  - b. Not Present

I interviewed ten participants from seven environmental and conservation directed entities, including federal agencies, private businesses, and non-profit organizations. Participants were found through recommendations from current contacts within similar organizations made during preliminary research on each market. Potential participants were initially contacted by email with information about the goals, benefits, and risks of participating in the study. If the individual was interested, a phone interview was scheduled and a list of interview questions was provided. Participants were called at the time of the scheduled interview and I went through the questions with the participants, recording their responses in written notes (Appendix II).

### Case Study

The second objective was to illustrate the complexities of determining viable participation in any ecosystem service market using a case study. To determine the ecosystem service market opportunities for the case study property, individuals who were known to have experience in various ecosystem service markets were contacted and presented with the situation. Some of the individuals were familiar with the landowners and the property of interest, but others had to be given a summary of the land's attributes and the family's situation. Fifteen individuals provided information and opinions for the case study, and five of these individuals

were also interviewed as part of the interview series. Each individual explained how well he or she thought the property could participate in a market, and the reasoning behind their opinions. Respondents drew heavily from past experiences when considering the options the family had for the land. Notes were compiled on each conversation and a summary of possible options was prepared for the family members. The results of this case were integrated with the results of the interviews to provide additional clarification on the hidden complexities of successful market participation.

## Results

### Interview Series

Collectively, the interviewees were part of various federal agencies, private businesses, and non-profit organizations with ranging backgrounds in markets for ecosystem services. Some were only familiar with a few of the markets, whereas others had experience working in all the markets being investigated. Seven participants had experience in wetland mitigation banking and conservation easements, five of the participants were experienced with conservation banking and recreation markets, and four participants had experience with water quality and carbon markets. Most individuals worked on privately owned, rural properties, and small ownerships. The most common vegetation types were hardwood forests and wetlands.

### *Carbon Banking*

Only eight out of the ten participants felt they had enough experience to answer the questions on the carbon market. Of the eight responses, the most commonly stated attributes of a property being successfully involved in the carbon market were private or industrial ownership, large size, in a rural area, and considered to be a wetland (Figure 1A). According to six of the participants the most important attribute for successful enrollment in the carbon market is large property size. The participants explained that enrollment in the carbon market takes a significant financial investment to determine baseline carbon levels and for monitoring over the 100 years of the agreement. Generally, only large properties can recoup the costs of enrollment and monitoring. Related to this factor, rural properties tend to be larger and less expensive than suburban or urban properties, making it easier to absorb the costs of participation in the carbon market. Finally, the most appropriate vegetation type was wetland. Wetland soils store a large

amount of carbon because they have lower rates of decomposition than other soils due to saturation for at least part of the year. The saturation leads to anaerobic conditions preventing breakdown of organic material by bacteria and leading to accumulation of organic matter.

Small properties, public lands, and lands in urban areas were chosen by seven, four, and six participants respectively as the attributes that negatively affect participation in the carbon market (Figure 1A). Small tracts of land do not fare well in the carbon market because of the financial inability to return the initial costs. Urban lands tend to be small and expensive, making it difficult for these properties to recoup enrollment costs as well. Public lands are usually unable to participate because the lands are already protected. Properties must ensure that the enrollment in the market leads to carbon sequestration that would otherwise be released into the atmosphere. The protected public land is under no threat that would cause the release of carbon, so enrollment in the market provides no additional sequestered carbon.

### *Wetland Mitigation Banking*

According to the interviews, the attributes most likely to positively affect a property's potential for involvement in wetland mitigation banking were private or industrial ownership, small size, non-specific vegetation, and located in suburban or rural areas (Figure 1B). A key attribute of a property involved in wetland mitigation is that the area was once wetland, but was altered by people. A good example mentioned by eight participants is agricultural land that has been ditched and drained to plant crops. Such an area can be restored or enhanced to generate credits to sell in the mitigation market. The size of the property does not seem to be as important as it is in the carbon market. Most projects are small because that is what the average landowner holds, but projects can be completed using larger properties. Also, an interviewee made the point

that large properties are often not enrolled in the wetland mitigation market because only a subset of the entire property contains areas that can be enhanced or restored to generate credits. Companies undertaking the project don't want to buy big pieces of property if there is only a small area that can be converted. It is best to buy only the area that will be generating credits to produce more income from the project. Rural and suburban areas were considered positive traits by seven and four interviewees respectively because land is cheaper and remains undeveloped. An important consideration with the location of projects is that credits must be sold in the same watershed as created. In summary, areas with available, previously converted wetland, sharing a watershed with a highly-developed area are favorable. Presence of threatened and endangered species appears to be neutral to success.

Attributes negatively affecting success in the wetland market tend to be large size, those under public ownership, and those in urban areas (Figure 1B). Large properties are mainly negative because it is hard for organizations to purchase the entire property, especially if there is not potential for wetlands across the entire property. Properties under public ownership are harder to enroll in the market because the process is complicated. Urban location negatively affects a property's potential because there is little available for conversion, the property is expensive, and there is concern about neighbors not wanting an adjacent wetland. None of these attributes completely exclude a property from participating in wetland mitigation, but they do make the property less appealing to organizations and companies looking for a project.

### *Conservation Easements/ Conservation Banking*

Conservation easements can be applied to many kinds of properties. There are several attributes that make a property appealing to the various land trusts who hold easements. The

attributes that positively affect a property's appeal for a conservation easement are private or industrial ownership, large size, any natural vegetation, rural location, and presence of endangered species (Figure 1C). Private and industrial ownership was stated as favorable by eight and six interviewees respectively because these lands are unprotected, in contrast to public land. Six individuals stated large sizes are favored because they protect more area, however, too large of a property can be an issue because the land trust may not have enough money to buy the development rights for the entire property. Additionally, the location of the property is more important than size. Small properties with rare ecotypes, or ones that connect existing protected areas can be more valuable than large, isolated areas. Pine forests, hardwood forests, mixed forests, and wetlands were all mentioned by four participants as beneficial vegetation types for conservation easements. Essentially, land trusts look for natural vegetation types when deciding on an easement. Pine plantations and crop fields are not desired because they are usually planted monocultures that do not supply enough resources to support high biological diversity. Rural lands were picked as favorable by seven participants, with suburban lands mentioned by only two participants. Rural lands are favored because there is more land available for conservation and it is cheaper than urban and suburban land. However, suburban land can also be beneficial, especially if it is in an important location or has a rare ecotype. Finally, presence of threatened or endangered species is also positive for development of a conservation easement. The presence of a listed species makes the property more attractive for conservation and organizations wanting to manage the land in a way that benefits the species.

The attribute most stated as having a negative relationship with successful conservation easements is public ownership (Figure 1C). Eight participants explained public ownership as a negative for easements because the land is already protected in most situations. Also, five

participants viewed urban areas as having little potential for conservation easements. These areas are often small and separated from other natural areas, and more expensive to purchase than rural lands. The higher price of urban properties makes it more cost effective for a land trust to protect large, rural properties.

### *Recreation*

Recreation was perhaps the most difficult area to determine positive and negative property aspects. Only eight of the participants provided information for this section, with the others quoting a lack of direct experience as their reason for not providing information. Of those who responded, the only property aspect consistently mentioned as beneficial was large size with six participants acknowledging its usefulness in providing more of any activity (Figure 1D). However, the benefit of a large property can be negated by its location. Four participants explained how large rural properties may be well-suited for an activity, but if they are too far from people they will not be utilized. The property must be large enough to provide the activity, but conveniently located to enough people that it will be consistently utilized.

There was no consensus for the remaining attributes among the participants, with five explaining how their answer for any attribute depended on the recreation activity. Seven interviewees stated they were using hunting as their main example because it is a common recreation activity that can provide income, and thus one often done on private lands. Other activities are harder to maintain for income on private lands because of competition. Public lands provide the recreation activity for free or for a smaller fee than private land, but higher availability can lower the quality of the activity for some people. Private lands have higher fees, but generally provide higher quality recreation because fewer people are participating in the

activity. The demand for an activity however, must be high enough to decrease the enjoyment of the activity in a public park for individuals to feel the need to seek out privately provided recreation. Hunting is an easy recreation activity for private landowners to provide profitably. The demand is high enough to lower hunting quality on public lands, so individuals are willing to pay for areas with fewer people and higher quality hunting.

The primary land attribute that negatively affects recreation potential is the presence of endangered species (Figure 1D). Human presence can put additional pressure on the vulnerable species, and people intentionally seeking out the endangered species can cause unneeded stress on the individuals. Presence of endangered species also places restrictions on the desired recreation activities to protect the species from human encroachment. Management is more easily conducted when endangered species are absent.

Figure 1: Interview Series Results

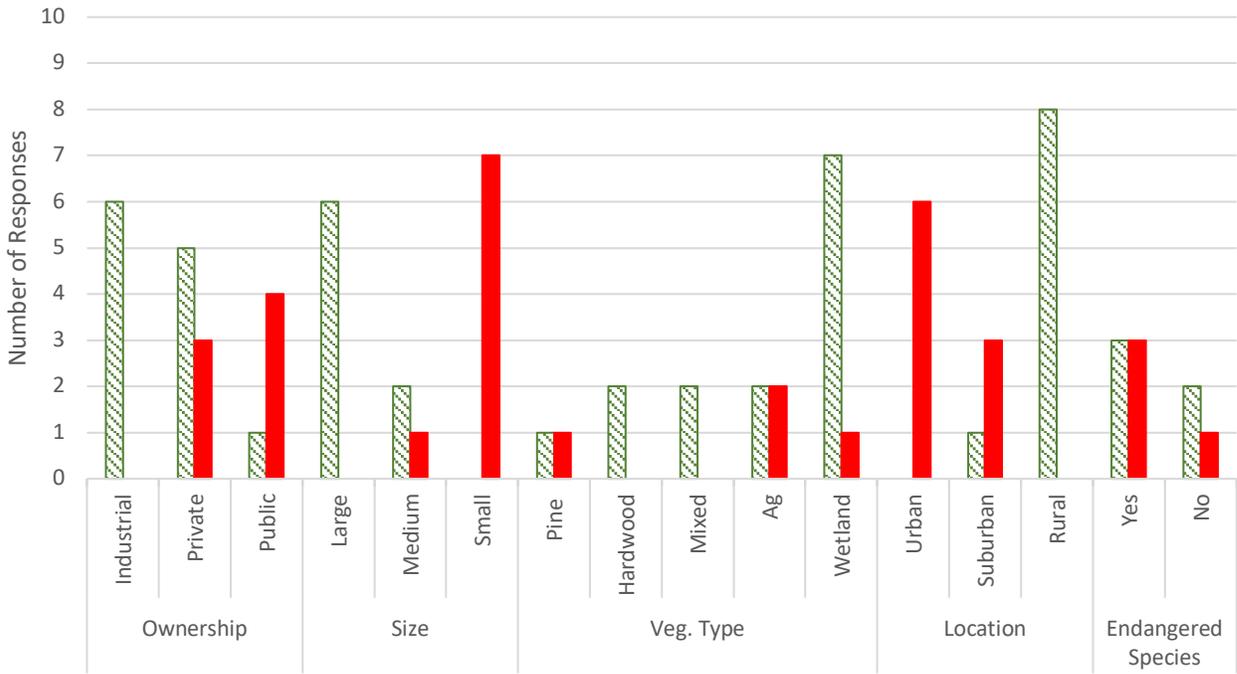


Figure 1A: Carbon Market

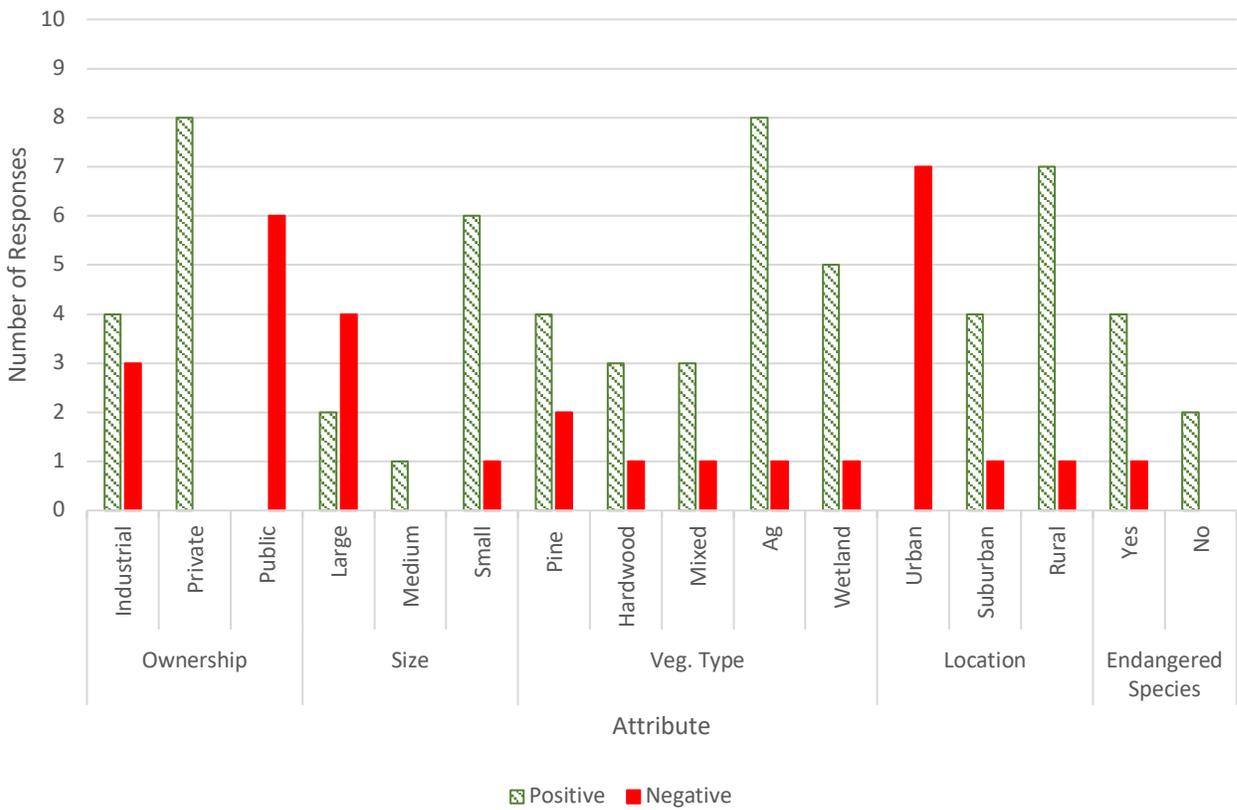


Figure 1B: Wetland Mitigation Banking

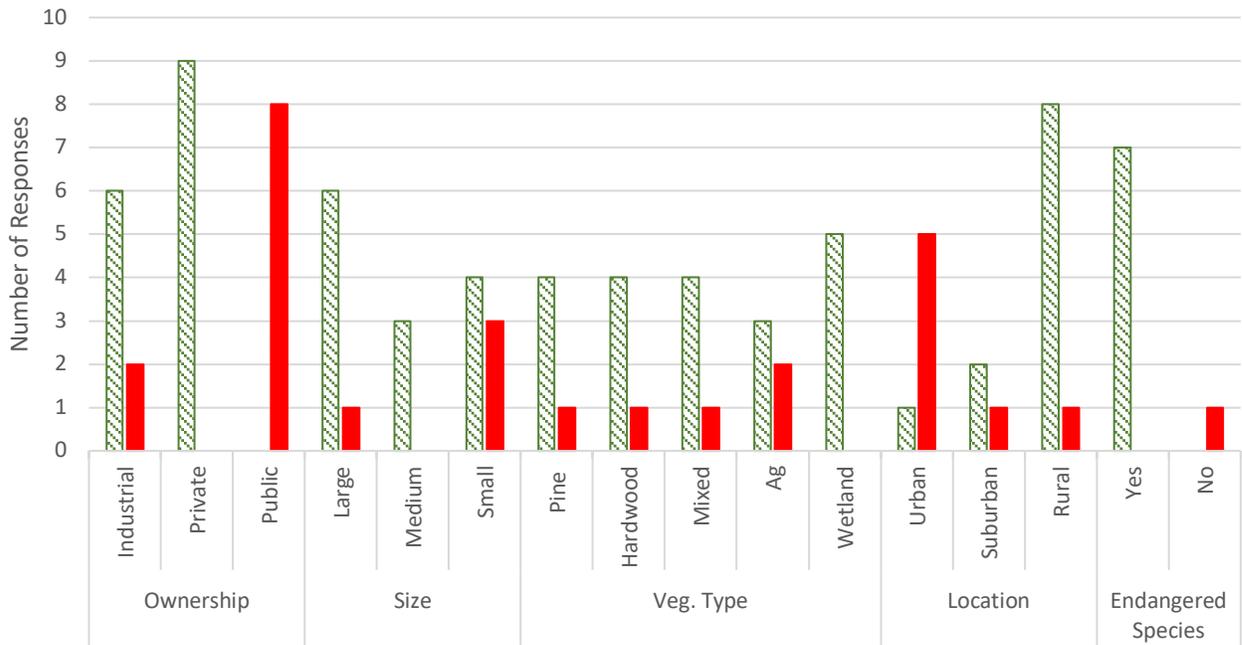


Figure 1C: Conservation Easements

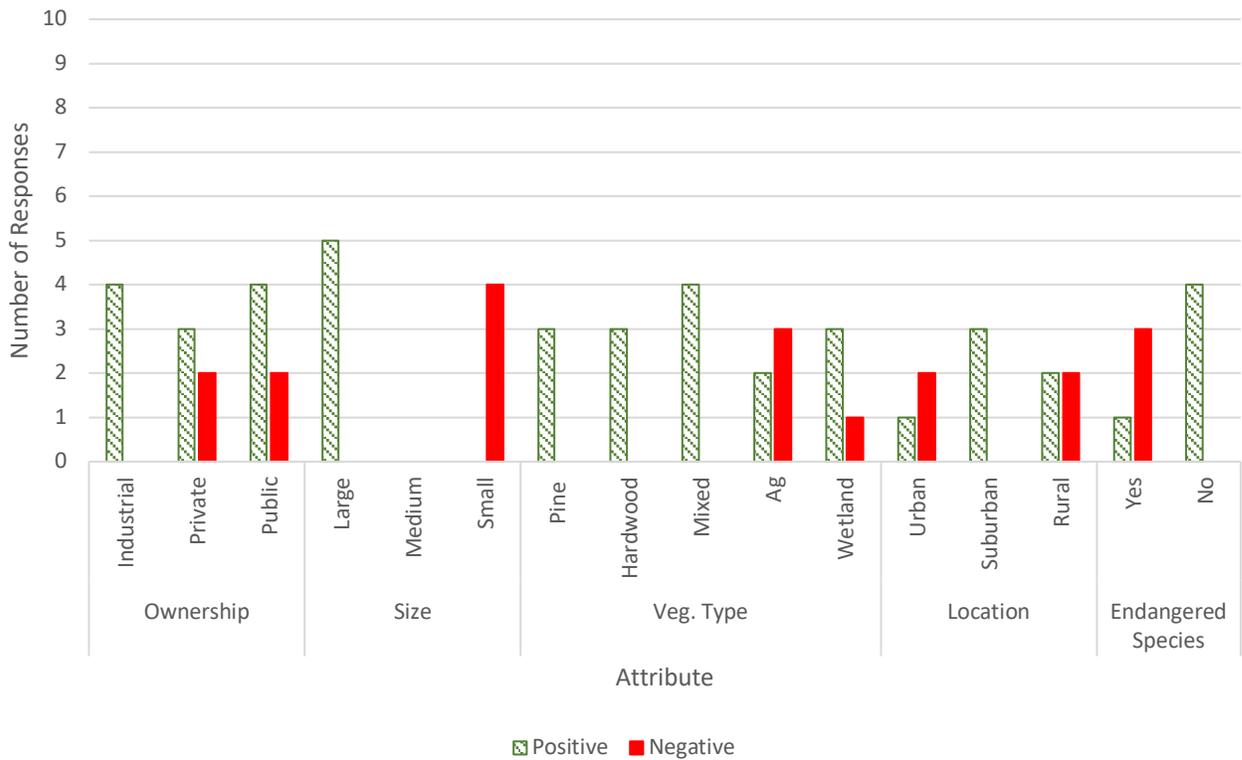


Figure 1D: Recreation

Figure 1: Interview series responses for positive and negative property attributes. 1A is responses for the carbon market, 1B is for wetland mitigation banking, 1C is for conservation easements, and 1D is for recreation.

## Case Study

The case study property has the following attributes: privately owned, large tract, mixed vegetation consisting of pine forests, hardwood forests, and wetlands, in a rural area, and with an endangered species present. Each attribute is one found favorable in at least one market, but the combination makes it harder to determine which market is most favorable for the landowners. The following paragraphs examine the case study property's potential for participation in each market covered during the interview series.

### *Carbon Market*

The case study property aligned well with the positive characteristics for the carbon market identified in the interviews. The property is large, it is privately owned, and it has both wetlands and mixed forests. The large size makes it more likely for the property to recoup costs incurred from enrollment and management. Also, while the land is in a rural area, there is encroaching development to the south from an industrial park. This development places the land under threat and makes it potentially eligible for Avoided Conversion in the Forest Protocol from California's Environmental Protection Agency Air Resources Board. This is the property's best option in the Forest Protocol because Reforestation and Improved Forest Management are better for cleared areas and plantations respectively. Unfortunately, the large population of endangered red-cockaded woodpeckers makes the property ineligible for Avoided Conversion. Because of the Endangered Species Act, the woodpeckers and the property they inhabit are protected by federal law. This lessens the threat of development to the land, making the carbon saved from Avoided Conversion no longer additional. This policy interaction shows how powerful the presence of an endangered species can be for market participation. The case study proved

promising for the carbon market, but the presence of red-cockaded woodpeckers would likely preclude it from participating.

### *Wetland Mitigation Banking*

The case study property has several attributes that positively affect its potential for the wetland market. It is under private ownership, in a rural area close to development, and it contains wetlands on the property. The main thing negatively affecting participation is the area is not a prior converted wetland. This means the only option for the land within the wetland mitigation market is preservation. In North Carolina, because a preservation project does not replace lost wetland functions it must be paired with a restoration, enhancement, or creation project to obtain credits. This makes it more difficult to obtain credits from the property, making it less desirable to companies who work to involve properties in the market. The property could still participate, but it must find another project to partner with to generate credits within the market.

### *Conservation Easement*

Potential for participation in a conservation agreement is high for the case study property. The land is large, has a rare ecotype (longleaf pine forest) with endangered red-cockaded woodpeckers, and is in an important location in relation to the recovery efforts for the species. The Nature Conservancy has shown interest in the property. The organization would like to own an easement on the land and establish a burning regime to manage the longleaf and support the population of red-cockaded woodpeckers. However, The Nature Conservancy does not have enough money to purchase the easement and donating the easement is too much of a financial

loss for the landowners. Because the land is taxed at its current use (forestry) the property taxes are lower than what they would be if the property was taxed based on its highest value (development). This means donation of the easement to The Nature Conservancy would not make much of a difference in the landowners' property taxes. Donation of an easement can also make a difference in a landowner's income taxes, but this was not explored in this case study to maintain the landowners' privacy. Unless a middle ground or a source of outside funding is provided, it is unlikely that this land will be sold for a conservation easement.

For a time, there was potential for the Department of Defense (DoD) to provide funding to The Nature Conservancy for a conservation easement on the case study property because Camp Lejeune could benefit from the population of red-cockaded woodpeckers found there. Camp Lejeune contains part of the Coastal North Carolina Primary Core Population of red-cockaded woodpeckers. Because the species is endangered, there have been restrictions on training activities on certain parts of the base. The base has worked together with the U.S. Fish and Wildlife Service to manage for the woodpeckers and increase the population on the base, lifting some training restrictions. However, the only way for all restrictions to be lifted is for the Coastal North Carolina Primary Core population to recover completely. In an effort to make this happen, Camp Lejeune has developed the Recovery and Sustainment Program (RASP) which provides funding to offsite locations for establishment and management of red-cockaded woodpecker populations. It was through this program that the DoD could potentially fund a conservation easement between The Nature Conservancy and the case study property. However, for the U.S. Fish and Wildlife Service to consider the population of red-cockaded woodpeckers on the case study property as beneficial to the population at Camp Lejeune, the two had to be considered demographically connectable, meaning individuals within each population could

easily travel to the location of the other, effectively increasing the gene pools of both populations. Unfortunately for both parties, the U.S. Fish and Wildlife Service has been unable to determine this. If the U.S. Fish and Wildlife maintains their decision the DoD will not fund a conservation easement because they cannot benefit from the population of red-cockaded woodpeckers on the case study property.

### *Recreation*

The case study property provides a good example of how difficult it is for private land to receive income from providing space for recreational activities other than hunting. The options presented to the landowners basically consisted of leasing their land to the county for trails or a community recreation center. One of the trails would be the West Pender County Rail trail that would follow the old rail line on the property. The other trail would be a Battleship to Battlefield trail that runs from Battleship North Carolina in Wilmington north to Moores Creek National Battlefield. Both options could provide some income to the landowners because they would lease their land to the county, however the trails would give the public access to the rest of their land. This introduces a huge liability for the landowners. The recreation center provides less public access, but less monetary value for the landowners. No other options were determined to have potential to provide the landowners with significant income.

### Additional Questions

#### *Participation by Private Landowners*

In addition to the relationships between property attributes and success in different ecosystem service markets, participants in the interview series were asked which market they

believed to be most open to participation by private landowners in general. Most participants ranked the choices but did not necessarily rank every choice. Recreation was the highest ranked for openness to private landowners, followed by conservation easements, and wetland mitigation banking. Carbon crediting and conservation banking were only included at the bottom of one list each, giving them the titles of least open to participation by private landowners.

Recreation was considered the most open market by the participants because there are many different recreational activities available from which to choose, and it is quite common for private landowners to lease their land for hunting. A hunting lease is a good investment for landowners because it not only provides income but helps the landowner maintain his property. The hunt club who leases the property often helps maintain the land and acts as an extra set of eyes for the landowner to ensure there are no illegal activities occurring on the property unknown to the owner.

Conservation easements were considered the next most open to private landowners because they allow a greater variety of land types and sizes than recreation. Generally, there are fewer limiting factors with developing conservation easements on a property than there are for any of the other markets which usually require some specific quality (degraded wetlands for wetland banking, large property for carbon banking). The downside of conservation easements is that the opportunity for payment can be low. Conservation organizations have limited funding so not all landowners who are interested in establishing a conservation easement will be able to sell an easement on their land. Donation to a conservation easement can provide tax benefits which may be comparable to selling the property for some landowners.

The remaining markets were considered less open to private landowners because the markets are not well-established, properties must have a specific quality to be successful, or

ability to navigate the market requires knowledge and experience in the market which many private landowners do not have. Maturation of the markets may open participation to more private landowners.

### *Other Factors Leading to Restriction*

Interview series participants were also asked to explain the qualities they felt most restricted a property from successfully participating in any market. Their answers fell into two main categories: barriers to entry and landowner characteristics. Barriers to entry included size, condition, and location; each of which depended on the market being considered as described above. The landowner characteristics mentioned by the interviewees included financial capabilities, market and legal knowledge, objectives for the land, time, and willingness to forgo future benefits from the land.

The barriers to entry are described in relation to each market in the previous sections and summarized here. In the case of size, most markets prefer bigger properties although some can work well with smaller tracts. A property can be too large in the sense that there are not enough funds to purchase the property from the landowners, and the land can be too small to provide significant benefits or to appropriately absorb costs. This factor depends on the market that is being examined. For condition, both damaged and pristine lands can be desirable depending on the market. Damaged wetlands are needed for mitigation, but pristine, unique lands are desired for conservation easements. Location seems to be the most important of these three. Three interview participants explained that a property can have all the desirable characteristics for a market, but if it is not in an area that demands the benefits then it will have a harder time participating in the market.

Landowner characteristics was an additional factor not addressed by the rest of this study due to the focus on property characteristics, but a factor that is equally important in the success of a property in any market for ecosystem services. Financial capabilities are an important factor due to the high entry costs, reoccurring costs, and delayed payback times that occur with some markets. Two participants stated how it is easier to work with wealthy, “cash rich” landowners because they can make the initial contributions that are required with some markets and have the financial security to ride out any fluctuations in the market. This does not exclude less wealthy landowners or landowners that have less liquid wealth from participating in markets, but it does make it harder to enter markets with a high initial enrollment cost.

Market and legal knowledge is a key determinant to whether a landowner will participate in a market. Two interviewees mention that lack of participation in the various markets is often because the landowners are not aware that the markets are an option, or if they are aware, they do not have the right knowledge to navigate the legal aspects of entry and upkeep obligations. Increased education and outreach for certain market programs done by knowledgeable market professionals could help this situation. One of the goals of this project was to support this kind of education and outreach in the form of the information pamphlet for landowners.

The final landowner qualities mentioned were objectives for their land, time, and willingness to forgo other benefits from the land in the future. Two participants felt the range of desirable characteristics for the different markets makes it possible to find a market for many properties to participate in, but they and one other interviewee explained that the participant’s objectives for the land and timeframe must coincide with how the market works. If the goals and management changes do not align to the landowner’s desires for the property, the timing of the process is too long, or if the landowner is worried about not having the land for some future

purpose then participation in a market in present time can be difficult. A landowner must be willing to manage their property in a way that fulfills the requirements of the market or be willing to forfeit their rights to the land thus ensuring it would not be used against the market's objectives in the future.

### *Multiple heirs*

Interviewees were asked how having multiple heirs to the property affects participation in markets for ecosystem services. Eight of the ten participants stated that multiple heirs tend to make the process more difficult. Of the remaining two participants, one declined to answer due to lack of experience and the other works in a program that requires families to have a designated steward for the property. Having multiple heirs frequently implies multiple opinions concerning what should happen with the property. If they have equal interests in the decision making, reaching a single decision can significantly delay the process. Each heir may have a different attachment to the land, market knowledge, financial interest, levels of trust, and if there is no clear legal will each may be making a different claim to the land. The situation is less problematic if the family designates one person as the decision maker; simplifying the process if there is disagreement among the heirs.

## **Discussion**

The objectives of my study were to examine and document for landowners the relationship between property attributes and available opportunities for ecosystem service markets and to illustrate the complexities of evaluating ecosystem service markets using a case study. The goal was to increase landowner knowledge of markets for ecosystem services and aid their decision-making process when determining which market is appropriate for their property and personal situation. I decided an appropriate way to assist landowners in their decision was to present how markets react to various property attributes thus allowing landowners to envision their own property enrolled in the discussed markets. Other studies have examined current and potential landowner participation through landowner opinions and knowledge of ecosystem service markets, conservation programs, and environmental policy governing the market (Bennett, Nielsen-Pincus, Ellison, et al., 2014; Tian, Poudyal, Hodges, et al., 2015), or how the structure of various markets and environmental programs affect landowner participation (Sorice, Oh, Gertner, et al., 2013), but mine is unique in examining participation potential with the focus on property attributes. This method provides information for landowners as opposed to policymakers.

Overall, the most favored property characteristics amongst the four markets are rural location, large size, and private ownership. Rural properties tend to be cheaper than urban areas which helps make participation in a project more feasible financially. The benefits of large size are related to the variety of habitat and resources they offer relative to smaller areas. Finally, private ownership is beneficial because land under private ownership is often unprotected and there are less legal restrictions to doing a project. The markets examined fell into two categories: high availability of funding yet high barriers to entry (carbon market and wetland mitigation

banking) and those with less available funding yet low barriers to entry (conservation easements and recreation). Within these two categories, a wide variety of properties outside of those containing the three attributes mentioned above have opportunity for participation in an ecosystem service market, but the opportunity for significant payment from the market is less likely. Landowners interested in preserving the natural state of their land should also be willing to sacrifice some financial benefits.

Additionally, landowners should recognize there are factors other than the attributes of their land affecting their ability to participate in each market. Landowner's objectives, amount of liquid wealth, timeframe, and levels of trust with outside parties can make a desirable market unappealing for the landowner. Also, limitations imposed by the Endangered Species Act may prevent participation in several markets as demonstrated in my case study. The interaction of environmental laws and regulations can make it impossible to participate even if all other factors agree with the market structure. These additional factors should be explored and taken into consideration while deciding which market to enter.

#### Case Study Property Recommendation

A critical component of this study was to use the information gathered to provide a recommendation for future management of the case study property. After consideration it was determined that none of the four markets for ecosystem services examined in this study were appropriate for the situation when the objectives of the landowners were taken into account. I believe the landowners should continue their current management of the property while working to determine if their population of red-cockaded woodpeckers is demographically connected to

the population at Camp Lejeune, and explore other sources of funding for a conservation easement on the property.

The family believes the property could be sold for residential housing or industrial property due to its proximity to the city of Wilmington and a developing industrial park. However, developing the property seems like a difficult option to pursue in this case due to the large population of red-cockaded woodpeckers. Any development would have to acquire an Incidental Take Permit to impact the population of woodpeckers in any way. Woodpeckers that were located in an area to be developed would have to be moved to a different location that would not be impacted. Relocating an individual woodpecker is a long and expensive process involving monitoring and establishment of a new nesting cavity in another location. More land is required to relocate the woodpeckers to, and more individuals must be moved to the new location than are impacted to account for some not becoming established in the new location. The amount of money that the entire relocation process would take would notably affect the profit from selling the land for development.

The property is a valuable one for conservation. It contains a unique ecotype with an uncommonly large population of an endangered species and is in a location that could serve to connect other conservation areas in the future. I believe that time will only increase the value of this property for conservation's sake, making it easier to sell at least a portion of the property for a conservation easement. With the costs of relocating groups of red-cockaded woodpeckers to develop the property included in the profit from developing the land, waiting to sell for a conservation easement may be worth the time; a decision ultimately up to the landowners.

## Future Research

Further work on this topic could be improved by incorporating the following suggestions. First, the interview questions covered a wide range of markets, but participants were only very familiar with one or two of them. Participants often answered the questions using indirect knowledge of the markets. This is valuable in this short study due to their experience in the field, but it is not preferred. Direct participation in the market means the individual has a better understanding of the structure and complexities of the market. This would allow the individual to provide more information about what factors facilitate a landowner's ability to successfully enroll and participate in the market, improving the accuracy of this study. Second, since some of the markets are relatively small, it was hard to find individuals who had experience in the market. This left some of the markets less explored during the interview process. Third, six people who were contacted never responded, and two chose not to participate at all. It is possible that these individuals chose not to participate because of the time commitment of conducting the interview over the phone. With the average interview taking an hour to complete, and many of the participants being involved in field work, it was difficult to find times that would work for both the interviewee and I. This led to a delay in the process of examining the data and finding additional participants, thus reducing the number of total interviews completed. With these matters in mind, a future interview series would likely work better as an online survey that can be sent out to entire organizations allowing individuals to complete it at their leisure. However, because individuals can complete the survey whenever they wish and are not dealing with another individual personally, online surveys can have a much lower return rate. Developing a shorter survey where the questions asked are more specific and based on the participant's professional experience could help increase the number of responses because the surveys would

be less time consuming. This arrangement would likely lose details the interviews can provide since individuals would be typing their answers instead of speaking freely, but the smaller time commitment and ability to distribute the surveys more easily than the interviews would hopefully aid in providing a larger sample size of individuals contributing information for the study.

The findings of this study are best applied in North Carolina, South Carolina, and Virginia due to differing natural resource policies in other states. Different policies in other states may change the function of markets in different areas of the country, as well as create completely different markets than the ones explored here. The structure of policies in different states may cause property types other than the ones mentioned here to be favored in a market. Applying the relationships determined here in a different state could possibly lead to wasted resources from a landowner pursuing market enrollment.

Finally, the passage of time affects market structure and market opportunities. In the future, some markets could be more mature and open to a greater variety of landowners, inefficient markets could no longer exist, and new markets could be in their place. As development continues natural land will become more valuable, especially those that are large and contiguous. Landowners who have the financial resources to wait may find more opportunities in the future.

## **Conclusion**

The purpose of this study was to increase the knowledge private landowners have about markets for ecosystem services, and to create an information pamphlet to provide a first, guiding step to the landowners to determine which market is best suited to their unique situation. The study showed each market has a slightly different preference for property type, creating opportunity for many kinds of property to utilize at least one market. Even small urban lands can be used for small city parks or greenways. However, it does seem like rural location, large size, and private ownership are the most favored property characteristics. The two markets examined that have the highest potential return also have the strictest requirements (wetlands need damaged wetlands and carbon needs large properties). If landowners are willing to be flexible and have enough wealth to withstand the uncertainty of the market there is a good possibility they can find a market for their land.

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**Appendix I**  
**Interview Questions**

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

There is minimal risk involved in participating in this survey. Names of individuals will not be published and will be kept separate from response notes. Organization names will be published, but mostly along with aggregate results. Individual organizations may be mentioned as the best organization to speak with if a property has a certain characteristic or if landowners want to get involved in a certain market. There is minimal risk of your responses being traced back to you, however, if you are part of a small organization that has few employees being interviewed, the risk of your answers being traced back to you are higher. Information published from the interview will not contain any personal information.

You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

*After confirmation from the participant*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, “ecosystem services” are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

Wetland/Stream Mitigation Banking

Water Quality

- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present (strictly listed species)

- Yes
- No

Could you please describe any other distinguishing property characteristics that you feel are important?

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

Can you explain why you believe that?

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

**Appendix II**  
**Answers from Interview Series**

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

There is minimal risk involved in participating in this survey. Names of individuals will not be published and will be kept separate from response notes. Organization names will be published, but mostly along with aggregate results. Individual organizations may be mentioned as the best organization to speak with if a property has a certain characteristic or if landowners want to get involved in a certain market. There is minimal risk of your responses being traced back to you, however, if you are part of a small organization that has few employees being interviewed, the risk of your answers being traced back to you are higher. Information published from the interview will not contain any personal information.

You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

After confirmation from the participant

Confirmed

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
  - Water Quality nutrient offset, riparian buffer credit (state law)
  - Conservation Easements → goes w/wetland
  - Conservation Banking
- ↳ big in other states  
F&E species

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial *some, TCF & Audubon Society, other conservation groups*
- Private *→ 60% of the lands they work with, family lands/individuals*
- Public *- tend not to work on public lands, different methods of obtainment, Division of Mitigation services gets there first.*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres) *→ a few are close to 2,000 acres*
- Small (below 1,000 acres) *usually*

Vegetation Type

- Pine Forest *wetlands & hardwoods are main focus*
- Hardwood Forest *some pine flatwoods & longleaf*
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested) *→ sometimes in rural/suburban interface*  
*↳ 98% of the time*

Endangered Species Present (strictly listed species)

- Yes
- No *great if they're there, but they're usually not there*  
*Like to include if they can*

Could you please describe any other distinguishing property characteristics that you feel are important?

- ownership and landowner's objectives
- looking at watershed as a whole & look for stressors in water quality functions are diminished & want to make improvements

#1  
3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

Industrial

Private → greater flexibility with individuals/family

Public

• industrial and public have more structure

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres) → doesn't think it matters very much b/c it hasn't been a factor for them. Most projects are small

Vegetation Type

Pine Forest

Hardwood Forest

Mixed Forest

Agricultural (cropland)

Wetland → generates the most revenue

Other please specify \_\_\_\_\_

Location

Urban (Greater than 3 housing units per acre, city or metropolitan area)

Suburban (Between 1 and 3 housing units per acre, residential area)

Rural (Less than 1 housing unit per acre, highly agricultural/forested)

↳ Land cost is less expensive, better opportunity for revenue. Other opportunities are too expensive for development options

Endangered Species Present

Yes

No

neutral, doesn't impact how their stuff works

Other, please specify

Doesn't feel qualified to answer

When they looked at it it didn't make economic sense

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private → most successful, doesn't have structure or bureaucracy of the other times
- Public → others take longer w/ contracting process

Size

- Large (above 5,000 acres)
  - Medium (between 1,000 and 5,000 acres)
  - Small (below 1,000 acres)
- Bigger is better. These projects are small but could have bigger ones

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland) → gives opportunity to do restoration → more credits → more value
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

↳ no infrastructure / trespass issues

Endangered Species Present

- Yes
  - No → great if you have it, can help from a value perspective but doesn't make it better
- Other, please specify \_\_\_\_\_

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

Industrial

Private

Public → most difficult to deal with

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres)

smaller it is (2 ac compared to 200 ac)  
the less value it has

Vegetation Type

Pine Forest to a certain degree, usually uplands

Hardwood Forest

Mixed Forest

Agricultural (cropland) → can have issues

Wetland

Other please specify \_\_\_\_\_

Location

Urban (Greater than 3 housing units per acre, city or metropolitan area) → lots of problems w/ rights of way, etc.

Suburban (Between 1 and 3 housing units per acre, residential area)

Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

Yes

No

Other, please specify

#1  
1  
7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial → ok  
 Private easier to work on  
 Public ↘ very difficult

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres) Doesn't seem to matter as much  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest Doesn't matter as much.  
 Mixed Forest  
 Agricultural (cropland) If it needs to be protected then it  
 Wetland needs to be protected  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested) } tend to have encroachment

Endangered Species Present

- Yes  
 No neutral

Other, please specify some species require active management  
have to make sure the easement includes this management

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres) *neutral*
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest *neutral*
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No *Ensures easement allows for management of habitat or species*

Other, please specify

#1 1  
9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial > hunting lease  
 Private  
 Public → gamelands

\* Depends on which recreation option you look at

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres) Larger the better  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Doesn't matter

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area) close to urban environment so you  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No  
could be conflict if they are present, people may be destructive

have participants close by

Other, please specify

#1  
10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial → doesn't want public on land unless compensated  
 Private  
 Public → depends on objectives of land

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres) → less desirable

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland) → don't want people ruining crops  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No → depending on how far it is from people  
Depends on species

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

All open to private landowners, depending on the landowners objective

Recreation → will pay for hunting & fishing, not usually hiking, not directly

Can you explain why you believe that?

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

Location- wetlands & streams are based on watershed basis. Property can be divided by watershed, one may have demand the other none

Location is also important for endangered species

Negative- could just not be in a good location  
could also depend on landowner objectives  
Landowner characteristics & location

#1 . . . . . 1

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Complicated - can make it very difficult

More parties involved, more difficult to come to an agreement

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

One they can purchase outright - gives them complete control

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

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You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

After confirmation from the participant *Consent*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking  
*(Species) and or wildlife*

*no specific money earned for water quality  
no crediting, but have done projects for  
water quality just no credits, but have  
been given money (loan) for the projects.*

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial → land owned by investment companies, used to be owned by industry → forestry industries sold to TMOs and conservation org.
- Private → under their ownership is included here
- Public

↳ 1/4 of the land they work on transfers to public ownership.

Size

- Large (above 5,000 acres) open to public & state owns deprepop rights; & direct public ownership
- Medium (between 1,000 and 5,000 acres) for most part
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested) primarily rural, some could be consider suburban

Endangered Species Present (strictly listed species)

- Yes various depending on location
- No

Could you please describe any other distinguishing property characteristics that you feel are important?

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

only regulated one is CARB precludes federal ownership of land. States can own land & be in carbon market but not federal

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

cost, must be able to spread out over large land base, measuring, regulation, monitoring

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

growth faster, credits from growth is good here could also generate credits from all forests depending on how you're measuring credits

ag. doesn't require enough C wet. protocols limit credits from harvests limited by law, can't harvest b/c of gov. restriction not eligible for carbon also not great at growing trees

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

avoidance of removal →

↳ growth of forest credits, mainly

Endangered Species Present

- Yes
- No

Do not want them here

presents precludes harvesting so hard to make legitimate claim

Other, please specify

- redwood forests are good at generating carbon credits grow fast & grow a lot

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

see notes from 3

Ownership

- Industrial
- Private
- Public

Federal can't be enrolled at all  
states still have a hard time w/ it

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

cost

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

most are less than 500 acres  
size is irrelevant, even on large  
properties you can id. spots for  
creation or work

Vegetation Type

- Pine Forest → to create credits you have to  
restore areas, pine plantations are ditched so you can  
restore this hydrology easier
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland) → also ditched
- Wetland → prevent protection of wetlands to  
generate credits
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

can be urban  
(Rocky Branch & state)

Endangered Species Present

- Yes
- No

neutral, don't make a difference

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial
- Private
- Public

had for them to make a legitime claim  
 some existing law that prevents them from  
 doing anything anyway

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

irrelevant

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

good candidates

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

→ attracts more funding usually

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

doesn't make too much of a difference

CRP project on small properties is an exception. Payment to maintain property in certain fashion for a term, not in perpetuity & wetland stuff (NRCS both of them)

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

→ more acres here, but less money spent

→ greater the threat of development the greater the chance of funding to protect property

Endangered Species Present

- Yes
- No

Problem is value becomes so high it exceeds funding available

Other, please specify

wildland/urban interface, also good candidates. can id large ownerships w/ ecological attributes threatened by development. Probably where most money is spent on easements.

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial
- Private
- Public

public has harder time getting funding & their management usually reaps it as is

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

→ unless in programs nations in 7

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

less funding for ag. changing as food security becomes a larger issue. more funding as it becomes a bigger issue

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

see 7

Endangered Species Present

- Yes
- No

Other, please specify

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public → more visitation & recreation here, not as much payment (ex gate fees)

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

urban → smaller ownerships, bigger demand

rural → larger ownerships are highly sought after, diff. kind of regeneration

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

doesn't really matter, best properties would be varied

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No neutral

Other, please specify

part size & location side by side

generally speaking, smaller ownerships are better if you are looking at payment scheme, more many or smaller ownerships.

in hunting easements, you have to split larger ownerships into smaller sections so org. can afford to lease it

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*more homogeneous is bad*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- 3 Wetland/Stream Mitigation Banking  
 Water Quality  
 2 Conservation Easements → particularly if you consider fed. programs for smaller landowners for-term  
 Conservation Banking  
 1 Recreation (hunting, hiking, biking, etc.)  
 Carbon Crediting  
 Other, please specify \_\_\_\_\_

Can you explain why you believe that?

Recreation → high demand, almost regardless of the size, 100+ has demand

Easements → federal programs available for smaller landowners, not permitted because their banking in here as well maintain property in certain state have a lot of landowners that have conservation ethic so they donate land

Wetland - seen done on small property for various landowners, market in small though

others - size needed to participate precludes about 90% of landowners

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

1. Landowner education

most landowners are unaware of their options & the programs

2. Size or financial capacity

→ significant initial cost associated w/ enrollment most people can't make these commitments

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Negative effect for any of the programs

clear title / heir property - hard to id. clear owner. If you can't do that you can't participate

even if you can id. all individuals trying to get them to agree on a program is difficult

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Carbon - large, well stocked (large timber volume), owned by individual or entity that is not motivated by financial return & will let forest grow anyway. If it's gonna grow let it pay you.

#3

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

There is minimal risk involved in participating in this survey. Names of individuals will not be published and will be kept separate from response notes. Organization names will be published, but mostly along with aggregate results. Individual organizations may be mentioned as the best organization to speak with if a property has a certain characteristic or if landowners want to get involved in a certain market. There is minimal risk of your responses being traced back to you, however, if you are part of a small organization that has few employees being interviewed, the risk of your answers being traced back to you are higher. Information published from the interview will not contain any personal information.

You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

*After confirmation from the participant*      *Consent,*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

- Recreation (hunting, hiking, biking, etc.)  
 Carbon Crediting  
 Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present (strictly listed species)

- Yes  
 No *depends, sometimes yes on average no but increasing # of threatened plants on tracts*

Could you please describe any other distinguishing property characteristics that you feel are important?

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes *not really that relevant*
- No

Other, please specify

*super positive for this is stocking levels relative to baseline. Not worth being involve in IFM unless they have higher stocking than surrounding area so that you have credits to start w/ & just maintain stocking levels*

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public

Doesn't know enough about public  
 Private is more complicated than industrial

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

• probably not possible on ag. unless it's tree related ag. maybe

• pine plantations don't lead themselves either. Have to maintain baseline so hard to cut ~~into~~ less than stand at different ages. May harvest more than you should and end up cutting into buffer/reserve

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

developmental pressure, doesn't accommodate carbon credits well. Messes w/ how much is grown & what is taken out

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

can only generate credits on subset of acre anyway so don't want to buy lots of property to only do something on small section

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

need property where water systems have been screwed up

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

not body often times credits must be used w/in same jurisdiction as the project

Endangered Species Present

- Yes
- No

good? probably good to help sell credits

credit need is in area where stuff is happening

Other, please specify

roads go over a lot of wetlands so DOT needs credits

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial
- Private
- Public

not the best. May have small piece but it's inside larger piece of property which makes it harder for developer to conservation b/c it's hard to buy the whole property

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

→ same reason. hard to buy all the land

really want small discreet section

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

doesn't think any are negative matter of screwed up water system

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

remediation is difficult where there is that much built up area

Endangered Species Present

- Yes
- No *not negative*

→ \*Threatened & Endangered

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements. *Looks a lot like carbon*

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No *more the better*

*rural but close to development (lots of warm bodies)*

*tricky, needs to be threatened with something so there is money to protect it*

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial
- Private
- Public

can't get anything done if public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

depends on where you are  
VA has unique program MIPF to protect nice land & put it into easement

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

tax deduction for donating land & also get tax credit. can take 40% of easement value in credits in VA. Built whole program around small so it is an exception

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

really rural, there's no threat, so harder to get money for easement.

Endangered Species Present

- Yes
- No

indifferent if they're not there. If they're there they can help

Other, please specify

can be any threatened or endangered species

Natural forest is better than ag & pine plantations  
conservation org. don't like ag & pine plantations

looking at it from private  
b/c it make many

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

if you hunt or fish, don't want to go to public land unless you have to. Private is much better for this community

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Traditionally large industrial is best. Mutualistic relationship

Vegetation Type

- Pine Forest
- 2 Hardwood Forest
- Mixed Forest
- 1 Agricultural (cropland)
- 1 Wetland
- Other please specify \_\_\_\_\_

better quality

if ducks

all the leases though are here, probably b/c these lands are industrial owned

Disrupter, getting small properties to rent just for a few days, of by species, or by use instead of to one group for a long time

Hardwood are not industrial, family owned who use it themselves

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

suburban, this is where the people are

Endangered Species Present

- Yes
- No

don't want to deal w/ people & their critter.

National forest in VA is too far for a lot of people to hunt off.

Other, please specify

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

see # 9

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

have something someone else screwed up or nothing

Large groups investment

11. In your opinion, which market is the most open to participation by private landowners?

- 4 Wetland/Stream Mitigation Banking
- Water Quality
- 2 Conservation Easements
- Conservation Banking
- 1 Recreation (hunting, hiking, biking, etc.)
- 3 Carbon Crediting
- Other, please specify \_\_\_\_\_

to common sell

becoming popular for other

Can you explain why you believe that?

Mainly money is in these areas.

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

short answer is no. Every property offers something, but may not be (carbon is stuck in high acreage) just have to find where to go for your attributes, (T&E, unique view shed, unique historical something)

Vegetation might restrict if it is very much a monoculture (pine plantation). Just ecological screwed up. no-no #2

#1 is to turn forest into ag. field. (to conservation folks)

Starting stacking affect how carbon crediting will do money wise



skinny certain properties don't do well in ES market but  
provide a lot of ES. Provide habitat as secondary growth  
doesn't work in market b/c it changes so fast

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Not sure, they buy from families. Having lots of heirs makes it more difficult to make a decision. Complicates things.

Generational change. Older have affinity for family farm, younger tend to want the money

3Ds - cause family to sell farm

Divorce, Death, Disengagement (going back)  
↳ particularly this one

Movement towards urbanization, people go into cities, especially young people people are distancing themselves from the land  
Ownership will become more concentrated

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Piedmont  
15,000 ac hardwood forest in bottomlands of south  
do double dip. Sell for conservation easement to keep as is  
conserve, working forest easement  
then do carbon credits. Paid to protect land & sell extra for carbon

Big property w/high stocking

Continue to do recreation, might get use way or public unless you can get use as private rec land w/hunting

hardwood is good for hunting  
easement lasts you cut trees but not enough to ruin carbon.

• would be hard to sell this property b/c it's heavily encumbered

# Corbett  
development  
river, with

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Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

After confirmation from the participant *Yes*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

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1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

- <sup>little</sup> Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

*Probably public & military*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present (strictly listed species)

- Yes
- No

*wood pecker  
property sizes vary & veg type varies  
use models to determine impacts on  
birds. use info on past families to  
develop models*

Could you please describe any other distinguishing property characteristics that you feel are important?

*Determine barriers to dispersal based on what  
past family groups have done  
Determine value of properties based on these  
models*

Doesn't know much about  
Carbon

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

Not sure what the potential is here for private other than industrial. Places have to be large

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

have to be large

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

wetland areas Peatland recrotting  
↳ definitely rural

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

doesn't have to have endangered species

Other, please specify

but when it does it creates a head scratcher  
RCW need fire, but don't want fire cut  
the way fire → gets rid of the good things

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public

*can't imagine that this matters*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*knows these are risk property out here*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

*↳ higher it has to be then*

Endangered Species Present

- Yes
- No

Other, please specify

Doesn't know much about wetlands

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Thinks this would be important here too

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)



Endangered Species Present

- Yes
- No

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*economy of scale is good.  
 large property can have multiple things  
 that you want. can also make it more  
 complicated*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*see back for  
 notes on  
 conservation  
 bankability*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

*not sure  
 more complicated in urban/suburban  
 than in rural*

Endangered Species Present

- Yes
- No

Other, please specify

*need some certainty that wildlife resource com. will do what  
 they need to do for management b/c they also want to  
 use it for game land*

space's neck garrland 2700 ac

habitat type = projected pop. size is 12 groups

variety of cover types

depends on species that you're looking at  
RCW like longleaf

12000+ ac Bear garden closed on by military/marine core

Determination of biological function

↳ run property through models & determine value

could support as many as 48 potential breeding groups

hydric soils & hydric systems. RAS? says ideal habitat 150 ac  
could support breeding group in perpetuity

wildlife commission doesn't like this number, what some wiggle room

rule of thumb for picking areas 200 ac per group

hydric areas need around 300 ac a group

what is the ~~desired~~ current condition of the landscape. How long will it  
take to get a property in a suitable state. Can they make b/w other  
habitats? what then to populate

• Larger the tract the better

using fire to manage property. Easier to do if neighbors are far away.  
unless they are managing one w/ fire as well.

• Need areas that are close to other populations (primary core populations)

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

Lands that are adjacent to existing pop are valuable  
Lands that you can manage properly are also valuable

Size - not super important for endangered sp. Large can be better,  
but smaller ones are also helpful

Veg - whatever the system that is supposed to be there (natural or opposed to crops)  
↳ also depends on the species

Ownership - public lands have a greater responsibility for endangered sp

Private lands are not as rigorous, don't have to grow pop.

To be part of a conservation bank, if there's an agreement for managing & compensation it can happen with any kind of ownership.

Any ownership works as long as they abide by agreement

A lot of the one is rural esp. w/ RCW b/c of management practices. Like to use fire for RCW which is harder closer to rural areas

Endangered ps. don't have to be present but there is a commitment to create the habitat for the species.

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

*depends on what you're doing*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*should win, should have a higher ability to absorb human use  
feel alone in busy (but large) parks  
More hunting opportunities on large properties (fishing)*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*People like to be near area in wild for solitude & finally seeing/hunting animals*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

*hunting on rural properties but suburban & urban properties are valuable (greenways, NC Museum of art)*

*Large is better than small, but value in all locations*

*Probably doesn't matter about endangered species, them being there helps add variety*

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Ownership can play into who can use the property & what the use can be. Public can be riding  
 Industrial can be restricted to a certain group of people

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

my size is useful but depends on use. Can't hunt on small property or not many people can

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

All are valuable. Even as has seasonal value that wildlife adapts to.

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

*ferret*

11. In your opinion, which market is the most open to participation by private landowners?

- top 3 {
- 3 Wetland/Stream Mitigation Banking
  - 2 Water Quality → depends on proximity to resource where it could do good
  - \_\_\_ Conservation Easements
  - \_\_\_ Conservation Banking
  - 1 Recreation (hunting, hiking, biking, etc.) → remember liability piece
  - \_\_\_ Carbon Crediting
  - \_\_\_ Other, please specify \_\_\_\_\_ → pretty tough for private landowners

Can you explain why you believe that?

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

one thing is when people consider selling an easement they might face as a better opportunity for themselves & their families (opportunity costs, more may else where)

conservation banking, being asked to do specific things

Tough call for private landowners, just more of best options future is uncertain

Mitigation are affect by various opportunities

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Generally he thinks it would make it more difficult

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Tough question

Part of landscape conservation partnership (could fear each other)  
people are good at conservation design & contacting people

Like to see a whole string of properties linking recovery pop- to Corbett property

Links between other recovery populations.

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

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After confirmation from the participant *Confirmed*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

- 1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

*Familiar with all use all w/ varied degrees*

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

*Working forest find does industrial but the rest is mostly private buy some property for public but no further*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*changed over the year used to be large influenced by partner agency capacity like larger areas but just more*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland, floodplains
- Other please specify \_\_\_\_\_

*some ag but more incidental if they get it. Mostly forests. can be pine plantation. would log to restore*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

*↳ traditional public projects (as partners)*

Endangered Species Present (strictly listed species)

- Yes
- No

*sometimes tend to be driven by goals of agency partner*

Could you please describe any other distinguishing property characteristics that you feel are important?

*Does our agency partner want us to help acquire it?  
All differ years*

*work in all suburban park & increasing urban*

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

indus. - does it make economic sense? compared to other projects  
 Private doesn't exist much outside of California b/c of scale issue  
 Public - generally can't do this b/c their management already protects carbon

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

scale is very important  
 even 5,000 may be too small to have positive returns

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

In NC, rehydrating peat to protect carbon from drying or burning  
 know less about ocean feasibility of other one

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

too small

Endangered Species Present

- Yes
- No

could be plus if you could  
 add species banks to project

Other, please specify

They like to stock nutrient & other things w/ carbon

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

Don't expect here

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

most potential as private land  
 'some industrial', private landowners seem to just be a better fit

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Public land preferred for ~~then~~ some agencies b/c they can get it for free. often these lands are not big enough to have an impact in the wetland. Large does exist for restoration only must be small to medium

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

→ impacts are here  
 → but land is available & affordable here

Endangered Species Present

- Yes
- No

they rarely present  
 but if ~~abundant~~ restoration is successful they may appear

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

Indus - qualifies but the owners typically aren't that interested & they don't want to donate their land

Most are on private family lands w/ conservation minded individuals. Receive some money but often donate some too

Public - can have it, state can hold easements on govt land. Few on state land b/c they have another system. difficult to get land out of this project. similar with federal

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

all over the place

several local can be very large

common on private land is less than 1000

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

All veg. types are eligible.

different kinds of easements, so they might just prevent development, veg type doesn't matter often you can still farm

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Tend to be more rural.

Endangered Species Present

- Yes
- No

If their present if can increase priority, but

Takes about the same effort to acquire 1 ac as it does 100ac. so get more for your time if you go big

Other, please specify

owners may want more compensation b/c of more regulations w/ their presents

conservation easement is more preferable than something like safe harbor

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

Industrial - most of these are in the gameled program or lease it to a private club. They also lease their land to hunters, they help watch over & maintain lands

Public - is open to other rec. (fishing, hiking, some hunting) we may have demand for rec other than hunting but no money to provide infrastructure

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

even small can attract hunting lease, not much but it's there

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

All forest types are good

Farmers don't want people on their crops  
Wetlands are hard to get through

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

→ growing demand for small amounts of green space  
People want to be able to walk to a park, not drive

Endangered Species Present

- Yes
- No

not originally what cities planned. Did large green spaces that you had to drive through

Other, please specify

How can private landowner encourage other rec. w/o increasing liability past revenue

access for a big issue in the location section

Thinking mainly hunting, fishing, hiking, nature study, horse back riding, biking

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

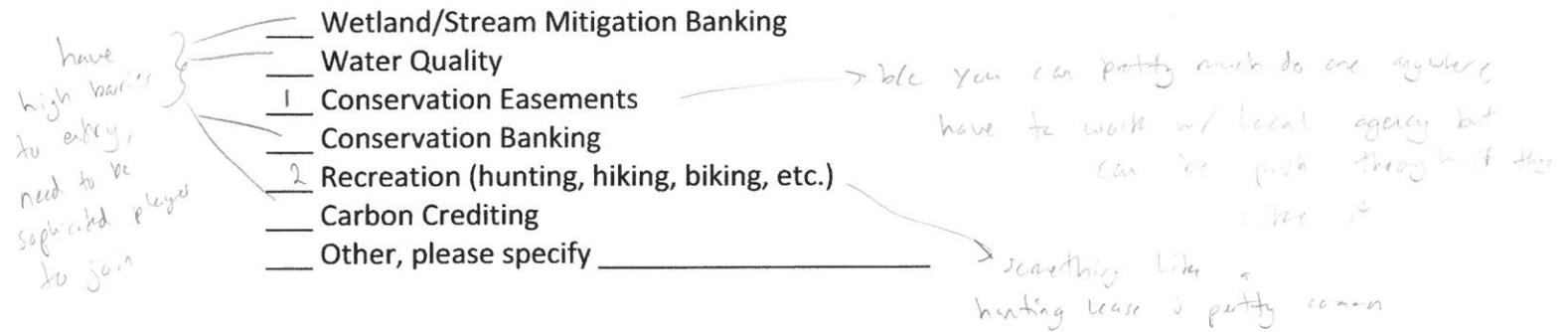
- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?



Can you explain why you believe that?

Policy may need to change to include more as markets grow this may happen

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

Barriers to entry - mitigation/market business takes a lot of work to get in. legal work etc. Need large enough property to spread costs over property to actually make money. smaller lands have harder time participating

They find out the landowners wants & needs & what is possible & can be provided financially

TCF is intending to get these properties here.

Some markets are just not big enough

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Makes it very difficult

People have diff. levels of edu. experience, trust, financial situations  
all affect how they want to participate

Can be a major barrier

Can be difficult w/ heir properties. No wills, people making  
different choices. Some want to sell, some don't

Gets more complicated w/ participation in markets because of  
commitment issues

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Example

1000 ac on Smith Creek, <sup>near Falls Lake</sup> joins park/private land protection  
taking advantage of a water quality market in Raleigh  
Raleigh is providing funds & a land trust is also helping  
Water quality protection market exists

\* in general, the bigger it is, the easier it is,  
only some experience w/ carbon

#6

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

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After confirmation from the participant *confirmed*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

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1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

*Also works with establishment  
of conservation easements  
& stream mitigation*

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

National wildlife refuge lands (majority)  
Also private, - ones that have con. easements

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Works on all, but always easier to get things done on big properties. Thing isn't size but priority ranking (characteristics, end. sp. or rare ecotype)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

depends on pine (longleaf is more interest)

Atlantic white cedar is also of interest

most oppo. in wetland this preference is changing with time. Partner program works w/ longleaf pine so they have interest here too

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present (strictly listed species)

- Yes
- No

Work on both types, majority doesn't but presence is a huge positive

Could you please describe any other distinguishing property characteristics that you feel are important?

unique ecotype that is dimensioning (like white cedar)  
if always of more interest  
wetlands w/ deep organic soils are most desirable. Peat is a carbon sink & nitrogen reservoirs (primary pollutant in NE & other areas)  
underlying soils matter.

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*doesn't matter what kind, soils & hydrology would matter here*

*good amount of carbon programs for ag. participation*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public → harder to work on here regulations make it hard

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

corporate ownership is probably fine, but industrial companies would be negative

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Typically small but can be large.

Limited market should be satisfied with small, really a neutral category here. Depends on demand. Developers need more land.

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland → h2
- Other please specify \_\_\_\_\_

Best site is one that was a wetland but is not one any more

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

better to have them but not dependent on this

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

Industrial

→ sec #5

Private

Public

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres)

Vegetation Type

Pine Forest

Hardwood Forest

Mixed Forest

Agricultural (cropland)

Wetland

Other please specify \_\_\_\_\_

assumes it is currently are (not damaged)

Location

Urban (Greater than 3 housing units per acre, city or metropolitan area)

Suburban (Between 1 and 3 housing units per acre, residential area)

Rural (Less than 1 housing unit per acre, highly agricultural/forested)

don't want to flood out neighbors →

Endangered Species Present

Yes

No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

Want land that is threatened  
 Industrial has more threat

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

bigger the better  
 Linear relationship, but  
 all are ok.

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

} depends on a rare or  
 unique assemblage  
 (longleaf → gets RCW)  
 white cedar  
 Bald cypress

Lots of small tracts (more people own  
 small tracts)

gets down to ecotype

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial
- Private
- Public

*Public land is already protected.*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*see, #7*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

hunting leases

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

strong correlation w/ size & ability to have rec. Bigger the better

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Depends, soil fertility & forest productivity  
Diverse forest stand is better for wildlife  
Hunting -> ag is good b/c certain species like to eat crops

some hunting species like this area ->

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

soil productivity should be a driver } complicated

Endangered Species Present

- Yes most people will get enjoyment at seeing an endangered sp.
- No

rural setting can produce the hunting areas, but people live in urban & suburban areas. Needs to be close enough that people will visit

Other, please specify

However, their presence may limit how you can manage the stand

Makes a lot of difference in the setting & what people want  
Some people want bear, some want deer, longleaf pine would want quail,  
waterfowl needs water/wetlands

ag is also good for lots of sp.

Rec market is low for some. Public lands provide a lot of it for free

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

However, public land can have a lot of visitors, but it is free.

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Doesn't have wild life it's probably not very good.  
wasn't old for mass production but also young for berries which need light

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- 3 Wetland/Stream Mitigation Banking  
 4 Water Quality  
 2 Conservation Easements  
 Conservation Banking  
 1 Recreation (hunting, hiking, biking, etc.)  
 Carbon Crediting  
 Other, please specify \_\_\_\_\_
- both pretty hard

Can you explain why you believe that?

- Rec is most common (some for industrial)
  - ↳ lease out to hunting clubs
- Con easement - limited funding so might not sell, but donating also has tax benefits if you donate

Carbon crediting is probably the hardest for the average person

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

Its condition and location

could be too far from the need

Wetland that is pristine is out of wetland market, need a messed up one

Also, neighbors. Neighbors/neighboring activities can conflict  
 Restoration of hydrology may flood neighbor farm field

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

More difficult, unless they can all agree.

Disagreement makes it hard.

Designated leader can make it easier

Other problem is receiving commitment and those actions happening is difficult

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

stream mitigation - dam removal, ugly dam in area w/ lots of stream mitigation needs is good, esp. if it didn't make a bunch of wetlands behind it.

Ag that has gone too far into wetlands - good for con. cost of wetland mitigation

Property that is natural & has endangered species is super easy to get con. agreement  
↳ (has natural character)

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After confirmation from the participant *Confirmed*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

*Banks for Private lands  
↳ for Public Banks*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*mostly small, small % medium*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland) → *occasional*
- Wetland
- Other please specify \_\_\_\_\_

*Just generally not, banks*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present (strictly listed species)

- Yes
  - No
- Do searches, but don't see them often*  
*do searches for permits*

Could you please describe any other distinguishing property characteristics that you feel are important?

*focus on wetlands & streams, eat habitat if its there  
conservation & preservation of rare plant communities*

*Don't write here*

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*can be, but don't want forested wetlands, so they can be enhanced*

*don't want prior converted wetlands,*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No *→ don't every really have them present*

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

→ hard to find enough land to convert

Endangered Species Present

- Yes
- No

don't want to disturb them

Other, please specify

if it's super small (like 30 acs) this is bad b/c it's not economically feasible. Too much money to convert

Forested doesn't work b/c they can't cut trees to make wetlands

well drained soils is negative, hilly, no water source is also negative

no streams or deep water table

Don't deal with these  
just there for their  
bank so answer me the  
same

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

Don't do the other

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

Not sure b/c of their narrow focus  
 she thinks recreation is the most, 2nd would be conservation easements & water quality

Can you explain why you believe that?

doesn't think carbon has hit the area.  
 wetland & stream has lots of parameters which closes it

our area, money more for land on fringe of rural to suburban  
 con. eas. for money & protection  
 others want to develop for money

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

see negatives from wetland  
 size, soils, water

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Depends on structure they have in place  
and who has the final say  
Can be extremely difficult

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

mitigating banking

- open field, ag land that's flat

clay soil, prior converted wetlands

shallow water-table, perennial stream that is well connected  
to flood plain

Ditches that can be filled in.

Something with little earthwork

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

There is minimal risk involved in participating in this survey. Names of individuals will not be published and will be kept separate from response notes. Organization names will be published, but mostly along with aggregate results. Individual organizations may be mentioned as the best organization to speak with if a property has a certain characteristic or if landowners want to get involved in a certain market. There is minimal risk of your responses being traced back to you, however, if you are part of a small organization that has few employees being interviewed, the risk of your answers being traced back to you are higher. Information published from the interview will not contain any personal information.

You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

After confirmation from the participant *Consent*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements / fee purchases -> selling land to conservation
- Conservation Banking

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public

*landowners but also partner w/ public agencies  
a lot of the land ends up in public management/ownership*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*Has done all sizes less than 1000  
77,000 acres*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*want more natural areas, but will  
revert ag land*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

*can be near  
some development*

Endangered Species Present (strictly listed species)

- Yes
- No

*not necessarily*

Could you please describe any other distinguishing property characteristics that you feel are important?

*Location is very important & what's there, not heritage info or survey info with important stuff.  
Can we connect different pieces together? Like a puzzle  
Case Study property is a good example of a property in a good location & great habitat*

not super familiar  
but very interested

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

larger the better

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

soil carbon

coastal plain & wetlands have

soil carbon

standing trees are good

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

↳ location

Endangered Species Present

- Yes plus but not essential.
- No

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public

*Public lands are already protected*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Some high quality natural wetlands can be isolated & good (Cordova bays) unusual vegetation & location but still great. Can be in any setting. Hard to pick isolated wetlands but can still be beneficial.

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

small wetlands for water quality  
hard for the back in the area is questionable

Endangered Species Present

- Yes - just a bonus
- No

Other, please specify

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial
- Private
- Public

Public Land is already is protected

If it slated for development it could benefit though

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Smaller patches don't contribute much esp. if they're not connected

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

*Larger the better*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

*The more natural the better  
Doesn't like to keep an area in  
pine plantation but may be only  
option for protection*

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

*smaller can be  
beneficial for  
urban*

Endangered Species Present

- Yes
- No *icing on cake*

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

less familiar  
not their  
but like main concern  
education & recreation  
passive  
They do leave land  
from hunting

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

depends on recreation  
still larger the better

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

mixed  
wetland, can be good for passive recreation

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

} all have important  
recreation uses

Endangered Species Present

- Yes
- No

Other, please specify

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
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 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

appealing if they're ok w/ restrictions

→ not always involved here unless it's the take-and depends on the landowner

→ these can tie in together

→ also needs to mature, not many users

→ landowner use it themselves or lease lands

→ needs to mature & stabilize, complex return can be good though can be good for big players

Can you explain why you believe that?

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

You need a property that has something

- need impaired wetlands
- need carbon options & size
- wildlife, good habitat etc.

what's on the property is important

Smart, patient, & wealthy enough landowners that can ride out the uncertainties that come w/ the market

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

More difficult

if multiple people aren't in agreement then it's hard to decide what to do.

Transition - family had land but kids moved away

may generate income but no acres or it any more

They're willing to talk & sell for conservation. Can be

very appealing to a lot of people. They like it being in

conservation

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Natural habitat, great location, (like case study)

good stuff & good connections to other areas

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After confirmation from the participant *Confirmed*

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- 1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

*these 2  
are*

*all marginally or conceptually  
not as a practitioner  
but review stuff for conservation  
& wetland as well*

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

All over the board

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial *→ some need for wetland & stream permits*
- Private
- Public *mostly, b/c they manage wildlife refuges carbon here, want to focus small market*

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres) *→ carbon - 1,000 to 10,000 acre chunks*
- Small (below 1,000 acres) *→ wetland*

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland, *reservoirs behind dams as well*
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested) *↳ b/c the office is conservation agency, restoration, protection of wildlife*

Endangered Species Present (strictly listed species)

- Yes *Endangered species related important areas are rural*
- No *get more attention b/c they are less damaged b/c they are involved in permitting (HEP) & managing*

Could you please describe any other distinguishing property characteristics that you feel are important?

*Job is what brings these characteristics benefit to endangered species, conservation/mitigation benefits*

*Almost all discretionary to enhancing conservation of certain resources*

The market he knows of in NC is theoretical, involves wetland restoration for soil carbon. Projects are demonstrations, have been funded, but no market really (yet)

#9

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

Industrial

Private

Public → cost of ownership is offset & just need money for restoration. Re-flood peat lands that have been drained to keep peat from decomposing. viable when you don't have to buy land

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres)

Vegetation Type

Pine Forest

Hardwood Forest

Mixed Forest

Agricultural (cropland) → lands that were wetlands but were drained for ag.

Wetland *raising*

Other please specify \_\_\_\_\_

Location

Urban (Greater than 3 housing units per acre, city or metropolitan area)

Suburban (Between 1 and 3 housing units per acre, residential area)

Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

Yes

No one less thing to deal with

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial
- Private
- Public

Lots of competition for this kind of area.  
Private is more costly

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Don't make math work

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

none is general

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

can get worked through, but complicate things

Other, please specify

No market, although there has been shown feasibility, math makes sense

Flooded lands don't burn/decompose so carbon is stored

No requirement for carbon mitigation so market isn't here  
^  
in NC

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

Industrial

To get credit it tends to be private

Private

Public

Just done on public b/c it's the right/beneficial thing to do, no money

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

match better w/what's needed

Small (below 1,000 acres)

Vegetation Type

Pine Forest

reservoirs to turn to stream

Hardwood Forest

drained agriculture lands

Mixed Forest

Agricultural (cropland)

Wetland

Other please specify \_\_\_\_\_

Location

Urban (Greater than 3 housing units per acre, city or metropolitan area)

Suburban (Between 1 and 3 housing units per acre, residential area)

Rural (Less than 1 housing unit per acre, highly agricultural/forested)

↳ outside of area to get the credits sold, not close enough to impacts

Endangered Species Present

Yes

No

just simpler if they're not there

birds caught

Other, please specify

Projects close to impacts (same watershed thing)

Energy behind private markets is the requirements for it to be done

not sure of anything overtly negative  
they don't search for them just see the  
acres that come through

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

They wouldn't do w/ industrial & urban in their office

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

They don't tend to be big

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

↳ too rural, not demand for credits

Endangered Species Present

- Yes
- No

Other, please specify

Just do comments on these

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Ownership

- Industrial
  - Private
  - Public
- riparian buffers  
Taking advantage of the programs being funded

Size

- Large (above 5,000 acres)
  - Medium (between 1,000 and 5,000 acres)
  - Small (below 1,000 acres)
- ↳ private lands tend to be small

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
  - Suburban (Between 1 and 3 housing units per acre, residential area)
  - Rural (Less than 1 housing unit per acre, highly agricultural/forested)
- ↳ could be subset of what they look at

Endangered Species Present

- Yes
  - No
- Agency tends to give money for endangered species but credits are stretched & those areas that benefit a lot of species get the money (CA)

Do lands benefit endangered species?

This is what FW answers to holder properties potential  
 Won't pay for end sp alone but can hold a properties value for conservation

Don't do the work so they  
don't see the negative,  
only see the ones that are working

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial → may make people shy away
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

They just don't see  
can see the projects but don't see them as a market.  
They are paired on the market project as a second benefit.

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

valuable, but no  
paid for solely

Benefits that can be compatible &  
stacked with others, just not a  
market to sell on their own

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

see #9

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking
- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

ones that have programs already established for private landowners, or that they can sell to others for some benefit/compliance w a regulation

Just so few markets in NC

Can you explain why you believe that?

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

Few actual markets

Lots of things that are beneficial but not marketed

Lack of contacts & knowledge about what can be done & who can do it

Location - interesting areas aren't those necessarily under threat or they don't provide benefits when they are needed

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Don't know don't do projects with heirs

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

FWS in into conservation & those that benefit <sup>and</sup> species

Dam removals work well for stream restorations.

streams can find path that hasn't been overleached on because it was under a lake the whole time.

Work well, get stream credits & benefit species benefits

Can have wetland benefits. Can regrow veg as it's own from seeds in impoundment. Great place to grow

Stream credits are sold to developers

So many & ecological benefit. Simple to do. Take the dam out & let

it do everything naturally  
Human intervention is minimal & practical, but lots of benefits

Hello, this is Katie Thomas with North Carolina State University. I am calling about the study on ecosystem service markets that you agreed to participate in. The purpose of this interview is to ask about your experience in ecosystem services to determine relationships between property aspects and successful participation in different markets. The goal of this study is to increase the general knowledge of these markets and to create a guide to help private landowners determine the best ecosystem services options for their land.

There is minimal risk involved in participating in this survey. Names of individuals will not be published and will be kept separate from response notes. Organization names will be published, but mostly along with aggregate results. Individual organizations may be mentioned as the best organization to speak with if a property has a certain characteristic or if landowners want to get involved in a certain market. There is minimal risk of your responses being traced back to you, however, if you are part of a small organization that has few employees being interviewed, the risk of your answers being traced back to you are higher. Information published from the interview will not contain any personal information.

You can refuse to answer any particular question and you may stop or withdraw from the interview at any time.

Please verbally confirm that you have received, read, and understood the risks and benefits of participating in the interview and that you are willing to continue the process.

*After confirmation from the participant* *Confirmed*

Thank you. You have provided your consent to participate in this study.

What follows is a 14-question interview to gain information about various ecosystem service markets and the kinds of lands that are best able to participate in them. Please feel free to ask any clarifying questions or ask for the question to be repeated.

In this interview, "ecosystem services" are defined as benefits people receive from ecosystems. Such benefits include food, flood regulation, water quality, recreational opportunities, and other benefits. Actions by people have caused changes in the provision of these benefits by the ecosystems. In some cases, services have been degraded due to development of natural lands. Markets have been developed in an effort to protect these services by incorporating the loss of the benefits into the economy. In this interview and others like it, I hope to determine what characteristics of a piece property are most important in determining the amount of revenue it can derive from various ecosystem service markets.

1. Please tell me which of the following ecosystem service markets you are most familiar with.

- Wetland/Stream Mitigation Banking
- Water Quality
- Conservation Easements
- Conservation Banking

- Recreation (hunting, hiking, biking, etc.)
- Carbon Crediting
- Other, please specify \_\_\_\_\_

2. This question will classify which kinds of property you work with most frequently. I will be asking you about five property characteristics, Ownership, Size, Vegetation Type, Location, and if Endangered Species are present, and will be giving you choices for each category. Please tell me which choice in the category best describes the kind of property you work with most frequently.

Ownership

- Industrial
- Private
- Public → sometimes

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Can be anything at all  
Rarely convert urban/impervious surface

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area) - rare, but a treat
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

→ TMDL credit stuff (stream restoration)  
limited by the size you can fit into the easement

Endangered Species Present (strictly listed species)

- Yes
- No

Rarely been any  
Banks will always be rural, mostly old farmland.  
Suburban is project specific.  
Development that wants onsite mitigation

Could you please describe any other distinguishing property characteristics that you feel are important?

Want land that hasn't been compacted (avoid logging sites)  
Trees won't grow b/c of soil compaction  
Desirable property is one that doesn't have existing easements  
Like easement with mineral rights to someone else

Don't know the market

3. Please describe which property characteristics you feel are most related to the successful participation (its ability to receive payments from a market) of a property in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

4. Are there any characteristics that you feel negatively affect a property's ability to participate in the carbon market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

underlined is negative

5. Please describe what property characteristics you feel are most related to the successful participation of a property in the wetland mitigation market.

Ownership

Industrial

Private

Public

Easier to deal w/ individual than bureaucrats

Industrial probably has too much liability

Public has more red tape, more people to communicate with

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres)

good size is 40-100

Vegetation Type

Pine Forest

Hardwood Forest

Mixed Forest

Agricultural (cropland)

Wetland

Other please specify \_\_\_\_\_

Ag is always #1, easier to find big chunks of land, soils are in more favorable condition

Lot of old ditched lands to be restored

construction & ecological benefit

Location

<sup>3</sup>  Urban (Greater than 3 housing units per acre, city or metropolitan area)

<sup>2</sup>  Suburban (Between 1 and 3 housing units per acre, residential area)

<sup>1</sup>  Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

Yes

No

Can be beneficial, projects that benefit species can get green lighted funds

Other, please specify

\* MBI site selection criteria

Forest is not ideal

ideally these are some to show the project will succeed

6. Are there any characteristics that you feel negatively affect a property's ability to participate in the wetland mitigation market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

Do in conjunction w/ Banks

So answers match up with Bankley

7. Please describe which property characteristics you feel are most related to the successful participation of a property in conservation easements.

Easement is byproduct of bank

Ownership

- Industrial
- Private
- Public

Size

- Large (above 5,000 acres)
- Medium (between 1,000 and 5,000 acres)
- Small (below 1,000 acres)

Vegetation Type

- Pine Forest
- Hardwood Forest
- Mixed Forest
- Agricultural (cropland)
- Wetland
- Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)
- Suburban (Between 1 and 3 housing units per acre, residential area)
- Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes
- No

Other, please specify

8. Are there any characteristics that you feel negatively affect a property's ability to participate in conservation easements?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

Personal experience, not through the company

9. Please describe which property characteristics you feel are most related to the successful participation of a property in the recreation market.

Ownership

Industrial

Private

Public

Public land is where people can access the rec

Hard to organize enough land with private entities

Also have to consider maintenance, Parks will keep it up more than land owner

Size

Large (above 5,000 acres)

Medium (between 1,000 and 5,000 acres)

Small (below 1,000 acres)

Bigger is better

Vegetation Type

Pine Forest

Hardwood Forest

Mixed Forest

Agricultural (cropland) → less than ideal

Wetland

Other please specify \_\_\_\_\_

Location

3  Urban (Greater than 3 housing units per acre, city or metropolitan area)

2  Suburban (Between 1 and 3 housing units per acre, residential area)

1  Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

Yes

No

People & endangered species don't mix

People can't use it w/ the species

Other, please specify

10. Are there any characteristics that you feel negatively affect a property's ability to participate in the recreation market?

Ownership

- Industrial  
 Private  
 Public

Size

- Large (above 5,000 acres)  
 Medium (between 1,000 and 5,000 acres)  
 Small (below 1,000 acres)

Vegetation Type

- Pine Forest  
 Hardwood Forest  
 Mixed Forest  
 Agricultural (cropland)  
 Wetland  
 Other please specify \_\_\_\_\_

Location

- Urban (Greater than 3 housing units per acre, city or metropolitan area)  
 Suburban (Between 1 and 3 housing units per acre, residential area)  
 Rural (Less than 1 housing unit per acre, highly agricultural/forested)

Endangered Species Present

- Yes  
 No

Other, please specify

11. In your opinion, which market is the most open to participation by private landowners?

- 3 Wetland/Stream Mitigation Banking  
2 Water Quality  
4 Conservation Easements  
5 Conservation Banking  
 Recreation (hunting, hiking, biking, etc.)  
 Carbon Crediting  
 Other, please specify \_\_\_\_\_

Can you explain why you believe that?

- Fee easiest, Lots of entities to work with, but not as much money for landowners
  - Con. easement doesn't have much incentive
- Mt. Banking is not as open b/c of supply & demand. Need development in watershed

12. What would you say most restricts a property from participating in markets for ecosystem services? Is there anything that negatively affects how well a property does in earning income from an ecosystem market?

- Existing easements on property
- Size of property is better, bigger tends to be better
- Quality of current ecosystem. Really good wetland/watershed doesn't have much to fix so no credits
- Impaired ecosystem watershed has more options

13. How does working with multiple heirs affect the prospects of enrolling a property in a market for ecosystem services? Does it make the process more difficult or easier?

Usually not bad.

In Mit. Banking there is a designated long term steward

Helps process.

14. Please pick one market, and describe what you would consider to be the perfect property to be enrolled in that market.

Wetland Mit.

150 acres of pasture or row crop that has a lot of ditched & drained areas

~~Few existing stands of forest~~

In impaired watershed

Adjacent to property with bog turtle (endangered sp)

lots of forested wetlands for preservation

**Appendix III**  
**Information Pamphlet for Landowners**

## **Introduction**

Markets for ecosystem services are a developing way for private landowners to benefit financially from their land while maintaining its natural integrity. Determining which market is most appropriate for you as a landowner can be an intimidating process if you are unfamiliar with the concept of markets for ecosystem services as a whole. This pamphlet explains what markets for ecosystems are, the goals behind some common markets open to private landowners, and the common attributes seen within properties successfully participating in these markets. The goal in providing this information is to help you decide which ecosystem service market to explore further, based on the structure of your property.

## **What are Ecosystem Services?**

Ecosystem services are simply the benefits we receive from natural functions. Food, timber resources, clean water, fresh air, and recreation opportunities are all good examples. A healthy ecosystem will provide a variety of services without human management but increasing rates of development threaten the supply of these services. Development fragments and degrades natural areas, disrupting the systems that produce the benefits we normally enjoy. Although there is an increased desire to protect natural lands from development in order to maintain the supply of these beneficial services, the high financial reward of developing property can outweigh the intrinsic value of undeveloped land for some landowners. One strategy to increase conservation of natural lands is to make conservation more financially competitive with development by creating markets for different ecosystem services. Landowners can become suppliers in these markets and receive payments from those who are causing reduction in the services elsewhere. As a landowner, enrolling your property in a market can help increase your revenue, making development less appealing if you are also interested in conserving your land.

## **Important First Steps: Classifying Your Land**

The purpose of this pamphlet is to help you decide which market you should research first based on what your property has to offer in five different attribute areas: ownership, size, vegetation type, location, and endangered species. The values of each category and their definitions are as follows:

1. Ownership
  - Owned by an industry or company (Industrial)
  - Owned by an individual or family (Private)
  - Owned by the State or Federal government (Public)
2. Size of Property
  - Above 5,000 acres (Large)
  - Between 1,000 and 5,000 acres (Medium)
  - Below 1,000 acres (Small)
3. Vegetation Type
  - Pine Forest
  - Hardwood Forest
  - Mixed Forest
  - Agricultural (cropland)
  - Wetland
4. Location
  - Greater than three housing units per acre, city or metropolitan area (Urban)
  - Between one and three housing units per acre, residential area (Suburban)
  - Less than one housing unit per acre, highly agricultural/forested (Rural)
5. Endangered Species (strictly listed species)
  - Present
  - Not Present

With each ecosystem service market presented in this pamphlet, we will provide some basic background and explain what property attributes tend to do well within the market. A summary of this information is provided in Table 1 with more detailed information in the sections following. We will also present additional factors to consider while researching markets on your own so you are more prepared when you contact an expert in the market to discuss your participation potential.

Table 1: Summary of the Key Characteristics and Favored Property Attributes of Each Market

Market	Key Characteristics	Favored Property Attributes
Conservation Easements	<ul style="list-style-type: none"> <li>• Legal agreement between property owner and a land trust</li> <li>• Potential tax benefits</li> <li>• Loss of development rights</li> <li>• Agreement is perpetual</li> </ul>	<ul style="list-style-type: none"> <li>• Private or industrial ownership</li> <li>• Large property size</li> <li>• Natural vegetation</li> <li>• Rural location</li> <li>• Endangered species present</li> </ul>
Wetland Mitigation Banking	<ul style="list-style-type: none"> <li>• Regulated by The Clean Water Act of 1972</li> <li>• Four ways to generate credits: preservation, restoration, enhancement, and creation</li> <li>• Each method has a different credit ratio determined on a case by case method</li> </ul>	<ul style="list-style-type: none"> <li>• Private or industrial ownership</li> <li>• Small property size</li> <li>• Suburban or rural location</li> <li>• Prior converted wetland</li> </ul>
Carbon Banking	<ul style="list-style-type: none"> <li>• Main market is in California</li> <li>• Can do Avoided Conversion, Improved Forest Management, or Reforestation to generate credits for carbon sequestration</li> <li>• Property must be managed for sequestration for 100 years</li> </ul>	<ul style="list-style-type: none"> <li>• Private or industrial ownership</li> <li>• Large property size</li> <li>• Rural location</li> <li>• Wetland</li> </ul>
Recreation	<ul style="list-style-type: none"> <li>• Many different activities are possible</li> <li>• Few offer significant payments to the landowner</li> </ul>	<ul style="list-style-type: none"> <li>• Large property size</li> <li>• Far enough from people to provide enough land, but close enough to people that they can access it</li> </ul>

## **Ecosystem Service Markets**

The following subsections contain information about four common markets for ecosystem services in North Carolina, South Carolina, and Virginia. A brief explanation of the structure of each market and its governing regulation is provided, as well as what property values tend to be the most successful in each market.

### *Conservation Easements*

Conservation easements work to protect natural land by creating a legal agreement between you as a landowner and a land trust. You can sell your land to the proper organization or donate the land to receive tax benefits in some cases. Once land has been sold or donated, various activities are restricted to protect the natural integrity of the land. Oftentimes you will maintain overall ownership, but you no longer have the development rights for the property.

Conservation easements can be applied to many kinds of properties. The attributes that positively affect a property's appeal for a conservation easement are private or industrial ownership, large size, any natural vegetation, rural location, and presence of endangered species. Private and industrial ownership is advantageous because private and industrial land is unprotected, in contrast to public land. Therefore, putting an easement on private or industrial land increases the amount of total land under protection which helps further the goals of the land trust. Large sizes are favored because they protect more area, however, too large of a property can be an issue if the owner is not willing to donate a portion of the land. The land trust may not have enough money to buy the development rights for the entire property, leaving a percentage of the land unprotected. Additionally, the location of the property is more important than size. Small properties with rare ecotypes, or ones that connect existing protected areas can be more valuable than large, isolated areas. Any vegetation type is beneficial, as long as it is the natural vegetation type for the area. Rural lands are favorable because there is more land available for conservation and it is cheaper than urban and suburban land. Suburban land can also be beneficial if it is in an important location or has a rare ecotype, but conservation in rural areas is more common. Rural and suburban lands are also more desirable than urban lands because they are less fragmented. A fragmented ecosystem is not as effective as a larger, connected system because the flow of resources and organisms in and out of the area is limited. Finally, presence of threatened or endangered species is a positive attribute for development of a conservation

easement because land trusts want to help protect the species from further harm. The lack of an endangered species does not preclude a property from an easement, but the presence does increase desirability.

### Wetland Mitigation Banking

Wetland mitigation banking developed in response to the regulations established by the Clean Water Act of 1972 (33 U.S.C. §1251 et seq.). Section 404 of the Act (33 U.S.C. 1344) regulates the discharge of dredge or fill materials into navigable waters (including wetlands) of the United States. This prevents avoidable damage to established wetlands that provide important ecosystem services and creates a demand for methods of mitigating negative wetland impacts. The 2008 Mitigation Rule established purchase of credits from mitigation banks as the preferred method for organizations to comply with Section 404 of the Clean Water Act (Compensatory Mitigation for Losses of Aquatic Resources, 33 C.F.R. § 332). Credits are generated by restoring, creating, enhancing, or preserving wetlands and organizations who have caused any unavoidable impacts to water resources can purchase credits in the same watershed to mitigate the losses.

For each project, a ratio of project acres to credits produced is determined based on the typical success of the mitigation method in replacing the functions lost and the quality of the impacted wetland. The typical ratios of each are as follows:

- Preservation- 5-10 acres preserved : 1 credit
- Restoration- 1:1 to 2:1
- Enhancement- 3:1 to 5:1
- Creation- 1:1 to 2:1

Preservation simply helps to prevent further loss of wetlands in the watershed by protecting intact wetlands. The other three methods involve establishing certain criteria found in all wetlands: hydrophytic vegetation, hydric soils, and wetland hydrology. Restoration involves wetlands that are missing two of the three criteria for wetlands and restores those two functions. Enhancement means restoring or improving one of the three functions in an area with the other two criteria. Creation requires establishing all three criteria in an area where there were none before. Restoration, creation and enhancement are preferred over preservation because these

methods re-establish the services that were lost. This is why the credit ratios for these three methods are smaller than the ratios for preservation.

The most favorable attributes for participation in wetland mitigation markets are private or industrially ownership, small, non-specific vegetation, and located in suburban or rural areas. A key attribute of a property involved in wetland mitigation is the area was once wetland but was altered by people. A good example is agricultural land that has been ditched and drained to plant crops. Such an area can be restored or enhanced to generate credits to sell in the mitigation market. Most projects are small because that is what the average landowner holds, but projects can be done on larger properties. Rural and suburban areas are considered positive traits because land is cheaper and remains undeveloped. Urban location negatively affects a property's potential because there is little land available for conversion, the property is expensive, and neighbors can be concerned about a wetland adjacent to their property. An important consideration with the location of projects is that credits must be sold in the same watershed as created. In sum, areas with available, previously converted wetland, sharing a watershed with a highly-developed area are most favorable.

### Carbon Banking

In 2012, the California Environmental Protection Agency Air Resources Board ruled that industry in California must take steps to lower their Carbon footprint. The overall goal is to reduce greenhouse gas emissions to 1990 levels by 2020, and to achieve an additional 80% reduction by 2050 (California Air Resources Board, 2017). Reductions are regulated through a cap and trade program which limits the amount of carbon an industry can emit (the "cap") but allows industries who can reduce their emissions below their limit to sell their excess credits to industries who cannot meet their limits (the "trade"). Industries can reduce their carbon emissions by investing in technology to achieve set goals, or by mitigating emissions following rules set by certain protocols. The protocol examined here is the Forest Protocol (California Air Resources Board, 2015) where management actions work to increase the amount of atmospheric carbon sequestered (or stored) by forests. This allows for creation of credits that can be sold to buyers in the California market in three ways: Reforestation, Improved Forest Management, and Avoided Conversion. Reforestation works by growing trees in a cleared area (such as an old farm field). Improved Forest Management is done in a currently forested area and management actions

are altered to maximize the amount of carbon stored by the trees in that location. Management actions include longer timber rotations, higher stocking, and fertilization. The final option is Avoided Conversion. This option protects land that would otherwise be cleared for development or an alternative land use. For each option payments for credits can be received annually, but projects must be enrolled and managed for 100 years and have a backup bank in case something negatively affects the sequestration of the main location (like a hurricane that knocks down several acres of trees). Enrollment and monitoring costs are also very high across the life of the projects. Enrollment is considered financially impractical unless the property is at least 5,000 acres.

Positive attributes of a property being successfully involved in the carbon market are private or industrial ownership, large size, in a rural area, and considered to be a wetland. The most important attribute for successful enrollment in the carbon market is large property size. Enrollment in the carbon market takes a significant financial investment to determine baseline carbon levels and for monitoring over the 100 years of the agreement. Generally, only large properties can regain the costs of enrollment and monitoring. Related to this factor, rural properties tend to be larger and cheaper than suburban or urban properties, making it easier to absorb the expenses of the carbon market. Finally, the most popular vegetation type is wetland, due to the ability of wetland soils to store large amounts of carbon.

### Recreation

This market has a wide range of opportunities catering to different consumers, but very few offer significant payment. Common recreation opportunities include hunting, camping, hiking, fishing, bird watching, and various water activities. Leasing property for hunting purposes is a common recreation option that brings in revenue to the owner. Property can also occasionally be leased to the county or state to provide some other recreation uses, but this is largely dependent on available funds.

Recreation is a difficult market to determine positive and negative property aspects because the beneficial attributes largely depend on the recreational activity offered. The only property aspect consistently considered beneficial is large size. However, the benefit of a large property can be negated by its location. Large, rural properties may be well-suited to providing one or more activities, but if they are too far from people they will not be utilized. The property

must be large enough to provide the activity, but conveniently located to enough people that it will be consistently utilized.

Other activities are harder to maintain for income on private lands because of competition from public lands. Public lands provide the recreational activity for free or for a smaller fee than private land, but higher availability can lower the quality of the activity for some people. Private lands have higher fees, but generally provide higher quality recreation because fewer people are participating in the activity. The demand for an activity must be high enough to decrease the enjoyment of the activity in a public park for individuals to feel the need to seek out privately provided recreation. Hunting is an easy recreational activity for private landowners to provide profitably. The demand is high enough to lower hunting quality on public lands, so individuals are willing to pay for areas with less people and higher quality hunting.

The primary land attribute that negatively affects recreation potential is the presence of endangered species. Human presence can put additional pressure on the vulnerable species, and people intentionally seeking out the endangered species can cause unneeded stress on the individuals. Presence of endangered species also places restrictions on the desired recreational activities to protect the species from human encroachment. Management is more easily conducted when endangered species are absent.

### **Questions for Consideration**

Keep in mind, the attributes mentioned are just the MOST favorable for each market, not the ONLY attributes the markets can benefit from. Especially with more flexible markets like recreation and conservation easements you may be able to participate even if your property does not seem to perfectly fit the attributes described. Additionally there are many other factors that influence the ability to participate in any market, which could affect your success and ability to enroll. Some additional things to ask yourself while exploring different markets are:

- What are the goals for your land?
- Would you like to continue any active management or would you like an organization to completely manage your property?
- Do you need steady payments?
- Can you afford upfront costs of enrollment and future management?
- Are you willing for your land to have public access?

- What is your primary reason behind your desire to participate in an ecosystem service market?
- Are you more willing to work with a private or a public company? Local or federal government?
- Do you have many heirs that will one day lay claim to the property? Are you willing to enroll one of them as the head decision maker for the property in case something happens to you?

Considering these questions before talking to a market representative will help you be better prepared for your initial conversation. Your answers to these questions can help decide which market is right for you personally, and not just which one fits your property structure.

### **What's Next?**

Now that you understand what property aspects are favorable in each market, you should be able to better determine which market your property has opportunity in. Consider the questions above and begin reaching out to environmental organizations in your area that work in the market.

## **Sources**

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