A Comparative Analysis of Conservation Awareness among New York and Massachusetts Woodland Owners

Emma L. Schnur, Shorna B. Allred, and David B. Kittredge

ABSTRACT

The Conservation Awareness Index (CAI) is a survey instrument used to assess how prepared family forest landowners are to make informed decisions about their land. First developed in Massachusetts, we report results of its application in New York. Administered to 496 randomly selected New York family forest landowners and 158 benchmark landowners who had received conservation training, results confirmed instrument validity and exposed low levels of awareness about conservation options among forest landowners in the study, especially concerning New York's current-use tax program and conservation easements. Education level, ownership acreage, and location were associated with higher levels of conservation awareness. A comparative analysis between New York and Massachusetts forest landowners revealed significantly higher levels of conservation awareness for the New England state's landowners. The CAI can be used to improve outreach efforts by targeting education toward the conservation options for which landowners have low levels of awareness. A high level of conservation awareness is the foundation for informed forest stewardship decisions.

Keywords: woodland owners, awareness, forest management, nonindustrial private forest owners, index

Compared to the rest of the nation, the percentage of forestland controlled by family forest owners is considerably greater in the northeastern United States where, for example, family forest owners control 76% of forestland in Massachusetts and 72% of forestland in New York (Smith et al. 2004). Family forest owner land-use decisions affect the landscape in significant ways, both positively through sustainable land management practices and negatively through practices that may convert, fragment, or degrade forestland.

In New York, there are approximately 614,000 family-owned forests and 89% of family forest landowners hold less than 50 acres (Widmann et al. 2007). The average acreage of land owned by family forest owners usually decreases as land changes hands, being divided into smaller parcels (Kittredge et al. 2008). Another threat to intact forestland in the region is development pressure from increasing land values (Van Fleet et al. 2012). Not only do fragmentation and development change the way humans use natural habitats, but they can also lead to a myriad of environmental issues such as habitat destruction, the overexploitation of species, changes in hydrology, and the introduction of invasive species (Widmann et al. 2007).

Birch and Butler (2001) found that owners of small land parcels are less likely to manage their forests than are owners of larger parcels in New York State. This is exemplified by the fact that only 9% of family-owned forestland in New York has a management plan, and only 12% of owners have sought management advice (Widmann et al. 2007). Opportunities to interact with professionals or peers and validate owners' existing knowledge can create well-informed woodland owners (Connelly et al. 2007, Allred et al. 2001, Broussard Allred and Sagor 2011). These opportunities can come from direct contact with a professional such as a New York State Department of Conservation forester or from outreach activities such as workshops, field days, and seminars run by Cornell Cooperative Extension educators or nongovernmental organizations such as the New York Forest Owners Association (Connelly et al. 2007, Connelly and Smallidge 2003). Opportunities can also be found through formal and informal peer interactions with other forest landowners (Allred et al. 2011, Broussard Allred and Goff 2009, Broussard Allred and Sagor 2010). However, only 1% of family forest owners deliberately seek such educational assistance, which creates the potential for misinformed management activities (Connelly et al. 2007). It is important to understand landowner awareness regarding conservation as it can influence their decisions and behavior.

Forest Landowner Conservation Awareness

Conservation awareness encompasses landowner knowledge of, familiarity with, and experience with forest conservation options and sources of information that support informed forest management decisions (Van Fleet et al. 2012). Decisions that owners commonly face involve the sale of timber, current-use property tax programs (CUTPs), conservation easements (CEs), and estate planning (EP) for the future of their land (Van Fleet et al. 2012). While threats from development, parcelization, and fragmentation exist, the aforementioned conservation options can provide an alternative

Manuscript received July 13, 2013; accepted October 1, 2013. http://dx.doi.org/10.5849/njaf.13-026.

Emma L. Schnur (els238@cornell.edu), Cornell University, Ithaca, NY. Shorna B. Allred (srb237@cornell.edu), Cornell University. David B. Kittredge (dbk@eco.umass.edu), University of Massachusetts Amherst. *This research was made possible through the Frederic N. Gabler '93 Memorial Research Grant through Cornell University. The research was also supported in part by the Cornell University Agricultural Experiment Station federal formula funds received from the National Institute of Food and Agriculture (NIFA), US Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the National Institute of Food and Agriculture (NIFA) or the United States Department of Agriculture (USDA). We would like to thank the Harvard Forest Research Experience for Undergraduates (REU) Program as this is where the project was first born.*

means of generating economic returns from sound forest management decisions. To help keep forests as forests, for example, enrollment in a current-use property tax can reduce the property tax burden for landowners. Another method for protecting land from development is a conservation easement, which provides a financial incentive for conservation. Not only do easements permanently restrict development, they also allow the owner to retain fee ownership and many of the rights over the land while reducing estate tax obligations and the annual real estate tax burden (D'Amato et al. 2009).

Thus far, the only formalized methodology for studying conservation awareness has taken place in Massachusetts (Van Fleet et al. 2012) where, like New York, the vast majority of forestland is privately owned. The Massachusetts study quantified landowner awareness of conservation options as a behavioral precursor (Van Fleet et al. 2012). Previous studies have focused on landowner attitudes toward specific conservation programs like selling carbon credits and forest certification (e.g., Fletcher et al. 2009, Mercker and Hodges 2007). Moreover, it has been assumed that private forest conservation progress could be projected on the basis of the number of people who had forest management plans (USDA 2009, Van Fleet et al. 2012). However, since the majority of landowners nationwide and in New York do not have these plans, there is clearly a disconnect between landowner interests and their participation in formal management planning (Van Fleet et al. 2012). As such, doubts have grown about the effectiveness of management plans in informing landowner decisionmaking (Van Fleet et al. 2012). Conservation awareness examines a broader set of options that support decisionmaking beyond simply having a management plan.

The CAI is based on research demonstrating that different forms of environmental knowledge can influence conservation behavior (Frick et al. 2004, Kaiser and Fuhrer 2003). Knowledge can have significant effects on behavior if the ecological behavior measure is sensitive to a person's particular life circumstances. For example, Frick et al. (2004) found that system knowledge, or the basic knowledge of ecosystems and environmental problems, strongly influences both action-related knowledge (knowledge of possible courses of action) and effectiveness knowledge (knowledge of relative benefits associated with a particular behavior). These researchers found that action-related knowledge not only predicted effectiveness knowledge but also determined behavior. Since the majority of forested land in New York State is owned by family forest owners with varying levels of knowledge affecting their conservation behavior, it is necessary to assess the various dimensions of their conservation awareness as their "collective, uncoordinated decisions will determine the future condition and persistence of this land" (Van Fleet et al. 2012, p. 207).

Research Questions

This study seeks to answer three research questions: (1) What is the conservation awareness of randomly sampled landowners from New York State and how does it differ from that of family forest owners with specialized training in forest stewardship? (2) What is the relationship between conservation awareness and demographic and landownership characteristics? (3) How does the conservation awareness of New York landowners compare to that of Massachusetts landowners?

Answers to these questions can be used to better inform conservation outreach by foresters, state extension agencies, and conservation organizations. Educational efforts can be targeted toward the conservation options for which landowners have low levels of awareness or toward groups with limited conservation awareness.

Methods

Study Area

This research used a comparative approach to study the conservation awareness of private landowners in New York and Massachusetts. In New York, the study focused on six contiguous towns in Schuyler and Chemung counties in the southcentral Highlands region (Figure 1). The towns in New York were selected on the basis of similarity to those in western Massachusetts in terms of town contiguity, size, and population (Van Fleet et al. 2012; Table 1).

Study Measure: The Conservation Awareness Index

We employed the Conservation Awareness Index (CAI) developed by Van Fleet et al. (2012) for Massachusetts to assess conservation awareness of New York private forest owners in the study area. This required slight modifications to the question wording to fit policies and programs in New York. The CAI is computed by scoring responses to four sets of questions with relevancy to forest conservation: (1) current use property tax programs (CUTPs), (2) conservation easements (CEs), (3) timber harvesting (TH), and (4) estate planning (EP). Each section included a parallel set of questions to assess the four different components of awareness, including *familiarity* (how much would you say you know about…), *knowledge* (please indicate whether the following statements are true or false…), first- and secondhand *experience* (have you or someone you know had experience with…), and *acquaintance* with important sources of information (do you know a… if yes, specify their name, if no, how would you find out about one). There are four questions in each of the four graded sections about components of awareness, resulting in 16 graded questions. An excerpt from the CAI questionnaire is provided in Figure 2 (Section 2, Conservation Easements) and shows how the survey instrument's questions were structured in each section.

Survey Implementation

Between January and March of 2013, the CAI questionnaire was mailed to 496 forest owners with land in the towns of Baldwin, Catherine, Cayuta, Chemung, Erin, and Van Etten. Landowner names and addresses were obtained from New York State Office of Real Property GIS Parcel Database and were randomly drawn from the population of forest landowners in the study area owning 10 or more acres, consistent with the Massachusetts study (Van Fleet et al. 2012). Ten acres was chosen as a baseline in Van Fleet et al.'s (2012) study since that is the acreage minimum to enroll in the state's CUTP. The number of landowners sampled from each town was proportionate to the total number of landowners in the town owning 10 or more acres. A four-wave Dillman (2000) method for surveying respondents was employed (survey and cover letter, reminder postcard, and up to two replacement surveys and cover letters). There were 271 surveys completed and returned, 43 undeliverable surveys, and 22 refusals, resulting in a response rate of 60%. The landowners who completed the questionnaire are referred to as random respondents.

Validating the Conservation Awareness Index in New York

In addition to surveying a random sample of forest landowners in the study area, we also conducted a CAI Web survey of a benchmark

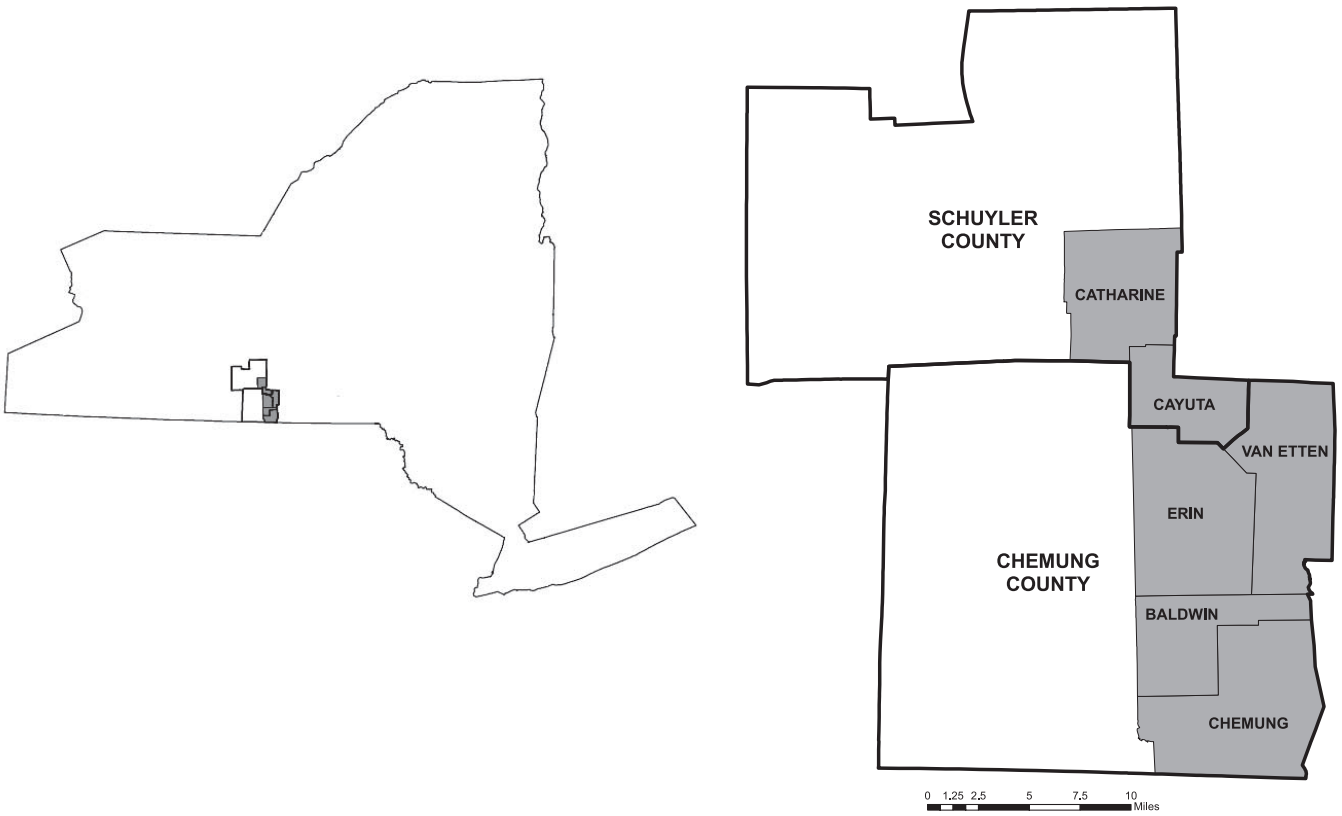


Figure 1. CAI New York study area, showing New York State and the six municipalities in Schuyler and Chemung counties.

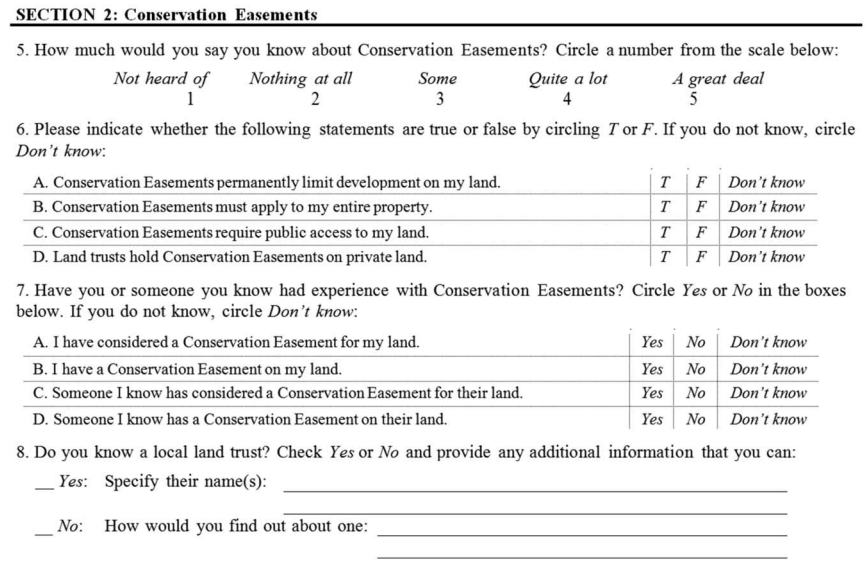
Table 1. Comparison of population sizes and total square miles for towns used in the Massachusetts and New York studies.

	2010 Census population	Total square miles	Population density (people/square mile)
Massachusetts towns	6,287	206	30.5
Becket	1,779	48	37.1
Chester	1,337	37	36.1
Middlefield	542	24	22.6
Peru	821	26	31.6
Washington	538	39	13.8
Worthington	1,270	32	39.7
New York towns	9,389	216	43.5
Baldwin	832	26	32.0
Catharine	1,930	33	58.5
Cayuta	545	20	27.3
Chemung	2,563	50	51.3
Erin	1,962	45	43.6
Van Etten	1,557	42	37.1

sample of forest landowners in the state. The benchmark landowners were New York's Master Forest Owner (MFO) volunteers—landowners that were predicted to have higher than average awareness due to the in-depth training and continuing education that they receive through the program. The MFO program, instituted in 1991 by Cornell Cooperative Extension, trains woodland owners in the principles of forest stewardship and management. During the four-day, 40-hour training session, attendees learn about forest economics, wildlife management, ecology, and other similar programs and organizations. The goal of the program is for trainees to not only manage their woodlands more effectively but also to motivate other owners to become actively involved in their forestland and promote conservation (Allred et al. 2011). A link to the CAI Web survey was emailed to the population of 158 active MFOs statewide and had a response rate of 50% ($n = 79$). In the study by Van Fleet et al. (2012), a benchmark group of landowners in Massachusetts was also sampled. These landowners were graduates of the Keystone Program, a University of Massachusetts Extension initiative with similar goals to the MFO Program.

Scoring the Conservation Awareness Index

For each of the four sections, a respondent could earn a maximum of 16 points. For familiarity questions, responses were scored from zero (for "not heard of") to four (for "a great deal") points. Knowledge responses were given one point for every correct true/false answer, −1 point for every incorrect answer, and zero points for a "don't know" answer. For experience questions, respondents received two points for having completed a conservation activity (e.g., timber harvesting [TH] on their land) and two points for secondhand experience (e.g., they know someone who has had TH on their land). They received one point if they considered the option, one point if someone they knew considered the option, and zero points if they chose "don't know." For the question related to important sources of information, respondents received four points for indicating "yes" and giving a correct name, three points for indicating "yes" and giving an approximate name, two points for indicating "yes" and not giving a name, one point for indicating "no" but providing a lead, zero points for indicating "no" and providing no lead, and −1 point for indicating "yes" and providing an inaccurate name (e.g., naming a logger instead of a private consulting forester). Based on the scoring algorithm, a respondent could receive a maximum CAI total score of 64 points and a minimum score of −20 points. Each respondent received an overall CAI score along with four subject category subscores.



SECTION 2: Conservation Easements

5. How much would you say you know about Conservation Easements? Circle a number from the scale below:

Not heard of	*Nothing at all*	*Some*	*Quite a lot*	*A great deal*
1	2	3	4	5

6. Please indicate whether the following statements are true or false by circling *T* or *F*. If you do not know, circle *Don't know*:

A. Conservation Easements permanently limit development on my land.	*T*	*F*	*Don't know*
B. Conservation Easements must apply to my entire property.	*T*	*F*	*Don't know*
C. Conservation Easements require public access to my land.	*T*	*F*	*Don't know*
D. Land trusts hold Conservation Easements on private land.	*T*	*F*	*Don't know*

7. Have you or someone you know had experience with Conservation Easements? Circle *Yes* or *No* in the boxes below. If you do not know, circle *Don't know*:

A. I have considered a Conservation Easement for my land.	*Yes*	*No*	*Don't know*
B. I have a Conservation Easement on my land.	*Yes*	*No*	*Don't know*
C. Someone I know has considered a Conservation Easement for their land.	*Yes*	*No*	*Don't know*
D. Someone I know has a Conservation Easement on their land.	*Yes*	*No*	*Don't know*

8. Do you know a local land trust? Check *Yes* or *No* and provide any additional information that you can:

__ *Yes*: Specify their name(s): _____

_____

__ *No*: How would you find out about one: _____

_____

Figure 2. Example section of the CAI questionnaire. The conservation easements section of the CAI depicts the four question types asked for each section: familiarity (question 5), knowledge (question 6), experience (question 7), and acquaintance with sources of information (question 8).

Survey recipients also were asked background questions about woodland ownership acreage and tenure, proximity of residence to woodland ownership, age, education level, and gender. An additional open-ended question asked respondents what their primary reason was for owning their woodland. These responses were then coded into six landowner objective categories: family, home, environment, noninstrumental (e.g., enjoyment and esthetics), recreation, and investment/income.

Conservation Awareness Response Analysis

The Shapiro–Wilk test was used to test for normality in CAI score from New York random respondents. Since CAI score data did not come from a normal distribution, correlations between CAI score and tenure and acreage were analyzed using Spearman's rho-statistic, a nonparametric and rank-based test (Corder and Foreman 2009). The Wilcoxon rank-sum (WRS) test, a nonparametric test for two independent samples (Corder and Foreman 2009), was used to explore differences in mean CAI scores between random and benchmark respondents. Friedman's two-way analysis of variance (ANOVA) by ranks was used to explore statistically significant differences between the random respondents' four subscores. The Kolmogorov–Smirnov (KS) and the Kruskal–Wallis (KW) tests, two nonparametric tests for independent samples (Corder and Foreman 2009), were used to compare score distributions among respondent samples, demographic classes, and towns. For the analysis between New York and Massachusetts random respondents, the Wilcoxon rank-sum test was first used to see if there was a significant difference between the CUTP scores for New York landowners owning above and below 50 acres, the minimum acreage needed to enroll in New York's CUTP, the Forest Tax Law (480-a) Program. This was done to provide a comparison with Massachusetts since all the landowners who received the questionnaire in that state had the minimum acreage to enroll in the state's CUTP (10 acres). The Wilcoxon rank-sum test was then used to examine differences in mean CAI scores and subscores between the states. The Kolmogorov–Smirnov test was used to analyze differences in score distributions between the states.

Nonresponse Bias Analysis

To test for nonresponse bias, 10% of nonrespondents ($n = 16$) were randomly selected and contacted by telephone and asked three questions from the CAI questionnaire for comparison with respondents. These questions asked about the respondent's ownership acreage, experience with timber harvesting, and acquaintance with a local land trust. Wilcoxon's rank-sum test was used to compare differences in acreages of random respondents and nonrespondents. Experience with timber harvesting and acquaintance with a local land trust were compared by the binomial proportions test (Van Fleet et al. 2012).

Results

Random and Benchmark Respondent Comparison

There were both similarities and differences between New York's random and benchmark respondents (Table 2). The average randomly sampled respondent was a male who owned 59 acres of land for 25 years, lived on his land, was 51–65 years old, and was a high school graduate. The average benchmark respondent, by comparison, was a male who owned an average of 247 acres of land for 26 years, lived on his land, was 66–80 years old, and had obtained a graduate or professional degree.

The CAI captured considerable differences in conservation awareness between random and benchmark respondents (Figure 3). Random respondents earned a mean CAI total score of 14.5 ± 8.7 while benchmark respondents were significantly different with a mean score of 37.75 ± 10.8 (WRS, $W = 22{,}692$, $P < 0.001$) (Figure 3). In addition, the subscore means and distributions on all four sections (CUTPs, CEs, TH, and EP) of the survey (familiarity, knowledge, experience, acquaintance) all differed significantly between random respondents and benchmark respondents (WRS, $P < 0.001$; KS, $P < 0.001$). For the random respondent sample, almost all subscore distributions were significantly different from one another (Friedman's test statistic $= 455.024$, $P < 0.001$), though the CUTP and CE subscores were not significantly different (Friedman's test statistic $= -0.200$, $P = 0.76$).

Table 2. Ownership and demographic characteristics for NY random respondents, NY benchmark respondents, and MA random respondents.

	NY random respondents (n = 271)	NY benchmark respondents (n = 79)	MA random respondents (n = 267)
Size (ac)			
Minimum	0	0	0
Maximum	400	1,600	530
Median	42	92	26
Mean	60	172.7	51.8
SD	61.1	246.8	72.3
Tenure (yr)			
Minimum	1	4	0
Maximum	63	52	63
Median	25	26	17
Mean	25.1	25.8	19.4
SD	13.7	12.4	12.7
	NY random respondents (%)	NY benchmark respondents (%)	MA random respondents (%)
Proximity (mi)			
Resident	69	60.5	53.9
< 10	10.3	15.8	5
10–100	12.7	14.5	24
> 100	7.9	9.2	17.1
Age (yr)			
< 30	0	0	<1
30–50	19.5	7.8	20.8
51–65	40.9	44.2	50.8
66–80	33.1	45.5	24.6
> 80	6.6	2.6	3.5
Education (highest level achieved)			
Some high school	2.4	0	1.6
High school graduate	32.1	9.2	16.3
Some college	21.8	7.9	15.2
College graduate	27.8	31.6	27.2
Graduate or professional degree	15.9	51.3	39.7
Gender			
Female	20.9	14.3	37
Male	79.1	85.7	63

Random Respondent Demographics and Ownership Characteristics

Overall, random respondents expressed low levels of familiarity with conservation options (Figure 4). Almost one-half of all random respondents reported that they had "not heard of" or knew "nothing at all" about CUTPs (47%) and CEs (45%). Slightly fewer random respondents had "not heard of" or knew "nothing at all" about EP (39%) with almost 20% knowing "some." Random respondents had the greatest familiarity with TH as 44% indicated they knew "some" and almost 10% knew "quite a lot" or a "great deal."

There were few incorrect answers to the knowledge questions on the questionnaire (Figure 5). The exception to this was the overwhelming majority of random respondents that answered "don't know" to true/false questions about CUTPs (88%) and CEs (85%). In contrast, there were far fewer "don't know" responses to TH (39%) and EP (49%). Roughly one-half of random respondents answered the TH (53%) and EP (49%) questions correctly.

First- and secondhand experiences varied among categories (Figure 6). Most random respondents indicated no personal experience considering or completing CUTPs (96%), CEs (96%), or estate plans (68%). Only 40% of random respondents had not considered or completed TH. For all the categories except EP, random respondents frequently reported that they knew somebody who had considered or completed these conservation options.

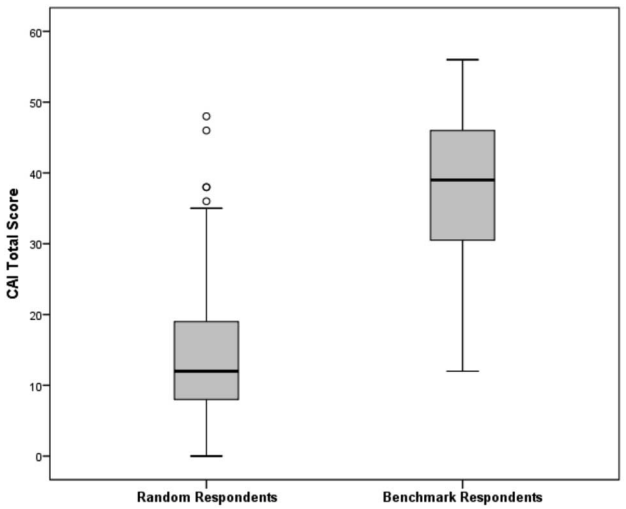


Figure 3. NY random and benchmark respondent CAI total scores. The CAI captured significantly different distributions of scores between the two samples (KS test, $D = 0.750$, $P < 0.001$).

While most random respondents had no secondhand experience with CUTPs (94%), CEs (82%), and EP (69%), only 15% of random respondents did not know somebody who had considered or completed TH.

Most random respondents were not acquainted with a professional source of conservation information (Figure 7). Few random respondents could name an estate planner familiar with land conservation (2%), a local Department of Environmental Conservation (DEC) forester (3%), a local land trust (8%), or a private consulting forester (13%). Most random respondents did not know a source of information or how to find one. Of the random respondents who did provide a lead, most said they would use the Internet or contact local/state governments to find professional sources of information.

CAI scores increased with education, acreage, and location. Random respondents who were college graduates or had obtained a graduate or professional degree exhibited higher CAI total scores than those who had completed some college or less (KW, test statistic = 22.645, $P < 0.001$). This was primarily due to their greater awareness of estate planning (KW, test statistic = 30.636, $P < 0.001$) and partially due to their awareness of CEs and TH (KW, test statistic = 11.991, $P = 0.017$ and test statistic = 9.592, $P = 0.48$, respectively). There was a low but significantly positive correlation between CAI total score and acreage (Spearman's rho = 0.271, $P < 0.001$), likely driven by the high correlations between TH and EP subscores and ownership acreage (Spearman's rho = 0.290, $P < 0.001$ and Spearman's rho=0.200, $P < 0.001$, respectively). While CAI total scores did not differ significantly between towns (KW, test statistic = 8.520, $P = 0.130$), random respondents with land in Catherine had higher CE subscores than those in other towns (KW, test statistic = 22.856, $P < 0.001$).

New York and Massachusetts Comparison

Since there was no significant difference between CUTP subscores for New York respondents owning over and under 50 acres (WRS, $W = 17{,}192$, $P = 0.551$), all New York random respondents were used in the comparison with Massachusetts respondents. Random respondents in New York and Massachusetts shared similar ownership and demographic characteristics (Table 2). The most

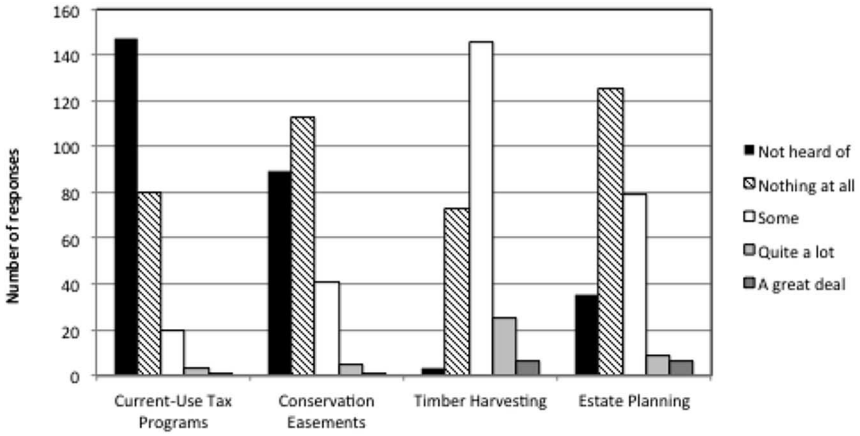


Figure 4. Random respondent familiarity with conservation options.

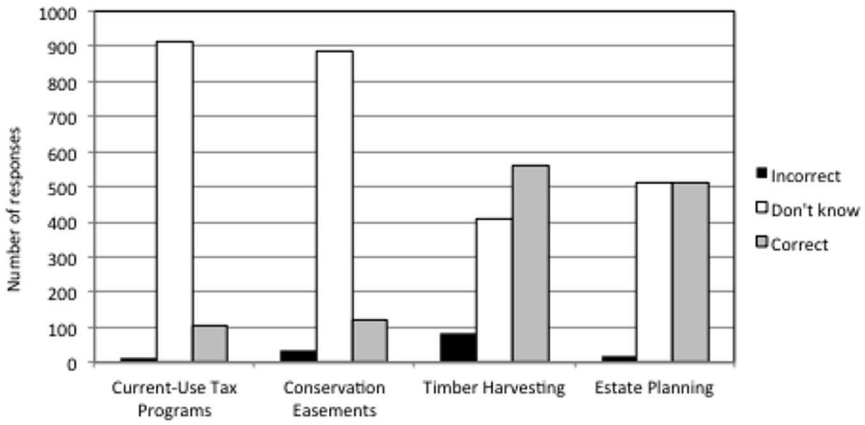


Figure 5. Random respondent knowledge of conservation options.

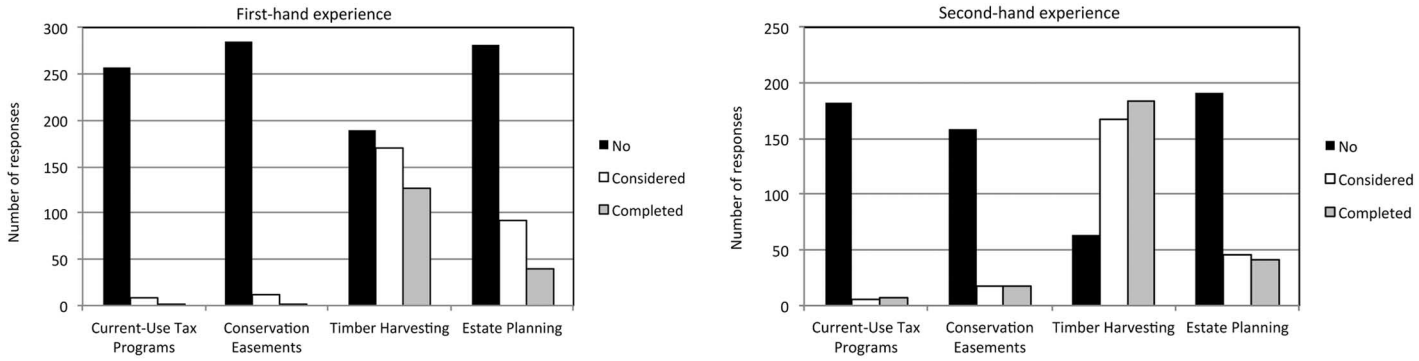


Figure 6. Random respondent experience with conservation options.

notable difference was in education level, which was higher in Massachusetts. New York random respondents owned larger acreages and had longer land tenures than did Massachusetts landowners. The average Massachusetts random respondent owned 52 acres for 19 years, lived on their land, was between 51 and 65 years old, had obtained a graduate or professional degree, and was a male. The average New York random respondent was also a male between 51 and 65 years old but, by comparison, owned 59 acres for 25 years and was a high school graduate.

The mostly commonly reported ownership objective for both states was related to owning woodland as a part of the owner's home site, though this percentage was quite a bit higher for Massachusetts (43%) than for New York (28%). These random respondents stated they owned forestland because it is a part of their home, farm, vacation home, or because it provides privacy. The second most common (25%) ownership objective for New York respondents was recreation. Reasons such as enjoyment, natural setting characteristics, and affection encompassed the second most common (19%) ownership objective for random respondents from Massachusetts.

A comparative analysis of CAI scores between New York and Massachusetts landowners depicts significant differences between

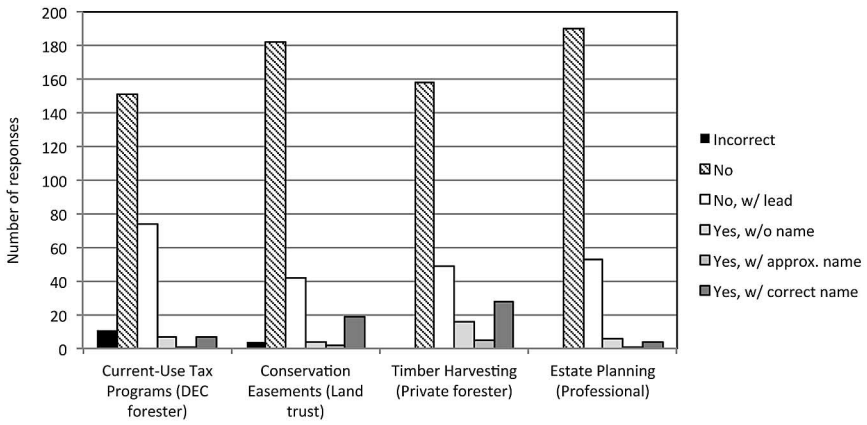


Figure 7. Random respondent acquaintance with sources of conservation information.

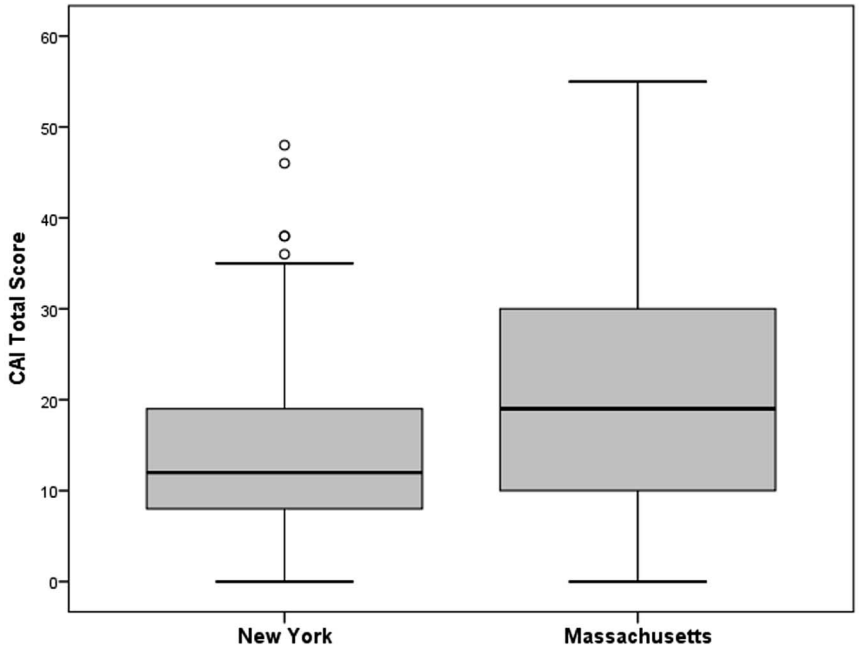


Figure 8. NY and MA random respondent CAI total scores. The CAI captured significantly different CAI total score means and distributions between NY and MA random respondents (WRS test, $P < 0.001$; KS test, $P < 0.001$).

the two states. New York random respondents earned a slightly lower mean CAI total score of 14.5 ± 8.7 compared to Massachusetts random respondents, who earned a mean total score of 20.3 ± 12.5 (WRS, $W = 80{,}073$, $P < 0.001$). Score distributions also differed significantly between respondents in the two states (KS, $D = 0.246$, $P < 0.001$) (Figure 8). Scores for the CUTP and CEs sections were significantly higher for Massachusetts (WRS, $W = 89{,}623$, $P < 0.001$ and $W = 87{,}412$, $P < 0.001$, respectively) (Figure 9).

Nonresponse Bias Results

We did not find a response bias, as answers to three questions from the CAI questionnaire were not significantly different between random respondent and nonrespondent samples (Table 3). The number of acres owned by random respondents and nonrespondents did not differ significantly (WRS, $W = 2{,}366.5$, $P = 0.475$), and both samples had similar responses to questions regarding firsthand experience with TH and knowledge of a local land trust.

Discussion

Instrument Validation

Variation in conservation awareness between New York landowners and benchmark respondents validates the assumption that benchmark respondents would score significantly higher on the CAI, though no one received the maximum score. This indicates the CAI's reliability, validity, and appropriate scaling. All questions in the instrument were found valid due to the variability detected with every question. While most respondents had relatively low CAI scores, their total scores and subscores varied widely, indicating a range of topical knowledge. These instrument validation findings are consistent with Van Fleet et al. (2012), who found that benchmark landowners had significantly higher levels of conservation awareness than did randomly surveyed forest landowners.

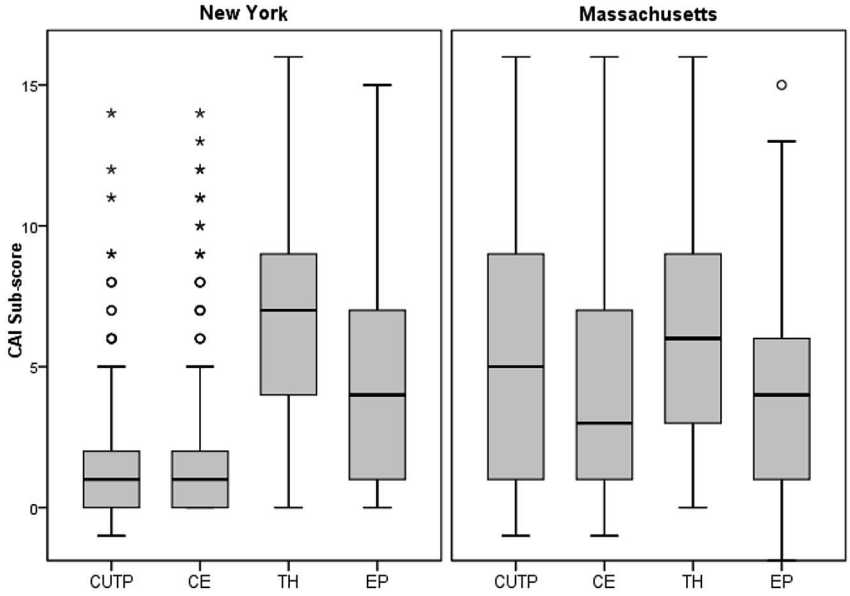


Figure 9. CUTP, CE, TH, and EP subscores for NY and MA random respondents. MA random respondents had significantly higher CUTP and CE subscores than NY respondents (WRS test, $P < 0.001$).

Table 3. New York random respondent and nonrespondent responses to three CAI questions.

	Question 1: How many acres of woodland do you own in New York?		Question 2: Have you harvested timber from your woodland or considered doing so?		Question 3: Do you know a local land trust?	
	Mean ± SD (ac)	Median (ac)	Yes (%)	No/don't know (%)	Yes (%)	No (%)
Respondents	59.2 ± 60.8	40	71.5	28.5	11.4	88.6
Nonrespondents	69.2 ± 67.5	50	62.5	37.5	18.8	81.3

Exploring Conservation Awareness in New York

Awareness of conservation options and sources of information is low for family forest owners in New York as estimated by the CAI in the sample area. Random respondents had the lowest levels of awareness for CUTPs and CEs, exemplified by the overwhelming majority of "don't know" responses to the knowledge questions and the degree to which respondents had little awareness of the options. Easements and tax programs provide options to protect forestland from development. Since random respondents had low levels of familiarity with and knowledge of these options, it is possible that they are not widely marketed by the state or land conservation organizations. It is also possible that random respondents in this area of New York have little desire or need to intentionally reduce their tax burden by maintaining the property in a forested condition so they have not sought out these available programs.

Characteristics of TH and EP may explain why random respondents were more knowledgeable of and had more experience with those conservation options. TH consists of a decision that can provide immediate profit for a forest owner. It is also a visible decision because timber harvests are posted and often advertised before a sale. While 40% of random respondents had harvested timber from their land, only 3% could name a local DEC forester and 13% could name a private consulting forester. This discrepancy suggests that timber harvests may not be following sound, silvicultural methods advised by professional foresters.

EP represents a necessary decision to ensure that a landowner's family and financial goals are met after their death. Due to the wide scope of EP and its importance for future generations, it is likely that multiple professionals, both inside and outside of the forestry sector, encourage it. It is possible that EP was the only section in which secondhand experience was lower than firsthand experience because it is a particularly personal matter involving finances and family matters that landowners may not be comfortable sharing with others.

There were very low levels of acquaintance with sources of conservation information among random respondents for all categories. This suggests that landowners may not know where to turn for accurate information when an important decision needs to be made about their land. Since land decisions are often infrequent, complex, and lengthy, landowners may not know detailed facts or have had any direct experience with making these decisions (Van Fleet et al. 2012).

The education level of random respondents in New York was the only demographic characteristic associated with CAI total score, mostly due to higher EP scores of those who were college graduates or had obtained a graduate or professional degree. Those with more formal education may have greater comfort working with legal professionals who produce estate plans. Further, higher socioeconomic status may necessitate the need for formal planning of how assets will be distributed after one's death. In Massachusetts, education was also related to CAI total score along with respondent's distance from land (Van Fleet et al. 2012).

Ownership acreage was the only land characteristic moderately associated with CAI total score in New York. This was due to correlations between acreage and TH and EP subscores. Larger acreages can yield higher TH profits and are also a substantial family asset, motivating landowners to seek formal advice about how their land should be divided after their death. A moderate positive correlation was also found between ownership acreage and CAI total score in Massachusetts (Van Fleet et al. 2012).

Comparing Awareness Between New York and Massachusetts

Random respondents from Massachusetts exhibited higher levels of awareness than those from New York, mostly due to higher CUTP and CEs scores. This may be a result of better marketing and encouragement of these programs to landowners by the Massachusetts state government, local land trusts, or outreach programs like Massachusetts' Keystone volunteers. A higher quantity of land trusts in Massachusetts may also attribute to higher knowledge levels of CEs. Since education level was positively associated with CAI score in both New York and Massachusetts, it is worth noting the overall higher average education level of respondents from Massachusetts. The average Massachusetts random respondent obtained a graduate or professional degree, which likely contributed to higher mean scores for all subcategories.

Conclusion

The deployment of the CAI in New York has revealed the low levels of awareness of landowners in the sample about conservation options and sources of information. Landowners are specifically lacking familiarity with, knowledge of, and experience with CUTPs and CEs. Acquaintance with sources of information is poor across all categories. A comparison with results from a similar study in Massachusetts reveals higher levels of awareness for landowners in sample towns in the New England state, specifically with regards to CUTPs and CEs.

While this study estimated the conservation awareness of landowners in six towns in central New York State, a future study could investigate awareness in other parts of New York. Are landowners who live in areas more prone to development more aware of their conservation alternatives? Alternatively, how does conservation awareness vary between areas of high historical conservation emphasis (e.g., the Catskill region that supplies water to New York City; the Adirondack region heavily dominated by state forestland)? A state as large and diverse as New York (socially, economically, ecologically, and demographically) may likely show considerable variation in landowner conservation awareness.

Furthermore, exploratory qualitative research through structured interviews or focus groups with landowners of low conservation awareness would shed important light on reasons for this. What information needs, pathways, or programs would help overcome low conservation awareness? Since they represent the overwhelming majority of landowners, determining underlying causes of low awareness will be crucial to improving outreach work.

For practicing foresters, the good news is that there were not a lot of incorrect answers in terms of knowledge about forestry (Figure 5) and secondhand knowledge of someone who had harvested was relatively high (Figure 6). Also, while not many respondents could correctly identify a forester, public or private, few if any respondents misidentified a logger as a forester (Figure 7). Since respondents seem to have relatively high secondhand knowledge of harvesting, foresters could consider building on this phenomenon. Obviously landowners are talking to one another if they are aware of others who have harvested. Practicing foresters, public and private, could consider enlisting the help of satisfied "customers" or landowners in spreading the word about their actions and results. Are there venues or opportunities where landowners might meet and exchange information, such as meetings of the NY Forest Owners Association (NYFOA)?

This study confirms the findings by Van Fleet et al. (2012) that private forest landowners are largely uninformed of the conservation options available to them. Importantly, the results of this study show the utility and relevance of CAI in New York and possibly other states and landscapes dominated by private ownership. Not only do few family forest owners have a management plan or intentionally seek educational assistance, but they also are unaware of where to turn for advice about decisions related to the future of their forestland. The CAI provides an opportunity to identify conservation options with which landowners have low levels of awareness so outreach efforts can be best targeted to forest landowners. Since the future of forestland in the United States will inevitably depend on those who own and manage it, understanding the conservation awareness of private forest landowners is necessary for encouraging sustainable land management decisions.

Literature Cited

ALLRED, S.B., G.R. GOFF, L.P. WETZEL, AND M.K. LUO. 2011. Evaluating peer impacts of a master forest owner volunteer program. *J. Ext.* 49(5).

BIRCH, B., AND B.J. BUTLER. 2001. Private forest-land owners of New York: 1980 and 1994. USDA For. Serv., Res. Bull. NE-153, North. Res. Stn., Newtown Square, PA. 64 p.

BROUSSARD ALLRED, S., AND G. GOFF. 2009. The power of peer learning programs in natural resources. Cornell University, Community and Rural Development Institute (CARDI) and Human Dimensions Research Unit (HDRU), Rural New York Minute, 32(August).

BROUSSARD ALLRED, S., AND E. SAGOR. 2011. Empowering woodland owners through peer learning. *J. For.* 109(5):303–304.

CONNELLY, N.A., AND P.J. SMALLIDGE. 2003. Using a natural disaster to understand the educational and technical assistance needs of small-scale forest landowners. *Sm. Sca. For.* 2(3):397–407.

CONNELLY, N.A., T.L. BROWN, AND P.J. SMALLIDGE. 2007. An assessment of family forest owners in New York State, 2007. Cornell University, Dept. Nat. Res. HDRU 07–6, Ithaca, NY. 44 p.

CORDER, G.W., AND D.I. FOREMAN. 2009. Nonparametric statistics for non-statisticians: A step-by-step approach. John Wiley & Sons, Hoboken, NJ. 264 p.

D'AMATO, A.W., P.F. CATANZARO, D.T. DAMERY, D.B. KITTREDGE, AND K.A. FERRARE. 2010. Are family forest owners facing a future in which forest management is not enough? *J. For.* 108(1):32–38.

DILLMAN, D.A. 2000. Mail and internet surveys: The tailored design method, 2nd ed. John Wiley & Sons, New York.

FLETCHER, L.S., D. KITTREDGE, AND T. STEVENS. 2009. Forest landowners' willingness to sell carbon credits: A pilot study. *North. J. Appl. For.* 26(1):35–37.

FRICK, J., F.G. KAISER, AND M. WILSON. 2004. Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Person. Ind. Diff.* 37:1597–1613.

KAISER, F.G., AND U. FUHRER. 2003. Ecological behavior's dependency on different forms of knowledge. *App. Psych. Int. Rev.* 52(4):598–613.

KITTREDGE, D.B., A. D'AMATO, P. CATANZARO, J. FISH, AND B. BUTLER. 2008. Estimating ownerships and parcels of non-industrial private forest in Massachusetts. *North. J. Appl. For.* 25(2):93–98.

MERCKER, D.C., AND D.G. HODGES. 2007. Forest certification and nonindustrial private forest landowners: Who will consider certifying and why? *J. Ext.* 45(4).

SMITH, W.B., P.D. MILES, J.S. VISSAGE, AND S.A. PUGH. 2004. Forest resources of the United States, 2002. USDA For. Serv., Gen. Tech. Rep. NC-241, North Cen. Res. Stn., St. Paul, MN. 137 p.

USDA FOREST SERVICE. 2009. The year in forestry: State and private forestry in the Northeast, and Midwest, fiscal year 2008. USDA For. Serv., North. Area State and Private For. NA-IN-05–09, Newtown Square, PA. 18 p.

VAN FLEET, T.E., D.B. KITTREDGE, B.J. BUTLER, AND P.F. CATANZARO. 2012. Reimagining family forest conservation: Estimating forest landowner awareness and their preparedness to act with the Conservation Awareness Index. *J. For.* 110(4):207–215.

WIDMANN, R.H., S. CRAWFORD, C. BARNETT, B.J. BUTLER, G.M. DOMKE, D.M. GRIFFITH, M.A. HATFIELD, ET AL. 2012. New York's Forests 2007. USDA For. Serv., Res. Bull. NRS-65, North. Res. Stn., Newtown Square, PA. 64 p.