PARTICIPATION IN CALIFORNIA'S FOREST CARBON OFFSET PROGRAM: MOTIVATIONS AND BARRIERS

A Thesis
by
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Abstract

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The State of California has the most comprehensive climate change policy in the United States in the form of a cap and trade program. The program has received international attention as a potential model for government-driven mitigation strategies. Within the program is a carefully constructed forest carbon offset component. Although the program is still relatively new, continuing analyses can assist in providing feedback for improving the program and for highlighting exemplary features that can be used by other programs in their formative stages. This work investigates the forest offset protocols where there are low rates of participation. Interviews and surveys provide a basis for understanding the motivations for entry and the barriers to participation landowners face in registering a project into California's forest carbon offset program. Six major criteria for credits are discussed (*real, enforceable, verifiable, additional, permanent,* and *quantifiable*) and preliminary findings suggest that the most serious barriers are the long time commitment, the high cost of entry coupled with a low-rate of return, and competing

environmental programs. Finally, recognizing the ultimate goal of mitigating the effects of climate change, commentary about perceived barriers and recommendations for reducing barriers is included.

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1. Introduction

1.1 Background

Now that scientific consensus has been reached on the fact that climate change is a real and serious concern, policy decisions regarding exactly how to handle the problem need to be made. Despite some proposals, no policy decisions have been made at the federal level nor are there pending proposals that appear imminent. One potential proposal was The American Clean Energy and Security Act, which would have created a national level economy-wide greenhouse gas (GHG) cap and trade system. This bill passed in the House but died in the Senate of the 111th Congress.

In response, states and regions have taken on the task of addressing mitigation strategies without the umbrella of the federal government. There is currently budding policy in the northeastern and Mid-Atlantic states collaborating on the Regional Greenhouse Gas Initiative (RGGI) which seeks to limit the amount of carbon output from nine states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont). Statewide, California has passed and implemented the Global Warming Solutions Act of 2006, which seeks to reduce emissions to the 1990 level by the year 2020 and to 80% below 1990 levels by 2050 (California Air Resources Board 2015b).

A number of policy solutions have been offered as to exactly *how* to decrease net GHG emissions, among which is the market-based approach of cap and trade. A cap and trade system is a market-based public policy developed to create a market for one of the world's most important pollutants: carbon dioxide. The government sets the limit on an

acceptable level (cap) of emissions and then decreases that limit every year. Regulated entities are then obligated to either (a) reduce their carbon dioxide emissions or (b) buy, sell, or bank emissions permits (trade) to stay within their prescribed limit.[1] The cap need only be met on a macro level. Therefore, regulated entities, including most of the power sector such as petroleum refineries, electric power distributors, and fossil fuel power generators, may trade allowances or permits to meet their own necessary reductions in the most efficient way possible. In comparison to other environmental policies, cap and trade is cost-efficient, making it a pragmatic political solution. It also presents a win-win situation for both government and the covered entities. The same amount of emissions reductions are achieved as if the government had set a command-and-control[2] regulation, however the means of staying within the cap are left to the covered entities and the demands of the market.

Cullenward (2014) offers the analogy of a game of musical chairs. In the analogy of the popular children's game, each emitting firm is a player in the game. The government is the person in charge of the game who removes one chair each round and slowly the emissions are reduced over time. The yearly decrease in allowable emissions levels and the flexibility in how entities achieve their net reductions allow the market to successfully regulate emission levels.

With the implementation of comprehensive climate change legislation, California is leading the way for other states, regions, and countries who are setting up their own carbon markets as a test case. The successes and failures experienced in the California compliance market will likely influence the design of future markets. The world is watching.

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[1] One carbon dioxide permit equals one metric ton of carbon dioxide emissions ($MTCO_2e$).

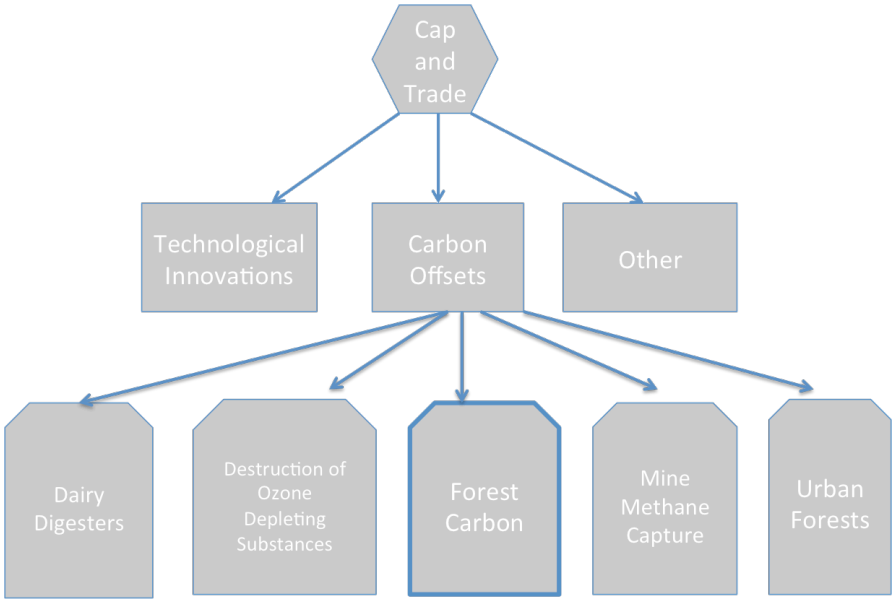
[2] Command- and-control regulations refer to a traditional method of environmental policy popular in the U.S. in the 1960s and 70s wherein the government sets a limit and industry is legally bound to comply with the standard.

One way of combating climate change is to not necessarily pollute less but rather to find a better way for the environment to the handle that pollution. This can be done in forests through a process called carbon sequestration. This is the process by which forests act as sinks, housing carbon and thus preventing it from being emitted into the atmosphere. Forests with certain characteristics sequester more carbon, essentially preventing it from entering the atmosphere and contributing to climate change. By investing in forests and other land use changes, stakeholders can make changes in how we perceive forests.

The method through which carbon sequestration is managed in the California cap and trade program is the carbon offset component (California Air Resources Board 2015b). Again, with the goal of efficiency, emitting firms may choose to meet their yearly levels of pollution reductions by purchasing carbon offset credits – the later cannot exceed more than 8% of the annual emission reductions. Carbon offsets come in many forms including offsets for dairy digesters, the destruction of ozone depleting substances, methane capture, urban forests, and forestry (see Figure 1).

The focus of this work will be on forest carbon offset credits, that is offset credits earned from forest management projects. The rationale behind this is that policymakers are creating an alternative to traditional forest management techniques by placing an actual monetary value on something – carbon sequestration by forestlands – that society values as a public good. Regulated entities that need to decrease their carbon dioxide emissions to comply with government regulations may purchase these carbon offsets to meet their own obligations. Offsets are a tradable credit representing the quantified, measured, and verified reduction of one metric ton of GHG emissions.

Figure 1: *Cap and Trade Components*



To ensure they are under the cap, emitting entities may invest in technological innovation, purchase carbon offsets, or employ some other method. If they choose to use carbon offsetting to meet the allowance, dairy digesters, destruction of ozone depleting substances, methane capture, and urban forests also provide markets for carbon.

Despite two active years of implementation and an apparent win-win situation for the government and landowners, there are still low numbers of participants in the forest offset program. Therefore, there must be something limiting entry into the program. What might that something be? What are the barriers landowners face in listing a forest offset project under California's forest offset project protocol? Furthermore, what were landowners' initial motivations in registering a project? This paper will present the results of surveys and interviews with experts, verifiers, landowners, and registry representatives regarding their experiences with the program, their motivations for participating initially, and barriers or features of the program that cause concern. It concludes with some final thoughts on forest offset policy while offering suggestions for the next round of policymaking.

1.2 The Forest Offset Protocol

California's Global Warming Solutions Act of 2006, also known as AB32, aims to reduce the state's GHG emissions by 2050 to 80% below 1990 level (California Air Resources Board 2015b). The California Air Resources Board (ARB), a division of the California Environmental Protection Agency (EPA), administers the program and provides support for forest projects and entities that are mandated to reduce their greenhouse gas emissions. The policy operates under two frameworks: regulatory and voluntary. The mandated components are the yearly reductions in carbon dioxide emissions, about 3% per year from 2015 to 2020. A covered entity must reduce its carbon dioxide output, but the ways in which it chooses to do that can vary. Another viable option is to instead invest in carbon credits. The voluntary part of this operation comes from the viewpoint of a landowner initiating an offset project. The landowner may choose to *voluntarily* enter the forest carbon offset market. This means that the landowner will attempt to preserve and increase the carbon stocks in and derived from the trees in the project.

Once a landowner decides to participate in the forest offset program, a series of technical steps must be followed to ensure the forest will, in fact, sequester carbon. The project must be registered with one of three ARB-approved registries: the Carbon Action Reserve (CAR), the American Carbon Registry (ACR), and the Verified Carbon Standard (VCS). At this point, the project is no longer voluntary and is instead held accountable in the form of a contract.

1.3 Forest Offset Projects

According to ARB protocol, there are three types of projects that can qualify as forest carbon offset projects: *avoided conversion, improved forest management,* and *reforestation*.

In avoided conversion, an area that is already forested but is not yet protected is dedicated as continuous forest cover. In improved forest management projects, a forest is actively managed to maintain or increase carbon stocks of forested land relative to baseline levels. Reforestation projects involve restoring tree cover on land that is not at optimal stocking levels, including land that has been decimated by fire or land that was previously farmland.

1.4 Six Criteria for Forest Offset Projects

In order for a forest carbon offset project to be legitimate, the credits it produces must conform to six criteria. Credits must be *real, verifiable, quantifiable, enforceable, permanent* and *additional*. The regulation provides tight standards for projects because it aims to ensure that only legitimate projects are credited. If projects that are illegitimate are credited, the cap is undermined and the purpose of the legislation (i.e., mitigate GHG emissions) is not met. Therefore, these high standards exist. The *permanence* and *additionality* standards are clouded in controversy and may pose serious barriers to potential participants. Many of these criteria are the results of lessons learned from other emissions trading models.

Real. For a project to be considered *real*, it must have GHG reduction that resulted from "a demonstrable action or set of actions, and are quantified using appropriate, accurate, and conservative methodologies that account for all GHG emissions sources…within the offset project boundary and account for uncertainty and the potential for activity-shifting leakage and market-shifting leakage" (California Air Resources Board 2015a, 50).

Verifiable. The *verifiable* standard comes into play at both the time of the initial accreditation period and intermittently throughout the next 100 years. A neutral third party verification body such as Environmental Services, Inc. or SCS Global Services must verify

the credits. The maximum amount of time between verifications, after the initial verification period, is six years.

Quantifiable. Credits must be *quantifiable*, meaning they must be measurable relative to the baseline. The methodology used in calculating the baseline must be reliable and replicable and account for uncertainty and leakage. Leakage is the notion that in a system without clear, closed boundaries unintended or secondary effects (e.g., double counting, land development or timber harvests on other forestlands) can undermine accurate carbon offset measurements. Another example of leakage is the notion that if there's a farm that has been converted into a forest and entered into this program, the food that farm produced must still be grown somewhere.

Enforceable. The *enforceability* standard is important because it gives the ARB the authority to hold parties liable if any provisions are violated. Without the power to enforce this regulation, the ARB would merely be suggesting ways to improve carbon sequestration.

Permanent. The requirement that projects be *permanent* manifests itself in the length of time for which landowners must enter into the contract. The regulation requires that projects be under contract for 100 years. If reversals occur, mechanisms are in place to ensure that all credited reductions "endure for at least 100 years" (California Air Resources Board 2015a, 42). This notion of permanence will be further discussed below.

Additional. Finally, projects must be *additional*. Additionality essentially asks whether the project would have happened without the policy. If the answer to that question is "yes," then the project is not additional. Additional projects are not simply conforming to the law or other regulations. Instead, the driving actor behind the change in a landowner's behavior must be directly attributable to the policy. A business-as-usual model is not

additional. Instead, a project must go above and beyond what is common practice, or what would have happened without the policy.

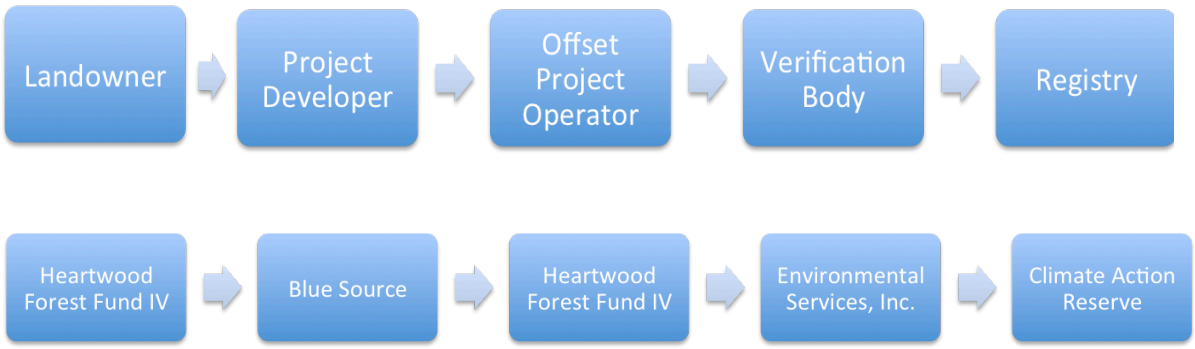
Why would you pay someone to do something they were going to do anyway? Essentially, this is the logic behind the additionality criterion. It is important to keep the big picture of cap and trade in mind here. In creating an offset, the ARB is allowing an entity in California to continue polluting with the implicit understanding that some forest somewhere else in the US is sequestering the carbon from that firm. If a forest that would have been doing that anyway is now credited, no emission reductions have occurred. The cap is undermined, and the legislation has caused no actual *change.*

1.5 Registering a Project

This policy as well as the process of verification involves many different stakeholders. It will help to start at the micro-level of one project landowner and work outward through the process to understand all the different players involved. Although this overview is broad, it will help to provide context for understanding barriers faced. First, a landowner may be interested in managing his or her forest through ARB's system in order to earn offset credits. He or she would contact a developer (or perhaps a developer might contact a landowner) for some initial tests and a site visit. The developer would then work to calculate the baseline for the project. This is the initial stocking level at the start of the project. Carbon stocks must increase in comparison to the baseline to be viable. At this time the project would be listed on a registry, a public database for public transparency. Next, a verification body would conduct a site assessment and then either approve of or disagree with the developer's calculations. The verification body acts as a neutral third party. Finally, if the

verification body approves of the calculations, the project earns credits from the ARB. The developer generally handles the selling of these credits. Figure 2 overviews the steps involved in registering a project. The top row displays the steps for a generic project while the bottom row displays one real-world example.

***Figure 2**: Process of Registering a Forest Carbon Offset Project*



1.6 Stakeholders

Various groups go through the process of registering their forests and earning offset credits to create the supply side of the carbon market. Suppliers include owners of family forests, Native American tribes, and large-scale corporate landowners such as Sierra Pacific Industries. Others are timber companies who invest in their own forests as a way to both ensure the future of the company and to diversify their portfolios. Corporations that protect their forests and enter the carbon market maintain the added benefit of advertising their apparent environmental good deeds to their customer base and shareholders.

Many projects come from non-profit groups such as land trusts and community groups interested in preserving local or community forests. However, some projects come from surprising sources, including the Walt Disney Company and General Motors. Although

not mandated to comply, in 2013, the Walt Disney Company received an award for its dedication to restoring forests, after investing 30 million dollars in global forest projects. Other projects include cities and towns from across the nation, such as the City of Arcata in California.

1.7 Carbon Offset Registries

The Carbon Action Reserve (CAR) is the largest carbon offset registry with 71 ARB compliant projects listed as of July 2015. Begun as the California CAR in 2001, the Reserve helped over 400 businesses, organizations, and government agencies calculate and report their GHG emissions all under a voluntary framework. It was approved as an ARB registry in December 2012. It is based in Los Angeles, California. The ARB's methodology protocol was modeled off of CAR's protocol.

The American Carbon Registry (ACR) is another ARB approved registry with 18 ARB compliant projects. It was approved December 2012. Headquartered in Arlington, Virginia, it operates to "create confidence in the environmental and scientific integrity of carbon offsets in order to accelerate transformational emission reduction actions" (American Carbon Registry, n.d). It also maintains a publicly accessible database of proposed, ongoing, and completed projects.

Approved in August 2014, the third option in choosing a registry is the Verified Carbon Standard (VCS) registry. The VCS operates out of Washington D.C. and, like the other registries, provides a neutral site for a marketplace for credit buying and selling. It, however, does not yet have active forest projects registered.

2. Literature Review

The merits of forest offset programs are still in healthy debate among environmental policy scholars and scientists. The rules by which projects are evaluated, and by extension the participation rules themselves (i.e., protocols) are "murky and mired in controversy" (Gray and Edens 2008). Credibility is the main concern. As scholars note, the offset program and its protocols must "provide inexpensive and standardized approaches to forest carbon accounting that are not prone to dishonest handling" (Fahey et al. 2010). The California forest carbon offset program is an attempt at this.

In a review of ten protocols, including eight voluntary and two compliance, Richards and Huebner (2012a) found that voluntary protocols would need to be improved before entering into the compliance setting. Among different protocols, consensus does not yet seem to have been reached on the matter of permanence and exactly how to define additionality and baselines. This makes a comprehensive market with low transaction costs difficult. They also critique the verification process, calling it a "checklist of inputs" rather than an "independent confirmation of estimations" (2012b, 423). As Richards and Huebner note, low transaction costs is one of the advantages of the offset approach to climate change mitigation.

Oliver (2013) also questions the legitimacy of carbon offsets, pointing out that forest offset calculations rely on a number of assumptions that are based on rudimentary data. Unlike reading a meter at a coal fired power plant, "reading" a forest is much more difficult, and requires experts who still must make professional judgment calls. Trees are part of living, growing ecosystems that are ever changing. Calculating the amount of carbon stored

in them at any one time is challenging, costly, and likely inaccurate. Furthermore, environmentalists raise issues of environmental justice, as polluters are able to continue polluting and simply pay forest landowners so they can continue their habits.

2.1 Payments for Ecosystem Services

As a market-based method of conservation, the concept of carbon offsetting can be contextualized as a payment for an ecosystem service (PES). An ecosystem service is any benefit that humans derive from natural ecosystems. Carbon sequestration, then, is an ecosystem service because it contributes to the human effort to decrease or mitigate emissions that contribute to climate change. In the case of forestry, a landowner would be monetarily compensated for the services (i.e., carbon sequestration) his land provides to the general public. A more specific definition is provided by Wunder (2005, 3) in which PES is "a voluntary transaction where a well-defined environmental service is being 'bought' by a service buyer from a service provider if and only if the service provider secures provision (conditionality)". In the case of California's market, landowners within the continental US may voluntarily provide carbon sequestration to entities regulated under the compliance market if and only if the service provider (landowner) registers his project to one of the three eligible registries.

The theory behind PES is based on the rationale that market failures cause an undersupply of the ecosystem service, so valuing and paying for these services will help encourage their provision (Engel, Pagiola, and Wunder 2008). PES systems work well when the service is a pure public good/service, such as the case with carbon sequestration. PES has

gained popularity in both actual practice and as buzzword in the past 15 years. Their main promise, like other market-based approaches to environmental problems, is cost-efficiency. However, PES is not a silver bullet as not all environmental problems work well in the PES context. The design characteristics of each specific program, as well as the social, economic, and political contexts in which they operate, also matter. Muradian et al. (2013) caution that an over-reliance on payments for ecosystems services as a win-win solution could lead to ineffective outcomes.

Despite the caution scholars advocate, they also offer useful suggestions. Daniels (2010) notes that until there is greater demand for credits, thus boosting their price at market, landowners will be unlikely to want to sell. The government can help create that demand by passing stricter regulations on industry and regulating more industries under the program. Stephan and Paterson (2012) remind us that these markets are inherently political, lest we imagine that these markets are strictly based on accurate calculations. The establishing of baselines, which essentially determines how many credits a landowner could earn and whether a project is even viable is more complicated than it may appear. Often factors that contribute to the baseline go unexamined. Exactly what is defined as the baseline, whether it is static or dynamic or recent or historic depend on the program and may be left up to interpretation (Richards and Huebner 2012a). It is the combination of many actors, perhaps doing "calculations of interest" who are operating within the norms and practices of the organizations for whom they work (Stephan and Paterson 2012, 553).

2.2 Landowner Participation in Carbon Markets

Research shows that there are a variety of reasons people choose to participate in voluntary environmental markets (Kerchner and Keeton 2015; Markowski-Lindsay et al. 2011; Schirmer and Bull 2014). Strong indicators include the belief that they are doing an environmental good and the sense of altruism that goes along with that, a desire to protect their land for future generations, and a belief in climate change (Schirmer and Bull 2014). Non-profit environmental groups such as land trusts and recreation areas share many of these same reasons. Businesses differ in their reasoning including a desire to diversify their portfolios, meeting corporate sustainability goals, and a desire to project (whether founded or not) an image of environmentalism to consumers.

While motivations are important to understand how to better develop a policy and how to recruit additional participants, understanding the barriers that groups face in trying to go through the process of earning carbon credits is also vital to ensuring continued support and success of the policy.

Markowski-Lindsay et al. (2011) studied barriers to landowner participation in carbon markets in Massachusetts using a mail survey. The survey presented four different hypothetical scenarios and asked landowners to rank them and whether they would be interested in participating in each. They found that there would be little interest in the programs. The main factors influencing the low rates of participation are additionality, early withdraw penalties, and contract length with respondents being more likely to participate in programs with no additionality requirement, no withdraw penalties, and shorter contract length. Similarly, Kerchner and Keeton (2015) look at the break-even points for small landowners and participation in California's regulatory forest carbon market by examining

25 real properties in the northeastern United States. They found that the point of viability is about 1,480 acres. This is a problem as the average northeastern landowner owns less than 50 acres (Butler 2008).

In following this strain of literature, Galik and Cooley (2012) find that different rules and accounting systems yield different results. Further, project accounting may have more influence on a project relative to business-as-usual, than carbon price or timber price. If the calculations are inherently political (Stephan and Paterson 2012) and accounting matters, a variety of results could occur on the same parcel of land.

2.3 Factors Influencing Participation in Conservation Programs

Researchers recognize that at a number of landowner characteristics shape the decision to participate in conservation programs (Galik and Cooley 2012; Galik, Murray, and Mercer 2013; Markowski-Lindsay et al. 2011); yet policymakers may not really consider landowner characteristics when writing the policy. Fischer and Charnley (2010) note that nonindustrial family forests differ from large scale industrial forests in three major areas: values, ecological knowledge, and risk perception. Family forest owners also tend to have different goals for how they manage their land with a preference toward promoting habitat and biodiversity (Charnley, Diaz, and Gosnell 2010); they are also less likely to have a management plan as only 4% of family forest owners in the US do (Butler 2008).

Finland, Sweden, and other Nordic countries have a strong record of voluntary environmental programs. Many of the studies on this topic come from that region. For example, Korhonen, Hujala, and Kurttila (2013) observe family forest owners in Finland and

their adoption of the voluntary program METSO which protects biodiversity by paying landowners to maintain their diverse, wooded lands. They applied Rogers' five characteristics affecting adoption of a policy to the METSO program: relative advantage, observeability, compatibility, trialability, and complexity. Rogers' five characteristics of policy adoption are relevant to the analysis of the supply side of California's Air Resources Board forest carbon offset policy.

Relative advantage refers to whether the new policy is likely to be perceived as an advantage over the current system. While this may be measured in economic terms, it may also be considered in terms of social advantage and convenience. The forest carbon offset policy provides a high degree of relative advantage. The traditional method of earning money from owning a forest was to harvest it as timber. This new policy provides an alternative to that management technique.

Compatibility refers to how well the new model meshes with the traditional way of thinking. Not only does this refer to business models and methods, but also to the values and norms of a social system. Those inclined toward a more traditional method of forest management could be turned away by the 180-degree turnaround in management technique. Moving from harvesting trees as the primary source of income in a forest to actively protecting those same trees seems inherently confusing and at odds. A shift in the way foresters and owners think about their forests is required for this policy to succeed. Managing for carbon is more likely to occur if it is complementary to a landowner's goals (Charnley, Diaz, and Gosnell 2010).

Complexity should be diminished. Complexity refers to the difficulty in interpreting and implementing a policy. The easier the conceptual foundations behind a new policy are to

understand, the more likely it is to be adopted faster. While the basic notion of carbon offsetting is easily understood, the details of it become highly complex very quickly. Wright, Beddoe, and Danks (2009) found that program complexity alone is a barrier for some landowners. Higher-level mathematics are required to fully understand how both the science behind carbon offsetting and the market value of the offsets function. However, look-up tables and prepared spreadsheets do aid implementation. A business that is already in the business of forestry has a distinct advantage in this regard. For example, a trained forester would have the knowledge to calculate baseline carbon stocks. However, siblings who inherited land from their parents might not have the expertise to understand the complexities of the policy. This is a barrier to nonprofits and family owned forests. Striking a balance between creating a policy that is complex enough to ensure real, additional, verifiable credits while at the same being simple enough for educated suppliers to understand is the key.

Observeability is the idea that policy changes or new ideas that are highly visible are more likely to spread than hidden ones. This is a problem consistently faced by those who work in the energy sector who seek to increase energy efficiency. Often the changes are technological or occur during the building of new structures or retro-fitting older ones. Because the changes are not highly observable, people are unaware they are occurring and so are less likely to adopt the innovation or new policy. This is part of the reason some of these energy efficient buildings have been granted LEED certified status and display a placard on their walls. Observeability in the case of forest offsets presents a unique situation. Often, vast swaths of forests are located where people are not. Further, even if a forest is preserved through this policy, there is no indication of this on public signs on the side of the road. There is a great likelihood that the general public is not even aware of this policy.

Finally, *trialability* refers to the degree to which a given policy or innovation can be experimented with on a limited basis. The easier it is to try something with limited consequences, the more likely it is to be adopted. In the case of the forest carbon offset policy, there is rather low trialability, at least with registering projects to be operated under the California compliance market. However, other voluntary carbon markets existed before the AB32, which could be viewed as test beds or natural experiments in carbon offsetting. A project could start out in a voluntary registry such as the CAR and then transfer over to be in compliance with the mandatory standards. These are known as early action projects.[3]

Research suggests that small family landowners differ from large corporate landowners in their motivations for land use. Small family landowners also face different challenges to entry in the forest carbon offset market. Therefore, two research questions emerge: *What are the barriers landowners face in registering a forest offset project under California's forest offset project protocol?* and *What are the motivations landowners have in participating in California's forest offset program?*

[3]An early action project is a voluntary offset project that has been issued offset credits by an approved voluntary registry between January 1, 2005 and December 31, 2014. These projects originated in the voluntary market and are transitioning to the compliance market.

3. Methods

I employed a mixed-method approach to determine the barriers to participation in forest offset projects. First, I read the protocols. Next, I conducted interviews with experts in the field and with participants in the market such as landowners, verifiers, developers, and registry representatives. This provided insight impossible to garner from simply reading the protocols themselves. These experts understand the day-to-day details of forest carbon offsetting or have been through the process of registering their own land. Using Markowski-Lindsay et al. (2011) as a model, I administered a survey to likely participants with specific questions targeting the reasons they withdrew from the program. One question asked about their initial motivations in deciding to participate. A final, separate survey was administered to those still involved in the program and who have projects registered with CAR.

3.1 Understanding the Forest Offset Project Protocol

The first step in understanding the complexity of the forest offset program was to read the protocols that dictate exactly what the program entails. The protocols define the different types of projects, set standards for measuring and calculating baselines, and lay out the rules for the timelines of verification. Although there are many protocols worldwide, I narrowed the focus to include only those eligible for and compliant with the Air Resource Board's policy. These are the "Compliance Offset Protocol US Forest Projects" adopted November 14, 2014 and created by the Air Resources Board, and the "Forest Project Protocol (FPP)"

adopted November 15, 2012 and created by the Climate Action Reserve. At this time, these are the only two eligible, approved protocols that meet ARB's standards.

The protocols are very technical and written specifically for professional foresters. It is highly doubtful that any landowner would read these documents. And, while both protocols follow the same general logic, there are slight differences in some of the methods of calculation of carbon credits.

3.2 Interviews

Interviews with diverse stakeholders were held to discover the experiences each had related to forest offset projects participating in California's carbon market. Initially, contacts were discovered through CAR's online database of projects. Each project must submit an application for listing a project. The forms include the name of the offset project operator or the authorized project designee, as well as their email addresses. The form also provides details about the land such as whether it is publically or privately owned, its location, and information about the landowner.

A total of 19 e-mail requests were sent out, and 6 interviews actually occurred between June and July 2015. At least one representative from each category of the process was interviewed. For example, an expert, landowner, developer, verifier, and registry representative were all interviewed. It was important to hear from representatives from each stage of the process for balanced results. All interviews except one were held over the phone and lasted between 15-40 minutes; one organization submitted its responses through email. They were audio recorded to ensure accuracy in reporting. Questions were open-ended and interviewees were generally eager to have their stories told. They often veered off track,

offering their own solutions to climate change by suggesting policies unrelated to forest offsets. Brining them back on track was a challenge.

The other method of discovering contacts was through colleagues of the research team. These people, having had a personal connection with Appalachian State, were more responsive. Then, the snowball technique was used to find other people willing to be interviewed. The interview questions are attached in the Appendix.

3.3 Surveys

Two separate surveys were administered through the online software system Qualtrics from May though July 2015 to two different target groups: participants and non-participants in the forest offset projects registered under California's forest offset protocols.

3.3.1 Survey 1: Non-Participants

For survey 1, the targeted audience was those individuals or entities who had started the process of registering a project, but did not follow through with the commitment. Earning credits and entering the carbon market is a multi-step process that often takes many months. The goal in hearing from this sub-group was to determine some barriers that they faced in going through the process. Some problem or barrier caused members of this group, after having initially invested at least some time and money into the project, to cease participating. Determining that major barrier that could not be overcome was the aim of the survey.

Sami Osman of the Climate Action Reserve (CAR) was instrumental in assisting with the survey administration. From the CAR registry's database, he collected the names and email addresses of people meeting the desired criteria: were "listed" or "registered." I sent

him a link to the survey and he sent it via Qualtric's email system to 89 contacts. Of those 89, 14 submitted a response to the survey. However, 10 of these were incomplete responses. Technically, Qualtrics codes this as a response even though many of these "submissions" were left completely blank. This left a total of four legitimate, complete surveys. Survey 1 is found in the Appendix.

3.3.2 Survey 2: Participants

The second survey was sent to 29 project owners registered with the Carbon Action Reserve registry. The criteria for this survey was the following:

1. Must be registered with CAR's registry and listed online as of July 13, 2015.
2. Must be a forest project.
3. Must be ARB eligible (i.e., project has an ARB identification number).
4. Must not be an early action project.
5. Must have associated documentation that is available to the public (i.e., live links, files available to be downloaded)

In some cases, Offset Project Operators (OPO) (those filing out the submission form) would also list an authorized project designee, generally a colleague. In the case where there were two names listed for the same project, both contacts were retained as hearing from two different people involved in the same project would not be detrimental. There were 51 unique projects listed. Finally, some developers were listed as the OPO for more than one project. To avoid sending multiple emails to the same contact, duplicates were removed. This brought the total number of unique names and e-mail addresses to 29. Of these 29 contacted, four have started the survey and one respondent has completed it. The survey instrument is available in the Appendix.

4. Results

4.1 Findings from the Interviews

Because the scope of the interviews included a wide range of actors involved, they focused on different types of barriers from a variety of perspectives. This subsection provides the findings and insights gained from the stakeholder interviews.

When asked about barriers, or roadblocks that cause landowners' worry, respondents often mentioned the 100-year time commitment for project participation. One landowner said, "nobody in their right mind" would encumber their land for 100 years, especially in such an unstable carbon market. Developers and verifiers seemed to agree. Every individual who was interviewed mentioned the lengthy contract at some point in the conversation, with many reiterating the fact that a 100-year verification and reporting commitment is a major barrier to project participants. One verifier, reporting on conversations with landowners, expanded on it, wondering with concern what would happen to the land when they died and whether they would want to tie up their children in a contract with the State of California. Table 1 highlights key points from each interview.

Table 1: Comments from interviewees illustrating key barriers to participation

Identifier	Stakeholder Type	100-year time commitment	Barriers
A	Expert	"Can buy their way out, one would need to look really carefully at the penalty to see if it's really a disincentive"	• "It all has to do with the value of the credits"
B	Landowner	"Nobody in their right mind"	• "A million problems" • "Huge fiasco" • Trouble finding an American Forestry Association certified forester
C	Developer	-Length of time commitment has proved most challenging for landowners	• "Some owners are less willing to sign on to a legally binding agreement with the state of CA" • Sequential sampling requirement overly stringent • Many strong projects "languish in ARB's queue" • "If baselines are set too high, many potential projects will not be viable for participation"
D	Verifier	"Number 2 reason for withdraw for small and medium landowners" -Don't know what's going to happen in next 10 years, let along the next 100.	• Some areas are already under SFC or SFI certification, but not the entirety of the project areas, which causes problems • "If they are currently managing their land in a sustainable way, meeting the additionality criteria could be difficult" • "If the review isn't perfect, you have to do it again"
E	Registry Representative	"Worrisome to landowners"	• Developers that don't have background get caught up in the details of inventory • Potential projects in AK are excluded

Both the verifier and the project developer mentioned that sequential sampling requirements for verification are overly burdensome. According to them, these requirements

are both costly and timely. The verifier estimated that these costs average about 25% of the total cost of a project. Furthermore, as the verifications require professional foresters to "walk the land" and examine the forest very thoroughly, high acreage projects are even more costly. And, as one verifier said, "if the review isn't perfect, you have to do it again."

The verifier and landowner also mentioned the problem of competing environmental programs. The landowner was researching placing his or her land in the EPA's Wetlands Restoration Program and was having difficultly meeting the standards required by both projects. The verifier also mentioned the problem of Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) certified lands, noting that *all* acreage within the project area had to be certified if some part of the forest was. This is proving difficult for some projects that now have the added cost of meeting two sets of criteria.

The registry representative mentioned that project developers are looking to Appalachian forests as diverse, deciduous forests that would be excellent candidates for this policy. Finally, according the registry representative, carbon finance has the potential to aid rural development, in addition to mitigating climate change.

4.2 Survey Results

Despite the very low response rate of the surveys, the responses they did garner are interesting in their own right and worthy of reporting. Including incomplete submissions, the response rate for survey 1 was 15.7%; excluding incomplete responses it was 4.5%. For Survey 2, the response rate for completed surveys was 3.4%. Table 2 displays the five survey responses, including motivations for joining initially. The last column displays barriers which

the respondent identified as “important” or “very important.” Respondent 4 only answered a few questions, but is nevertheless included in the analysis.

Table 2: Characteristics of survey respondents and motivations (n=5)

Survey ID Number	Participant or Non-Participant	Acreage	State	Type of Project	Ownership	Role	Motivation
1	Non-Participant	Less than 500 acres	WA , OR	Reforestation	Large Corporate Landowner	Landowner	To benefit from the sale of carbon allowances and/or offsets
2	Non-Participant	500-1,000 acres	n/a	Improved Forest Management	Land Trust	Landowner	Financial return to support organization conservation mission
3	Non-Participant	Less than 500 acres	n/a	Reforestation	Large Family Landowner	Project Developer	Alternative Revenue Generation
4	Non-Participant	n/a	n/a	n/a	n/a	n/a	n/a
5	Participant	Over 2,000 acres	CA	Improved Forest Management	Tribal	Authorized Project Designee	Forest management for tribal benefits

Table 3: Survey respondents and reported barriers

Survey ID Number	Participant or Non-Participant	Barriers: Selected important or very important	Other Comments
1	Non-Participant	• Initial Inventory Costs • Administrative effort and/or costs • Reporting (verification) timelines • Overall costs exceeded potential benefits	• "Difficulty understanding why the organization would want to be so exclusive"
2	Non-Participant	• n/a	• n/a
3	Non-Participant	• Initial inventory costs • Administrative effort and/or costs • Reporting (verification timelines) • Uncertain market demands • Price of carbon • Expected number of credits • Risk of fire, drought, or other natural disaster, • Not compliant • Overall costs exceeded potential benefits • Not compliant • Other – verification costs • Inclusion of pre-existing brush in baseline	• "Cost of verification that was excessive for this small project. Cost of this 200 acre project was nearly the same as for projects of several thousand acres."
4	Non-Participant	• Administrative effort and/or costs • Reporting (verification timelines) • Uncertain market demands • Price of carbon • Expected number of credits • Risk of fire, drought, or other natural disaster, • Not compliant • Other – arbitrary staff interpretation	• Verification costs exceeded the value of any carbon allowances for the first decade.

5	Participant	• Administrative effort and/or costs • Monitoring requirements • Reporting requirements • Verification requirements • Price of carbon • Difficulty in working with a government agency • Initial inventory costs • Lengthy review period at ARB cause delays	• n/a

However, it is likely that the five (combined participants plus non-participants) respondents are fairly representative of the larger population in many facets (Table 2). Table 4 displays 39 projects with the same criteria as those invited to take Survey 2. However, only 29 of these projects were invited because some Offset Project Operators (OPOs) were listed on multiple projects. To avoid inviting someone to take the survey twice, repeated e-mails were deleted. Tables 2 and 4 allow for comparison between survey respondents and the larger population of forest carbon offset projects.

Table 4: CAR registered forest offset projects (as of July 13, 2015)

CAR ID Number	Acreage	State	Type of Project	Role	Ownership
CAR993	7,660	CA	IFM	APD	Yurok Tribe
CAR973	229,601	MI	IFM	APD	Heartwood Forestland Fund IV
CAR1173	7,659	KY	IFM	APD	Berea College
CAR1168	460	CA	R	OPO	Sierra Pacific Industries
CAR1167	5,971	CA	R	OPO	Sierra Pacific Industries
CAR1166	221	CA	R	OPO	Sierra Pacific Industries
CAR1165	921	CA	R	OPO	Sierra Pacific Industries
CAR1164	4,775	CA	R	OPO	Sierra Pacific Industries
CAR1163	654	CA	R	OPO	Sierra Pacific Industries
CAR1162	1,460	ME	IFM	APD	Forest Carbon Partners, LP
CAR1161	547	ME	IFM	APD	Northeast Wilderness Land Trust
CAR1160	4,000	VA	IFM	OPO	The Nature Conservancy (TNC) holds easement and timber rights
CAR1159	5,750	VA	IFM	OPO	TNC holds easement
CAR1147	11,090	VA	IFM	OPO	TNC holds easement
CAR1141	2,167	CA	IFM	OPO	n/a
CAR1140	18,008	CA	IFM	APD	n/a
CAR1134	10,209	SC	IFM	OPO	Norfolk Southern Railway Company
CAR1130	4,861	TN	IFM	OPO	Brimstone Forest Company
CAR1129	2,141	NH	IFM	OPO	Northeast Wilderness Trust Corporation holds easement
CAR1104	4,039	CA	IFM	APD	GM Gabrych Family LP
CAR1102	2,102	CA	IFM	APD	New Forests – Forest Carbon Partners
CAR1100	15,911	CA	IFM	OPO	TNC
CAR1099	13,913	CA	IFM	OPO	TNC
CAR1098	23,780	CA	IFM	OPO	TNC
CAR1095	23,780	CA	IFM	OPO	Coastal Forestlands
CAR1092	14,662	CA	IFM	OPO	Sierra Pacific Industries
CAR1091	24,501	CA	IFM	OPO	Sierra Pacific Industries
CAR1090	18,960	CA	IFM	OPO	Sierra Pacific Industries
CAR1067	2,112	CA	IFM	OPO	Berry Summit, LLC
CAR1063	19,118	ME	IFM	OPO	Downeast Lakes Land Trust
CAR1062	3,982	MO	IFM	OPO	n/a
CAR1046	11,350	CA	IFM	OPO	n/a
CAR1041	16,941	CA	IFM	OPO	Sierra Pacific Industries
CAR1032	9,753	VA	IFM	OPO	n/a
CAR1028	19,296	ME	IFM	OPO	GLS Woodlands, LLC

CAR1013	19,552	CA	IFM	APD	Sustainable Conservation, Inc.
CAR1006	113,460	CA	IFM	OPO	Fruit Growers Supply Company
CAR1109	3,7131	SC	AC	APD	n/a
CAR1094	520	WA	IFM	APD	Nisqually Land Trust

Key: IFM=Improved Forest Management, AC=Avoided Conversion, R=Reforestation

First, survey respondents represented the different role categories and included project developers, landowners, and authorized project designees. For most projects, the person filling out the initial submittal form was the Offset Project Operator (OPO). This is often the owner in fee of the land or the easement holder. Alternatively, the Authorized Project Designee (APD) may also submit this form acting on behalf of the landowner.

Second, types of projects were represented in what seems to be a fair proportion to actual projects (Tables 2 and 4). One interviewee mentioned that there are few avoided conversion projects approved because the standards guiding them are very strict, so this explains the absence of respondents with avoided conversion projects in this study. In fact, there is only one active avoided conversion project listed in the larger sample (Table 4). The majority of forest carbon offset projects are Improved Forest Management (IFM) projects at 84% of projects in the larger population. Two out of five of respondents had IFM projects. Reforestation projects are overrepresented in the survey as only 15% of the larger population has reforestation projects (Table 4) but two out of five survey respondents had reforestation projects (Table 2). Notably, all reforestation projects in the larger population were in the same county in California and involved re-planting after a fire had decimated the forest.

Third, respondents to the survey may represent the typical type of landownership one would expect to see among current project participants. The category not represented is small family landowners, an expected result as both the literature (Charnley, Diaz, and Gosnell 2010; Fischer and Charnley 2010) and interviewees suggest that small forest landowners face

the highest barriers to entry into the program. Small forest landowners may lack the expertise and forestry network necessary to register an offset project (Fischer and Charnley 2010; Korhonen, Hujala, and Kurttila 2013). Tribal ownership is overrepresented in the survey as there was only one within the larger population (Tables 3 and 4). Corporate ownership is accurately represented in the survey as about 48% of the larger population falls into this category and two out of five respondents were corporate landowners.

Finally, existing projects vary by the size of the project (acreage) its location (state)(Table 4). Projects ranged from a minimum of 221 acres to a maximum of 229,601 acres. However, most projects fall in the 7,000 to 12,000 range (Table 4). The larger sample has more projects with higher acreage than the five survey respondents. Of the survey respondents (non-participants), two had projects under 500 acres. In the larger population, only two out of 39 projects were under 500 acres, which is supportive of the claim that project size is a barrier for landowners with small forests. The average project size, excluding the project over 200,000 acres, is 12,721 acres. There is a propensity towards projects located in California (59%). Other regions represented seem to occur in clusters with multiple projects occurring in Maine, New Hampshire, and Virginia. Washington, Missouri, Michigan, Kentucky, Tennessee, and South Carolina each have one project listed.

All four non-participants said that “overall costs exceeded potential benefits” of project participation. This was a very important factor in their reported decision to stop participating. Exactly what these costs were needs further examination, however, the same group also said “administrative effort and/or cost” was an important factor in the decision to stop participating (Table 3). Respondents also had the opportunity to expand open-endedly

on any of the questions and one person wrote "verification costs exceeded the value of any carbon allowances for the first decade."

All of the respondents selected "neutral" for the question *"How important was each of the following in your decision to stop participating: time frame of obligation?"* However, this does not mean the timeframe should be discounted as a barrier. Participants would have known about the 100 years before signing the contract, so it may not be the cause of their withdraw from the program. Instead, it is likely that it was a feature that caused some concern and perhaps turned away those who did not even make it as far as listing a project. However, although they did not explicitly mention the 100-year time commitment as a barrier or problem, respondents were asked *"What would have been an acceptable commitment participation period?"* with a sliding scale of 0 to 100 years from which to select. Three respondents chose 50 years while one selected 100 years. According to one interviewee, larger companies with a conservation objective are more accepting of the 100 years, while smaller and medium sized landowners are more likely to balk.

Every survey respondent was asked about motivations for wanting to register their land initially. Their responses were as follows:

- *forest management for tribal benefits*
- *to participate in the carbon offset/allowance markets, both for our own facilities and for outside sales of offsets for profit*
- *financial return to support organization conservation mission*
- *to benefit from the sale of carbon allowance and/or offsets*
- *alternative revenue generation.*

From these responses, it seems that revenue is the main motivator. The statement that one respondent sees carbon offsetting as an "alternative" form of revenue suggests that this was not the original intended land use and is still not yet the norm.

4.3 Summary of Findings

The overarching barrier for respondents to both the interviews and surveys is cost. Reportedly, high transaction costs for entry (registry fees) combined with the high costs of sequential verification seem to prevent some from participating. Interviewees suggest that the 100-year time commitment is too long a time period, especially in a market as unstable as carbon's. Finally, competing non-complementary conservation programs appear to be a barrier for large corporate landowners.

5. Discussion

5.1 Motivations

Understanding the motivations of landowners for participating in forest offset projects is important for policymakers who want to understand low participation rates. It is unlikely that there will be widespread participation until there is federal climate change legislation that would drive up the demand for forest carbon offset credits (Charnley, Diaz, and Gosnell 2010). The main motivator was the financial return from the sale of credits. Therefore, to entice more landowners into the program, the price of carbon would need to be higher. But, this presents a catch-22 because as more credits are issued, supply increases, demand decreases, and price falls. If landowners and experts were examining this from a truly rational-choice perspective, those already in the market would want to exclude others from entering to preserve the value of their product.

5.2 Barriers

In a discussion of the barriers to participation, it is important to remember the goal of the policy. It may seem a strange notion, but some barriers are built into the project *by design.* The policy maintains rigorous standards not to exclude people arbitrarily (as some landowners seem to feel), but rather because the program dictates high standards to ensure that actual carbon mitigation is occurring. Of course, this goal walks a fine line: have too strict standards and you exclude those you may actually want in but have too loose standards and you approve people who are not actually mitigating additional carbon. These two problems can be viewed from a statistical lens as what Trexler, Broekhoff, and Kosloff

(2006) call “phantom reductions” (false positives) and “lost opportunities” (false negatives). Decrease the likelihood of one problem occurring; the other is likely to increase.

Therefore, barriers need to be understood in two distinct ways. First, there are purposeful barriers, or barriers that are designed consciously by the makers of the policy. Even labeling these “barriers” is misleading, however they are perceived as barriers by potential participants so I will retain the language. In fact, though, they are not so much barriers as eligibility requirements. These barriers are in place to avoid the problems of a Type 2 error. Second, legitimate barriers also exist. In this sense I mean barriers to be impediments to participation for truly additional projects. This can be compared to the occurrence of a Type 1 error.

Distinguishing between the two types of barriers proves challenging. In the following sections I discuss some of the barriers cited by interviewees and survey respondents. However, it is important to keep in mind that developers, and especially landowners may have a narrower view of the policy. What a landowner might see as a barrier, the policymaker may see as a conscious design characteristic to ensure the integrity of the policy. This is to suggest that a stakeholder’s position may influence what he or she experiences as a barrier. Nevertheless, all are barriers and will be discussed here. Barriers can be grouped into four categories: biophysical characteristics, design characteristics, market characteristics, and attitudinal and compatibility characteristics.

5.2.1 Biophysical Characteristics

Biophysical characteristics refer to the land itself. The forest’s ability to sequester carbon depends on the type of trees on the site and the age of those trees. Another barrier here is location of the project. Forests in Alaska and Hawaii are currently ineligible for

entering the program. One interviewee noted that there was lots of interest in projects in Alaska, but they are waiting from the approval from ARB before developing a project.

A serious and often cited barrier is that a project's baseline is too high. The forester has likely been managing his land in a sustainable way for some years, and there isn't much room for *improved* forest management. Landowners perceive this as a barrier, yet it is truly an eligibility requirement written into the protocol to avoid approving projects that are not additional.

Landowners must have a rather large swatch of land to be a good candidate for the program. While there is no explicit mention of minimum acreage required for a project, the financial restraints of a small-scale project remain too burdensome for many. For example, the registry fees are fixed rate fees and do not function on a sliding scale. This means that a 100 acre project would have to pay the same steep registry fee as a 10,000 acre project. This is a barrier to many small-scale, family-owned forests, especially in the East and South. This is significant because 62% of the privately owned forests in the US are family forest owners and 53% of family forestland is owned by people with more than 100 acres (Butler 2008). This is a large segment of potentially eligible forestlands that are excluded from the market. One verifier cited about 3,000 acres as the minimum threshold for a project to be profitable, thereby excluding *many* smaller family forests that are less than than 3,000 acres. This seems to be a large piece of the puzzle that is missing.

5.2.2 Design Characteristics

Design characteristics refer to the details of the policy and the ways in which it was designed to operate. One design characteristic cited by interviewees (although not by survey respondents) was the 100-year time commitment. Signing a contract for three generations

into the future with the State of California seems to make many landowners balk. According to a verifier, this does not seem to be as much of an issue for large-scale corporate landowners who often have pre-existing long–term forestry plans, but it certainly causes concern among medium-sized and small landowners.

One recurring barrier among large-scale projects was the problem of competing conservation programs. The policy anticipated converting land that had already been in a conservation easement into the carbon market. It lays out specific guidelines about how to do this. However, other competing conservation/reforestation programs pose a problem for some. For example, interviewees mentioned at least four other conservation programs that their land was already involved in or certified by: the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI), the Forest Legacy Project, and the Wetlands Restoration Program (WRP). For example, the SFI includes standards for certification that may not necessarily be in accordance with the criteria for carbon offset credits. The SFI is broader and includes measures for protecting water quality and biodiversity. However, it is now standard practice that paper companies be certified. It is difficult or impossible for forest industry projects to meet both standards, so they are forced to choose, as found in this study.

5.2.3 Market Characteristics

Some barriers to participation come from the carbon market itself. For some, the price of carbon is too low to justify going through with the project. The flip side of this coin is that the costs of joining the market are too high. There are steep up front transaction costs in registering a project. One interviewee cited this as the number one reason people cannot become involved and noted that verification fees are significant but start at the low end at 25,000 dollars (US). One expert estimated that a project of 100,000 acres would have

verification costs around 55,000 to 60,000 dollars (US) and registry fees at about 150,000 dollars (US). Others estimate project development between 125,000 and 200,000 dollars (US) (Jenkins and Smith 2013). While this example is at the upper end of project size, it provides a general idea about how costly a project can be. This finding is consistent with the literature that suggests that a fundamental constraint on family forest owners is the low price of carbon and the high cost of participating (Charnley, Diaz, and Gosnell 2010).

Therefore, investors need to know how long they can expect to wait before seeing a return. With the price of carbon being unstable, and currently fairly low at 12 dollars (US) per ton of carbon dioxide, that return could take longer than investors are willing to wait.

5.2.4 Attitudinal and Compatibility Characteristics

Attitudinal factors refer to the landowner's perception of what the land is used for and its inherent value. A community's social norms also play a role in shaping participation in an altitudinal sense as well. For example, Schirmer and Bull (2014) found that in parts of Australia where there is a strong tradition of farming, land is perceived to be less valuable if it is not being farmed. Fallow land, or land growing trees to harvest carbon, as two non-traditional land uses, may be seen as inferior. This suggests that perhaps in the US context, where traditional farming is the social norm, harvesting carbon could face additional challenges.

Carbon finance could be used as a method of rural development. However, the social norms of some places in Appalachia dictate a mistrust of outsiders. There is a strong history of its people and land being exploited by outsiders (Eller 1982). Therefore, this mistrust is an additional barrier developers must overcome in seeking out projects in certain parts of the country, including farmland in the Midwest and forests in Appalachia.

Compatibility refers to how well the new management plan or program would mesh with the traditional methods of management. For example, can conservation easements easily be transferred to new property owners willing to follow the contract or easement terms? Can the owner's forest management plan be adjusted without too high a cost in both time and money? These considerations regarding how a community or an individual responds to change are important in understanding the extent to which landowners participate in a voluntary program.

6. Conclusion

6.1 Reflections

One limitation of this research was the small sample size. It is difficult to make generalizations with the limited number of respondents. One reason for the low response rate among the non-participants survey could be their frustration with the entire process. Perhaps they lost a significant amount of time and money on a project and the survey was a painful reminder of the experience. Another reason could be that companies are hesitant to share the details of their plans and experiences for fear of losing money. Finally, some could worry that they might "say the wrong thing" and risk a reversal occurring.

Another limitation is the fact that only projects from one registry, the CAR, were examined. These projects could have had experiences unique only to the CAR. There is the opportunity for further research here using the same methods but with a different database, such as the ACR.

If I were to redesign this research project, I would differentiate early on between the property sizes of projects. When discussing barriers, interviewees almost always responded first with small-scale projects and then with large-scale projects, clearly differentiating between the two. It seems the barriers a landowner might face may very well be dependent on the size of his or her property. Furthermore, this distinction is often made by researchers who focus either on a) small family forests or b) large scale corporate forests (Charnley, Diaz, and Gosnell 2010; Fischer and Charnley 2010). Making this distinction in practical terms would be difficult in working with the CAR database with the projects that had been

removed, as that data would not have been available. Nevertheless, the differences between the two groups are important and should not be ignored. More could be discovered by addressing different questions to the different groups.

6.2 Commentary

People are imperfect and so too is policy. Even the most expertly written policy will be implemented by people who are motivated by their own interests or organizational incentives (Stephan and Paterson 2012). The policy process is inherently political and public programs are carried by both bureaucrats and professional foresters, who have different goals and earn their paychecks from different sources.

In the current political arena, passing climate change policy is no easy task. Fortunately, California has been able to design a system that has potential. Designing a policy that both successfully change behavior by incentivizing forest protection while at the same time disallows bogus projects from entering the market (to ensure the cap is an actual cap) is difficult. Carbon sequestration by forestlands is certainly one important component of a whole host of climate change solutions. Taking it as the silver bullet answer would be a mistake.

After setting the price floor, California has essentially stepped out of the market. The current price of carbon is about 12 US dollars per ton. In order for landowners to truly be incentivized to change their management plans and to enter this market, carbon must be valued as a commodity at a higher price. Of course, this could change in the coming years as the number of covered entities expands. Theoretically, the demand for credits would increase and the price they could fetch would also increase. However, if more and more forests are

certified and earning credits, there could be an overabundance of supply and the price could remain low. This remains to be seen.

However, there is potential here and the promise of making serious, significant climate change without crippling the economy, in fact at the same time enhancing it, makes cap and trade and carbon sequestration the most practical policies. Developing some type of evaluation criteria to judge the success of the policy is an important step. The forest carbon sequestration component of the umbrella cap and trade program almost functions as a separate program within the policy. That program also needs to be evaluated from a critical lens. Increasing the number of participants is not necessarily best for the overall goal of the policy: GHG mitigation.

As the threat of climate change becomes increasingly imminent and pressure on policymakers to take action increases, carbon markets around the world will be watching California. Its successes will be duplicated and its failures scrutinized, criticized, and improved upon in markets around the world. This research contributes to one component of the policy by examining the barriers to participation for different types of landowners and their motivations for participating in the first place.

6.3 Recommendations

In making a recommendation to the ARB, I would advocate creating an aggregation protocol for small-scale landowners which would increase the number of participants and acres of protected land. The minimum acreage for a project seems to be about 3,000 acres or 5,000 acres for a "comfortable" project. A large segment of both the population and forested acres is excluded from the market, calling into question issues of justice.

Second, the ARB should consider ways to redesign the contract so that the time-commitment is more manageable. Even foresters and those in forest management, who tend to have a further outlook than the finance field, seem to agree that 100 years is simply too far out for any meaningful plans. Survey respondents suggest 50 years as a reasonable contract length and interviewees were suggesting an even lower length at between 25 and 30 years. The ARB worries about the permanence criterion being met. This is a reasonable concern if they maintain the permanence standard, however, this in itself seems to be a problem. The regulation in essence defines permanence as 100 years, but that is not what this word means to the rest of the world. As long as verifiers are doing their calculations correctly and owners are earning true market price for their carbon, the age of the forest should not matter. It may make a difference to individual landowners, but at the national, aggregate levels those details wash out. From the perspective of the atmosphere there is no difference between 10 projects lasting 10 years or one project lasting 100 years. The ARB would do well to remove the standard, set a more manageable timeline, and avoid misleading people with a label that is not accurate.

Third, working to align with pre-existing conservation programs should be a goal of the ARB's. This will be a challenge as projects have differing goals, but they seem to go hand-in-hand, and the ARB should work to accommodate those partnerships. They were able to successfully anticipate land being in conservation easements and had a section of the protocol dedicated to explaining the details of how a transfer would function. A similar transfer, or existence in both markets, could be worked into future renditions of the protocol.

Fourth, the sequential verification standard seems to be overly burdensome on landowners and verifiers. The process requires a significant amount of time in the field.

Because there are a limited number of certified foresters eligible to legally work on these projects, this could be preventing new projects from getting off the ground. The standard could be rewritten so that verification occurs less often, for example every eight years instead of every six. Another option is to employ a "looser" methodology and spot check in a less dense pattern. Of course, this opens up the policy to more criticism from environmentalists and those who worry that sequestration does not really do anything. Admittedly, with less stringent sequential verification standards, there is more room for error and abuse. However, this option should at least be considered as a compromise if entering more forests into the program is at least a peripheral goal.

6.3 Future Research

While this research design provided good preliminary results, it leaves room for future research. First, CAR respondents may be facing fatigue so it would be wise to use a different database. The American Carbon Registry (ACR) is an excellent option. The same basic research design could be followed with projects registered with the ACR. This would also provide data on whether barriers are similar across the registry or unique to just one of the registries. Making a clear distinction between large corporate owners and small family forests is also important in future work. Understanding that they operate under very different decision-making structures is important to keep in mind. They should be evaluated under two different research designs.

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Appendix: Data Collection Instruments

Interview Questions for Project Developer

1. Who initiates contact in the early stages of a project? Does you reach out to landowners, land trusts, and TIMOs or do they contact you?
    a. How familiar are landowners with the details of the ARB or CAR protocol?
    b. To what extent are you involved in helping design a project?

2. What aspects of the ARB and CAR forest protocols (e.g., term-commitment, complexity, costs, etc.) have proven most challenging, or cause the most reluctance or angst, for project owners?
    a. Do differences between the ARB and CAR protocols affect project owner decisions? If so, in what ways?
    b. Do differences in how the ARB and CAR protocols treat the different project types (i.e. reforestation, improved forest management, or avoided conversion) affect project owner decisions? If so, which differences, and how are project owner decisions affected?

3. In your experience, what parts of the ARB and CAR protocols tend to be the most problematic during verification, and how material to the quantification of GHG offsets are these problem areas? Please explain how or why these issues arise, and offer any ideas you may have regarding changes or clarifications that would help alleviate these issues.

4. Are there other aspects of the ARB or CAR protocol or process that have affected the supply of forest offsets either positively or negatively? If so, which aspects, and how did the effect manifest?
    a. Are you aware of and forest sequestration projects that withdrew from participation in the CAR or ARB but continued to conduct the project activities? If so, why did they withdraw, and what, if any, changes to the protocols or program might have maintained their participation?
    b. Are you aware of any forest sequestration projects that withdrew from participation in the CAR or ARB and ceased conducting project activities? If so, why did they withdraw, and what, if any, changes to the protocols or program might have maintained their participation or supported continued project activities?

5. How have the protocols and other requirements for carbon offsets changed over time? (e.g. become more clear, more complex, more difficult to put in practice) And do these changes, in your opinion, expand or contract the potential supply of forest offsets, affect the cost or risk of projects earning offsets, and provide a more reliable quantification of actual carbon sequestration compared to the approach prior to implementation of the change?

6. Have you seen a decrease or increase in the number of participants, potential participants, or parties interested in the program in recent years?

7. How does the current market for carbon offsets impact property owners' decisions to participate (or not) in the ARB offset program? [future market prices, regulatory reversals, opportunity cost, transaction costs, other]

8. Finally, what aspect(s) of the protocol or the market has the greatest impact on the number of offsets earned by a project?

Interview Questions for Project Verifier

1. What is your position at you company? How long have you been involved in this industry?
2. Do you work directly with landowners?
3. How familiar are landowners with the details of the ARB or CAR protocol?
4. What aspects of the ARB and CAR forest protocols (e.g., term-commitment, complexity, costs, etc.) have proven most challenging, or cause the most reluctance or angst, for project owners?
5. Do differences between the ARB and CAR protocols affect project owner decisions? If so, in what ways?
6. Do verifiers talk?
7. Do differences in how the ARB and CAR protocols treat the different project types (i.e. reforestation, improved forest management, or avoided conversion) affect project owner decisions? If so, which differences, and how are project owner decisions affected?
8. In your experience, what parts of the ARB and CAR protocols tend to be the most problematic during verification, and how material to the quantification of GHG offsets are these problem areas? Please explain how or why these issues arise, and offer any ideas you may have regarding changes or clarifications that would help alleviate these issues.
9. Are there other aspects of the ARB or CAR protocol or process that have affected the supply of forest offsets either positively or negatively? If so, which aspects, and how did the effect manifest?
10. Are you aware of and forest sequestration projects that withdrew from participation in the CAR or ARB but continued to conduct the project activities? If so, why did they withdraw, and what, if any, changes to the protocols or program might have maintained their participation?
11. How have the protocols and other requirements for carbon offsets changed over time? (e.g. become more clear, more complex, more difficult to put in practice) And do these changes, in your opinion, expand or contract the potential supply of forest offsets, affect the cost or risk of projects earning offsets, and provide a more reliable quantification of actual carbon sequestration compared to the approach prior to implementation of the change?
12. Have you seen a decrease or increase in the number of participants, potential participants, or parties interested in the program in recent years?

13. How does the current market for carbon offsets impact property owners' decisions to participate (or not) in the ARB offset program? [future market prices, regulatory reversals, opportunity cost, transaction costs, other]

Interview Questions for Experts

1. Did you register a project?
2. Did you work at all with a specific registry?
3. Does Winrock run the ACR?
4. Does you land have a forest management plan?
5. Do you think the additionality component is overly burdensome for landowners?
6. To what degree do you believe carbon offsets are a viable means of mitigating the effects of global warming?
7. Describe your confidence in the carbon market.
8. What is your opinion on the 100 year-time commitment?

Interview Questions for Landowners

1. What were some of the problems you faced?
2. How did you first learn about California's carbon offset program?
3. Do you have any previous experience with carbon credits?
4. What is the current use of the land? Is any part of it harvested?
5. How confident are you in the carbon market?
6. Was the project deemed to be a poor financial decision?
7. Did a field technician provide an estimate of your carbon stock?
8. What ultimately caused you to decide NOT to go forward with the project?

Interview Questions for Registry Representatives

1. What is your role in the organization?
2. How many years of experience do you have in carbon markets?
3. What barriers do you see in the process for landowners?
4. How often do you interact directly with landowners?
5. Do you keep track of dropouts (i.e. people who have started the process of registering but dropped out?

Survey for Non-Participants in Forest Offset Projects

This survey is part of a study funded by the United States Forest Service (USFS) and Appalachian State University. The questions below relate to your involvement in the forest carbon offset program administered by California's Air Resources Board and the Climate Action Reserve. The responses will be used only in aggregate and any identifying information will be removed in the final report. We estimate that this survey will take no

more than 15 minutes to complete. The results of this project will help to provide guidance to program administrators for future refinements. We thank you in advance for your participation in this research. Participation in this research is voluntary. You may choose not to participate or stop at any time with no consequences. If you have questions, contact Celina Szymanski at 828-262-6350 or Tatyana Ruseva, PhD, at 828-262-8238.

This survey is designed to be answered with one project in mind. We recognize that one project developer may have more than one project that has been de-listed. Please fill out one survey per project. While we would love to have all of the projects represented in our data, if you need to limit your time commitment, please choose a project you feel is representative of the projects that you work with.

Appalachian State University's Institutional Review Board has determined this research to be exempt from further review. By continuing on to the survey, you acknowledge you have read and agree to the descriptions and terms outlined in this consent form, and voluntarily agree to participate in this research.

Q1 What is the name of the project?

Q2 What was the CAR ID Number for this project?

Q3 What is the name of your organization?

Q4 In what capacity were you involved in this project?

- ❍ Project Developer (1)
- ❍ Landowner (2)
- ❍ Authorized Project Designee (3)
- ❍ Technical Consultant (4)
- ❍ Other (5) _____

Q5 Initially, what was the reason you undertook the project?

Q6 Which market were you intending to be a part of? (I.e. California's ARB, RGGI, etc.)

Q7 Which protocol was the project operating under?

- ❍ CAR Forest Project Protocol (1)
- ❍ ARB Compliance Offset Protocol US Forest Projects (2)
- ❍ Other (3) _____

Answer: If "Which protocol was the project operating under?" and CAR Forest Project

Protocol Is Selected:

Q7.1 Which version of the protocol was used?

- ❍ Version 3.3 (adopted November 15, 2012) (1)
- ❍ Version 3.2 (adopted August 31, 2010) (2)
- ❍ Version 3.1 (adopted October 22, 2009) (3)
- ❍ Version 3.0 (adopted September 1, 2009) (4)
- ❍ Version 2.1 (adopted September 6, 2007) (5)
- ❍ Version 1.0 (adopted June 13, 2005) (6)
- ❍ Don't Know (7)

Answer: If "Which protocol was the project operating under?" and ARB Compliance Offset

Protocol US Forest Projects Is Selected:

Q7.2 Which version of the protocol was used?

- ❍ US Forest Projects (adopted October 20, 2011) (1)
- ❍ US Forest Projects (adopted November 14, 2014) (2)
- ❍ Don't Know (3)

Q8 What type of project was listed?

- ❍ Improved Forest Management (1)
- ❍ Avoided Conversion (2)
- ❍ Reforestation (3)

Q9 Approximately when was the project listed with the registry?

Drop Down Menus: options 2004-2015

Drop Down Menus: options January – December

Q10 Approximately when was the project withdrawn from the registry?

Drop Down Menus: options 2004-2015

Drop Down Menus: options January – December

Q11 What was the "ARB Project Status" when it was withdrawn from the registry?

- ❍ Active ARB Project (1)
- ❍ Active Registry Project (2)
- ❍ Proposed Project (3)
- ❍ Early Action Eligible (4)
- ❍ Early Action Project (5)
- ❍ Not ARB Eligible (6)

Q12 What was your project's CAR status when it was withdrawn from the registry?

- ❍ "New" (i.e. never appeared on registry) (1)
- ❍ Verified (2)
- ❍ Listed (3)
- ❍ Completed (4)
- ❍ Don't Know (5)
- ❍ Other (6) _____

Q13 How would you describe the ownership of the land on which the project was being implemented?

- ❍ Lands held in a trust / nonprofit organization (1)
- ❍ Small Family landowners ((2)
- ❍ Large Family landowners (>1,000 acres) (3)
- ❍ Timber Investment Management Organization (4)
- ❍ Large Corporate landowner (5)
- ❍ Other (please describe) (6) _____

Q14 What was the approximate acreage of this project?

- ❍ Less than 500 acres (1)
- ❍ 500-1,000 acres (2)
- ❍ 1,001 - 2,000 acres (3)
- ❍ Over 2,000 acres (4)

Q15 What was the single most important factor in the decision to stop participating?

Q16 How important was each of the following in your decision to stop participating?

	Not Important (1)	Slightly Important (2)	Neutral (3)	Important (4)	Very Important (5)	Not Applicable (6)
Time frame of Obligation (1)	❍	❍	❍	❍	❍	❍
Initial inventory costs (ex: legal costs) (2)	❍	❍	❍	❍	❍	❍
Administrative effort and /or cost (3)	❍	❍	❍	❍	❍	❍
Reporting (verification) timelines (4)	❍	❍	❍	❍	❍	❍
Uncertain market demand (5)	❍	❍	❍	❍	❍	❍
Price of carbon (6)	❍	❍	❍	❍	❍	❍
Expected number of credits (7)	❍	❍	❍	❍	❍	❍
Risk of fire, drought or other natural disaster (8)	❍	❍	❍	❍	❍	❍
Change in intended land use (9)	❍	❍	❍	❍	❍	❍
Overall costs exceeded potential	❍	❍	❍	❍	❍	❍

benefits (10)						
Hesitance to work with a government agency (11)	❍	❍	❍	❍	❍	❍
Not Compliant (14)	❍	❍	❍	❍	❍	❍
Other - please explain (12)	❍	❍	❍	❍	❍	❍
Other - please explain (13)	❍	❍	❍	❍	❍	❍

Answer: If "How important was each of the following in your decision to stop participating? Timeframe of Obligation - Very Important Is Selected Or How important was each of the following in your decision to stop participating? Timeframe of Obligation - Important Is Selected:"

Q16.1. What would have been an acceptable commitment participation period?

_____ Years (1) [Sliding Scale of 0 to 100 years]

Answer: If "How important was each of the following in your decision to stop participating? Price of carbon - Very Important Is Selected Or How important was each of the following in your decision to stop participating? Price of carbon - Important Is Selected:"

Q16.2 Approximately what would the price of carbon need to be in order for you to participate?

_____ Price per ton of Carbon (USD) (1) [Sliding Scale 0 to 100$, USD price per ton of Carbon]

Q17 Please elaborate on any of the aforementioned that you feel were very important factors.

Q18 What were other factors that influenced your decision to stop participating?

Q19 What would have made participation in the program more appealing?

Q20 If you would be willing to be contacted for future research on this topic, please provide your email address below.

Email Address (1)

------End of Survey------

Survey for Participants in Forest Offset Projects

A study funded by the United States Forest Service (USFS) and Appalachian State University examines motivations for participation in compliance forest offset projects. The questions below relate to your participation in projects registered with the Climate Action Reserve (CAR) and/or California's Air Resources Board (ARB) compliance offset program. Your participation in this survey is very important and we greatly value your input and your time. All information will be used only in aggregate; thus, no one will be able to identify individual projects in the final report. The survey should take no more than 12 minutes to complete. Your participation is completely voluntary.

The survey is designed to be answered with one project in mind. Please fill out one survey per project, choosing a project you feel is most representative of the projects you work with. The results will help inform future program refinements and assist program administrators. We thank you in advance for your participation in this research.

Appalachian State University's Institutional Review Board has approved this research under study number 15-0162. By continuing on to the survey, you acknowledge that you have read and agree to the descriptions and terms outlined in this consent form, and voluntarily agree to participate in this research. If you have any questions or concerns, please contact Celina Szymanski at 828-262-6350 or Tatyana Ruseva at 828-262-8238.

Q1 What is the name of the forest offset project?

Q2 What is the CAR ID Number for this project?

Q3 In what capacity are you involved in this project?

- ❍ Project Developer (1)
- ❍ Landowner (2)
- ❍ Authorized Project Designee (3)
- ❍ Technical Consultant (4)
- ❍ Other (5) _____

Q4 How would you describe the ownership of the land on which the project is located?

- ❍ Lands held in a trust / nonprofit organization (1)
- ❍ Small family landowner ((2)
- ❍ Large family landowners (>1,000 acres) (3)
- ❍ Timber Investment Management Organization (4)
- ❍ Large corporate landowner (5)
- ❍ Other (please describe) (6) _____

Q5 What was the main motivation for undertaking this project?

Q6 Please indicate how influential each of the following has been in your decision to participate in a forest offset project.

	Not at all influential (1)	Slightly influential (2)	Somewhat influential (3)	Very influential (4)	Extremely influential (5)	Not applicable or don't know (6)
Initial carbon stocking level (2)	❍	❍	❍	❍	❍	❍
Financial viability of project (3)	❍	❍	❍	❍	❍	❍
Property size (4)	❍	❍	❍	❍	❍	❍
Property location (5)	❍	❍	❍	❍	❍	❍
Price of carbon (6)	❍	❍	❍	❍	❍	❍
Market demand for carbon offsets (7)	❍	❍	❍	❍	❍	❍
Desire to mitigate GHG emissions (8)	❍	❍	❍	❍	❍	❍
Available financing for project development (9)	❍	❍	❍	❍	❍	❍
Existing forest management plan (10)	❍	❍	❍	❍	❍	❍
Desire to actively manage land (11)	❍	❍	❍	❍	❍	❍
Uncertain	❍	❍	❍	❍	❍	❍

long-term monitoring and reporting costs (14)						
Other administrative costs (15)	❍	❍	❍	❍	❍	❍
A 100-year monitoring and reporting requirement (16)	❍	❍	❍	❍	❍	❍
Other - please explain (12)	❍	❍	❍	❍	❍	❍
Other - please explain (13)	❍	❍	❍	❍	❍	❍

Q7 Please indicate the degree to which each of the following may have been a problem for your project thus far.

	Not at all a problem (1)	Minor problem (2)	Moderate problem (3)	Serious problem (4)	Not applicable or don't know (7)	Prefer not to answer (8)
Initial inventory costs (i.e. costs of determining baselines) (1)	❍	❍	❍	❍	❍	❍
Administrative effort and costs (i.e. registry fees) (2)	❍	❍	❍	❍	❍	❍
Monitoring requirements (3)	❍	❍	❍	❍	❍	❍
Verification requirements (4)	❍	❍	❍	❍	❍	❍
Reporting requirements (5)	❍	❍	❍	❍	❍	❍
Uncertain market demand (6)	❍	❍	❍	❍	❍	❍
Price of carbon (7)	❍	❍	❍	❍	❍	❍
Expected number of credits (8)	❍	❍	❍	❍	❍	❍
Risk of fire, drought, or other natural disaster (9)	❍	❍	❍	❍	❍	❍
Difficulty in working with a government	❍	❍	❍	❍	❍	❍

agency (11)						
Lengthy review period at ARB delayed / is delaying project (15)	❍	❍	❍	❍	❍	❍
Penalty for early withdraw or termination of project (13)	❍	❍	❍	❍	❍	❍
Other (10)	❍	❍	❍	❍	❍	❍
Other (14)	❍	❍	❍	❍	❍	❍

Q8 What factors do you think would make participation in a forest offset project more appealing to forest owners?

Q9 Please indicate how strongly you agree or disagree with each of the following statements.

	Strongly disagree (1)	Somewhat disagree (2)	Disagree (3)	Neither agree nor disagree (4)	Agree (5)	Somewhat agree (6)	Strongly agree (7)	Not applicable (8)
The benefits of program participation have outweighed the costs of participation. (1)	❍	❍	❍	❍	❍	❍	❍	❍
I am satisfied with the current price of carbon. (2)	❍	❍	❍	❍	❍	❍	❍	❍
The 100-year requirement for project monitoring, verification, and reporting is a serious barrier to participation in forest offset projects.	❍	❍	❍	❍	❍	❍	❍	❍

(3)								

Q10 In your opinion, what commitment period will make participation in a forest offset project more attractive to forest owners?

_____ Years (1)

Q11 If you are willing to be contacted for a follow-up related to this research, please provide your email address and phone number below.

Email Address (1)

Phone number (2)

Vita

Celina Szymanski is originally from Elkton, Maryland and a graduate of The Tome School, in North East, Maryland. In 2013, she earned her B.S. in Law and Society from Frostburg State University. As of the approval of this thesis, Celina Szymanski will be a graduate of the Cratis D. Williams Graduate School at Appalachian State University with a Master of Arts in Political Science. Her concentration is Environmental Policy and Politics. Her research interests include forest policy, carbon sequestration, and environmental literacy. She may be reached at celina.szymanski@gmail.com.