Estate planning as a forest stewardship tool: A study of family land ownerships in the northeastern U.S.

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ABSTRACT

Forested lands produce a multitude of societal benefits, and landowner decisions influence the provision of these benefits over space and time. The fate of over half of the 330 million hectares of forestland in the United States (U.S.) rests in the hands of private ownerships, and over 35% of U.S. forestland is owned by families. Landowner estate planning offers a means for families to make critical decisions about the future stewardship of their land, including whether and how to split up lands or to take steps to ensure lands remain forested. Yet, decision-making regarding ownership transition and formal estate planning remains poorly understood. Our research provides foundational knowledge of the current status of family landowners' formal estate planning in four northeastern U.S. states. Using a mail survey in Massachusetts, Maine, New York and Vermont, we compiled information on owners' current management, future intentions, estate planning, and demographics. Approximately 66% of respondents have made use of a will for estate planning; 25% have combined the use of a will with a tool that may control use; and 34% have not employed any formal planning tools. Findings from a multinomial logit model of estate planning actions suggest that landowner and land characteristics, barriers to the planning process, and intentions to pass to heirs, recreational and financial investment objectives, and landscape area differences explain variation in the extent and type of planning by owners. Our results underscore the importance of additional research on estate planning, including the conservation intent of these plans, and offer guidance to practitioners interested in bolstering engagement with these planning tools.

1. Introduction

Forested lands provide a multitude of societal benefits, including timber markets, recreational opportunities, water quality, biodiversity, and carbon sequestration (Barrio and Loureiro, 2010; Millennium Ecosystem Assessment, 2005; Stein et al., 2009). Provision of these benefits depends partly on the management and tenure decisions of numerous forest ownerships. In fact, many of these benefits are best ensured through land that will not only remain forested, but in parcels large enough to realize the benefit from the land (e.g., habitat, forest management) (Hatcher et al., 2013; McDonald et al., 2006).

Of the 330 million hectares of forest in the U.S., the fate of an estimated 58% is held and managed by 11.5 million private ownerships,

and of these, 10.7 million ownerships are families (i.e., families, individuals, trusts, estates, and family partnerships), reflecting 117 million hectares of forest or 36% of all U.S. forest area (Butler et al., 2016b; Butler et al., 2016a), each making their own decisions about the future of their forests. These family-forest ownerships contribute a non-trivial amount of social and economic benefit of all forests; in 2015, they produced close to 50% of the timber removals nationally (Butler, 2016).

Landowner estate planning offers a means for owners to make critical decisions about the future stewardship of their land, including whether and how to split up lands or to take steps to ensure lands remain forested. Yet, decision-making of private forest ownerships regarding transition and formal estate planning remains poorly understood. Although much work has been done engaging landowners in

active forest management to achieve stewardship goals, less research and fewer programs address the connections between ownership transition and formal estate plans and the stewardship or conservation of these private forest ownerships (Broderick et al., 1994). Landowner estate planning has been identified as important for preserving both farm and forestland (Broderick et al., 1994; Salomon and Lockhart, 1980; Tyson and Broderick, 1999). Estate plans can ensure that assets (e.g., land, house, financial accounts) are distributed in a way that will meet the financial needs and personal goals of the owner and the owner's family; conservation-based estate plans are those that directly formalize plans to keep some or all of landowner's land in its natural, undeveloped state (Catanzaro et al., 2014). Estate planning for forest owners is sometimes considered a form of woodland management (Dennis, 1981).

Research on estate planning for forest ownerships has been limited to only a few aspects of the process. For example, the literature has covered subjects related to legacy – finding inheritance an important factor in wanting to provide heirs a legacy (Majumdar et al., 2009); forestland concerns/interests of the next generation owners (Mater et al., 2005), estate planning statistics (AARP Research Group, 2000) and financial structures (Howard, 1985). One study assessed attitudes and decisions surrounding estate planning in Connecticut, finding age and education related to interest in keeping forest protected from development (Broderick et al., 1994). Catanzaro et al.'s (2014) preliminary Massachusetts analysis reports that cost and family-related issues were the most common barriers to estate planning for forest ownerships.

The literature on farm succession is extensive and indicates that legacy issues are also important to farm ownerships (Grubbstrom and Soovali-Sepping, 2012; Steiger et al., 2012). Several studies of farm ownerships indicate that having a farm succession plan is shown to be positively associated with several characteristics, including age, education, government support, farm size, farm wealth, and geographical region (Calus et al., 2008; Lange, 2012; Lobley et al., 2010; Mishra et al., 2010; Mishra and El-Osta, 2007; Remble, 2010). Farm transfer issues were found to be related to such things as family-related conflicts, lack of time, and ability to find the right professional (Anderson and Rosenblatt, 1985; Hachfeld et al., 2009; Kaplan et al., 2009; McGonigal, 1991; Pitts et al., 2009; Taylor and Norris, 2000; Waters, 2013).

Knowing where private forest and family-forest ownerships are at in terms of their estate planning for their land is the beginning step of the process to help policy and outreach target those who would most benefit. Understanding how this information then matches up with ownerships' goals for the future of their land would be the subsequent step that enables assessment of how policy and education can help these goals be met via estate planning. Directing efforts in this way could help owners make informed decisions about the future of their land, including helping those who wish to have their land maintain the private and public benefits they currently provide.

Gaining such an understanding is important in the U.S., and particularly in the Northeastern U.S. (i.e., New England and New York) where the majority of the land-mass is forest (73%), privately owned (58%) and owned by families (34%) (Butler et al., 2016a; U.S. Census Bureau, 2010). Focusing on "families" (as defined by Butler et al. (2016a)) in this forest-laden region targets both forest and farm ownerships where issues of succession, use and forest stewardship are common to both ownerships. Understanding the estate planning of these family land ownerships (FLOs) has international relevance as well. While strong land use planning, zoning, and land controls designed to limit conversion are found internationally (e.g., Europe and Scandinavia), issues of future use and potential fragmentation still loom large, as indicated by international estate planning research exploring inheritance patterns (e.g., Lidestav (2010) and factors of succession, most frequently related to farms (Calus et al., 2008; Grubbstrom and Soovali-Sepping, 2012; Lobley et al., 2010).

In light of the importance of FLOs, their land and decisions, and research knowledge gaps, our research objectives are to:

1. Understand the extent of formal estate planning that FLOs have undertaken to plan for the future of their land; and
2. Identify factors associated with the type of planning that has been undertaken.

2. Methods

2.1. Study region

The study region encompasses forested areas within Massachusetts, Maine, New York and Vermont. Approximately 73% of the total land-mass in these states is forested, 82% of that is privately owned, and 46% of these roughly 18 million hectares of forest are family-owned (Butler et al., 2016a; U.S. Census Bureau, 2010). We established our study region by selecting two forest landscapes from each state. We used "medium and high change" watersheds as defined by *Forests on the Edge* (Stein et al., 2005) as the basis for selecting landscapes estimated to be threatened by housing density increases. Where watersheds identified by Stein et al. covered a wide geographic area, individual counties within the watersheds were chosen as the landscape. Specific watersheds and counties in our study region include (See Fig. 1):

- Maine: Lower Penobscot River and Saco watersheds
- Massachusetts: Millers and Westfield watersheds
- New York: Cortland and Onondaga counties, and Delaware and Greene counties
- Vermont: Orleans and Rutland counties

2.2. Sample frame

We designated the sample frame as FLOs of 4 or more hectares located within the study region. We constructed the sample frame using property information available from state and municipal agencies. We included ownerships located in municipalities where 50% or more of the town was located within the study region. We did not restrict the sample to designated forest ownerships; in this heavily forested region, most ownerships > 4 ha involve some amount of forested land. In fact, family-forest owners of four or more hectares reflect over 7 million-hectares of forest in these four states and 349,000 ownerships (Butler et al., 2016a). Ownerships of four or more hectares are better-suited for economically viable forests (Hatcher et al., 2013), forest management, and other forestry-based programs (Butler et al., 2016b).

Property tax assessment data provided the raw ownership information for private individual or family ownerships. The sample frame consisted of randomly selected ownerships, and we accounted for multiple-property ownerships when generating the frame. While most data records reflected single-property ownerships, some of the data reflected multiple-property ownerships (i.e., ownerships of separate, unconnected parcels). We designed the sample frame so that each ownership has the same likelihood of being selected: the numerous records of each multiple-property ownership were collapsed into one record. The result was one record per ownership reflecting the property with the largest acreage.

2.2.1. Sample selection

We used a stratified sampling approach to select the sample for survey data collection. Given our interest in mostly forested landscapes that are viable working forests and possess high ecological value, it was important for the sample to contain larger parcels. In the northeastern region of the U.S., the majority of parcels are smaller, averaging 21 ha per ownership for the four states in our study region (Butler et al., 2016a). To ensure that larger parcels are included in the survey sample, we used a stratified sample, selecting half the ownerships to exceed a
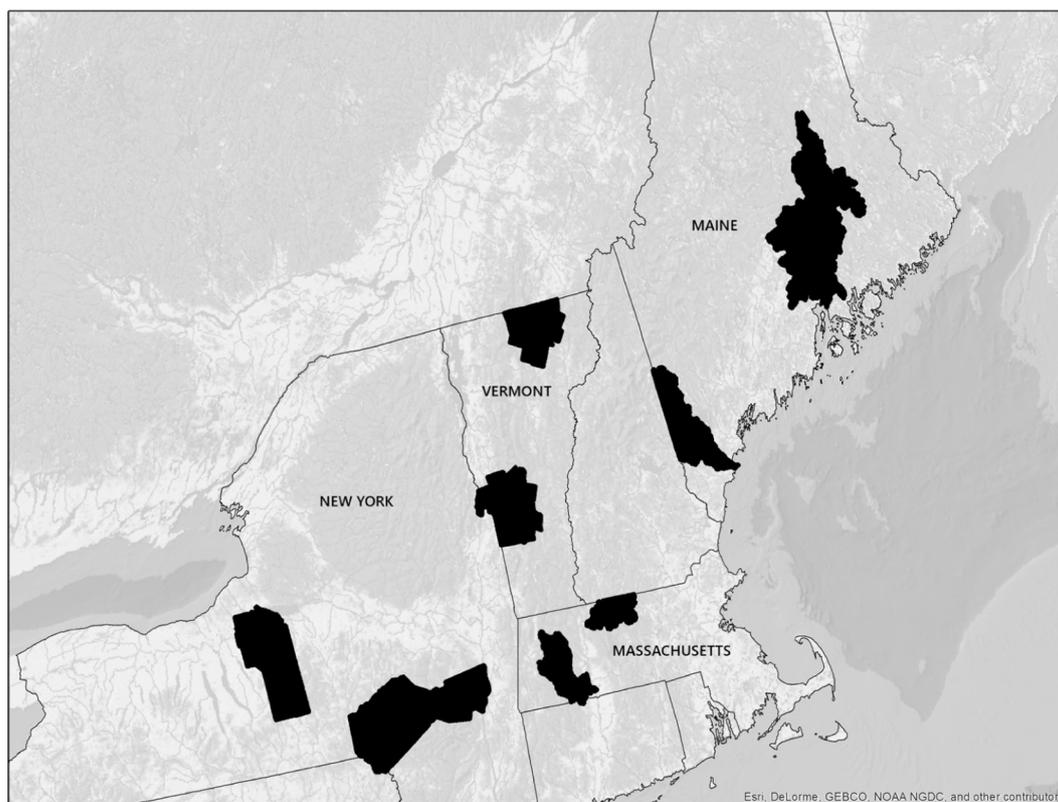
Fig. 1. Sample states and landscapes chosen for analysis.

minimum area of 16 ha and half to fall below that area. While an exact size reflecting the minimum viability of ownerships for long-term silviculture is not yet established, existing studies indicate support for a minimum level (McDonald et al., 2006). Within each of these strata, survey recipients were randomly identified. The sample reflects 2500 ownership records in total, or 625 ownerships per state (312 or 313 per landscape in each state).

2.3. Survey design and administration

We designed a mail survey questionnaire to collect information from FLOs and gain a better understanding of the basic demographics, future intentions, and estate planning of these owners in this northeastern U.S. region (See Fig. S.1, Supplementary material for a copy of the survey). Specifically, we asked FLOs to respond to the survey for the largest property they own in the property location (i.e., the town) which was printed on the survey envelope. We based several questions on the regularly-administered National Woodland Owner Survey, which underwent extensive pretesting. We then added questions to address our research objectives, asking a series of questions based on the Transtheoretical Model (Fried et al., 2010; Prochaska et al., 2008), to understand various estate planning activities and what factors would hinder them from taking action. Specifically, we asked FLOs if they have planned for the future of their land in the form of a will, trust, limited liability corporation (LLC), limited liability partnership (LLP), family partnership, corporation, and/or conservation easement. A will is a legal document that can formalize wishes for future ownership of the land; it is meant to be a temporary tool to distribute assets. A trust is a legal entity that manages assets, including land, into the future. It outlines the future ownership of the land and can be developed to hold and manage the asset for decades and therefore can be used to help determine the future use of the land, though not permanently. LLCs, LLPs, family partnerships, and corporations transfer ownership and can determine the use of the land through their operating agreements.

Conservation easements cannot be used to transfer ownership, but can determine the use of the land in perpetuity. Following prior surveys of FLOs, we also included questions to collect data describing owner demographics, objectives and intentions, and parcel characteristics. These data allowed us to examine empirically what drives differences in extent of formal estate planning.

We administered the mail survey in the spring of 2015 using a modified Dillman tailored design method (Dillman et al., 2014): prenotice postcard sent three days prior to the mail survey; mail survey including a detailed cover letter explaining the importance of responding; thank you post card sent one week later expressing appreciation or reminding individuals to respond; replacement mail survey and detailed cover letter sent 3 weeks after previous survey mailing. Within each of the four states, an equal number of surveys was sent to each of two landscapes in each state, for a total of 2500 sent surveys. Mail surveys were scanned using Teleform OCR software to create an Excel database of survey responses.

2.4. Data and analysis

To assess non-response bias, we conducted two tests: a series of phone calls with non-respondents and compared their responses to those of who completed the whole survey, and compared selected survey responses from early and late respondents. For the phone calls, we attempted to contact 10% of the non-respondent pool to obtain answers to key survey questions. For the second comparison, we identified early and late respondents by generating quartiles based on survey response date. Respondents in the first quartile were considered early respondents and those in the last quartile late respondents. We compared answers to the same key survey questions identified for the telephone analysis.

We generated descriptive statistics to summarize land planning status responses by question and initiate our empirical assessment. We developed and estimated a multinomial logit model (described in the

next section) to examine extent of FLO formal estate planning. We used five categories of explanatory variables describing FLOs and lands chosen based on existing literature (and in some cases, gaps in the literature): landowner and land characteristics; barriers to making plans; objectives; future intentions; and landscape area.

We completed testing to identify multicollinearity among potential explanatory variables using "Variance Inflation Factor" (VIF) diagnostics (Allison, 1999). VIFs and their reciprocal (i.e., tolerance levels) are produced for each independent variable; tolerance levels below 0.4 are associated with high multicollinearity (Allison, 1999). We conducted the exploratory and discrete regression analyses using STATA 14 software.

2.5. Model

The dependent variable that provides the basis for our multinomial logit (MNL) model reflects distinct categories of the extent of formal FLO estate planning. The categories reflect the range of effort and desire for formality put into estate planning for their land. We focus on three categories to reflect no formal planning (*No Plans*), formal planning only by establishing future owners (*Will Only*), and formal planning that could establish both future ownership and use (*Will + Other Tool(s)*). (Table 1) We hypothesized that each of these three categories is associated with landowner and land characteristics; perceived barriers to planning; intentions for the future of the land; and ownership objectives.

2.5.1. Explanatory variables

2.5.1.1. Landowner and land characteristics.
Numerous landowner and land characteristics provided in the survey are available to test the association with likelihood of having undertaken formal estate planning. These characteristics include size of holdings, tenure of ownership, if land was inherited, number of owners, landowner age, education, gender, and whether the owner lives within 1.6 km of the land. The hypothesis of these associations draws from forestry and farming literature (Broderick et al., 1994; Lidestav, 2010; Lobley et al., 2010; Majumdar et al., 2009; Mishra and El-Osta, 2008). We hypothesized that increased holdings, tenure, inherited land, number of owners, age, and education would be associated with *Will Only* or *Will + Other Tool(s)*. Further, we hypothesized that there might be some relationship between gender and home location and extent of estate planning, but have no priors for these relationships. These and all other explanatory variables are defined in Table 2.

2.5.1.2. Barriers to planning.
The survey asked questions using 5-point Likert scale agreement questions (i.e., strongly agree, agree, neutral, disagree, strongly disagree) about perceived barriers to planning the future of their land. These questions included: knowing where to go for

Table 1
Definitions of estate planning categories for multinomial logit model[a].

Estate planning tool	No plans	Will only	Will + other tool(s)
Established Will		"Yes"	"yes +"
Established Trust			
Set up LLC/LLP[b]	"No" to all of these		
Set up Family Partnership		"No" to all of these	"yes" to at least one of these
Set up Corporation			
Has Conservation Easement			

[a] "No" indicates the respondent either has not thought about using that tool, has thought about it but has not used the tool, plans to use the tool in the next year, or does not plan to use the tool. "Yes" indicates the respondent has already developed or is currently developing that tool. "Yes +" indicates the respondent has a will or is currently developing one and in addition has another of the designated tools.

[b] LLC = Limited liability corporation; LLP = limited liability partnership.

Table 2
Variable definitions and statistics for analysis sample (n = 535).

Variable name	Descriptive statistic[a]	Definition
Extent of formal estate planning	24.7%	Will + Other Tool(s)
	41.7%	Will Only
	33.6%	No Plans
Ln(Hectares)	2.9 (1.0)	Log of hectares of land owned
Tenure	25.5 (13.8)	Number of years owned, range 1–66
Inherited	17.8%	Inherited the land
Number of legal owners	91.6%	1 or 2 owners (coded as 0)
	4.1%	3 owners (coded as 1)
	2.8%	4 owners (coded as 2)
	0.6%	5 owners (coded as 3)
	0.2%	7 owners (coded as 5)
	0.2%	8 owners (coded as 6)
	0.6%	10 owners (coded as 8)
Age	62.7 (11.7)	Age of respondent, range 27–93
College education	58.9%	Received 2-year University degree or higher
Gender	29.2%	Female = 1
Home within 1 mile	62.2%	Yes = 1
Barrier: Information	12.2%	Strongly agree
	39.8%	Agree
	27.7%	Neutral
	15.3%	Disagree
	5.1%	Strongly disagree
Barrier: Finances	15.3%	Strongly agree
	40.4%	Agree
	25.8%	Neutral
	11.4%	Disagree
	7.1%	Strongly disagree
Barrier: Family	13.5%	Strongly agree
	36.6%	Agree
	36.5%	Neutral
	9.9%	Disagree
	3.6%	Strongly disagree
Intentions: Not to sell land	52.7%	No intentions to sell = 1; 0 else
Intentions: Pass to heirs	59.4%	Intentions to pass land to heirs in future = 1; 0 else
Intentions: Keep undeveloped	31.6%	Intentions to keep undeveloped in future = 1; 0 else
Objective: Family	68.2%	Raise family/pass to heirs: Important or Very Important
Objective: Financial Investment	40.4%	Land investment: Important or Very Important
Objective: Timber/Wood	38.9%	Timber products/firewood: Important or Very Important
Objective: Non-consumptive Use	89.0%	Beauty/privacy: Important or Very Important
Objective: Ecological	79.6%	Protect nature/water/wildlife: Important or Very Important
Objective: Recreation	56.1%	Recreation: Important or Very Important
Objective: Hunting	37.2%	Hunting: Important or Very Important
Landscape area	10.7%	MA: Millers
	14.4%	MA: Westfield
	9.9%	ME: Lower Penobscot River
	11.8%	ME: Saco
	9.5%	NY: Cortland/Onondaga
	13.3%	NY: Delaware/Greene
	15.5%	VT: Rutland
	15.0%	VT: Orleans

[a] Descriptive statistics: mean (standard deviation) for continuous variables; frequency for categorical variables.

information, having enough financial resources to move forward, and having a family that agrees on how to move forward. The responses to each of these questions are ordinally coded such that −2 reflects "strongly agree" and 2 reflects "strongly disagree." We hypothesized that the greater the barrier (i.e., the greater the disagreement with the

statement), the more likely of having no plans. These relationships are tested based on published literature (Anderson and Rosenblatt, 1985; Catanzaro et al., 2014; Hachfeld et al., 2009; Kaplan et al., 2009; Pitts et al., 2009; Taylor and Norris, 2000).

2.5.1.3. Intentions for the land. The survey asks FLOs three questions describing whether the FLO intends to: sell any or all land; pass any or all the land to heirs; keep the land undeveloped in the future. These variables are coded as a 1 if the respondent answered "yes" or 0 otherwise. Without a priori evidence, we hypothesized these intentions to be associated with extent of estate planning undertaken. We hypothesized that intentions to: sell any or all land would be associated with less formal or no planning for the land because it is destined to be sold; pass land to heirs would be associated with *Will Only* or *Will + Other Tool(s)* to reflect respondents desire to ensure a smooth transition; and keep the land undeveloped in the future would be associated with *Will Only* or *Will + Other Tool(s)* to reflect respondents desire to ensure their intentions are realized.

2.5.1.4. Ownership objectives. The survey asks a series of questions about how important various reasons are for owning their land. These questions were grouped into 7 categories: family, financial investment, timber/wood, non-consumptive use, ecological, recreation, and hunting. In all cases, having the objective means that the landowner responded "Important" or "Very Important" to at least one of the questions within each category. Family objectives are based on answers to two questions: to raise my family, to pass land on to my children or other heirs. Financial investment objectives are based on the answer to one question: for land investment. Timber/wood objectives are based on answers to two questions: for firewood, for timber products (such as logs or pulpwood). Non-consumptive use objectives are based on answers to two questions: to enjoy beauty or scenery, for privacy. Ecological objectives are based on answers to three questions: to protect nature or biological diversity; protect water resources, protect or improve wildlife habitat. Recreation objectives are based on the answer to one question: for recreation (other than hunting). Hunting objectives are based on the answer to one question: for hunting. We hypothesized a relationship between objectives and extent of formal estate planning, as existing literature has indicated that ownership objectives are associated with the future disposition of land (Rozance and Rabotyagov, 2014). Without a priori evidence, we hypothesized that having any of the objectives would be associated with *Will Only* or *Will + Other Tool(s)* because respondents would have a vested interest in their land and perhaps desire it to pass on with their instruction.

2.5.1.5. Landscape area. Because each of the sample areas were chosen to be consistent in terms of several indices (e.g., forest management and ecological benefits, areas expecting to experience similar changes in housing density based on Stein et al. (2005)), we considered the eight landscapes as a single study region (see Fig. 1). However, it is likely that there are other geographic factors influencing land-based actions and decisions of FLOs that are not captured by other explanatory variables in the model. These geographic factors could reflect regional variation in policies and markets; cultural, economic or demographic aspects of areas; and/or properties of forest systems. We expect regional variation in policies and programs aimed at landowners and land use (forest management and conservation, development, property tax), conservation activities and development pressure to influence decision-making and planning (Alig et al., 2004; Irwin et al., 2009). Research also indicates that forest owner actions and opinions are influenced by social networks within communities (Kittredge et al., 2013; Ma and Kittredge, 2011). Based on this assumption, we include dummy variables for each landscape (leaving one out of the model as the reference variable) to reflect these systematic differences.

2.5.2. Multinomial logit model

We used the multinomial logit (MNL) model to examine systematic patterns in our dependent variable. The MNL model is appropriate for our data because our dependent variable is discrete and unordered (i.e., extent of formal estate planning does not reflect a series of ordered choices; rather, they encompass tools used to reflect owners' wishes.) The MNL provides a set of probabilities for these discrete categories given a certain set of respondent characteristics (Ben-Akiva and Lerman, 1991; Greene, 2011). The probability of an individual i being in category j from a set of J categories is represented as (1), under the assumptions that the error term is independently and identically distributed and has a Gumbel distribution (Ben-Akiva and Lerman, 1991; Greene, 2011).

$$Prob(y_i = j) = \frac{exp(\beta_j x_i)}{\sum_j exp(\beta_j x_i)}, j = 0, 1, 2, ...J$$

For our model, the equation above describes how and to what degree certain characteristics affect the probability of a respondent having made decisions that place them in one of three estate planning categories. Parameter interpretation is done via comparison with a "reference" outcome. Probabilities for the $J + 1$ choices for a respondent with characteristics x_i result from the estimated equations, and the parameters, β, vary for each of the J alternatives (Greene, 2011).

3. Results

3.1. Mail survey results

Of the 2500 mailed surveys, 140 addresses were undeliverable, and 789 surveys were returned for a 33% cooperation rate. In our attempt to call 10% of non-respondents, we reached only 5% of the non-respondent sample, likely due to the sensitive nature of the subject. A statistical comparison of the response and non-response groups (*t*-test) indicated there is no difference between them for acreage of forest owned, whether they have a will, age, and gender. The significant difference in education showed that non-respondents were less educated than respondents but only by one education category. The significant difference due to "year acquired" showed that non-respondents owned their land longer than respondents, by 4 years on average. The comparison of early responses to late responses showed that those who responded to the survey earlier owned their land slightly longer than late respondents, by 3 years. While this result appears to conflict with the telephone survey, neither one of these analyses show a large disparity in number of years that land has been owned. The early/late comparison indicated that those who responded early were more likely to be male than later respondents, but when comparing the mean proportions, the difference in values was small (the difference in mean response 0.2). Early respondents are closer to saying they "have a will" versus late respondents who are closer to saying they "are doing this now." Based on these analyses, it appears that nonresponse bias is low, and no adjustments have been made to the data.

Of all 789 survey respondents, 535 provided enough information to be included in the analysis. Eight of the characteristics of the respondents excluded from the analysis based on item non-response (n = 254) were significantly different from those of the analysis respondents (n = 535); however, many of these significant differences did not reflect substantial differences in values. Geographically, the proportion of respondents from the Millers area was lower for analysis sample than the excluded sample (i.e., 11% vs. 17%, p < 0.05), while the proportion of respondents from Delaware/Greene area was higher for the analysis sample than the excluded sample (13% vs. 8%, p < 0.05). The analysis sample more frequently had their home within 1 mile of their land (62% vs. 55%, p < 0.10), had no intentions to sell (53% vs. 45%, p < 0.05), had intentions to pass to heirs (59% vs. 49%, p < 0.01), had family-based ownership objectives (68% vs. 55%,

p < 0.01), and had hunting-based ownership objectives (37% vs. 31%, p < 0.10) than the excluded sample. For demographics, the analysis sample was on average younger than the excluded sample (63 years old vs. 65 years old, p < 0.05). The statistics below describe those of the analysis sample for ease of comparison with the model results.

3.1.1. Respondent characteristics

Respondents, on average, own 18 ha (converted from the mean logarithm statistic of 2.9), are 63 years old, and have owned their land 26 years. Approximately 18% inherited the land, and the land is owned on average by 2 owners with a range of owners from 1 or 2 owners (92% of sample) to 10 owners (0.6% of sample). Nearly 30% of the sample is female, and 59% have received a college degree. Roughly 62% own a home within 1 mile of their land. Over half the sample indicates barriers related to not having enough information, finances or agreement among family. Over half (53%) do not have plans to sell their land, 59% have plans to pass their land to heirs, and 32% said they plan to keep their land undeveloped in the future. The reasons for owning land in frequency order include non-consumptive use (89%), ecological (80%), family (68%), recreation (56%), financial investment (40%), timber/wood (39%), and hunting (37%). These FLO characteristics are generally similar to those of the family-forest owners reported from the 2013 National Woodland Owner Survey (Butler et al., 2016b). See Table 2 for variable definitions, sample means/standard deviations of continuous variables, and frequencies for categorical variables.

3.1.2. Extent of formal estate planning

The survey results indicate that more respondents than not (66%) have made use of some form of estate planning tool to manage their land into the future. Approximately 42% of respondents have employed the single tool of a will, which may establish future ownership and, perhaps, non-binding future use instructions. Roughly 25% of respondents have undertaken estate planning involving a will plus another tool which may establish future ownership and use for land into the future. Approximately 34% have not employed any formal planning tool to determine the future of their land. Of those in the *Will + Other Tool(s)* category, 83% of them had a trust, 22% an easement, 8% an LLC, LLP or family partnership, and 5% a corporation.[1]

The sample statistics on barriers by estate planning category indicate some notable trends. For each barrier considered, there was a statistically significant difference across estate planning category at the 1% level. Those who have no formal estate plans most frequently perceived barriers to the process, with not knowing where to go for information cited most often (33%), followed by perceptions of not having enough financial resources to move forward with planning the future of the land (31%), and the family not agreeing on how to move forward regarding planning the future of their land (21%). The proportion of respondents citing these barriers who have done some sort of planning was much smaller: those who are categorized as *Will Only* cited not knowing where to go for information most frequently (16%) and those categorized as *Will + Other Tool(s)* cited not knowing where to go for information and family disagreements equally (11%). (See Table 3).

Sample statistics on intentions for keeping land undeveloped in the future indicate a similar trend of responses (yes, no, undecided) across estate planning category. Regardless of the extent of formal estate planning, most respondents are undecided about keeping it undeveloped in the future, followed by those who do intend to keep it undeveloped (Fig. 2).

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[1] These percentages do not sum to 100% because respondents may be using more than one of these tools.

Table 3
Frequency of barriers about planning the future of the land by estate planning category.

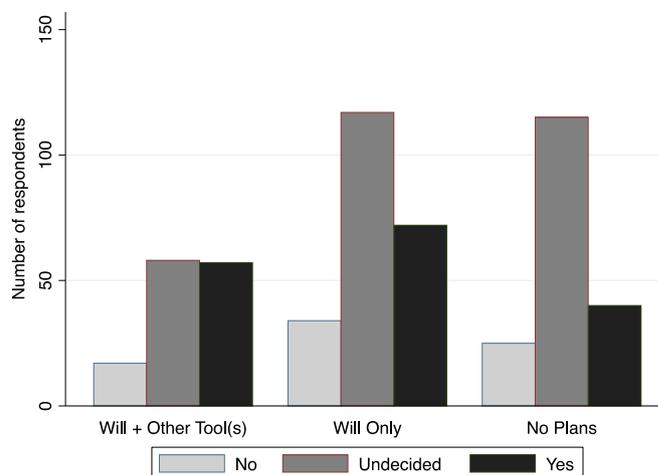| Barrier	Will + Other Tool(s)	Will Only	No plans
Does not know where to go for information about planning the future of their land	11%	16%	33%
Does not have enough financial resources to move forward with planning the future of their land	9%	14%	31%
Family does not agree on how to move forward regarding planning the future of their land	11%	9%	21%

Fig. 2. Intentions to keep land undeveloped by estate planning category.

3.2. Model results

Expanding on these results of estate planning category, we next turn our attention to the model that systematically identifies factors associated with the type of planning that has been undertaken using the multinomial logit model (MNL). Overall, the estimated MNL model did well, explaining 19% of the variation (pseudo-R^2). Additional global tests showed support of the model, including rejecting the hypothesis that all parameters associated with explanatory variables were equal to 0 (Likelihood Ratio Chi-Square test statistic 223.78, 56 degrees of freedom, p-value = 0.000). Correlation and multicollinearity tests among variables did not indicate strong levels of correlation. The lowest tolerance level for variables in this analysis was 0.53 (age); the mean tolerance level was 0.73, both above the 0.4 tolerance level associated with high multicollinearity (Allison, 1999). Likelihood ratio testing (Greene, 2011) of whether explanatory variable coefficients vary with landscape areas supported our choice of a pooled model specification.

The MNL provides coefficient estimates that allow one category to be compared to a reference category (i.e., *No Plans*), however, these parameter results do not indicate relative ranking of variables. As such, the results reported here describe the marginal effects of the model, which show all estate planning categories and allow for a relative ranking of variables. The marginal results indicate the percent change in respondent type associated with a 1-unit change in the independent variable (where the "unit" is based on the variable definition). Marginal effects can be used to compare magnitude of effect across the independent variables and estate planning category (Table 4). The full reporting of coefficient estimates is provided in Table S.1, Supplementary material.[2]

Nearly all landowner and land characteristics showed significant association with the estate planning category.

Table 4
Marginal results for multinomial logit model of estate planning category.

Independent variable	Will + Other Tool(s)	Will Only	No plans
Ln(Hectares)	6.6%***	− 2.7%	− 3.9%**
Tenure	0.2%	0.1%	− 0.3%**
Inherited	− 7.1%	3.0%	4.1%
Number of legal owners above 2	3.4%*	1.5%	− 4.9%
Age	0.5%**	0.3%	− 0.7%***
College education	5.4%	7.0%	− 12.4%***
Gender (Female)	− 1.2%	6.3%	− 5.1%
Home within 1 mile	− 8.0%**	6.2%	1.8%
Barrier: Information	− 4.6%**	− 1.4%	4.8%***
Barrier: Finances	− 3.5%*	− 2.2%	5.7%***
Barrier: Family	− 2.5%	− 3.0%	5.5%***
Intentions: Not to sell land	0.5%	− 5.2%	4.7%
Intentions: Pass to heirs	5.6%	4.7%	− 10.3%**
Intentions: Keep undeveloped	3.7%	− 1.8%	− 1.9%
Objective: Family	− 2.8%	− 3.2%	6.0%
Objective: Financial Investment	6.1%*	− 5.2%	− 0.9%
Objective: Timber/Wood	2.9%	− 2.1%	− 0.8%
Objective: Non-consumptive Use	3.9%	− 2.4%	− 1.5%
Objective: Ecological	− 3.1%	5.3%	− 2.2%
Objective: Recreation	− 1.4%	8.8%*	− 7.4%*
Objective: Hunting	− 5.4%*	5.8%	− 0.4%
MA: Millers	6.7%	− 10.7%	4.1%
ME: Lower Penobscot River	− 17.4%**	7.8%	9.6%
ME: Saco	− 10.2%	6.7%	3.5%
NY: Cortland/Onondaga	− 6.5%	16.9%**	− 10.4%
NY: Delaware/Greene	0.5%	1.5%	− 2.0%
VT: Rutland	3.8%	− 5.2%	1.4%
VT: Orleans	− 9.3%	4.7%	4.6%

Observations: 535; Likelihood Ratio (LR) Chi-Square test, 56 degrees of freedom: 223.78; P-value from LR test = 0.0000; pseudo-R^2: 0.1943.

* p-value ≤ 10%.
** p-value ≤ 5%.
*** p-value ≤ 1%.

- *Forest holdings*: The greater the forest holdings (in log of hectares), the more likely to have a *Will + Other Tool(s)* for the land and less likely to have *No Plans*.
- *Tenure*: Every additional year that the land is owned decreases the probability of having *No Plans* by 0.3% (3% decrease for every 10 years that land is owned).
- *Number of legal owners* > 2: Every additional owner above 2 owners increases the probability of having a *Will + Other Tool(s)* by 3%.
- *Age*: The older the respondent, the more likely to have a *Will + Other Tool(s)* and the less likely to have *No Plans* for the future of the land. Increasing age by one year increases the probability of having a *Will + Other Tool(s)* by 0.5% (5% for a 10-year increase) and decreases the probability of having *No Plans* by 0.7% (7% for a 10-year increase). Fig. 3 shows how age varies with estate planning category over time.
- *College Education*: Having at least a 2-year University degree is associated with a decreased probability of having *No Plans* by 12%. Put another way, having less than a 2-year University degree is associated with an increased probability of having *No Plans* by 12%.
- *Home*: Having a home within 1 mile of wooded land decreases the probability of having a *Will + Other Tool(s)* by 8%.

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[2] A multinomial logit of only those respondents who own 4 or more hectares of forest (vs. 4 or more hectares of land) indicate close to no difference in the marginal results. Comparing coefficient results with Table S.1, with the *Will + Other Tool(s)* group, *Inherited* gains significance at the 10% level (marginal result is − 8.5%); *Home within 1 mile* significance drops from 5% to 10%; and significance for *Barrier: Information* increases from 5% to 1%. For the *Will Only* group, *Barrier: Family* gains significance at the 10% level (marginal result is − 5.5%), Objective: Recreation gains significance from 5% to 10%; and NY: Cortland/Onondaga loses significance.
For the *No Plans* group, *Forest Holdings* significance drops from 5% to 10%, *Tenure* and *Intentions: Pass to heirs* both lose significance, and significance for *Barrier: Information* and *Barrier: Finances* both drop to 5%. Analytic results reflect 449 observations with a pseudo-R^2 of 0.1913.
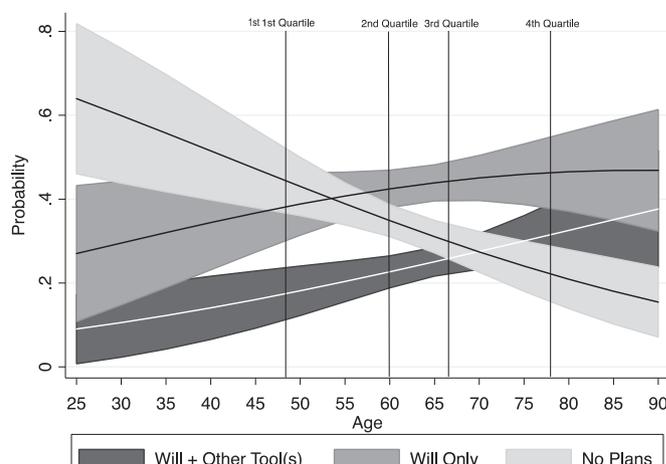

Fig. 3. Predictive margins for extent of estate planning with 95% confidence intervals and mean of quartiles for analysis sample.

All variables reflecting barriers to the land planning process had significant effects on the estate planning categories at the 1% level. Not having enough financial resources to move forward was the barrier with the greatest impact on planning category, followed by the family not knowing how to move forward, and, lastly, not knowing where to go for information. Having these barriers increased the likelihood of having *No Plans* between 5% and 6%.

The FLO intention having a significant effect on estate planning category involved passing land to heir. Intentions not to sell the land and to keep the land undeveloped in the future did not significantly affect estate planning category in the model. Not having intentions to pass land on to heirs increases the probability of having *No Plans* for the land by 10%.

Three ownership objectives had a significant influence on estate planning categories at the 10% level and involved those who found financial investment, recreational use of their land and hunting to be important or very important.

Two landscape area variables show systematic differences across estate planning category at the 5% level.

- *ME*: *Lower Penobscot River*: Compared with respondents from Westfield watershed (MA), individuals in the Lower Penobscot River area (ME) were 17% less likely to have a *Will + Other Tool(s)*.
- *NY*: *Cortland/Onondaga*: Compared with respondents from Westfield watershed (MA), individuals in the Cortland/Onondaga area (NY) were 17% more likely to have a *Will Only*.

4. Discussion

With appropriate estate planning tools, FLOs have the ability to transfer their land in a way that designates future ownership and future use, and even the ability to keep it undivided and in forest use. In this way, estate planning has the potential to be an important element of forest stewardship. However, up to this point, little is known about even the extent of formal estate plans with FLOs, let alone the content of these plans. Our research goal was twofold: to conduct an assessment of the extent of formal estate planning that FLOs have undertaken to plan the future of their land in heavily forested areas under the threat of development, and to systematically identify factors associated with the type of planning that has been undertaken so as to develop policy and programs to better inform these decisions.

We found that two-thirds of respondents have a will, 25% of the respondents use a will with some additional type of estate planning tool (i.e., trust, partnership, corporation, easement), and over one-third of respondents have not used any type of formal tool to plan the future of

their land. This result has set a baseline for understanding formal land-based estate planning actions that had yet to be determined in other research. We also found that the majority of land stewardship that is happening using formal estate plans is associated with designating future ownership. While many respondents use a tool that could be used to establish both future ownership and future use, it is unclear at this point to what extent this is being achieved by these tools. Desire for and plans to manage for future use is an important and complex issue to be explored with further research. The intent of this study was to fill a gap in the literature and establish a baseline level understanding of what FLOs have done in terms of estate planning; thereby paving the way for future research to dig deeper into the intent and goal for those estate plans.

What we can explore with the analytic model is what factors are associated with estate planning categories. The model results indicate that those FLOs who have taken the step to formalize plans for their land's future with tools that may be used to control future ownership and use (i.e., those with *Will + Other Tool(s)*) on average own more land, have more owners in the ownership, are older, and are more likely absentee owners than those who only have a will or have no formal estate plans. These landowners are more likely to have financial investment ownership objectives and less likely to indicate barriers to the planning process.

FLOs who have no formalized plans for their land on average own less land, have owned it fewer years, have fewer owners in the ownership, are younger, are more likely to not have a college degree, and are more likely male than those who have formalized plans for the future of their land. These FLOs are more likely to indicate barriers to the planning process, less likely to have intentions to pass the land to heirs, and less likely to have recreational objectives for owning their land than formal planners. The significant landowner and land associations are supported by the forestry and farming literature (Broderick et al., 1994; Lidestav, 2010; Lobley et al., 2010; Majumdar et al., 2009; Mishra and El-Osta, 2008), and the results related to barriers are similar to that discussed in Markowski-Lindsay et al. (2016).

Age emerges as a potentially interesting characteristic in the model. A graphical look at the marginal results associated with respondent age validate findings of the life-cycle model that uses retirement as a major decision point in time regarding assets (Modigliani, 1986; Modigliani and Brumberg, 1954, 1980). Fig. 3 shows an inflection area around the retirement years (55–65). Certainly, respondents are motivated by changes in income, life and health circumstances around this time. However, the results also validate the findings of the future land ownership and use decision framework (Markowski-Lindsay et al., 2016) that decisions regarding the land occur all along the life span, suggesting that issues other than the land may be influencing many of the decisions affecting their land. The decrease in the probability of having no estate plans occurs throughout the lifespan, as does the corresponding increase in using other tools along with a will.

The results of the model do not indicate any strong associations with the estate planning category that involves only have a will. While many people have a will, perhaps the associations were not statistically significant because of the ubiquitous nature of the tool. Relative to other estate planning tools, wills are easy to obtain – landowners may see a lawyer to draw up a will or they may freely download a form from the internet. While both situations qualify as holding a will, these two routes for establishing the will are very different. For example, the former is more costly, involves travel to and interaction with an attorney, and necessitates communicating ones wishes in a systematic way to an outside individual who then writes it up in a formalized document. The latter is potentially free and relies on one's own words to establish. There are likely other differences as well, such as content about future land disposition. It may be that the two routes are taken by two very different type of landowners, thus confounding the analysis of this estate planning category in the model.

The data in our analysis provide us the opportunity to understand

the *extent* to which FLOs use estate planning tools to plan the future of the land, they do not give us the ability to specifically say *if and how* they are being used to determine future ownership and use of the land. Understanding future land disposition would (and will) require a study with many more questions geared toward understanding FLO desires for their land, realistic intentions given their family/financial/life situation, and extent of actions taken to designate future ownership and use. A much more involved and costly approach would involve longitudinal work in which FLOs' actions are tracked throughout the ownership period.

Clearly, the differences in planning by landscape area and by land and landowner characteristics (Table 4) indicate that individual differences matter when considering who undertakes formal estate planning. The estate planning categories as presented are not meant to reflect a ladder to be climbed (e.g., first one should develop a will, then proceed to more forms of estate planning), but rather as tools meant to fit with owners' wishes. The FLO must match his or her financial and personal needs with the tools most appropriate to reach that goal. For example, should an FLO wish to control use, then a formalized planning tool other than a will must be used; should an FLO only wish to designate future ownership, then a will may be most appropriate. Extension efforts should not take a one-size-fits-all approach, and instead should be tailored to individual goals. Moreover, the differences in planning by barrier (Table 3, Table 4) suggest that materials directed at clarifying and/or reducing the costs of the planning process could provide a realistic view of the financial requirements for moving forward. For example, establishing policies through the Forest Stewardship Program or the Natural Resources Conservation Service to cost-share the expense of estate planning or to change the income tax structure to make estate planning expenses for land deductible, might yield more landowners acting in a formal way to designate the future of their land.

5. Conclusion

Forest stewardship must include the formal planning of the land's future to ensure that silvicultural strategies and other conservation practices implemented on the land are given the time to reach their desired goal. Whether and how landowners make decisions about the future of their forests affects the economic viability of those forests to provide societal, regional economic, and other non-market benefits. Conservation-based estate planning tools provide FLOs the ability to pass on land in a way that reduces conversion and parcelization.

The goals of our research were to establish a baseline understanding of the status of estate planning for forests under the threat of development and to identify factors associated with various types of planning that have occurred. These goals are necessary, initiating efforts to more broadly understand how estate planning tools are used for forest stewardship. Very few people have explored estate planning in this context.

Policy should encourage FLOs to think about the goals for the future of their land and move forward to establish estate plans that formalize their wishes. Clearly individuals have different goals for their land when it comes to ownership and use, and not all tools work for every goal. However, by formalizing plans, those individuals who have the desire to keep their land forested have a better chance of doing so. We therefore hypothesize that greater adoption of conservation-based estate planning tools will lead to reduced conversion and parcelization; however, this necessitates further study, and we challenge future research to explore the relationship between the rates of conservation-based estate planning and forest conversion and parcelization.

Though we have gained a better understanding of estate planning of FLOs in the northeastern U.S., the next step is to conduct additional research that teases out the use of tools with the goal of establishing future ownership or future use, or both. Focusing on these next steps would provide a better understanding of landowner preferences for

conservation-based estate planning tools. This additional research also would be critical to advancing programs and policy designed to encourage FLOs, resource managers and foresters to recognize how estate planning can be used as a land stewardship tool that, ultimately, will help maintain the benefits that forests supply.

Acknowledgements

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.forpol.2017.06.004.

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