

“IF SOMEONE WANTS MY CARBON, LET THEM PAY”:
EXAMINING NONINDUSTRIAL PRIVATE FOREST OWNER (NIPF) INTEREST IN
SELLING FOREST CARBON CREDITS UNDER CALIFORNIA’S
CARBON MARKET

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ABSTRACT

“IF SOMEONE WANTS MY CARBON, LET THEM PAY”: EXAMINING NONINDUSTRIAL PRIVATE FOREST OWNER (NIPF) INTEREST IN SELLING FOREST CARBON CREDITS UNDER CALIFORNIA’S CARBON MARKET

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As a response to global climate change, policies have increasingly incorporated forest carbon offset projects into mitigation efforts. To this end, California has implemented the first US forest carbon offset program within a compliance cap-and-trade system. Improved Forest Management projects allow for the production of forest products while also providing landowners with an alternative revenue stream. Therefore, the inclusion of these projects may have important implications for landowner livelihoods and the health of their forests. Landowners have a variety of motivations for participating within this type of program. However, nonindustrial private forest (NIPF) owner behavior is particularly complex and motivated by multiple objectives, including economic incentives. This research aimed to identify motivations and barriers to NIPF participation within this carbon offset program. Although studies have provided information on landowner behavior within hypothetical markets, this research focused specifically on NIPF participation within California’s newly implemented forest carbon offset program. A mail questionnaire was used to assess NIPF perceptions of forest project requirements. Most respondents were interested in participating in this program in order to receive additional revenue and to improve forest health, regardless of forest ownership objectives. However, participants also identified possible constraints in joining

the market, such as the lengthy time commitment, high costs, and protocol complexity. The results of this study contribute to the growing body of knowledge regarding NIPF behavior within incentive-based management programs.

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INTRODUCTION

With the incorporation of forest offsets into carbon cap-and-trade markets, forest landowners will play an important role in greenhouse gas mitigation efforts. Regulated markets for forest carbon credits are emerging in order to encourage management practices that promote carbon sequestration and storage in private forests. In January of 2013, California implemented the first forest carbon offset program under a regulated carbon-trading system in which high-emitting industries are required to comply. While previous markets have offered offset credits to buyers on a voluntary basis, California aimed to develop a market model to help industries comply with greenhouse gas reduction requirements under a new compliance cap and trade program. Because offset credits are priced at a lower cost than state-auctioned carbon allowances, including carbon offsets in this market may lead to a high and continuous demand for credits.

Within the California cap-and-trade program, Improved Forest Management (IFM) projects are the most common forest project type, as they allow some flexibility in forest management techniques (Climate Action Reserve, 2014). Landowners can incorporate timber harvesting into an approved management plan as long as carbon stocks are projected to increase and timber is converted to long-lived wood products (California Air Resources Board, 2011). IFM projects can thus provide landowners with an alternative revenue stream in addition to what is received from the sale of timber products.

This program could provide significant financial returns to landowners who develop viable projects and participate in the market. However, the forest carbon offset protocol is complex, and requires forest owners to engage in an expensive and lengthy process in order to list an offset project with a state registry. Protocol requirements include a time commitment of at least 100 years, project area verification, and ongoing monitoring and reporting obligations (California Air Resources Board, 2011). Forest owners who do not have the financial or professional resources to satisfy these requirements will ultimately be excluded from California's program.

The carbon market is now in full swing, and we can begin to examine forest owner participation rates. A variety of forest owner types have developed IFM forest projects across the US. However, nonindustrial private forests owners (NIPFs) have developed only a few projects in proportion to their cumulative forest holdings. NIPFs, or "family forest" owners own 62% of private forest land in the US – significantly more area than corporate owners or other noncorporate owners combined (Smith et al., 2009) – but account for only 15% of IFM project area acres (Tables 1 and 2).

Table 1. Forest land acreage and Improved Forest Management projects in the US by ownership type, 2007 (Smith et al., 2009).

| Ownership type | | Number of forested acres in US | Percent of forested acres in US | Percent of eligible (private) forested acres in US | Percent of IFM projects |
|-----------------------------|-----------------------------------|--------------------------------|---------------------------------|--|-------------------------|
| Private noncorporate | NIPF, or “family forests” | 264 million | 35% | 62% | 15% |
| | Other (NGOs, clubs, tribal, etc.) | 21 million | 3% | 5% | 59% |
| Private corporate | | 138 million | 18% | 33% | 26% |
| Public agencies | | 328 million | 44% | - | n/a |
| Total | | 751 million | 100% | 100% | 100% |

Table 2. Improved Forest Management project characteristics by ownership type in the US as of August 2015 (Climate Action Reserve, 2015).

| Ownership type | Number of projects | Total number of combined acres |
|------------------------------------|--------------------|--------------------------------|
| Investment (TIMO, REIT) | 10 | 618915 |
| Conservation NGO/land trust | 24 | 324727 |
| Industrial | 15 | 296764 |
| NIPF | 15 | 272612 |
| Tribal | 6 | 244137 |
| Other | 25 | |
| Total | 91 | |

The low rate of project development on NIPF land could indicate that landowners are either not interested in this carbon sequestration program, or are facing barriers to market entry.

NIPFs stand to gain important financial and ecological benefits from selling carbon credits. NIPFs are facing increasing pressures to subdivide due to urbanization

and increased property costs, and the average acreage size owned by NIPFs is decreasing (Conway et al., 2003). Many NIPFs are in need of additional revenue in order to keep forest parcels intact, and revenue received from an offset project could help to promote forest retention (Galik et al., 2003). However, NIPFs may be excluded from California's market due to their modest property sizes and lack of investment capital.

NIPF management decisions could heavily impact carbon sequestration capacity due to their cumulative landholdings (Majumdar et al., 2008, Butler and Leatherberry, 2004, Alig, 2003). Addressing limitations to NIPF offset project development might effectively help to advance California's emission reduction goals while also providing important benefits to landowners. Although previous research has examined NIPF participation in hypothetical markets, this research explores the views of NIPF landowners toward California's newly enacted market, including whether they would participate, what obstacles and incentives exist for participation, and how carbon markets coexist with their existing management objectives.

LITERATURE REVIEW

The body of literature related to nonindustrial private forests is extensive. Researchers have aimed to understand and predict NIPF behavior for decades due to their significant cumulative landholdings. Decision-making related to forest management has been of particular interest. While a considerable amount of research has focused on behavior and decision-making related to forest management and incentive-based management programs, scant literature exists that specifically discusses NIPF behavior in carbon sequestration programs in the US. In this section, I review research related to NIPF management objectives and decision-making, participation in incentive-based management programs, and attitudes towards developing carbon projects.

NIPFs: A Dynamic and Unpredictable Ownership Group with Multiple Objectives

NIPFs are a heterogeneous group, making their future management plans hard to predict (Majumdar et al., 2008). Nonindustrial private forest owners, or “family forest” owners, include families, individuals, estates, trusts, family partnerships, and other unincorporated groups of individuals who own at least one acre with 10% forest cover (Butler and Ma, 2011). NIPFs are exhibiting significant demographic shifts. Forest owners in the US are aging, with a third of NIPF owners currently over 65 years old, and a fifth of owners over 75 years old (US Forest Service, 2008). NIPF owners are becoming more urban-oriented, as more “white-collar” workers are becoming forest owners (Best

and Wayburn, 2001), and an increasing number of forest parcels are owned by absentee owners (Conway et al., 2003). These anticipated land transfers make NIPF decisions more unpredictable: As land is passed on to the next generation, or sold to new owners outside of the family, land management objectives and techniques could change under new ownership. The diverse nature of NIPFs makes them particularly interesting in the context of California's carbon market. While other ownership groups may have clear objectives for participation, it is difficult to predict how NIPFs will behave within this new market.

In order to better understand and predict NIPF management behavior, a rich collection of research has examined forest ownership objectives (Joshi and Arano, 2009, Creighton et al., 2002, Majumdar et al., 2008, Newman and Wear, 1993, Kuuluvainen et al., 1996, Conway et al., 2003, Arano and Munn, 2006, Ma and Kittredge, 2011, Ferranto et al., 2011). NIPFs have particularly complex objectives (Arano and Munn, 2006) and are not always motivated by profit and financial gain (Ma and Kittredge, 2011, Newman and Wear, 1993). Therefore, management objectives tend to be more in line with techniques that promote nonmonetary benefits and capture the valuable services provided by standing forests (Ferranto et al., 2011, Hartman, 1976, Newman and Wear, 1993).

Many NIPFs have multiple management objectives, and are strongly motivated by both consumptive and nonconsumptive use values (Majumdar et al., 2008). Ferranto et al., (2011) surveyed California forest and rangeland owners, finding that landowners' primary motivations were for natural amenities and investment opportunities. Ma and Kittredge (2011) show similar results in their survey of Massachusetts NIPFs, identifying

two major reasons for owning forests: amenity values and income from forest products.

This substantiates previous research describing the multiple objectives of NIPF landowners and their interest in jointly producing both timber income and forest amenities (Conway et al., 2003).

Several studies have produced NIPF typologies in order to organize these complex landowners into discreet groups. Kuuluvainen et al. (1996) identified four groups based on NIPF ownership objectives in Finland: “multiobjective owners”, “recreationists”, “self-employed owners”, and “investors”. Kline et al. (2000) also identified four ownership objective groups based on responses from a survey of NIPFs in Oregon and Washington. The four groups were labeled as “timber producers”, “multiobjective owners”, “recreationists”, and “passive owners”. Majumdar et al. (2008) developed a similar classification of NIPFs from the southeastern US in order to better understand their ownership motivations. “Multi-objective” owners were the most common ownership type, followed by “timber” owners (those motivated by timber management and land investment) and “nontimber” owners (those who value the nonconsumptive uses of forestland). While the existing literature discusses NIPF ownerships in various locations, it is important to note that landowner attitudes and objectives depend on the political and social environments of the region (Kuuluvainen et al., 1996). To my knowledge, a typology based on ownership objectives of NIPFs in California has not yet been created.

California’s forest carbon offset program could support existing NIPF objectives while also incentivizing forest stewardship at the policy level. The forest carbon offset

protocol incorporates multi-objective forest owners by allowing timber harvesting (and conversion to long-lived wood products) as compatible with carbon sequestration. Forest owners can benefit from additional revenue, while continuing to produce timber products. This study builds on previous research by discussing the relationship between ownership objectives and management decisions within the context of the carbon market. My research specifically examines NIPF ownership objectives and forest management decisions in California, where the cap-and-trade carbon market has been implemented.

The Uncertainty of Incentive-Based Management Programs for NIPF Owners

California's offset program could provide incentives that help NIPFs achieve their ownership objectives, but existing literature describes the uncertainty surrounding NIPF behavior within incentive-based management programs, specifically those providing payments for ecosystem services. Incentive-based management programs offer financial incentives such as direct payment, subsidies or tax incentives to encourage landowners to practice certain management techniques on their land. Researchers have found that the probability of investing in forest management is directly related to landowner income. Therefore, subsidies and incentives have been used as a method of increasing income and stimulating forest management on NIPF land (Romm et al., 1987). When applied to conservation efforts, financial incentives allow forest owners to account for the value of ecosystem services on their land when making management decisions (Plieninger et al., 2012).

Payment for ecosystem services (PES) is a type of incentive-based policy tool that compensates landowners for the adoption of management practices, leading to beneficial environmental outcomes that would not have occurred without compensation (Knoot, 2015, Layton, 2009). PES has gained in popularity as a strategy for promoting the provision of many ecosystem services, including those provided by forests (Farley and Costanza, 2010, Layton, 2009). However, participating in PES programs presents high transaction and opportunity costs for forest owners, and owners of small forest parcels are particularly constrained by financial barriers due to limited scale economics (Amacher, 2014, Knoot, 2015, Layton, 2009). In their survey of NIPFs in Finland, Layton and Siikamaki (2009) explain that PES programs must be properly designed and implemented to effectively meet conservation goals. In addition, they assert the importance of understanding and predicting NIPF decisions within these policy programs.

Although incentives are designed to be attractive to forest owners, the results of a previous study suggest that incentive programs might not be an effective way of influencing landowner behavior (Daniels et al., 2010). Ownership objectives vary considerably among forest owners; therefore, incentive programs that are attractive to some may have weak appeal to others. Results of a survey of forestry officials in the 20 northern US states show that forestry incentive programs are an effective tool in promoting forest sustainability on NIPF land (Jacobson et al., 2009). However, Daniels et al. (2010) found different results from conducting eight NIPF focus groups throughout the US. As explained by Daniels et al. (2010), “Programs that are intended to increase the profitability of forest management do not have much traction with landowners because

profit is not their primary ownership objective” (p. 60). The authors explain that ownership objectives and preferences lay a crucial foundation for developing effective incentive programs. There is no one-size-fits-all program design, and programs may need to reflect the diversity of landowners and their objectives.

My research examines how NIPF ownership objectives will affect landowners’ interests in receiving payments for carbon sequestration under California’s market, and explores whether the particular protocol requirements for IFM projects disincentivize participation.

Attitudes Towards Carbon Sequestration and Trading Programs, and the Limitations of NIPF Participation

Managing for carbon might align with the ownership goals of many NIPF owners (Miller et al. 2012), and a properly designed offset program could provide landowners with an additional revenue stream and promote forest retention (Galik et al., 2013). In a survey of NIPF owners in the US, Thompson and Hansen (2012) found that 37% of respondents held positive attitudes regarding the management of forestland for carbon sequestration and trading. In addition, NIPF owners place high importance on the legacy of their forests (Majumdar, 2009). Landowners who plan to bequeath forests to their heirs generally have a positive attitude towards carbon sequestration programs, indicating an interest in maintaining longevity of forestland (Thompson and Hansen, 2012).

However, carbon sequestration programs have limitations to NIPF participation. Charnley et al. (2010) offer an in-depth discussion of the challenges involved in small landowner participation in these types of programs. The authors explain that forest offset programs are set up in a way that favors industrial landowners and excludes small family forest owners. Unlike industrial landowners, NIPFs might not have financial and professional resources available to develop carbon offset projects through California's program. For example, landowners must first hire a professional to inventory and verify the proposed project area. Industrial landowners might already have a professional forester or verifier on the payroll; however, family forest owners who do not actively harvest may have never hired a professional. NIPFs have fewer informational resources overall, with only 2 in 5 acres owned by people who have received forest management advice (US Forest Service, 2008). Therefore, forest landowners who do not actively manage their land or interact with forestry professionals may have difficulty accessing this program.

Markowski-Lindsay et al. (2011) found that forest owners in Massachusetts would have very little interest in participating in a hypothetical voluntary market described by the researchers because of high costs, complex protocols, stringent reporting requirements, withdrawal penalties, and contract length. Other researchers have found similar results (Charnley et al., 2010, Fletcher et al., 2009, Miller et al., 2012, Wade and Moseley, 2011). NIPF landowners are generally considered to be "land rich and cash poor", which suggests that they will only participate in programs that are "flexible and lucrative" (Wade and Moseley, 2011).

These studies offer insights into how landowners will behave within hypothetical markets; however, research has yet to examine NIPF attitudes towards California's existing regulatory forest carbon offset program. While the barriers found in previous research will likely exist in California's market, the particular requirements (and high carbon prices) of this new market may impact NIPF perceptions of the benefits and limitations of participating.

RESEARCH QUESTIONS AND HYPOTHESES:

Research Question 1

How do NIPFs in Northern California manage their forests?

Research Question 2

What are NIPF ownership objectives? Are there dominant objectives that can be used to classify landowners?

Research Question 3

What are NIPF attitudes towards California's forest carbon offset program?

- Are NIPFs familiar with this program? What is their primary information source?
- How do management practices, ownership objectives, and climate change perceptions affect attitudes towards project development and protocol requirements?
- What would motivate NIPFs to participate, and what are the potential barriers to project development?

I developed several hypotheses addressing RQ3:

Hypothesis #1: Familiarity with the program

I expected to find that the majority of NIPFs are unfamiliar with California's program, and that most landowners who are familiar with the program obtained program information from the media. However, some landowners will be more familiar than others due to their access to expert knowledge. More specifically:

- Landowners who practice higher management intensity will have more familiarity with the forest carbon offset market, due to their likely interactions with forestry professionals and agencies.
- Landowners who own land for income/investment value will know more about this financial incentive based program.

Hypothesis #2: Motivations for participation in California's forest offset compliance market

I expected to find that landowners with different ownership objectives would have different motivations for participation, and:

- Landowners who place high importance on forest amenities will be primarily motivated by the non-monetary benefits provided by an offset project (such as improving forest health).
- Landowners who place high importance on forest investment and income will be primarily motivated by the income provided by an offset project.

Hypothesis #3: Climate change perceptions

I hypothesized that perceptions of climate change would affect NIPF opinions of the program, and that landowners who are skeptical of climate change would be less likely to participate in a program aimed at reducing greenhouse gasses.

Hypothesis #4: Willingness to satisfy protocol requirements and landowner concerns regarding these requirements

I hypothesized that most forest owners would not be willing to satisfy protocol requirements as described, and would not enroll any of their forests in an offset project.

- A 100-year commitment would be too long for most NIPFs, but they might be willing to commit to a shorter time period.
- Initial project development, project area inventory and ongoing verification, and ongoing monitoring and reporting would be too costly and too complex for most NIPFs.

However, concerns regarding protocol requirements would vary depending on landowner ownership objectives and management regimes.

- Landowners who place high importance on forest investment and income will be more willing to satisfy protocol requirements, due to their willingness to invest in forests in order to receive financial returns.
- Landowners who practice higher management intensity will be more willing to satisfy protocol requirements, as they might already have experience performing certain activities involved in project development (such as working with a

professional firm, hiring a Registered Professional Forester, and completing forest inventories).

METHODS

Survey Design and Rationale

This research relied on a mail questionnaire, as it would allow me to gather information from forest landowners across a large geographic area. This technique also allowed me to provide landowners with printed informational material regarding forest carbon offsets under California's carbon market. The questionnaire therefore served as both a survey instrument and an outreach tool.

In order to gather the data required for my analysis, survey questions covered information related to forest ownership, forest uses, future plans for forest, ownership objectives, and opinions regarding forest carbon offset project development. National Woodland Owner Survey questions regarding general forest ownership and management information were incorporated into the questionnaire. I also included questions related to climate change attitudes developed by Markowski-Lindsay et al. (2011).

I accomplished my outreach objectives by developing an informational insert describing California's carbon market and the role of forest offsets in meeting emission reduction goals. This insert accompanied the questionnaire mailings, and included website addresses where participants could find supplementary information. In addition, the questionnaire itself contained a section introducing Improved Forest Management (IFM) projects in more detail, describing the potential benefits to landowners and their forests (Figure 1), and the protocol requirements for IFM project development (Figure 2).

Forest Carbon Offset Projects

California has implemented a cap and trade program that includes forestry projects to help reduce greenhouse gases, including carbon dioxide. Forests can capture and store carbon dioxide in tree trunks, stems, roots, and soil. This is known as carbon sequestration. Carbon stored in trees can remain stored even after being harvested if the wood is converted into long-lived wood products.

Landowners may participate in this new program by demonstrating increased carbon sequestration in forests. Participating landowners receive carbon credits, representing tons of stored carbon within a project area. These credits can then be sold to industrial facilities that are required to compensate for greenhouse gas emissions. This is also known as a forest carbon offset project.

We are interested in Improved Forest Management projects, in which landowners increase forest carbon stocks through management compared to baseline conditions.

There are two ways for private landowners to develop Improved Forest Management projects on forested land, depending on the condition of the project area:

- If the forested project area is stocked at levels that exceed the regional average for other landowners of the same forest type, landowners receive initial credits for carbon stored in standing forests. Landowners may then receive credits annually if they demonstrate an ongoing increase in carbon sequestration. One private firm has estimated that initial credits received from well-stocked forests are approximately 5-30 tons per acre (\$50-\$300 per acre), and annual carbon sequestration generally ranges from 2-5 credits per acre per year (\$20-\$50 per acre per year).
- If the forested project area is stocked below the regional average for other landowners of the same forest type, landowners will receive fewer or no initial credits, but can receive credits annually for demonstrating an increase in carbon sequestration over time.

In either scenario, landowners can manage for wood products within the project area. Levels of carbon stocks must be maintained or increased over time, and cannot decrease over any consecutive 10-year period. The forest-offset program could have significant impacts on landowners and their forests. We would like to ask you some questions about your likeliness to participate in this program.

Figure 1. Questionnaire description of Improved Forest Management offset projects.

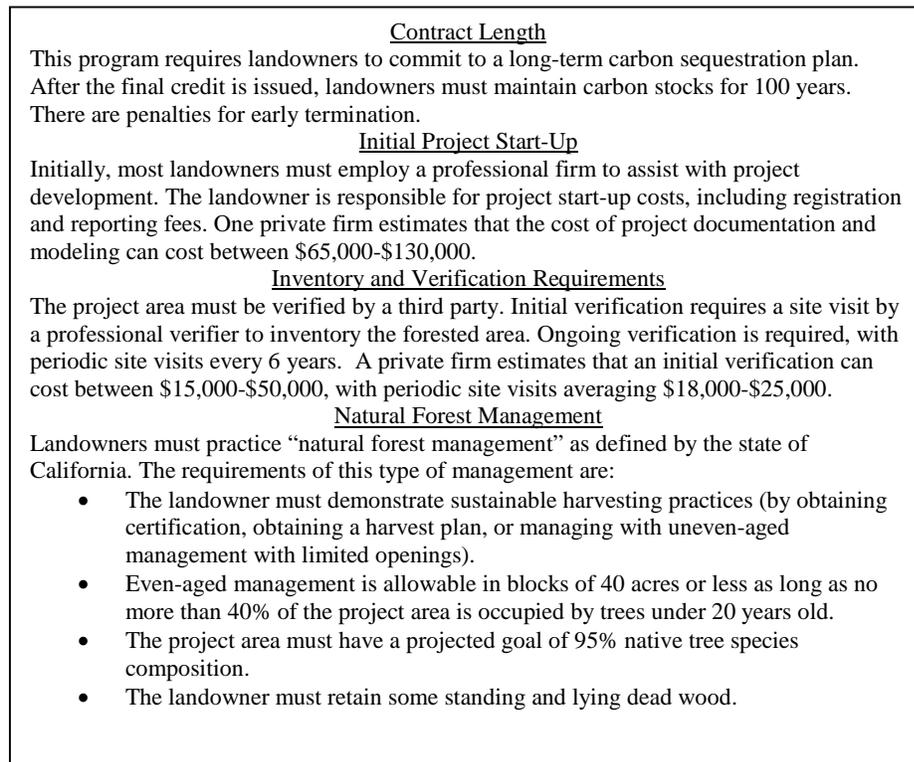


Figure 2. Questionnaire description of protocol requirements for IFM project development

Survey materials were subject to extensive review by experts ($N=15$) including University of California extension researchers (4), local foresters (4), offset project verifiers (2), university professors (4), and a local forest landowner (1). Reviewers helped to ensure that my descriptions characterized California’s program accurately, and were understandable to a non-academic audience.

The final 20 page 5”x8” booklet was mailed with an introduction letter, the informational insert, and a pre-stamped return envelope.

Sample Area and Strategy

My research targeted forest landowners in California with enough land to potentially develop a viable offset project. I conferred with experts to identify a minimum parcel size that could theoretically support a financially viable offset project. Generally, estimates ranged from 250-2000 minimum project area acreage. I set my minimum target parcel size at 100 acres in order to include landowners who might be able to participate in the future. This could occur if project development costs are reduced, offset credit prices rise considerably, or if aggregation protocols are included in the regulated market. I sampled from five Northern California counties previously surveyed by Ferranto et al. (2011) in their survey of California rangeland and forest owners. These five counties represent three forest bioregions of Northern California:

1. Klamath/North Coast bioregion: Humboldt, Mendocino, and Shasta (western region) counties.
2. Modoc bioregion: Shasta (eastern region) and Plumas (northwest) counties.
3. Sierra bioregion: Sierra and Plumas counties.

ArcMap was used to identify parcels that met my sampling parameters. GIS parcel data was obtained from each of the five Northern California counties. I then collected GIS data from the US Forest Service CALVEG system to identify forested parcels and CALFIRE 2010 Fire and Resource Assessment Program (FRAP) ownership data to identify private land. I selected privately owned parcels with at least 100 acres of forest, excluding land that appeared to be primarily unforested based on the USFS

CALVEG data. Assessor's Parcel Numbers (APNs) for all selected parcels were then sent to each county's assessor's office to request landowner names and addresses. All duplicate and corporate landowner names were dropped.

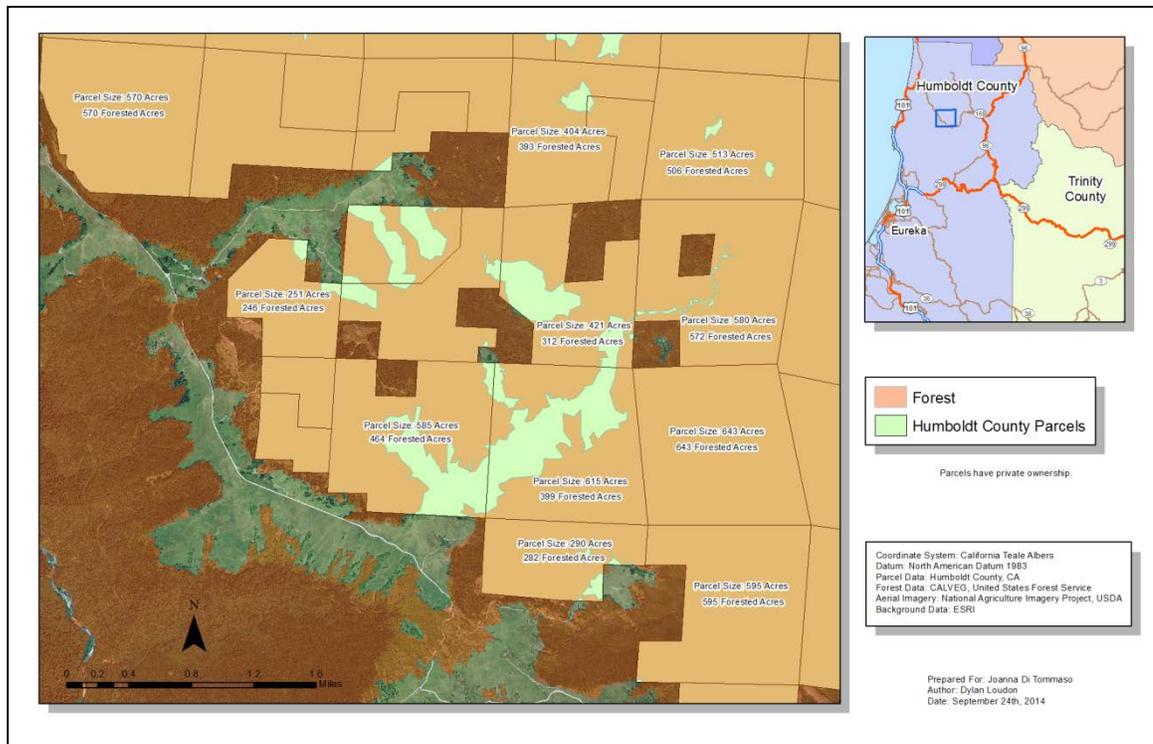


Figure 3. GIS data was layered in ArcMap to identify privately owned parcels with at least 100 acres of forest cover. An example from Humboldt County is shown here.

Landowner names for my sample were randomly selected from each county. Two hundred names were selected from each large county (Humboldt, Mendocino, and Shasta). I planned to select 100 names each from Sierra and Plumas counties due to their smaller size; however, these counties each had fewer than 100 forest owners who met my

sample qualifications, so all 82 Sierra county landowners and 83 Plumas county landowners were included in my sample.

Each landowner was assigned a random four-digit case number to ensure confidentiality. After adjusting for undeliverable addresses, survey packets were mailed to 754 landowners following the Dillman Total Design Method (Dillman, 2009). Landowners were mailed a postcard a week after the initial mailing thanking participants for completing the questionnaire, and reminding non-responders to do so. Those who did not return the questionnaire were mailed a replacement booklet one month later.

Data Analysis

Data was organized and analyzed using IBM SPSS Statistics software. I conducted statistical tests and analyses using methods detailed by Babbie et al. (2000) and Mertler and Vannatta, (2002) unless otherwise noted.

RESULTS

I received a total of 165 completed surveys from California private forest owners. My response rate was 21%. This is somewhat low compared to those of other NIPF surveys, which range from 15.9-63% (Lind-Riehl et al., 2015, Thompson and Hansen, 2012, Miller et al., 2012, Markowski-Lindsay et al., 2011, Kilgore et al., 2008, Butler, 2008). The low response rate was likely due to the length of the questionnaire booklet and the approximate time required to complete it (20 minutes). My sampling strategy was successful, as most (86%) of these surveys were completed by NIPFs (Table 3). Only questionnaires received from NIPFs were used in my analysis, accounting for a total of 142 usable surveys.

Table 3. Respondent ownership types.

| Ownership type | Frequency | Percent |
|--|------------------|----------------|
| Family forest / nonindustrial private forest | 142 | 86 |
| Conservation nonprofit / land trust | 8 | 5 |
| Industrial | 3 | 2 |
| Other | 10 | 6 |
| No response | 2 | 1 |
| Total | 165 | 100 |

Landowner Demographic, Ownership and Forest Information

Sixty-eight percent (68%)¹ of landowners were between 55 and 74 years old, and 18% were over 75. Most respondents were male (76%) with an average household income of over \$50,000 (81%) and a bachelors or graduate degree (69%). The majority of landowners (90%) obtain 0-20% of their income from the sale of timber products.

Median acreage size was 455 acres (range=12-30,000). NIPFs owned their forests for an average of 39 years (range=1-200) primarily in Humboldt (31%), Mendocino (23%), or Shasta (17%) counties. Most reported that their primary residence is not located within a mile of their forest (57%). Of these respondents, 82% reported that their primary residence is in California, 11% live outside of the state, and 7% have some other arrangement (split time between residences, split property between owners, etc.).

Table 4. County with majority of participant's forest.

| County with majority of forested land | Frequency | Percent |
|--|------------------|----------------|
| Humboldt | 43 | 31 |
| Mendocino | 32 | 23 |
| Shasta | 24 | 17 |
| Plumas | 16 | 11 |
| Sierra | 13 | 9 |
| Butte | 4 | 3 |
| Lassen | 2 | 1 |
| Trinity | 2 | 1 |
| Other | 4 | 3 |
| No response | 2 | 1 |
| Total | 165 | 100 |

¹ All percentages presented in results are valid percentages, which exclude missing responses. N values represent the total number of valid responses for each question.

The most common forest types were Doug-Fir dominant mixed conifer (46%) and pine dominant mixed conifer (22%), followed by mixed oak woodland (12%) and Redwood (11%). Many landowners reported that areas in their forests are over-stocked (49%) or under-stocked (26%), and 49% of respondents are satisfied with the condition of their forests.

Table 5. Forest condition responses.

| Condition of forest | Yes (%) | No (%) |
|--|----------------|---------------|
| I am satisfied with the condition of my forest | 49 | 51 |
| Areas in my forest are over-stocked | 49 | 51 |
| Areas in my forest are under-stocked | 26 | 74 |
| My entire forest is under-stocked | 2 | 98 |
| My entire forest is over-stocked | 2 | 98 |

Half (51%) of respondents own forest classified as a Timber Production Zone (TPZ), allowing them to receive tax benefits for dedicating land to the production of timber and other compatible uses. Twenty-six percent (26%) of NIPFs have used a cost-share program to help with forest management expenses, while 11% have participated in a green certification program such as the Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI). Eleven percent (11%) of respondents have a conservation easement, and 3% of those who do not have a conservation easement plan on getting one in the future.

Twenty percent (20%) of respondents reported that they will likely sell their land to someone outside of the family in the next 10 years, 13% are undecided, and 67% stated

that selling land to someone outside of the family is unlikely. Landowners who plan to sell selected “High or unpredictable regulatory costs” (35%) and “Part of my investment strategy” (31%) as primary reasons for selling.

Management Activities

Seventy eight percent (78%) of landowners have cut or removed trees from their forested property at some point. Of these respondents, 64% used a professional forester. Most respondents have performed some type of management activity in the past 5 years, primarily road construction or maintenance (45%), removing trees for own use (41%), or improving wildlife habitat (40%). Seventeen percent (17%) had not performed any of the listed activities (Table 7). Landowners provided similar responses for their management plans for the next 10 years (Table 8). The most common activities planned include road construction or maintenance (48%), improving wildlife habitat (44%), removal of trees for sale (39%) or own use (39%), and giving some or all land to heirs (39%). Many landowners plan minimal activity (31%), while some plan no activity at all (15%) or have no plans for future management (10%).

Table 6. Tree removals performed by landowners in the past.

| Have you performed any of the following activities? | Yes % | No % |
|--|----------|---------|
| Cut or removed trees from forested property?* | 78 | 22 |
| If yes: | | |
| Cut or removed trees for sale? | 66 | 34 |
| Cut or removed trees for own use? | 41 | 59 |
| Cut or removed for other reasons? | 13 | 87 |
| Was a professional forester used for these cuts?* | 64 | 29 |

Table 7. Management activities performed by landowners in the past 5 years.

| Have you performed any of the following activities in the past 5 years? | Yes % | No % |
|--|----------|---------|
| Road construction or maintenance* | 45 | 55 |
| Cut and/or removed trees for own use* | 41 | 59 |
| Improved wildlife habitat* | 40 | 60 |
| Cut and/or removed trees for sale* | 26 | 74 |
| Trail construction or maintenance | 19 | 81 |
| None of the above | 17 | 83 |
| Collected non-timber forest products | 15 | 85 |
| Eliminated or reduced unwanted insects or disease* | 14 | 86 |
| Eliminated or reduced non-native trees* | 13 | 87 |

Table 8. Management activities planned in the next 10 years.

| Which of the following activities will you perform in the next 10 years? | Yes % | No % |
|---|----------|---------|
| Road construction or maintenance* | 48 | 52 |
| Improve wildlife habitat* | 44 | 56 |
| Cut and/or remove trees for sale* | 39 | 61 |
| Cut and/or remove trees for own use* | 39 | 61 |
| Give some or all of my land to children or other heirs | 39 | 61 |
| Minimum activity to maintain forest | 31 | 69 |
| Eliminate or reduce non-native insects or disease* | 24 | 76 |
| Eliminate or reduce non-native trees* | 16 | 84 |
| Sell some or all of my land | 16 | 84 |
| Leave it as is – no activity | 15 | 85 |
| Collect non-timber forest products | 13 | 87 |
| No plans | 10 | 90 |
| I don't know | 5 | 95 |
| Divide all or part of my forested land and sell the subdivisions | 4 | 96 |
| Convert some or all of my land to another use | 2 | 98 |

Management intensity index

Management activity responses were used to create an index of management intensity. I used the index to address my research questions related to forest management activity. Fourteen variables were combined to create the index, and are indicated with asterisks in Tables 6-8. Only respondents who answered all 14 questions received a score for the index variable. Frequency statistics for the index can be seen in Table 9. I then recoded the index into an ordinal variable in preparation for analysis (Table 10). I ran Chi-square tests to explore relationships between management intensity and demographics (Table 11). I only identified one significant relationship: NIPFs with high management intensity receive a higher percentage of income from forest products than other management groups ($X^2(8, N = 105) = 40.201, p = 0.000$).

Table 9. Management intensity index statistics.

| Management intensity index statistics | |
|--|------|
| Valid n | 110 |
| Range | 0-14 |
| Mean | 6 |
| Median | 6 |
| Modes | 4, 6 |
| Standard deviation | 3.2 |

Table 10. Recoded management intensity group information.

| Management intensity recode group | Range | N |
|--|--------------|----------|
| Low management intensity | 0-4 | 42 |
| Moderate management intensity | 5-9 | 52 |
| High management intensity | 10-14 | 16 |

Table 11. Management intensity group characteristics.

| | | Low management | Moderate management | High management | All respondents** |
|--|------------------------------|-----------------------|----------------------------|------------------------|--------------------------|
| Number of landowners within group | - | 42 | 52 | 16 | 142 |
| Most frequent age group | - | 65-74 years (46%) | 65-74 years (36%) | 55-64 years (50%) | 65-74 years (37%) |
| Gender | Male (%) | 63 | 84 | 79 | 76 |
| | Female(%) | 37 | 16 | 21 | 24 |
| Household Income | <100,000 (%) | 59 | 50 | 54 | 53 |
| | 100,000+ (%) | 41 | 50 | 46 | 47 |
| Percent of income from forest products* | 60% or less (%) | 100 | 96 | 71 | 96 |
| | Over 60% (%) | 0 | 4 | 29 | 4 |
| Highest level of education received | Associate degree or less (%) | 38 | 37 | 29 | 31 |
| | Bachelor degree (%) | 25 | 22 | 43 | 31 |
| | Graduate degree (%) | 37 | 41 | 28 | 39 |

*NIPFs with high management intensity receive a higher percent of income from forest products than other management groups ($X^2(8, N = 105) = 40.201, p = 0.000$).

** Statistics for “all respondents” include responses from NIPFs who were not included in the index.

Ownership Objectives

Landowners were asked to rate the importance of a variety of reasons for owning forestland. Amenity and legacy values were the most important ownership motivations for the majority of landowners (Table 12). Land investment was an important reason for half of respondents, while other monetary benefits (production of forest products or income from eco-tourism and biofuel) were considered less important overall.

Table 12. Ownership objective responses.

| Reasons for owning forest | Important % | Neutral % | Not Important % |
|---|--------------------|------------------|------------------------|
| To enjoy beauty or scenery | 76 | 12 | 12 |
| To pass land on to my children or other heirs | 69 | 11 | 20 |
| To protect nature and biological diversity | 67 | 18 | 15 |
| For privacy | 64 | 14 | 22 |
| Part of my farm or ranch | 60 | 9 | 31 |
| Part of my home or vacation home | 54 | 12 | 34 |
| To protect land from development (e.g. housing) | 52 | 19 | 29 |
| For land investment | 50 | 17 | 33 |
| For recreation, other than hunting or fishing | 48 | 20 | 32 |
| For production of timber products | 37 | 22 | 41 |
| For hunting or fishing | 26 | 23 | 51 |
| For production of firewood | 24 | 29 | 47 |
| To leave land unmanaged and let nature take its course | 20 | 29 | 51 |
| For cultivation or collection of non-timber forest products (e.g. berries, mushrooms) | 9 | 14 | 77 |
| For eco-tourism income | 5 | 7 | 88 |
| For production of biofuel (energy) | 4 | 19 | 77 |

Ownership objective groups

In order to explore data related to ownership objectives in my analysis, I condensed responses from sixteen questions (listed in Table 12) into a single variable. My goal was to classify landowners and create a typology based on ownership objectives. A cluster analysis was the most appropriate method for this type of classification, as it would place landowners into discreet groups (Aldenderfer and Blashfield, 1984). I followed the methods of a study by Kuluuvainen et al. (1996). In preparation for the cluster analysis, I performed a principal components analysis using Varimax and Kaiser

Normalization rotation methods. The factor analysis was limited to three factors, accounting for 51.44% of total variance (Table 13). By identifying objectives with high loadings within each factor, I was able to identify three ownership objective types: Forest for natural amenity value, forest as part of legacy, and forest for investment value or income generation (Table 14). Participants' principal component scores were saved as new continuous variables, and these scores were used as grouping variables in the subsequent cluster analysis. I used a TwoStep Cluster Analysis or "Quick Cluster" in SPSS, which can be used with continuous variables of equal scale when the desired number of clusters is known (Bacher et al., 2004). TwoStep clustering uses a sequential approach to pre-cluster cases, then utilizes a hierarchical technique to assign each case to the closest cluster according to the distance measure used to find the clusters (Euclidean distance or log-likelihood distance, depending on variable types) (Bacher et al., 2004). The number of clusters was pre-determined at three (3), and Euclidean distance was used to cluster cases.

Table 13. Principal component analysis eigenvalues and total variance explained using Varimax with Kaiser Normalization rotation method.

| | Factor I | Factor II | Factor III |
|--------------------------------------|-----------------|------------------|-------------------|
| Eigenvalues | 3.26 | 2.77 | 2.21 |
| % of total variance explained | 20.36 | 17.30 | 13.78 |

Table 14. Principal component analysis values for forest ownership motivations using Varimax with Kaiser Normalization rotation method.

| | Factor I | Factor II | Factor III |
|--|-----------------|------------------|-------------------|
| To enjoy beauty or scenery | 0.844 | 0.219 | -0.017 |
| To protect nature and biological diversity | 0.799 | -0.004 | 0.013 |
| For recreation, other than hunting or fishing | 0.639 | 0.193 | 0.101 |
| For privacy | 0.604 | 0.563 | -0.015 |
| To leave land unmanaged and let nature take its course | 0.565 | -0.380 | -0.359 |
| To protect land from development (e.g. housing) | 0.554 | 0.248 | 0.028 |
| Part of my farm or ranch | 0.210 | 0.739 | -0.077 |
| To pass land to children or other heirs | -0.008 | 0.631 | 0.046 |
| Part of my home or vacation home | 0.465 | 0.606 | -0.061 |
| For production of firewood | 0.109 | 0.594 | 0.283 |
| For hunting or fishing | 0.169 | 0.526 | 0.338 |
| For production of biofuel (energy) | -0.073 | 0.244 | 0.741 |
| For eco-tourism income | 0.227 | -0.004 | 0.630 |
| For land investment | 0.000 | -0.240 | 0.613 |
| For production of timber products | -0.389 | 0.154 | 0.605 |
| For cultivation of collection of non-timber forest products (e.g. berries, mushrooms) | 0.002 | 0.279 | 0.413 |

These factors account for 51.44% of cumulative explained variance. Components were assigned the following labels based on high factor loadings:

1. Factor I – Forest for natural amenity value.
2. Factor II – Forest as part of legacy.
3. Factor III – Forest for investment value or income generation.

Cluster quality was fair (Silhouette measure of cohesion and separation of 0.4).

The three resulting clusters were in line with my previously identified ownership objective groups. Each group label was based on the principal component with the highest positive mean value (Table 15).

Table 15. NIPF ownership objective group labels based on highest principal component mean value for that cluster.

| Objective group | N* | Mean of principal component score | | |
|-------------------|----|-----------------------------------|--------------|--------------|
| | | Factor I | Factor II | Factor III |
| Amenity | 68 | 0.623 | 0.137 | -0.024 |
| Legacy | 25 | -1.090 | 0.766 | -0.335 |
| Income/Investment | 21 | -0.720 | -1.357 | 0.478 |

*Twenty-eight (28) cases were excluded from the analysis because they did not answer one of the 16 objective questions.

Cluster analysis produced three distinct groups, which I've titled "Amenity", "Legacy", and "Income/Investment". Characteristics for landowners in each group are shown in Table 16 below. This cluster grouping produced a manageable variable to help address research questions related to ownership objectives.

Table 16, Objective group characteristics.

| | | Amenity | Legacy | Income/ Investment | All respondents * |
|---|------------------------------|-------------------|-------------------|-----------------------|-------------------------|
| Number of landowners within group | - | 68 | 25 | 21 | 142 |
| Most frequent age group | - | 65-74 years (34%) | 55-64 years (50%) | 65-74 years (37%) | 65-74 years (37%) |
| Gender | Male (%) | 75 | 68 | 79 | 76 |
| | Female (%) | 25 | 32 | 21 | 24 |
| Household Income | <100,000 (%) | 54 | 57 | 31 | 53 |
| | 100,000+ (%) | 46 | 43 | 69 | 47 |
| Percent of income from forest products | 60% or less (%) | 95 | 100 | 84 | 96 |
| | Over 60% (%) | 5 | 0 | 16 | 4 |
| Highest level of education received | Associate degree or less (%) | 30 | 46 | 11 | 31 |
| | Bachelor degree (%) | 26 | 37 | 37 | 31 |
| | Graduate degree (%) | 44 | 17 | 52 | 39 |

* Statistics for “all respondents” include responses from NIPFs who were not included in cluster groups.

NIPF Familiarity with California’s Program

Respondents reported that they were mostly unfamiliar with California’s program before receiving the questionnaire (Table 17). While 22% of landowners were familiar or very familiar with the program, 52% were only a little familiar or not familiar at all.

As hypothesized, landowners primarily received program information from the news or other media (37%). Registered Professional Foresters were an information source for 20% of landowners, followed by community groups (landowner organizations, watershed councils, etc., 17%), university extension programs (11%), other landowners

(10%), and agency outreach (such as the California Air Resources Board or the Climate Action Reserve) (6%) (Table 18).

Table 17. Familiarity with California forest offset program before receiving questionnaire.

| Respondent familiarity | Percent of NIPF responses |
|-------------------------------|----------------------------------|
| Not familiar | 52 |
| Somewhat familiar | 26 |
| Familiar | 22 |

Table 18. Where have landowners gained prior knowledge about California's program?

| Information sources | Yes (%) | No (%) |
|--|----------------|---------------|
| I did not have prior knowledge about this topic | 39 | 61 |
| News or other media | 37 | 63 |
| Registered Professional Forester (RPF) | 20 | 80 |
| Landowner organizations, watershed councils, or other community groups | 17 | 83 |
| University extension programs | 11 | 89 |
| Other landowners | 10 | 90 |
| Agency outreach, such as the Climate Action Reserve or the California Air Resources Board | 6 | 94 |

Familiarity and management intensity

Landowners who practice high levels of management activity are significantly more familiar with California's program than landowners with low management activity, $F(2, 104) = 5.227, p = 0.007$ (Table 19).

Table 19. Familiarity with California's program increases with management intensity ($F(2, 104) = 5.227, p = 0.007$).

| | Mean familiarity rating |
|-------------------------------------|--------------------------------|
| Low management activity | 2.02 |
| Moderate management activity | 2.65 |
| High management activity | 3.29 |

ANOVA tests were performed to identify significant differences in mean management intensity scores for respondents who did and did not receive information from each source. Mean management intensity was higher for respondents who received information from a Registered Professional Forester (mean=8.31, $F(1, 108) = 19.553, p = 0.000$) and agency outreach (mean=8.33, $F(1, 108) = 5.105, p = 0.026$) than those who had not received information from these sources (means=5.33 and 5.83, respectively, Tables 20 and 21).

Table 20. Landowners received prior information regarding California's program from a Registered Professional Forester (RPF) ($F(1, 108) = 19.553, p = 0.000$).

| Received information from a Registered Professional Forester (RPF) | Mean management intensity score |
|---|--|
| Yes | 8.31 |
| No | 5.33 |

Table 21. Landowners received prior information regarding CA program from agency outreach ($F(1, 108) = 5.105, p = 0.026$).

| Received information from agency outreach | Mean management intensity score |
|---|---------------------------------|
| Yes | 8.33 |
| No | 5.83 |

Familiarity and ownership objectives

Chi-square tests were used to determine if program familiarity and information sources differed between objective groups. A difference in familiarity exists between the income group and the amenity and legacy groups. Fifty percent (50%) of landowners in the income group were familiar or very familiar with the program, compared to 15% in the amenity group and 17% in the legacy group ($X^2(8, N = 112) = 15.270, p = 0.05$).

There is a significant difference between how many landowners received information from a Registered Professional Forester (RPF) within each ownership group. Forty-three percent (43%) of landowners in the income group received program information from a RPF, compared to 12% in the amenity group and 16% in the legacy group ($X^2(5, N = 114) = 10.447, p = 0.005$). All other information sources showed no significant difference between groups.

Climate Change Perceptions

In order to gauge perceptions of climate change, participants were asked to rate their level of agreement with the statement “Human activity is causing climate change at unprecedented rates” on a five point Likert scale. Attitudes varied widely within my sample (Table 22). Over one-third (38%) of respondents disagree or strongly disagree with this statement, 41% agree or strongly agree, and 21% hold neutral opinions.

Table 22. Responses to statement “Human activity is causing climate change at unprecedented rates”.

| | Percent of landowner responses |
|----------|--------------------------------|
| Agree | 41 |
| Neutral | 21 |
| Disagree | 38 |

There was no relationship between levels of management intensity and perceptions of climate change ($p > 0.05$).

Climate change perceptions and ownership objectives

Results of an ANOVA indicated that climate change perceptions differed between objective groups ($F(2,109) = 8.041, p = 0.001$). A Bonferroni post-hoc test showed that the mean response of the legacy group (mean = 2.17) was significantly lower than mean responses of my two other objective groups (Amenity group mean = 3.46; Income group

mean= 3.8). Individuals in the legacy group were thus more likely to be skeptical of human-induced climate change.

Table 23. The legacy group was significantly less likely to agree with the statement “Human activity is causing climate change at unprecedented rates” ($F(2,109) = 8.041, p=0.001$).

| | Mean response | N |
|-------------------------|---------------|----|
| Amenity group | 3.46 | 68 |
| Legacy group | 2.17 | 24 |
| Income/Investment group | 3.8 | 20 |

Motivations for Participation

Overall, landowners were most motivated by the opportunity to receive revenue from their forests, followed by improving forest health and reducing greenhouse gases (Table 24). Participating in a progressive program and encouraging others to participate were not important motivations for many landowners.

Table 24. Potential motivations for participating in CA forest offset program

| | Important | Neutral | Not Important |
|--|-----------|---------|---------------|
| Participating would allow me to receive revenue from my forest without harvesting wood products | 61 | 17 | 22 |
| Participating would help me to maintain or improve the health of my forest | 58 | 23 | 19 |
| Participating would allow me to receive revenue from my forest in addition to what I already receive for wood products | 57 | 14 | 29 |
| I want to reduce greenhouse gases and help curb the effects of climate change | 48 | 25 | 27 |
| The revenue I receive from participating would help me to keep my land | 45 | 22 | 33 |
| I want to participate in a new and progressive forestry program | 31 | 27 | 42 |
| Successfully developing a project would encourage others to participate | 27 | 29 | 44 |

Program motivations and climate change perceptions

In order to determine whether attitudes towards climate change affect motivations for participation in California's carbon sequestration program, I ran linear regressions between climate change perception scores and each program motivation (Table 25). I found that respondents who agree that human activity is causing climate change at unprecedented rates are more likely to be motivated to participate in this program in order to reduce greenhouse gases ($p=0.00$, $R^2=0.35$).

Table 25. Results of regression analysis of program motivations and climate change attitudes.

| Independent variable | Dependent variable | Sig Value | R Square |
|-----------------------------|---|------------------|-----------------|
| Climate change Likert score | Motivation – Reduce greenhouse gases | 0.000 | 0.349 |
| | Motivation – Encourage others to participate | 0.000 | 0.144 |
| | Motivation – Participate in progressive program | 0.002 | 0.074 |
| | Motivation – Revenue without harvesting wood | 0.027 | 0.036 |
| | Motivation - Improve forest health | 0.032 | 0.034 |
| | Motivation – Revenue in addition to wood | 0.292 | 0.009 |
| | Motivation – Revenue to help keep land | 0.777 | 0.001 |

Program motivations and satisfaction with forest health

Results of an ANOVA indicate that landowners who are satisfied with the health of their forests place significantly less importance on participating in order to improve forest health (mean=3.28 on 5 point Likert scale, $F(1,124) = 5.763$, $p=0.018$) than landowners who are not satisfied with forest health (mean=3.86). Landowners who are

satisfied with forest health also placed less importance on receiving revenue to help keep their land (mean=2.82, $F(1,126) = 6.691, p=0.011$), than landowners who are not satisfied with forest health (mean=3.54).

Table 26. Mean rating for “forest health” motivation by satisfaction with forest health ($F(1,124) = 5.763, p=0.018$).

| Satisfied with condition of forest | Mean rating for forest health motivation |
|------------------------------------|--|
| Yes | 3.28 |
| No | 3.86 |

Table 27. Mean rating for “revenue to keep land” motivation by satisfaction with forest health ($F(1,126) = 6.691, p=0.011$).

| Satisfied with condition of forest | Mean rating for revenue to keep land motivation |
|------------------------------------|---|
| Yes | 2.82 |
| No | 3.54 |

Program motivations and ownership objectives

I used one-way ANOVA tests with Bonferroni post-hoc tests to determine if the importance of each program motivation differed between ownership objective groups. I found no significant difference in importance of receiving revenue or improving forest health between objective groups ($p>0.05$). However, individuals in the legacy group placed significantly less importance on the motivation to reduce greenhouse gasses ($F(2,109) = 8.319, p=0.000$) than both the amenity and income groups. The legacy group also placed less importance on motivations to participate in a progressive program

($F(2,109) = 5.753, p=0.004$) and encourage others to participate ($F(2,108) = 4.580, p=0.012$) than the amenity group (Table 28).

Table 28. Motivations for participation differ between objective groups.

| | Mean Likert ratings | | |
|--|---------------------|----------------|---------------------------|
| | Amenity cluster | Legacy cluster | Income/investment cluster |
| I want to reduce greenhouse gases and help curb the effects of climate change* | 3.64 | 2.28 | 3.29 |
| I want to participate in a new and progressive forestry program** | 2.92 | 1.88 | 2.24 |
| Successfully developing a project would encourage others to participate*** | 2.8 | 1.88 | 2.52 |

* $F(2,109) = 8.319, p=0.000$, ** $F(2,109) = 5.753, p=0.004$, *** $F(2,108) = 4.580, p=0.012$

Program Requirements

Willingness to satisfy program requirements

Participants were presented with a brief description of the protocol requirements for offset project development under California's carbon market. Each requirement description was accompanied by an estimate of related costs. Protocol requirements include a 100-year time commitment, initial requirements including start-up costs, initial and ongoing verifications, and natural forest management as defined by the state (See descriptions in Figure 2).

Time Commitment

Participants were asked if they would be willing to commit to a long-term carbon plan of at least 100 years in order to ensure permanence of carbon storage. Of those who

answered, 23% were willing to satisfy this commitment requirement, while 77% were not. Respondents who answered “No” were then asked to write in how many years they would be willing to commit to carbon management. They were also instructed to write in “zero” if they were not willing to commit any time at all. Of the 103 individuals who answered “No”, 87 answered this follow-up question. Responses ranged from zero to 50 years.

Thirty landowners responded that they would not be willing to commit any time at all. This was the most frequent response, followed by 10 years (18 responses), 20 years (13 responses), 25 years (10 responses), and 50 years (7 responses).

There was no significant difference in willingness to commit to long-term carbon sequestration between objective groups or between levels of management intensity ($p < 0.05$).

Concerns related to time commitment

Respondents were offered three possible concerns related to long-term commitment and were asked to rate their level of concern for each on a five-point Likert scale (frequency data presented in Table 29). Landowners were most concerned about their heirs having the freedom to make their own decisions (69% found this as somewhat of a concern or a major concern). Roughly half of respondents were concerned that their management decisions might change over time or that they might want to sell some land someday (56% and 50% respectively).

There was no significant difference in level of concern for each option between objective groups ($p>0.05$). Levels of concerns were not related to management intensity ($p>0.05$).

Table 29. Concerns related to time commitment.

| | Not a concern at all (%) | Not really a concern (%) | Neutral (%) | Somewhat of a concern (%) | Major concern (%) | n |
|--|---------------------------------|---------------------------------|--------------------|----------------------------------|--------------------------|----------|
| My management decisions might change over time | 14.7 | 7.4 | 22.1 | 22.8 | 33.1 | 136 |
| My heirs might want to make their own decisions | 15.2 | 2.9 | 13.0 | 21.7 | 47.1 | 138 |
| I may want to sell some of my land someday | 22.2 | 14.8 | 13.3 | 13.3 | 36.3 | 135 |

Initial Requirements

Participants were asked if they would be willing to satisfy initial program requirements in order to develop an offset project. Of those who answered, 8% were willing to satisfy initial requirements as described, 69% were not willing, and 24% did not know. There was no significant difference in willing to satisfy initial requirements between objective groups ($p>0.05$) or levels of management intensity ($p>0.05$).

Concerns related to initial requirements

Respondents were offered five possible concerns related to initial requirements and related costs and were asked to rate their level of concern for each using a five-point likert scale (frequency data presented in Table 30). Respondents were most concerned with upfront costs (90% found this as somewhat of a concern or a major concern). Many respondents were also concerned about the complexity (66%) and the amount of time required (49%) to satisfy initial requirements. Working with a professional firm and granting someone access to private land each seemed to be less of an issue.

Table 30. Concerns related to initial requirements.

| | Not a concern at all (%) | Not really a concern (%) | Neutral (%) | Somewhat of a concern (%) | Major concern (%) | <i>N</i> |
|---|---------------------------------|---------------------------------|--------------------|----------------------------------|--------------------------|----------|
| The upfront costs involved | 4.3 | 2.2 | 3.6 | 9.4 | 80.6 | 139 |
| Working with a professional firm | 34.1 | 14.5 | 18.8 | 13.0 | 19.6 | 138 |
| Granting someone access to my land | 27.5 | 16.7 | 15.2 | 12.3 | 28.3 | 138 |
| Finding time to satisfy this requirement | 15.2 | 12.3 | 23.2 | 22.5 | 26.8 | 138 |
| Complexity of this requirement | 8.0 | 7.2 | 18.8 | 21.0 | 44.9 | 138 |

Level of concern regarding finding the time required to satisfy initial requirements was significantly different between objective groups ($F(2, 109) = 9.885$, $p=0.000$; Table 31). A Bonferroni post-hoc test indicated that individuals in the income

group were significantly less concerned about finding time (mean=2.29) than the amenity group (mean=3.41) or the legacy group (mean=3.96). Individuals in the income group were also significantly less concerned about granting access to their land ($F(2,109) = 8.824, p=0.000$; Table 32). Level of concern regarding upfront costs, working with a professional firm, and complexity of initial requirements did not differ between objective groups ($p>0.05$). Levels of concerns related to initial requirements were not related to management intensity ($p>0.05$).

Table 31. Level of concern with finding time to satisfy initial requirements by objective group ($F(2, 109) = 9.885, p=0.000$).

| Initial requirements concern - Finding time | |
|--|-----------------------|
| | Mean level of concern |
| Amenity cluster | 3.41 |
| Legacy cluster | 3.96 |
| Income cluster | 2.29 |

Table 32. Level of concern with granting access to satisfy initial requirements by objective group ($F(2,109) = 8.824, p=0.000$).

| Initial requirements concern – Granting access | |
|---|-----------------------|
| | Mean level of concern |
| Amenity cluster | 3.20 |
| Legacy cluster | 3.56 |
| Income cluster | 1.81 |

Verification requirements

Participants were asked if they would be willing to satisfy verification requirements in order to develop an offset project. Eight percent of respondents would be willing to satisfy verification requirements as described, 68% would not, and 24% did not know. There was no significant difference in willingness to satisfy verification requirements between objective groups ($p>0.05$) or between different levels of management intensity ($p>0.05$).

Concerns related to verification requirements

Participants were offered six possible concerns related to verification requirements and were asked to rate their level of concern for each on a five-point Likert scale (frequency data presented in Table 33). Landowners were most concerned with upfront and ongoing costs, followed by complexity of requirement, and finding time to satisfy the requirement. Respondents were less concerned with granting someone access to their land and working with a professional verifier.

Table 33. Concerns related to verification requirements.

| | Not a concern at all (%) | Not really a concern (%) | Neutral (%) | Somewhat of a concern (%) | Major concern (%) | <i>N</i> |
|---|---------------------------------|---------------------------------|--------------------|----------------------------------|--------------------------|----------|
| The upfront costs involved | 4.3 | 2.9 | 2.1 | 10.7 | 80.0 | 140 |
| The ongoing costs involved | 2.9 | 0.7 | 7.9 | 17.9 | 70.7 | 140 |
| Working with a professional verifier | 26.8 | 13.8 | 25.4 | 13.0 | 21.0 | 138 |
| Granting someone access to my land | 28.1 | 14.4 | 18.0 | 13.7 | 25.9 | 139 |
| Finding time to satisfy this requirement | 18.1 | 13.0 | 23.9 | 15.9 | 29.0 | 138 |
| Complexity of this requirement | 10.2 | 8.8 | 17.5 | 19.7 | 43.8 | 137 |

ANOVA tests were used to determine if levels of concerns related to verification requirements differed between objective groups. Levels of concern regarding working with a professional firm ($F(2,109) = 3.523, p=0.033$), granting access to land ($F(2,109) = 7.839, p=0.001$), and finding the time required to satisfy verification requirements ($F(2,109) = 8.011, p=0.001$) differed significantly between groups (Tables 34 and 35).

Bonferroni post-hoc tests were used to further examine these differences between groups. Individuals in the income group were significantly less concerned about granting someone access to their land (mean=1.81) than both the amenity group (mean=3.15) and the legacy group (mean=3.40). The income group was also less concerned about finding time to satisfy verification requirements (mean=2.24) than the amenity group (3.38) and

the legacy group (mean=3.84). Likewise, individuals in the income group were less concerned about working with a professional verifier (mean=2.14) than those in the legacy group (mean=3.24).

Table 34. Level of concern with granting access to satisfy verification requirements by objective group ($F(2,109) = 7.839, p=0.001$).

| Verification requirements concern - Granting access | |
|--|-----------------------|
| | Mean level of concern |
| Amenity cluster | 3.15 |
| Legacy cluster | 3.40 |
| Income cluster | 1.81 |

Table 35. Level of concern with finding time to satisfy verification requirements by objective group ($F(2,109) = 8.011, p=0.001$).

| Verification requirements concern - Finding time | |
|---|-----------------------|
| | Mean level of concern |
| Amenity cluster | 3.38 |
| Legacy cluster | 3.84 |
| Income cluster | 2.24 |

Natural Forest Management requirements

Participants were given a brief description of Natural Forest Management requirements as defined by California's program protocol. Landowners were then asked if their management techniques are already in line with NFM requirements. Most landowners (78%) responded that their management techniques are already in line with NFM. Only 22% practice techniques that are not in line with NFM requirements. Of

those who answered “No”, 5% stated that they would be willing to practice NFM.

Willingness to practice NFM was not significantly related to management intensity ($p>0.05$) or objective group ($p>0.05$).

Likelihood to Participate in California’s Program

Following the sections describing potential benefits of program participation as well as protocol requirements, participants were asked how likely they would be to enroll any or all of their forest in a forest carbon offset project. They were also asked how likely they would be to enroll with financial assistance and if they were able to share costs with other landowners. Responses were on a five-point Likert scale (Table 36).

Table 36. Likelihood of enrolling in California’s program.

| | Would not enroll | Don’t know | Would enroll | <i>N</i> |
|--|-------------------------|-------------------|---------------------|----------|
| How likely would you be to enroll any or all of your forested land in a forest carbon offset project? | 45 | 40 | 15 | 141 |
| How likely would you be to enroll any or all of your forested land in a forest carbon offset project <i>if you were to receive financial assistance?</i> | 33 | 44 | 23 | 140 |
| How likely would you be to enroll any or all of your forested land in a forest carbon offset project <i>if you were able to develop an offset project with other landowners and share costs?</i> | 35 | 42 | 23 | 141 |

Most frequently, landowners did not know whether they would enroll or not (40%), regardless of financial assistance availability (44%) or the possibility of sharing costs with other landowners (43%). Objective groups did not differ in likelihood to enroll

in the program as described ($p>0.05$), with financial assistance ($p>0.05$), or by sharing costs with other landowners ($p>0.05$).

DISCUSSION

NIPFs could play a key role in carbon sequestration efforts under California's carbon market while also receiving significant benefits from participation. However, previous studies have shown varying levels of interest in or willingness to join forest offset project development in the US (Miller et al., 2012, Thompson and Hansen, 2012, Markowski-Lindsay et al., 2011, Fletcher et al., 2009). My main research objectives were to examine how ownership objectives affect interests in participating in California's newly implemented forest offset program, and to identify potential barriers to NIPF project development. While previous research identified potential concerns related to hypothetical markets, this research aimed to test those findings using the protocol requirements of California's new program.

A New Typology of California NIPFs

NIPFs are a dynamic group, and ownership objectives vary widely across geographical regions. Previous studies have developed typologies of NIPF ownership objectives as a way of making sense of the management objectives and behaviors of this complex group of forest owners. However, these typologies were specific to other

locations, and did not include California forest owners. My research contributes to the existing literature by introducing a new typology of NIPFs in Northern California. I identified three ownership objective groups specific to my region. While previous researchers identified similar groups to my “amenity” and “income/investment” objective groups (such as the “nontimber” owners identified by Majumdar et al. (2008) and the “investors” identified by Kuuluvainen et al. (1996)), I identified a distinct group of NIPFs in California who value their forest as part of a family legacy (Table 37).

Table 37. Objective groups identified by previous researchers, compared to my current findings.

| Researchers | NIPF location | Objective groups identified | Group characteristics |
|--------------------------|------------------------------|-----------------------------|--|
| Kuuluvainen et al., 1996 | Finland | Multiobjective owners | Value both monetary and amenity benefits of forest. |
| | | Recreationists | Emphasize the nontimber and nonmonetary values of forest. |
| | | Self-employed owners | Emphasize the employment opportunities and labor income provided by forest. |
| | | Investors | Forest property is an asset and a source of regular sales income and economic security. |
| Kline et al., 2000 | Oregon and Washington states | Multiobjective owners | Interested in financial values, but also include nontimber services among their forest ownership objectives. |
| | | Recreationists | Mostly interested in aesthetics and recreation. |
| | | Passive owners | No strong interests in any services provided by forest. |
| | | Timber producers | Interested solely in financial value of forest. |
| Majumdar et al., 2008 | Southeastern US | Multi-objective | Strongly motivated by both consumptive and nonconsumptive use values equally. |
| | | Timber | Primarily motivated by monetary objectives, emphasizing the importance of timber production and land investment. |
| | | Nontimber | Emphasize nonfinancial amenity objectives. |

| | | | |
|------------|---------------------|-------------------|--|
| My results | Northern California | Amenity | Owners value nonmonetary amenities and want to “protect” forests. |
| | | Legacy | Forest is part of a working farm or ranch that will be passed on as a family legacy. |
| | | Income/investment | Owners are primarily motivated by the income or investment value of forests. |

These “legacy” driven forest owners maintain a farm or ranch on their property, and view their forest as a part of a working landscape that will eventually be passed on to heirs. Legacy forest owners were particularly interesting for the purposes of my research, as they had very distinctive views compared to other objective groups. This group expressed skepticism of human-induced climate change, and was significantly less likely to be interested in a program that aims to reduce greenhouse gasses and curb the effects of climate change. In addition, legacy owners were most concerned about committing to a long-term program that might prevent their heirs from being able to make their own management decisions in the future. The group’s demographics did not vary drastically from the other two groups, but legacy respondents did appear to be slightly younger and obtained a lower level of education.

Creating this new typology highlights some of the particular social dynamics in Northern California within the context of my research. The typology made it possible to understand how NIPFs with different objectives fit into California’s carbon market, and how they might respond to this new incentive program. By examining NIPF objectives in Northern California, I was able to identify groups of forest owners whose objectives were more or less in line with the requirements of developing offset projects. Legacy owners might be inherently opposed to a program aimed at addressing climate change, and would

likely not participate. However, NIPFs in the income/investment group could be prospective participants. Income/investment owners were primarily motivated by financial incentives and were less concerned with requirements than other groups. My findings, and those of previous researchers, illustrate the importance of identifying geographically distinct objective groups when examining NIPFs. Future researchers and policy-makers can now utilize this new typology, or create similar ones, to better understand specific landowner types based on their objectives for their forests.

NIPFs are Unaware of California's Market

While respondents were generally not interested in participating in California's forest carbon offset program, their responses help us to understand how they obtain and perceive carbon policy information. As hypothesized, NIPFs in my study were mostly unfamiliar with California's program, reaffirming previous findings regarding NIPF unfamiliarity with carbon markets (Miller et al., 2014). Less than a quarter of respondents were familiar with this program; however, this number is probably lower in other regions of the US, as California landowners might be more familiar with the policies of their own state.

As expected, media is the primary source of information regarding California's market for my NIPF respondents in Northern California. RPFs were also an important information source for respondents, possibly due to California requirements of forest owners to work with highly trained RPFs when managing forests. RPFs are likely

knowledgeable about both forest management and emerging carbon markets (Wade and Moseley, 2011), and my research suggests that some NIPFs are able to access this professional knowledge. Respondents who had higher management intensity were more likely to receive program information from an RPF or agency, and were more familiar with the program. In addition, significantly more landowners in the income objective group received program information from an RPF, compared to the amenity and legacy groups. These numbers reveal significant disparities in access to expert information within my sample. Access to information sources plays an important role in shaping landowner perceptions of carbon sequestration and trading, and access to expert knowledge could be critical to facilitating market entry.

Previous studies have indicated that increasing awareness of incentive-based programs increases participation (Kilgore et al., 2008). While increasing outreach efforts seems like the logical solution to addressing a lack of program awareness, this study demonstrates that NIPFs who receive outreach materials might still have major concerns regarding the policy's protocols. In the context of California's market, program limitations to NIPF participation might have to be addressed before outreach efforts can have any significant effect on participation rates.

Many NIPFs are Interested in Program Benefits

Participation in California's forest carbon offset program could provide forest owners with a lucrative alternative revenue stream, and would also result in important ecological benefits. I wanted to know why NIPFs in California would be motivated to participate in this program, and how their ownership objectives, climate change perceptions, and management practices relate to their interests in participating. Daniels et al. (2010) explain that many forest owners are not primarily motivated by the profitability of forests because profit is not their primary ownership objective (Daniels et al., 2010). However, over half of my respondents expressed that receiving revenue from their forests would be an important motivator, even if forest income was not their primary ownership objective.

Maintaining or improving forest health would also be an important motivator for most landowners, especially those who believe their forest is in need of management improvement. Landowners might not have the resources to adequately manage their forests, or they might not be familiar with forest management techniques. This point was illustrated by one respondent's written-in comment expressing interest in participating in this program in order to receive "expert advice on how to best manage forest." Although respondents identified important motivators for developing carbon projects under California's program, a lack of financial, professional, and informational resources could ultimately limit NIPF access to the market.

As hypothesized, climate change perceptions also affected opinions regarding project development. Reducing greenhouse gasses was an important motivator for roughly half of respondents. However, over one-third of respondents do not believe that human activity is causing climate change at unprecedented rates, and were even more skeptical of human-induced climate change than respondents in a similar survey in Massachusetts (Markowski-Lindsay et al., 2011). My respondents are also significantly less likely to participate in a program aimed at reducing greenhouse gases. As I briefly mentioned, I found that my legacy objective group was particularly skeptical regarding the threat of climate change, and was significantly less interested in participating in a program that aims to curb the effects of climate change and reduce greenhouse gasses. The legacy group was, however, motivated to participate in order to receive revenue and maintain/improve forest health.

Although I hypothesized that NIPFs with different ownership objectives would identify different motivations for participation, many NIPFs in my study shared similar motivations for participation (for profit and forest health) regardless of their objectives. However, I was able to determine that landowners in my legacy group might be less interested in participating due to an inherent opposition to a forestry policy aimed at addressing climate change. By analyzing distinct landowner types, I was able to identify a group of NIPFs that might be particularly challenging to integrate into this emissions reduction program.

Protocol Requirements are Preventing Market Entry

As expected, most respondents were unwilling to satisfy protocol requirements as described, even after learning of the potential benefits of program participation. My results are in line with previous findings, as participants expressed most concern regarding contract length, high costs, complex protocols, and the time required to satisfy requirements (Charnley et al., 2010, Fletcher et al., 2009, Markowski-Lindsay et al., 2011, Miller et al., 2012, Wade and Moseley, 2011).

Most landowners shared concerns regarding costs, but other concerns regarding protocol requirements differed between ownership objective groups. The income objective group was less concerned with finding time to satisfy requirements and granting access to their land. This group is primarily motivated by profitability of forests and is probably more willing to satisfy requirements that might lead to financial returns. In a study by Thompson and Hansen (2012), respondents who placed a high importance on legacy generally held positive attitudes towards carbon sequestration programs due to their interests in maintaining longevity of forests. However, my legacy group did not differ from other respondents in their unwillingness to commit to a 100-year carbon management plan. In fact, when presented with a description of the contract length requirement, respondents were very concerned about allowing their heirs' to make their own decisions in the future. Wade and Moseley (2011) suggest flexibility in carbon sequestration program design. Allowing some commitment flexibility might help ease NIPF concerns regarding authority over future decision-making. Reducing contract

length would undermine the protocol's carbon sequestration permanence rationale; however, if policy-makers want to incorporate NIPF land into sequestration efforts, new and flexible requirements could help to forge some middle ground.

My respondents were not concerned with protocol requirements to practice "Natural Forest Management" (NFM), as most of them already practice management techniques are in line with NFM. However, NFM requirements closely mirror current forestry regulations already enforced within California, and landowners outside of CA likely practice techniques that are not in line with NFM. Satisfying NFM requirements could be a potential hurdle for landowners in other states.

CONCLUSION

This study examined NIPF characteristics in Northern California, as well as their attitudes towards California's forest carbon offset program. The heterogeneity of NIPFs makes them particularly interesting within the context of California's carbon market. This study highlights the diversity of NIPFs by examining the ways in which different management practices and ownership objectives affect opinions. While offset project requirements might be in line with the management objectives of many forest owners, NIPF participation is limited by the costly and complex project development process and a lack of landowner awareness.

Addressing these limitations could increase NIPF participation, potentially helping California to meet carbon sequestration goals. However, removing barriers to entry would be a multipart process that could be difficult to implement. These potential changes might include increased program flexibility, landowner assistance measures to aid with complex and extensive requirements, and reducing costs to forest owners (by incorporating aggregation projects or providing financial assistance). In addition, an increase in carbon prices would help to strengthen incentives for landowners and could stimulate NIPF interest in participation. If NIPF access limitations are addressed, outreach techniques can be expanded to increase NIPF awareness. UC extension offices should increase efforts to reach NIPFs, by acting as both an information source and a point of contact for interested landowners. In addition, agencies such as the Climate Action Reserve and the Air Resources Board should continue to incorporate media

outlets to reach a broad audience. Program awareness will surely affect participation, and landowner outreach could be a major component in ensuring that all landowners have access to programs that might offer significant financial and ecological benefits.

Additional research is needed to explore relationships that were outside of the scope of this study. Similar research could be conducted in other regions to determine if distinct objective groups (such as my legacy group) exist elsewhere. Forest landowners across the US are eligible for offset project development, so creating objective typologies in other forested areas will help us to predict how NIPFs will act within this carbon market as well as future incentive programs. I also see research opportunities related to recent research that stresses the importance of community networks and peer-to-peer influence in NIPF decision-making (Mary Sisock, 2009, Schubert and Mayer, 2012, Lind-Rhiel et al., 2015). I would urge researchers to follow suit by examining the relationships between NIPF social networks and views towards incentive programs, including carbon sequestration and trading. The results of such studies could be crucial to understanding how geographic location and social dynamics play a large role in shaping NIPF perceptions.

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APPENDIX A: QUESTIONNAIRE BOOKLET



HUMBOLDT STATE UNIVERSITY

**McIntire-Stennis Cooperative Forestry
Research Program**

California Forest Landowner Survey
Developing Forest Carbon Projects

Thank you for participating in this survey. Your opinion is extremely important. Please complete this questionnaire and return it in the enclosed self-addressed stamped envelope by August 30th, 2014.

Please do not write your name on this questionnaire.

The following questions are to be answered by the landowner.
If you are not the landowner, please describe your relation to the landowner here:

Please indicate that you have been made aware of the research process and your rights as a participant:

By checking this box, I consent to the research process described in the enclosed letter and acknowledge that I have been made aware of my rights as a participant in this survey.

Section A. Information about your forested property and land ownership

1. How long have you owned any forested land in California?

_____ years

2. How would you characterize your ownership type?

- Industrial (Owns >50,000 forested acres and/or a mill)
 Family forest/ Non-Industrial Private Forest (NIPF)
 Conservation Non-profit / Land Trust
 Tribal
 Other (please specify): _____

3. Approximately how many acres of forested land do you own in California?

_____ acres.

3a. Do you currently own more than one property with forested land in California?

Yes



If Yes, how many separate, unconnected properties with forested land do you currently own?

_____ properties with forested land in California.

No

4. In which California county is the majority of your forested land? (Please specify):

5. Is your home (primary residence) on or within a mile of any of your forested land in California?

- Yes
- No, I DO NOT live on or within a mile of my forested property. I live:
- In California
 - Outside of California
 - Other (please specify): _____

6. Is all or most of your property classified as a Timber Production Zone (TPZ)?

- Yes
- No
- Don't Know

7. Conservation easements are legally binding agreements (sometimes the result of a payment to the owner) that restrict land from being used for certain, designated purposes, such as development.

Is there a conservation easement on any of your forested property(ies) in California?

- Yes



If Yes, what types of activities are restricted? Check all that apply:

- Conversion of forested land to another land use
- Splitting of forested land into smaller land holdings
- Harvesting of trees
- Other (please specify): _____

- No



If No, do you plan to get a conservation easement? *Check only ONE.*

- Yes
- No
- Maybe
- Don't Know

- Don't Know

8. What is the most common forest type on your property(ies)?

- Redwood
- Mixed Conifer (Doug-Fir dominant)
- Mixed Conifer (Pine dominant)
- Mixed Oak Woodland
- Other (please specify): _____

**9. Which of the following statements apply to the condition of your forested land in comparison with other forested land in your region?
Select all that apply:**

- There are areas in my forest that are **under-stocked** (areas that could be replanted or reforested)
- My entire forest is **under-stocked**
- There are areas in my forest that are **over-stocked** (areas where forest is dense and in need of thinning)
- My entire forest is **over-stocked**
- I am satisfied with the condition of my forest
- I don't know

Section B. Uses of your forested land

10. Have any trees been cut or removed from your forested property in California since you have owned it?

- Yes, for sale
- Yes, for personal use
- Yes, for other reasons
- No

If No, skip to question 11.

10a. Was a professional forester used to plan, mark, contract, or oversee any of the cuts?

- Yes
- No
- Don't know
- Not applicable

11. Which of the following have occurred on your forested land in California in the past 5 years? Check all that apply.

- Cut and/or removed trees for sale
- Cut and/or removed trees for own use
- Collected non-timber forest products
- Eliminated or reduced non-native trees
- Eliminated or reduced unwanted insects or diseases
- Improved wildlife habitat (including road management and maintenance for stream restoration)
- Road construction or maintenance (not related to stream restoration)
- Trail construction or maintenance
- None of the above

12. Cost-share programs provide landowners with money to help them establish or otherwise manage their forested land. Examples include the Conservation Reserve Program, the Environmental Quality Incentives Program, the Forest Land Enhancement Program, and various state funded programs.

12a. Have you ever used a cost-share program to help you establish or manage your forested land in California?

Yes



If Yes, have you done so in the last 5 years?

Yes

No

No

Don't know

13. To encourage good forest management, groups have created green certification programs to recognize landowners who comply with the groups' standards. Examples include American Tree Farm System, Green Tag, Forest Stewardship Council, and Sustainable Forestry Initiative.

13a. Is any of your forested land in California currently green certified?

Yes

No

Don't know

Section C. The future of your forest

14. What are your plans for your forested land in California in the next ten years? Check all that apply.

- Cut and/or remove trees for sale
- Cut and/or remove trees for own use
- Collect non-timber forest products
- Eliminate or reduce non-native trees
- Eliminate or reduce unwanted insects or diseases
- Road construction or maintenance
- Improve wildlife habitat
- Sell some or all of my forested land
- Give some or all of my forested land to my children or other heirs
- Divide all or part of my forested land and sell the subdivisions
- Convert some or all of my forested land to another use
- Leave it as is – no activity
- Minimum activity to maintain forest
- No plans at this time
- I don't know

Section D. Landowners have many different motivations for owning forested land in California. The following questions will help us to understand why you own forestland.

16. How important are the following reasons for why you own forestland in California? Please mark ONE box for EACH item.

Not Important..... Important

1

2

3

4

5

| | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| To enjoy beauty or scenery | <input type="checkbox"/> |
| To protect nature and biological diversity | <input type="checkbox"/> |
| For land investment | <input type="checkbox"/> |
| Part of my home or vacation home | <input type="checkbox"/> |
| Part of my farm or ranch | <input type="checkbox"/> |
| For privacy | <input type="checkbox"/> |
| To pass land on to my children or other heirs | <input type="checkbox"/> |
| For production of timber products | <input type="checkbox"/> |
| For cultivation or collection of non-timber forest products (e.g. berries, mushrooms) | <input type="checkbox"/> |
| For production of firewood | <input type="checkbox"/> |
| For production of biofuel (energy) | <input type="checkbox"/> |
| For hunting or fishing | <input type="checkbox"/> |
| For recreation, other than hunting or fishing | <input type="checkbox"/> |
| For eco-tourism income | <input type="checkbox"/> |
| To protect land from development (e.g. housing) | <input type="checkbox"/> |
| To leave land unmanaged and let nature take its course | <input type="checkbox"/> |

| Section E. Climate change and the role of forest management. | | | | | | | | | | | | | | | | |
|--|---|--------------------------|--------------------------|--------------------------|--------------------------|--|----------------------------|--|--------------------------|--|--|---|---|---|---|---|
| <p>17. Please indicate the extent to which you <u>agree or disagree</u> with the following statements</p> | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="width: 20%; text-align: center;">Strongly Agree.....</td> <td style="width: 20%;"></td> <td style="width: 20%; text-align: center;">Strongly Disagree</td> <td style="width: 20%;"></td> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> </tr> </table> | | | | | | Strongly Agree..... | | Strongly Disagree | | | 1 | 2 | 3 | 4 | 5 |
| | Strongly Agree..... | | Strongly Disagree | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | | | | | | | | | | |
| Human activity is causing climate change at unprecedented rates | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | | | | | | | |
| Humans have a responsibility to alleviate the impacts of climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | | | | | | | |
| Forests can help to reduce the impact of climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | | | | | | | |
| <p><u>*PLEASE READ BEFORE CONTINUING*</u></p> <p><u>Forest Carbon Offset Projects</u></p> <p>California has implemented a cap and trade program that includes forestry projects to help reduce greenhouse gases, including carbon dioxide. Forests can capture and store carbon dioxide in tree trunks, stems, roots, and soil. This is known as carbon sequestration. Carbon stored in trees can remain stored even after being harvested if the wood is converted into long-lived wood products.</p> <p>Landowners may participate in this new program by demonstrating increased carbon sequestration in forests. Participating landowners receive carbon credits, representing tons of stored carbon within a project area. These credits can then be sold to industrial facilities that are required to compensate for greenhouse gas emissions. This is also known as a forest carbon offset project.</p> <p>We are interested in Improved Forest Management projects, in which landowners increase forest carbon stocks through management compared to baseline conditions.</p> | | | | | | | | | | | | | | | | |

There are two ways for private landowners to develop **Improved Forest Management** projects on forested land, depending on the condition of the project area:

- **If the forested project area is stocked at levels that exceed the regional average for other landowners of the same forest type**, landowners receive initial credits for carbon stored in standing forests. Landowners may then receive credits annually if they demonstrate an ongoing increase in carbon sequestration. One private firm has estimated that initial credits received from well-stocked forests are approximately 5-30 tons per acre (\$50-\$300 per acre), and annual carbon sequestration generally ranges from 2-5 credits per acre per year (\$20-\$50 per acre per year).
- **If the forested project area is stocked below the regional average for other landowners of the same forest type**, landowners will receive fewer or no initial credits, but can receive credits annually for demonstrating an increase in carbon sequestration over time.

In either scenario, landowners can manage for wood products within the project area. Levels of carbon stocks must be maintained or increased over time, and cannot decrease over any consecutive 10-year period.

The forest-offset program could have significant impacts on landowners and their forests. We would like to ask you some questions about your likeliness to participate in this program.

21. We are interested in knowing why landowners choose to develop forest carbon offset projects. What factors would motivate you to participate in this type of incentive-based carbon offset program?

Please rate the importance of each factor in affecting your decision to develop a forest carbon project
Check ONE box for EACH item.

| | Not Important..... Important | | | | |
|---|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Participating would allow me to receive revenue from my forest in addition to what I already receive for wood products. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Participating would allow me to receive revenue from my forest without harvesting wood products. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The revenue I receive from participating would help me to keep my land. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Participating would help me to maintain or improve the health of my forest. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I want to reduce greenhouse gases and help curb the effects of climate change. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I want to participate in a new and progressive forestry program. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Successfully developing a project would encourage others to participate. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

The following are some of the requirements of the forest carbon offset program. We would like to know if you would be willing to satisfy these requirements, and if any factors related to these requirements would be of particular concern to you.

22. This program requires landowners to commit to a **long-term carbon sequestration plan**. After the final credit is issued, landowners must maintain carbon stocks for 100 years. There are **penalties for early termination**.

Would you be willing to **commit to long term carbon sequestration** in order to participate in this program?

- Yes
- No



If No, how many years would you be willing to commit your forest project (If you would not be willing to commit at all, please write *zero*)?

_____ years

22a. *Whether you answered yes or no*, please tell us if any of the following **factors related to time commitment** present any level of concern (1=Not a concern, 5=Major concern). Please select ONE option for EACH item:

| | Not a concern.....Major concern | | | | |
|---|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| My management decisions might change over time | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| My children/heirs might want to make their own management decisions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I may want/need to sell <i>some</i> of my land someday | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I may want/need to sell <i>all</i> of my land someday | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

23. Initially, most landowners must employ a professional firm to assist with project development. The landowner is responsible for **project start-up costs, including registration and reporting fees**. One private firm estimates that the cost of project documentation and modeling can cost between \$65,000-\$130,000.

Would you be willing to satisfy **initial project development requirements** in order to participate in this program?

- Yes
- No
- Don't Know

23a. *Whether you answered yes, no, or don't know, please tell us if any of the following factors related to initial project development present any level of concern (1=Not a concern, 5=Major concern). Please select ONE option for EACH item:*

| | Not a concern.....Major concern | | | | |
|---|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Upfront costs involved | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Working with a professional firm | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Granting someone access to my land | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Finding the time to satisfy requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Complexity of this requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

24. The project area must be verified by a third party. Initial verification requires a site visit by a professional verifier to inventory the forested area. Ongoing verification is required, with periodic site visits every 6 years. A private firm estimates that an initial verification can cost between \$15,000-\$50,000, with periodic site visits averaging \$18,000-\$25,000.

Would you be willing to satisfy **initial and ongoing verification requirements** in order to participate in this program?

- Yes
- No
- Don't Know

24a. *Whether you answered yes, no, or don't know, please tell us if any of the following factors related to verification requirements present any level of concern (1=Not a concern, 5=Major concern). Please select ONE option for EACH item:*

| | Not a concern.....Major concern | | | | |
|---|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Upfront costs involved | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ongoing costs involved | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Working with a professional verifier | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Granting someone access to my land | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Finding the time to satisfy requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Complexity of this requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

25. After initial project development, landowners must complete **annual monitoring and reporting** and are responsible for **related fees**. A private firm estimates the cost of annual project updates at \$1,000-\$2,000, in addition to an annual account fee of \$500. Monitoring and reporting can again require employment of a professional firm.

Would you be willing to satisfy this requirement in order to participate in this program?

- Yes
- No
- Don't Know

25a. *Whether you answered yes, no, or don't know, please tell us if any of the following factors related to ongoing monitoring and reporting requirements present any level of concern (1=Not a concern, 5=Major concern). Please select ONE option for EACH item:*

| | Not a concern.....Major concern | | | | |
|--|---------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| The costs involved | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Working with a professional firm | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Granting someone access to my land | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Finding the time to satisfy this requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Complexity of this requirement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

26. Landowners must practice “**natural forest management**” as defined by the state of California. The requirements of this type of management are:

- The landowner must demonstrate **sustainable harvesting practices** (by obtaining certification, obtaining a harvest plan, or practicing uneven-aged management with limited openings).
- **Even-aged management is allowable** in blocks of 40 acres or less as long as no more than 40% of the project area is occupied by trees under 20 years old.
- The project area must have a projected goal of **95% native tree species** composition.
- The landowner must retain some **standing and lying dead wood**.

Are your management techniques already in line with the “natural forest management” requirements described above?

Yes

No



If No, would you be willing and/or able to satisfy the requirements of “natural forest management”, either now or in the future?

Yes

No



If No, why not? (please explain):

Section F: Finally, please provide some basic information about yourself.**30. What is your age?**

- Under 25 years
- 26 – 34 years
- 35 – 44 years
- 45 – 54 years
- 55 – 64 years
- 65 – 74 years
- 75 years or older

31. What is your gender?

- Male
- Female

32. What is your annual household income?

- < \$10,000
- \$10,000 – \$29,999
- \$30,000 – \$49,999
- \$50,000 – \$74,999
- \$75,000 – \$99,999
- \$100,000- \$200,000
- > \$200,000

33. Approximately what percentage of your income comes from forest products?

- 0-20%
- 21-40%
- 41-60%
- 61-80%
- 81-100%

34. What is the highest level of education you have achieved? Please check only ONE.

- Less than high school diploma
- High school diploma or GED
- Some college
- Associate or technical degree
- Bachelor degree
- Graduate degree

Thank you for your participation!
Please return this questionnaire in the enclosed envelope
by August 30th, 2014

This questionnaire was printed on FSC certified Paper

Please do not write in this section

Participant ID#: _____

APPENDIX 2: SUPPLEMENTAL INFORMATIONAL INSERT

The California Cap and Trade Carbon Market Information for Forest Landowners

California's Cap and Trade Carbon Market

California has developed a carbon cap and trade program to reduce industrial greenhouse gas emissions. The state now limits how much pollution certain industries can emit. Industrial facilities are assigned a certain number of emission allowances, each representing one-ton of carbon dioxide. To allow for flexibility, companies can buy and sell allowances within a carbon market. This encourages emitters to invest in more efficient technologies with the incentive of potentially profiting from the sale of excess allowances.

Emitters may also purchase credits from carbon offset projects to account for up to eight percent of their emission allowance. Offset projects reduce greenhouse gas emissions by increasing carbon sequestration or reducing the release of ozone-depleting substances. There are currently four compliance offset project types: forest projects, urban forest projects, livestock projects, and ozone depleting substances projects. Although compliance is only required of emitters in California, offset projects may be developed anywhere in the continental U.S.

Improved Forest Management Carbon Offset Projects

Improved Forest Management (IFM) projects allow private forest owners to participate in the cap and trade market by selling offset credits to industries. The IFM project protocol requires management techniques that increase carbon stocks within a forested project area. **Harvesting is allowable within project areas**, as long as carbon stocks are projected to increase and harvested wood products are long-lived. This means that landowners can continue receiving revenue from wood products while also receiving revenue from carbon credits.

For More Information...

To learn more about forest carbon projects and protocol requirements, visit:

The California Air Resources Board website at
<http://www.arb.ca.gov/cc/capandtrade/protocols/usforestprojects.htm>

The Climate Action Reserve website at
<http://www.climateactionreserve.org/how/protocols/forest/>

Your local UC Extension office at
http://ucanr.edu/County_Offices/