

# Family Forest Owners in the Redwood Region: Management Priorities and Opportunities in a Carbon Market<sup>1</sup>

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## Abstract

California's cap-and-trade carbon market has included forest offset projects, available to all private landowners across the United States. The redwood region has been at the forefront of the market, creating the earliest forest carbon projects. From carbon registries, we compiled a database of all forest carbon projects in the market, in order to determine where projects were located, what types of landowners (e.g. industrial, non-industrial, tribal, timber investment management organizations [TIMO]) were participating, and how projects were being developed.

Notably, non-industrial private forest landowners or "family" forest landowners were underrepresented within the market relative to their landholdings. We conducted a survey of family forest landowners in several forested regions across California, in order to determine landowner management objectives and willingness to participate in the carbon market, including obstacles and incentives for participation, and how carbon markets coexist with management objectives. We found that, though many of the carbon market objectives align well with family forest landowner objectives, the burdens of entering the market discourage participation. Further, using cluster analysis, we grouped family forest owners in California according to three management objective types, which we labeled Amenity, Legacy, and Income groups. These three groups had different views of the carbon market and climate change. If family forest owners are to be included in this or other carbon-sequestration incentive programs, the management motivations and constraints of distinct landowner types need to be considered.

## Introduction

In January 2013, California implemented the first forest carbon offset program in the United States under a regulated (cap-and-trade) market. Part of the market, through a program of Improved Forest Management (IFM), has functioned to encourage forest management that increases carbon sequestration and storage in private forests. Forest landowners voluntarily join the program, but once in the program they are in a regulatory market with stringent protocols that can entail great expense, including carbon-specific inventory requirements, third-party verification, and 100-year obligations to maintain carbon stocks. These requirements have shaped market access, with most economically marginal and small-scale landowners excluded from the market. This paper presents landowner participation data for the market as a whole<sup>4</sup>, focused on what landowner types have joined the market and in what regions, with emphasis on non-industrial private landowners and their motivations and constraints within the cap-and-trade market. While these landowners are underrepresented within the regulated market, findings help us understand family forest owners' views toward payments for ecosystem services (PES) programs, including potentially other carbon payment schemes that could include family forest owners.

Forest land ownership in the United States includes public (44 percent) and private (56 percent) landowners (table 1). Public agencies are typically non-participating in the California forest offset

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<sup>4</sup> We include all projects registered on the Climate Action Reserve and American Carbon Registry, though a small proportion of these projects are still in the voluntary market.

market, which leaves 56 percent of land eligible for the market, as forests across the country may participate in the market. The most common type of private ownership in the United States is non-industrial private forest land ownership or “family forest” land, which comprises 62 percent of private forests. Private corporate ownership, including both industrial (mill-owning) landowners and institutional investors, constitute 33 percent of private forests.

**Table 1—Forest land area and Improved Forest Management (IFM) projects in the United States by ownership type, 2007 (Smith et al., 2009), and percent IFM carbon projects**

Ownership type		Number of forested ha in US	Percent of forested ha in US	Percent of eligible (private) forested ha in US	Percent of IFM project by area	Percent of IFM projects
<b>Private noncorporate</b>	Non-industrial private forest (NIPF)	99.6 million	35%	62%	2.3%	11%
	Other (conservation, tribal, etc.)	8.5 million	3%	5%	35%	44%
<b>Private corporate<sup>a</sup></b>		55.8 million	18%	33%	62%	45%
<b>Public agencies</b>		133 million	44%	-	-	-
<b>Unknown</b>		-	-	-	1.6%	3.2%
<b>Total<sup>b</sup></b>		303.9 million	100%	100%	100%	100% <sup>b</sup>

<sup>a</sup> Includes industrial and TIMO-owned forests.

<sup>b</sup> Rounding may cause the total values to deviate from 100%.

Table 1 makes clear that a high proportion of private corporate, conservation, and tribal landowners have enrolled projects in the California market. NIPF landowners, on the other hand, have a disproportionately low percentage of their land enrolled. This confirms findings by a number of researchers that the requirements to enter carbon markets are too costly and complex for most NIPF landowners (Charnley et al. 2010, Fletcher et al. 2009, Markowski-Lindsay et al. 2011, Miller et al. 2012, Thompson and Hansen 2012). This is especially true for the California market, which has more complex, stringent requirements than previous (voluntary) markets (Schmitz and Kelly 2016).

The redwood region is in many ways central to the functioning of the California offset market. The earliest projects in the market were created by land trusts in the redwood region, experimenting with nascent protocol versions to fine tune requirements (fig. 1; see also Schmitz and Kelly 2016). The redwood region was therefore an incubator of the IFM program, with landowners outside the redwood region entering the market over time and particularly beginning in 2013 when the cap-and-trade program began.

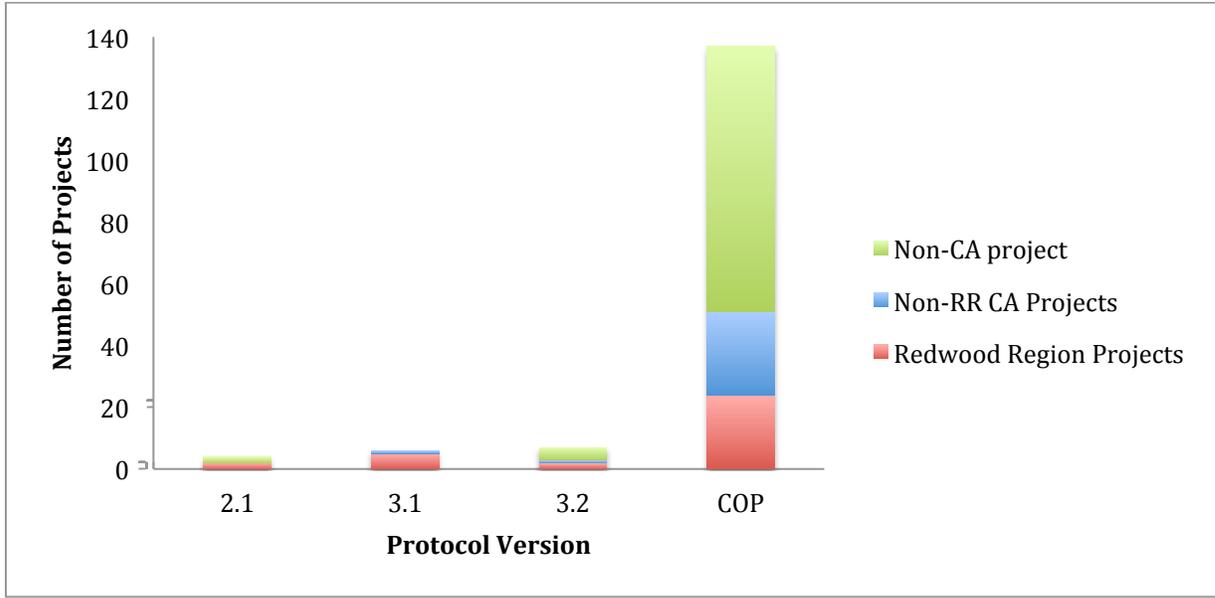


Figure 1—Projects developed under the California IFM protocols, from earliest (version 2.1) projects in 2006 through cap-and-trade (COP) versions, which were developed beginning in 2013.

The redwood region also has the greatest number of projects under NIPF ownership, with almost 70 percent of the NIPF hectares enrolled in the market. This reflects the fact that the redwood region has a landowner enrollment pattern that differs from the rest of the United States (table 2), with a much higher proportion of NIPF and conservation projects than the rest of the United States, and lower TIMO and miscellaneous projects.

**Table 2—Hectares of land enrolled in the California market by each landowner type (RR = redwood region; Non-RR = rest of United States)**

	RR ha in market	% of RR ha in market	Non-RR ha in market	% of Non-RR ha in market
Conservation	57,590	32.9%	118,227	6.2%
Industrial	57,552	32.9%	603,034	31.5%
Miscellaneous <sup>a</sup>	313	0.2%	84,470	4.4%
NIPF	33,198	19.0%	14,305	0.7%
Tribal	20,291	11.6%	410,170	21.4%
TIMO	3,659	2.1%	641,388	33.5%
Unknown	2,246	1.3%	30,646	1.6%
<b>TOTAL</b>	<b>174,849</b>	<b>100.0%</b>	<b>1,916,774</b>	<b>100.0%</b>

<sup>a</sup>Miscellaneous ownership projects include a hunting club, a church, a gated community, and several carbon developer-owned projects, among others.

We tested NIPF landowners’ willingness to enter the market—and the constraints and opportunities they identified—because of their underrepresentation in the market, but also because family forest owners are known to have diverse ownership objectives (Majumdar et al. 2008), many of which may already align with IFM objectives, such as managing for longer rotations and non-timber revenue. NIPF owners may also benefit greatly from joining the market, as they are less likely

than other landowners to have management plans, and they often have intergenerational transfer issues that threaten their ability to maintain their forest lands intact (Best and Wayburn 2001, Butler 2008). Finally, the views of NIPF landowners toward the IFM program and its particular constraints and opportunities allow us to consider how to better tailor other payment for ecosystem services programs in the future.

## Methods

### Database

For landownership data in the introduction, we compiled all project information from online offset registry databases. We included all projects registered on the two official California market databases, American Carbon Registry and Climate Action Reserve, up to September 2016, excluding projects that were double-counted, voluntary, or completed, for a total of 155 projects.

### Survey

We mailed a survey with questions related to forest ownership objectives, forest uses, future management plans, and viewpoints regarding forest carbon offset project development. We incorporated questions from the National Woodland Owner Survey regarding general forest ownership and management information (Butler et al. 2005), and questions related to climate change attitudes developed by Markowski-Lindsay et al. (2011). We also included an insert describing California's carbon market and the role of forest offsets in meeting emission reduction goals. Survey materials were reviewed by experts ( $n = 15$ ), including University of California extension researchers, local foresters, offset project verifiers, university professors, and a local forest landowner.

We targeted non-corporate forest landowners in California with more than 40.5 ha (100 ac), identified as smaller than the minimum parcel size that could theoretically support a financially viable offset project. We included financially non-viable acreages because of the possibility of future aggregation protocols. We sampled from five northern California counties previously surveyed by Ferranto et al. (2011), representing three forest bioregions:

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.

We utilized ArcMap to identify parcels that met our sampling parameters, and contacted all five counties to obtain GIS parcel data and parcel numbers for sampled parcels. All duplicate and corporate landowner names were dropped from the sample. We randomly selected 200 landowners from Humboldt, Mendocino, and Shasta counties, which all have large numbers of landowners. We sent surveys to all 82 Sierra County and 83 Plumas County landowners because each county had few landowners. For most of the findings of this paper, we utilized only the surveys from Humboldt and Mendocino counties, which we termed the "redwood region," though many of the projects occurred on mixed-conifer forests.

We ensured confidentiality by assigning case numbers to surveys; after adjusting for undeliverable addresses, survey packets were mailed to 754 landowners following the Dillman survey method (Dillman et al. 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 1 month later. Data were organized and analyzed using IBM SPSS Statistics software.

## Survey Results

A total of 165 completed surveys were sent back (response rate = 21 percent). We excluded land trust and industrial forest landowners, resulting in 142 usable surveys from all five California counties. We received 75 usable surveys from the redwood region.

### Beliefs Regarding Climate Change and Knowledge of the Market

Forest carbon projects are intended to mitigate climate change through increased sequestration of greenhouse gas emissions. We therefore asked RR landowners how they viewed climate change, with fewer than half indicating they believed human activity is causing climate change, though more than half indicated that humans are responsible for alleviating climate change and that forests can reduce the impact of climate change (fig. 2).

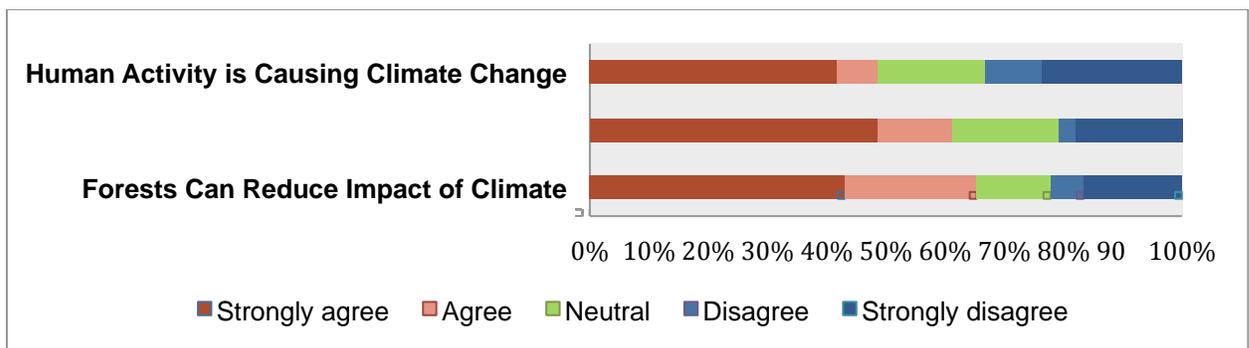


Figure 2—Landowners in Humboldt and Mendocino counties: views on climate change, and humans' responsibility to alleviate climate change.

Because the IFM program was developed in California and largely tested in the redwood region, we hypothesized that landowners of the region would have some knowledge of the program. We found that over 60 percent of landowners did have knowledge of the market prior to receiving the survey (fig. 3). Of those who had some knowledge of the market, information sources varied, with news or other media the most common source and Registered Professional Foresters (RPFs) the second most common source (fig. 3).

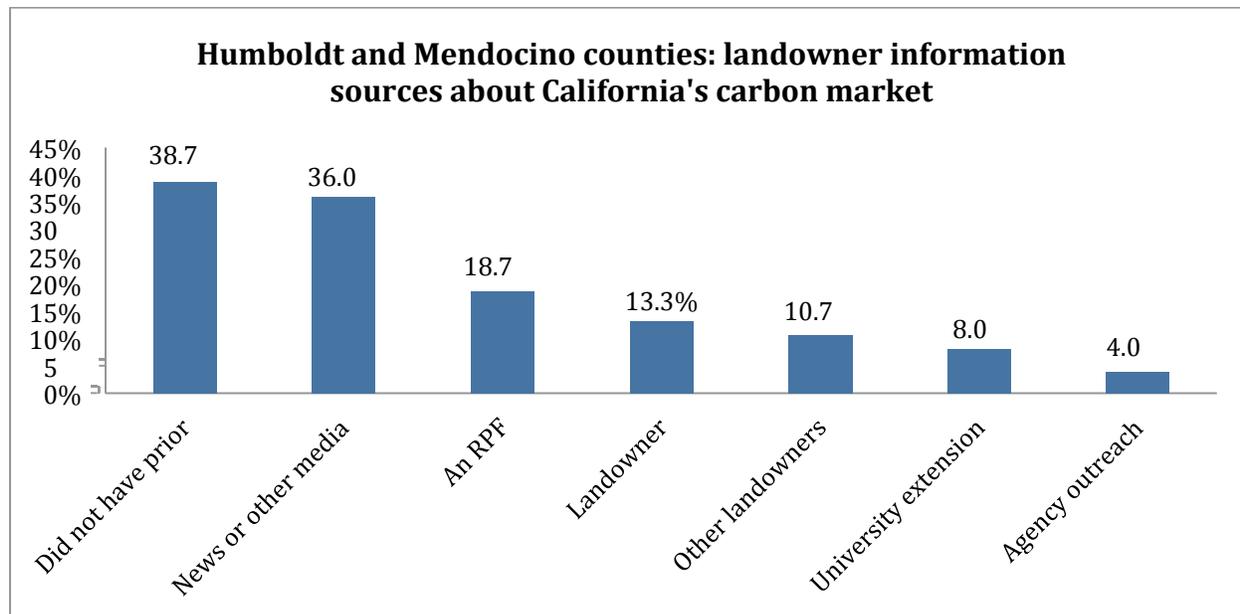


Figure 3—Sources of information regarding IFM projects and the California cap-and-trade program for landowners in the redwood region.

### Willingness to Join the Market, and Constraints for Doing So

Redwood region landowners indicated they were unlikely to enroll in the market because of the obligations of the market, with or without financial assistance, though a high proportion indicated they “didn’t know” whether they would enroll (fig. 4).

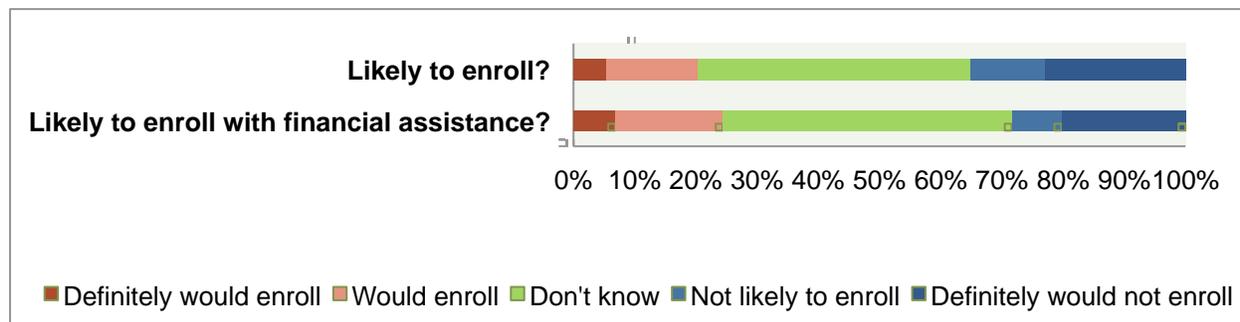


Figure 4—Likelihood of Humboldt and Mendocino county landowners to join the market.

This supports numerous previous findings and was an expected result. The survey was not only intended to gauge landowners’ perceptions of the market, but also to ask about possible motivations and constraints regarding the market, and to inform them about the market. We therefore walked landowners through market obligations, and asked landowners about the specific concerns that may constrain market participation. The survey detailed obligations related to time commitment, upfront project development, ongoing verification, and monitoring and reporting requirements. Figure 5 is a representative selection of landowner concerns, reflecting the importance of upfront and ongoing costs and the complexity of project development, with lesser concerns related to granting access to land and time commitment concerns surrounding the possibility of selling land and changing management decisions (fig. 5). For this figure, “finding time” and “granting access” were related to initial project development, but we found that concerns about finding time and granting access for verification and monitoring were similar.

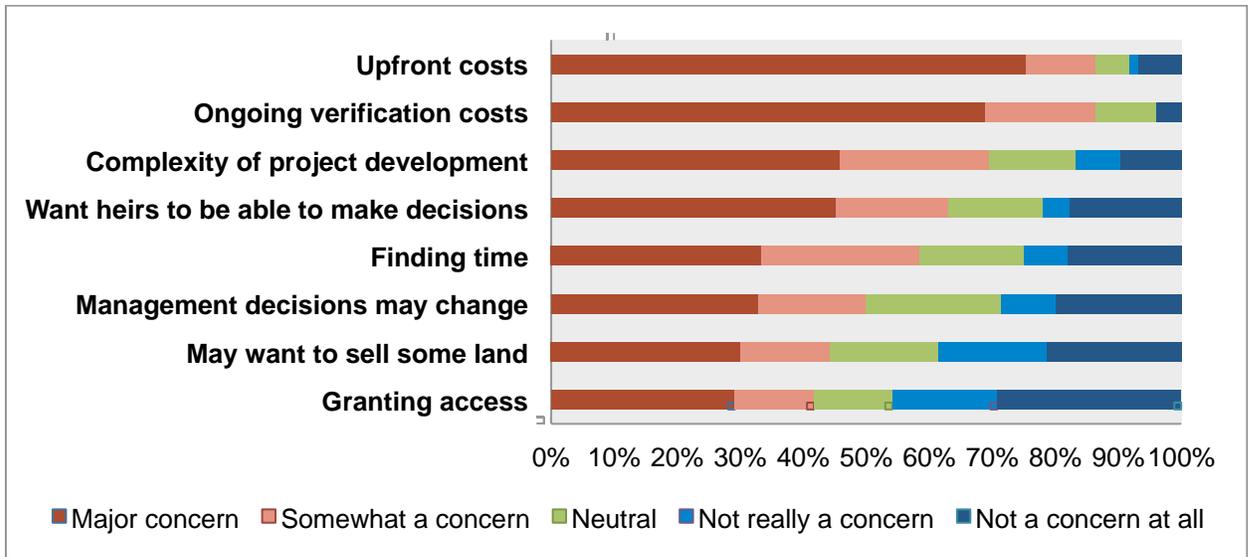


Figure 5—Redwood region landowner concerns regarding enrollment in the California market.

### Ownership Objectives

Redwood region landowners have diverse ownership objectives (fig. 6). Figure 6 includes the 10 most commonly identified landowner objectives. This result was also expected; it underscores the complexity of NIPF ownership and the many considerations of NIPF landowners toward management decisions on their lands.

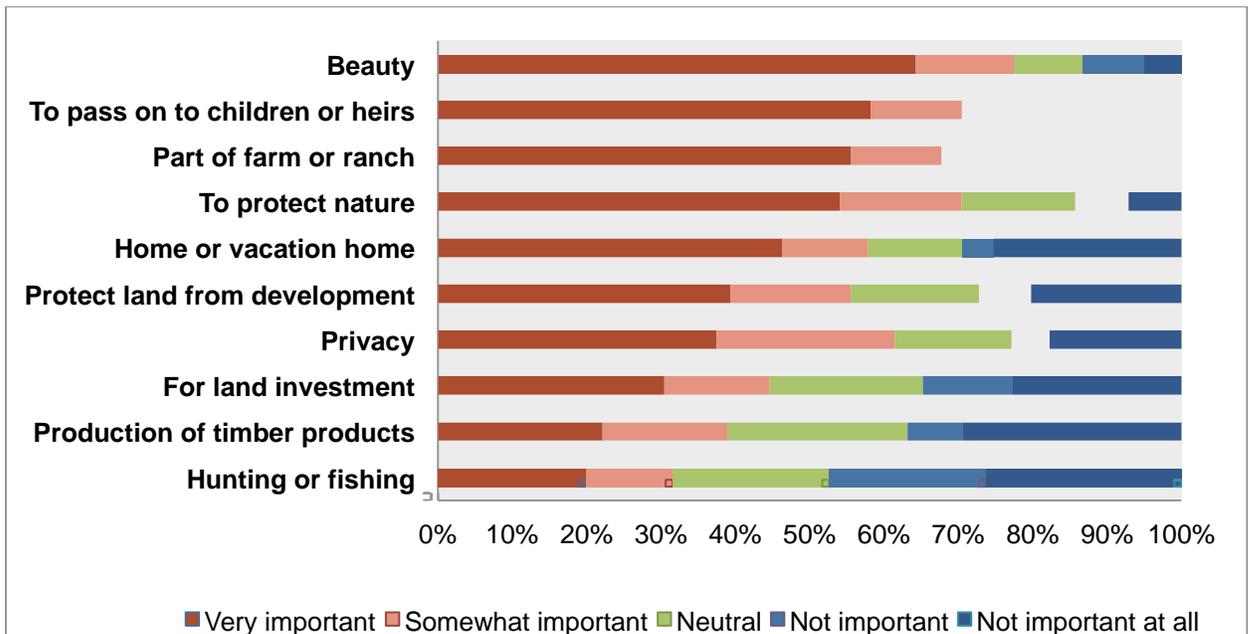


Figure 6—Ten most common ownership objectives for land ownership in the redwood region.

Because the IFM program may provide an alternative source of revenue for these multi-objective NIPF landowners, we asked about possible motivations for participating in the market (fig. 7).

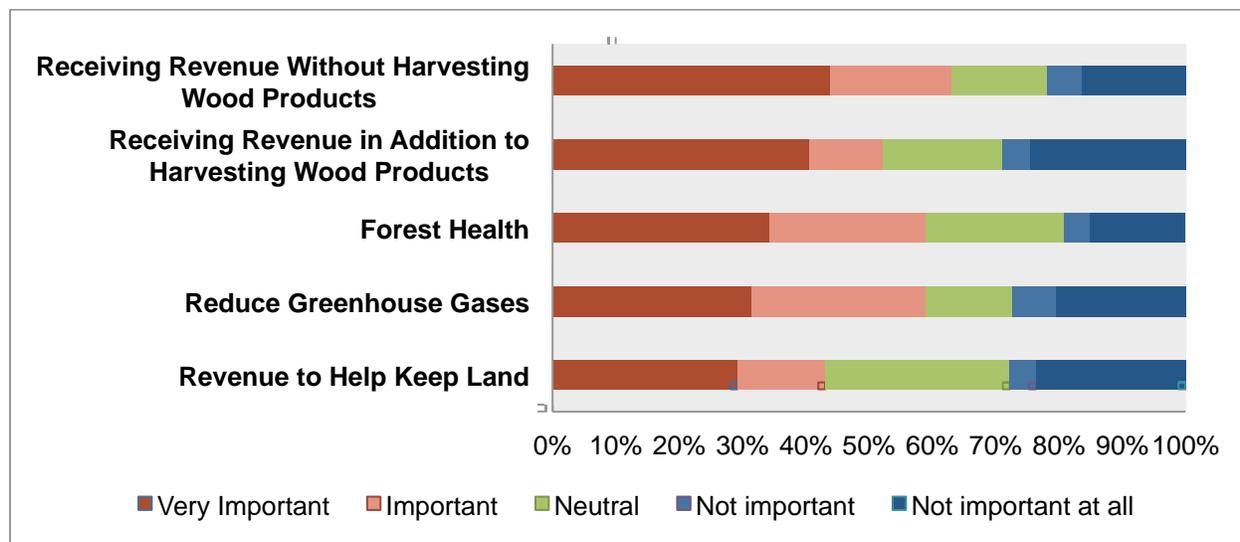


Figure 7—Landowners in Humboldt and Mendocino counties’ potential motivations for joining the market.

These motivations reflect the diverse objectives of NIPF landowners, and show a particular interest of NIPF landowners in receiving revenue that is in addition to or separate from timber harvest.

## Discussion

In common with previous research, we found that NIPF owners were generally unwilling to join the forest offset market, which may represent a missed opportunity for the IFM program—assuming that the program wishes to have high acreages enrolled—as family forest owners have extensive landholdings in the United States. These landholdings are possibly an opportunity for the IFM program, but also an opportunity for other payment for ecosystem services programs that aim to provide habitat, and maintain open space. NIPF landowners have diverse objectives, many of which are not related to timber harvesting, which may align well with the California carbon market protocols. But they have low levels of knowledge about the market, and concerns about entering a market with high upfront costs and complex requirements. With this and other payment for ecosystem services markets, NIPF landowners likely need incentives to participate, including monetary incentives and expertise.

This paper, among many others, has demonstrated that NIPF landowners have diverse objectives in addition to timber harvesting. We feel that these diverse objectives (including not cutting timber) could fit with the California cap-and-trade market protocols. However, some researchers have found that the forestry protocols of the California market do not result in optimal carbon sequestration because of underrepresentation of carbon sequestered in wood products and the effects of substitution (e.g. using wood instead of concrete or plastics). When wood products and substitution are taken into account, commercially-managed forests may sequester higher levels of carbon compared with less intensively managed stands (van Kooten et al. 2015; see also Perez-Garcia et al. 2007). This suggests that incentivizing *more* timber harvesting may have net carbon benefits. Thus protocol design has a significant impact on how forests are managed for carbon markets, and any findings about landowner willingness to enter these markets are limited to the protocols under consideration.

While our findings grouped NIPF landowners together, there is another way to interpret landowner motivations, by clustering landowners into objective types. Elsewhere<sup>5</sup>, we used responses

<sup>5</sup> Di Tommaso, J.; Kelly, E.C.; Gold, G. The willingness of family forest owners to enter California’s carbon offset market. Manuscript in review.

from the entire California sample and created a typology based on 16 landowner objective questions. We utilized cluster analysis to place landowners into discreet groups following an altered clustering method developed by Kuuluvainen et al. 1996. We found three landowner types based on objectives: an amenity group, characterized by concern for non-timber land ownership values, including aesthetic values and protecting nature; a legacy group, primarily motivated by concerns about passing land on to children and maintaining a farm or ranch; and an income group focused on the production of timber products and other economic benefits such as land investment. Among these groups, we found some distinctions in attitudes toward the market, its constraints, and possible motivations for joining it. For example, we found distinctions between amenity landowners, who were more likely to believe in climate change and to be motivated to potentially join the market in order to curb greenhouse gases. On the other hand, legacy landowners were less likely than others to believe in climate change, and indicated that curbing greenhouse gas emissions was not a motivator. Income landowners were the most familiar with the market, and most likely to receive information from RPFs; they also stated lower levels of concern regarding several market obligations, including finding time to participate and granting access to their land to professionals. These distinctions among landowner types were not found when we considered the Humboldt and Mendocino landowners in isolation, but similar landowner groupings have been found elsewhere (Kline et al. 2000, Kuuluvainen et al. 1996, Majumdar et al. 2008).

Considering the diversity of ownership objectives and landowner types in the redwood region, therefore, it is important to consider a diversity of outreach and education programs for joining the IFM program, if that is an objective. Amenity landowners may be motivated by the non-extractive PES markets. Outreach to legacy landowners could focus on the importance of maintaining working lands and natural resource-based livelihoods, and the opportunities of alternative sources of income for maintaining family ownership. Income landowners could see the benefits of multiple revenue streams, especially in regions that have declining forest products infrastructure or for forests that are economically marginal in terms of wood products.

However, the underrepresentation of family forest owners within the carbon offset market does not mean that more landowners need to be pushed into a potentially unsuitable market. Rather, similar payment for ecosystem services programs could be developed that are more response to landowners' concerns and objectives.

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