

Conservation Awareness Index: A Peer-Reviewed Method for Evaluating Forest Landowner Education

WATERSHED AGRICULTURAL COUNCIL (WAC) 2017 FILTRATION AVOIDANCE DETERMINATION (FAD) RECOMMENDATIONS



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Forestry Program
nycwatershed.org





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Conservation Awareness Index: A New Cornerstone for Evaluating Forest Landowner Education

Executive Summary

Private woodland owners own more than two-thirds of the forests in the New York City Watershed. The decisions these 30,000 owners make influence the economic and environmental values their lands provide to more than 9 million New Yorkers.

The Watershed Agricultural Council's Forestry Program uses a variety of methods to help Watershed landowners make decisions that will benefit the region's forests and water. But how effective are these methods? Are Watershed landowners prepared to make informed decisions about their land that take its conservation value into account?

We used a peer-reviewed landowner survey, the Conservation Awareness Index (CAI), to assess Watershed landowners' awareness of New York's Forest Tax Law Program (480-a), conservation easements, timber harvesting, and conservation-based estate planning. CAI is a short, modular, quantitative evaluation tool with almost limitless analytical potential. It can assess differences based on demographics, types of awareness, and individual conservation decisions.

The primary purpose of this White Paper is to explain CAI. To demonstrate its use we have included a specific analysis of the CAI data in *Annex #1: "Conservation Awareness Index in the New York City Watershed: Does 480-a Eligibility Matter?"* To help you understand how to use CAI scores to measure success we have included *"Interpreting CAI Scores"* in *Annex #2*.

The current Filtration Avoidance Determination (FAD) calls for an annual evaluation of 5-year-old forest management plans (5-Year Survey). As a result of changes to the Watershed Forest Management Planning Program (480a Focus and MyWoodlot.com), the 5-Year Survey has become outdated. WAC feels the evaluation of these efforts would be better conducted using CAI.

CAI offers greater evaluation potential than the 5-Year Survey because it can compare participants and non-participants. It can also reach far more landowners than previous methods. For example, a 2015 CAI survey in the New York City Watershed resulted in more than 900 usable responses, more than every 5-Year Survey combined. CAI also provides in-depth opportunities to study the effectiveness of Watershed landowner education efforts over time, particularly as they relate to crucial conservation decisions like timber harvesting, conservation easements, estate planning, and enrolling in New York's Forest Tax Law Program.

In light of the benefits of evaluating Program effectiveness with CAI, WAC recommends the following changes to section 4.5 of the FAD:

- In section **4.5 Watershed Forestry Program** under the **Activity and Reporting Requirements** replace "Evaluate the implementation status of five-year-old WAC forest management plans" with "Evaluate the effectiveness of the Watershed Forest Management Planning Program and Landowner Education programs once every five years with Conservation Awareness Index (CAI)"

Are Watershed Landowners Prepared to Make Informed Conservation Decisions?

Like much of the eastern United States, the New York City Watershed depends on private woodlands and woodland owners for a host of environmental benefits. About two-thirds of the forest in the New York City Watershed is privately owned (Figure 1). And also as with much of the eastern United States, small parcels and family ownerships dominate this private woodland landscape.

The decisions the Watershed's 30,000 woodland owners make influence the values their lands provide, among them clean water for 9 million New Yorkers. The Watershed Agricultural Council's Forestry Program uses a variety of methods to help Watershed landowners make decisions that will have positive effects on the region's forests and water quality.

But how effective are these methods? Are Watershed landowners prepared to make informed decisions about their land that take its conservation value into account?

We tested a potential long-term evaluation tool that could answer these questions. That tool, the Conservation Awareness Index (CAI), offers a wealth of possibilities for charting Watershed landowners'—and the Forestry Program's—progress over time. This white paper summarizes what CAI is and describes some ways it might be used.

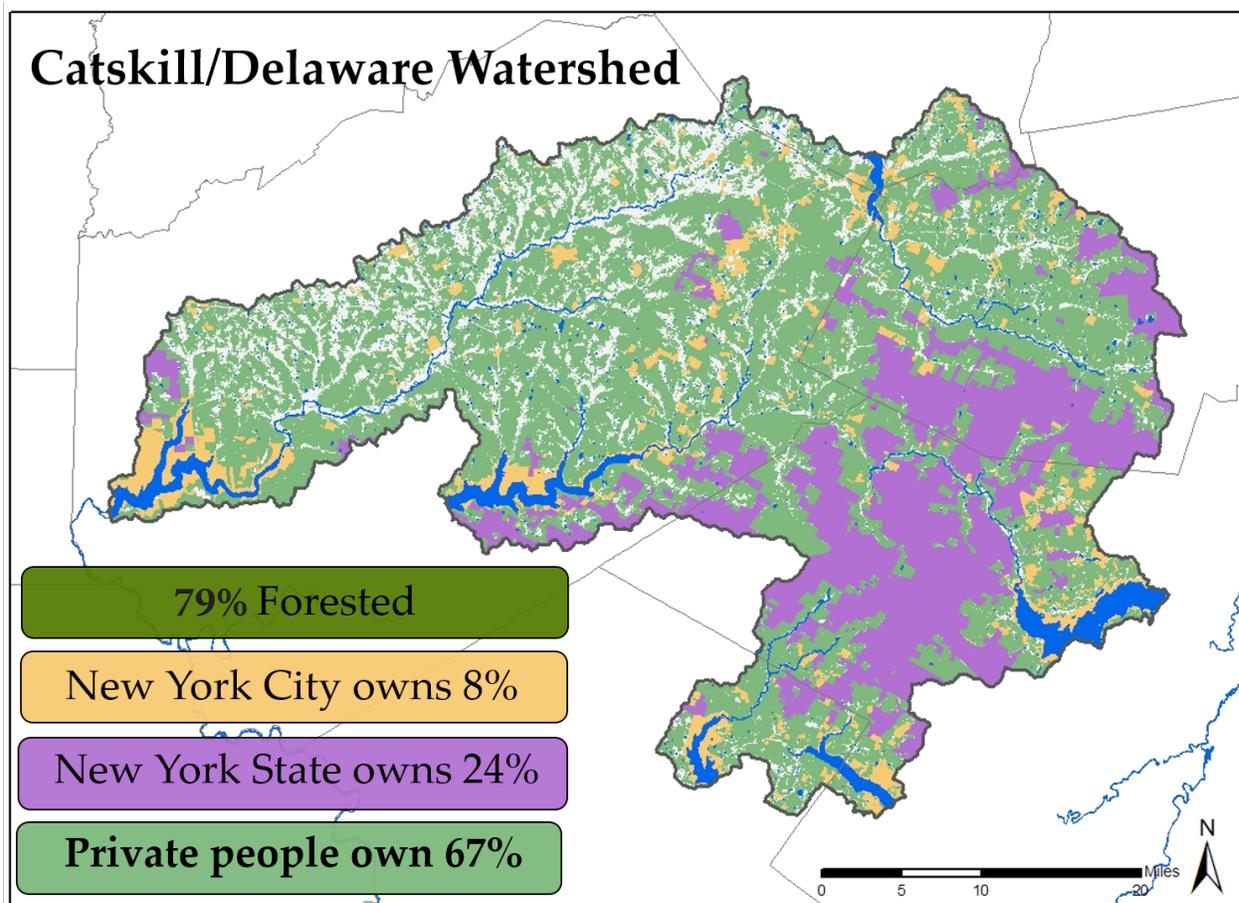


Figure 1. Private ownership dominates land cover in the New York City Watershed. 79% of the city's main water supply, the Catskill/Delaware Watershed, is forested. Of that forested land, about two-thirds is held by private citizens, most of them families owning small acreages. Map credit: Tom Pavlesich

What Is the Conservation Awareness Index, or CAI?

Developed by researchers at the University of Massachusetts-Amherst, CAI is a single-page, front-and-back survey that assesses landowners’ awareness of four conservation decisions they are likely to face. CAI’s developers chose these decisions because they represent key choices that can either positively or negatively affect a woodlot for the long term (Van Fleet et al. 2012). These conservation decisions are:

1. New York’s Forest Tax Law Program (480-a)
2. Conservation easements
3. Timber harvesting
4. Estate planning

CAI is set up as a grid (Table 1). For each conservation decision, CAI looks at four types of awareness by asking four types of questions:

1. General familiarity (“how familiar are you with ___ on a scale of 1 to 5?”)
2. Knowledge (four true/false/don’t know questions)
3. Experience (both first- and second-hand, i.e., “Have you ever done ___, or considered doing it?” and “Do you know someone who has done ___, or considered doing it?”)
4. Professional contacts (“Where would you go to find more information about ___?”)

The response to each of the four question types is worth between -1 and 4 points. Because the four question types are repeated for each of the four conservation decisions, the maximum score for one decision is 16 and the maximum total CAI score is 64.

In addition to the scored questions, CAI asks for demographic information such as age, gender, and whether the landowner lives on or away from his or her land.

For more information on CAI’s development and scoring, see Van Fleet et al. (2012).

		Awareness Type			
		Familiarity	Knowledge	Experience	Professional Contacts
Conservation Decision	Forest Tax Law	4	4	4	4
	Conservation Easements	4	4	4	4
	Timber Harvesting	4	4	4	4
	Estate Planning	4	4	4	4

Table 1. CAI is set up as a grid, asking about 4 types of awareness for each of 4 conservation decisions. Each question can earn up to 4 points, for a maximum CAI score of 64.

How Did We Conduct a CAI Survey?

We wanted to establish a baseline of CAI scores among Watershed landowners. We hope to compare future CAI results against this baseline to gauge change in conservation awareness over time.

To ensure a reliable baseline, we matched our survey and analytical methods to those used by previous, peer-reviewed CAI studies (Van Fleet et al. 2012, Schnur et al. 2013, Kittredge et al. 2015).

Survey Methods

We mailed the CAI survey to 3,000 landowners with at least 10 wooded acres in the New York City Watershed. We used county tax parcel information to randomly select landowners, and we excluded public and industrial landowners so we could focus on private, nonindustrial lands.

We used a modified Tailored Design Method (Dillman et al. 2009) for our mailing process. We sent recipients a pre-survey postcard followed by a survey with a cover letter and stamped return envelope. All recipients were then sent a combination thank-you/reminder postcard. Three weeks after sending out the first round of surveys, non-respondents received a second follow-up survey, also with a cover letter and stamped return envelope.

Of the 3,000 surveys sent out, 396 were either undeliverable or disqualified because the owner had passed away or no longer owned their land. That left 2,604 successfully delivered surveys. 920 were returned, for an effective response rate of 35%. This rate is comparable to other CAI efforts. Using the Wilcoxon Rank-Sum Test, we found no indication of non-response bias among CAI scores.

Data Analysis

Although this paper is about how the Forestry Program might use CAI and not results from our initial baseline, we did perform some analyses to use as examples. When we did, we used the same statistical tests as previous CAI analyses. Specifically, we used the Wilkes-Shapiro and Wilcoxon Rank-Sum tests to test for statistical differences between groups. Where we tested quantitative variables (such as acreage), we used Spearman's rho-statistic. For all tests we used an experiment-wise alpha of 0.05 and performed calculations in Microsoft Excel using the Real Statistics add-in (Zaiontz 2015).

Ways to Examine the Data

With its grid design and consistent scoring, CAI opens up a wealth of possible analyses. It can obviously look at CAI as a whole (the full 64-point maximum, see Table 2a), but it can also look at subsets of the survey for more nuance and detail. Analyses can focus on one conservation decision, such as easements (Table 2b). Alternately, they can examine one awareness type, such as professional contacts (Table 2c). In each of these cases, statistical tests would compare the difference between groups out of a maximum possible score of 16.

It’s even possible to examine a single type of awareness for a single conservation decision, such as landowners’ experience with the Forest Tax Law (Table 2d). In these cases, examining the distribution of scores is more appropriate than testing for differences in the average.

		Awareness Type			
		Familiarity	Knowledge	Experience	Professional Contacts
Conservation Decision	Forest Tax Law	4	4	4	4
	Conservation Easements	4	4	4	4
	Timber Harvesting	4	4	4	4
	Estate Planning	4	4	4	4

Table 2a. At the most basic level, CAI can be analyzed as a whole, looking at every awareness type for every conservation decision. The maximum score possible here is 64.

		Awareness Type			
		Familiarity	Knowledge	Experience	Professional Contacts
Conservation Decision	Forest Tax Law	4	4	4	4
	Conservation Easements	4	4	4	4
	Timber Harvesting	4	4	4	4
	Estate Planning	4	4	4	4

Table 2b. CAI scores can also be interpreted for a single conservation decision. In the case illustrated in this table, analysis focuses on conservation easements, resulting in a maximum score of 16.

		Awareness Type			
		Familiarity	Knowledge	Experience	Professional Contacts
Conservation Decision	Forest Tax Law	4	4	4	4
	Conservation Easements	4	4	4	4
	Timber Harvesting	4	4	4	4
	Estate Planning	4	4	4	4

Table 2c. A third way to examine CAI data is to look at one type of awareness. In this example, analysis focuses on whether landowners can identify professional contacts across the four conservation decisions. The maximum score is 16.

		Awareness Type			
		Familiarity	Knowledge	Experience	Professional Contacts
Conservation Decision	Forest Tax Law	4	4	4	4
	Conservation Easements	4	4	4	4
	Timber Harvesting	4	4	4	4
	Estate Planning	4	4	4	4

Table 2d. It's possible to evaluate single questions on the CAI survey. In this table, analysis focuses on landowners' experience with the Forest Tax Law Program, or 480-a. Because the maximum score is only 4, these analyses are best limited to the distribution of scores.

Adding to the complexity, any of these potential analyses can occur with respect to any of the demographics collected alongside CAI, among them

1. The county a landowner lives in
2. The county a landowner's property is located in
3. Whether the landowner is absentee or a resident
4. How big the property is
5. Whether the property is eligible for 480-a
6. How long a landowner has owned his or her property
7. How old a landowner is
8. How educated a landowner is
9. Whether a landowner is male or female

Furthermore, in select cases we can compare CAI data from the Watershed with results from other regions, since we used the same survey and methods followed in previous studies.

Put together, all these options create more than 200 potential analyses from a single CAI survey effort. With so many possibilities, which ones should the Forestry Program run? There are more options than staff has time to complete, and many of the answers would not be relevant to the Forestry Program's work anyway. The choice of which analyses to perform comes down to the questions the program wants to answer, and the ways it hopes to use CAI's information.

Ways the Forestry Program Could Use CAI

1. Understand Watershed Landowner Demographics

By better understanding who Watershed landowners are, the Forestry Program can tailor its initiatives to meet landowner needs. But who are Watershed landowners? Statewide figures exist from the National Woodland Owner Survey (Sustaining Family Forests Initiative 2009), yet regional statistics are harder to come by.

CAI provides a way to learn more about the background characteristics of Watershed landowners. For instance, based on our CAI survey, Watershed woodland owners on average¹:

- Own 32 wooded acres
- Have owned their land 24 years
- Are older: 85% are over 50, and 40% are over 65
- Are male: 75% are men
- Don't live in the Watershed: 53% are absentee
- Are well-educated: 60% are college graduates, twice the New York State average

We can also gauge the effects these demographics have on landowners' conservation awareness. Based on our CAI survey, larger acreages, resident ownership, and higher formal education all correlate with higher CAI scores. By contrast, owner age and tenure make no difference. Male landowners had slightly higher CAI than female landowners, but the difference was small and not reflected in other CAI studies.

¹Because the data had a non-normal distribution, this report uses medians rather than means when discussing averages. The statistical tests we used also analyzed differences in medians rather than means.

2. Identify Landowner Education Priorities

While demographics provide general guidance, CAI can do more to help the Forestry Program choose where it should focus its landowner education.

One way to identify priorities is to look at which sections of CAI lag behind others, suggesting room for improvement. All four conservation decisions had low average scores (Figure 2). The highest, estate planning, had an average score of just 5 out of a possible 16. Even so, awareness of the Forest Tax Law and conservation easements was even lower: 1 and 2 out of 16. With scores that low, both of these conservation decisions could be potential priorities for landowner outreach.

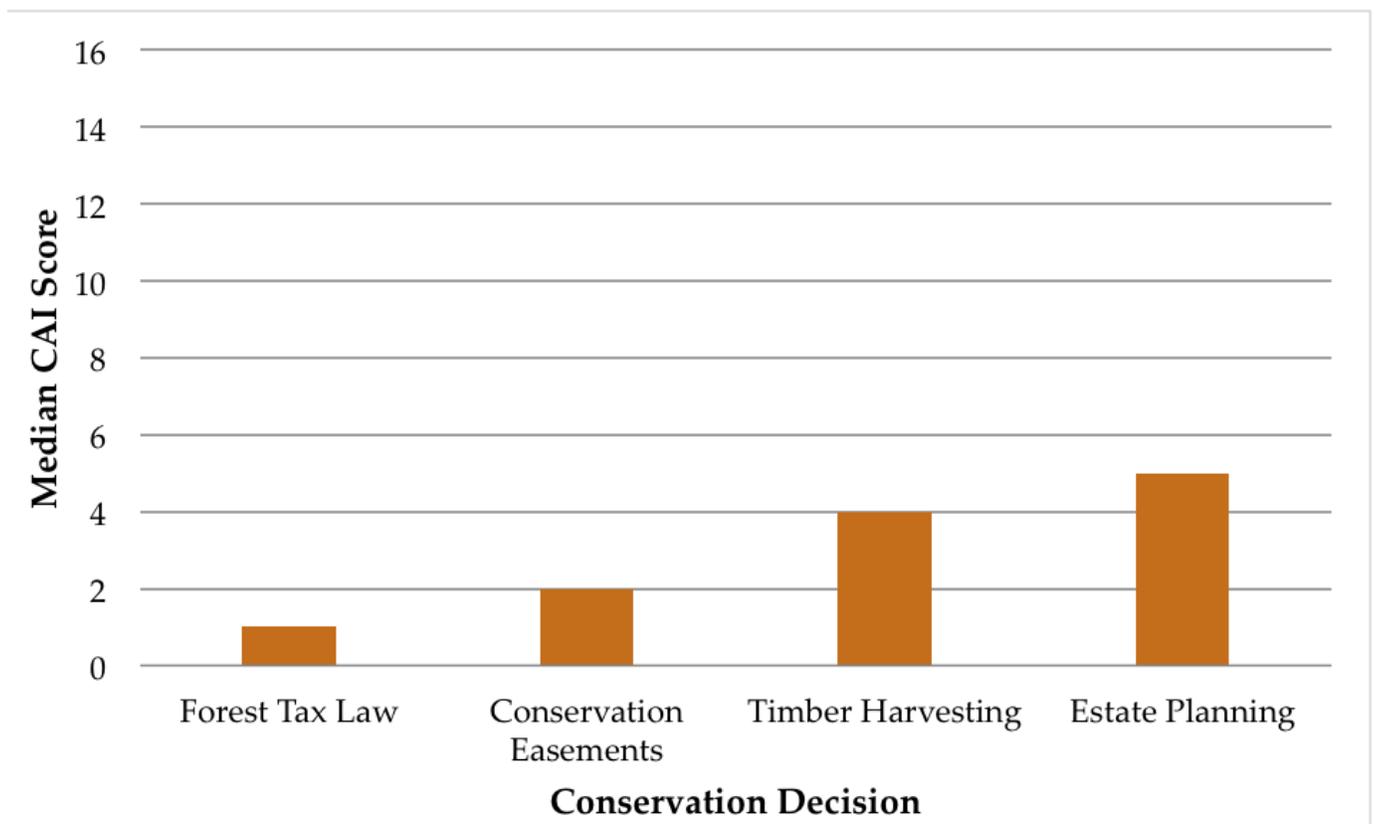


Figure 2. CAI scores were low across all conservation decisions, but the Forest Tax Law (480-a) and conservation easements were particular weak points, with medians of 1 and 2 out of a possible 16.

Digging further into the data can suggest other priorities. Timber harvesting had a low average score, yet 35% of respondents indicated they had completed a harvest (Figure 3). Since timber harvesting can harm water quality if not done well, the fact that many landowners are cutting with little awareness of harvesting practices may be a cause for concern.

In addition to education topics, CAI can help point out where incentives could be useful. Estate planning had the highest awareness of any of the four conservation decisions, but it had low first-hand experience: less than 20% of respondents indicated they had completed it. Given that many Watershed landowners are older, estate planning is clearly important. Yet despite their knowledge, most landowners have never even considered it. Incentives to help them get started could be a potential priority.

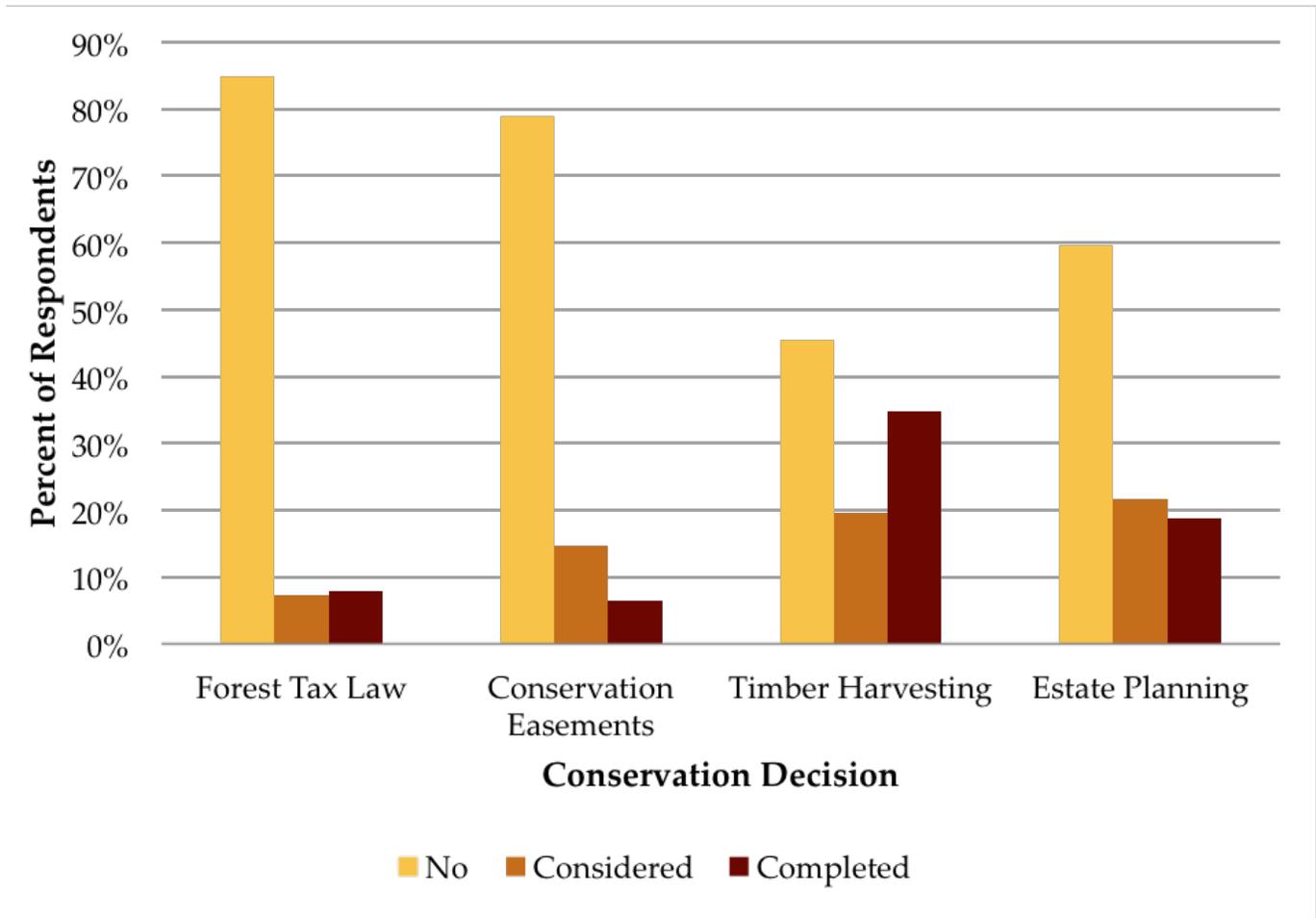


Figure 3. Respondents’ reported first-hand experience with each conservation decision.

3. Plan Spatially

One of the most exciting aspects of CAI is its ability to show results in map form. We can use this ability to better plan not only which topics to focus on, but where to concentrate effort.

CAI scores are not uniform across the Watershed. Landowners who live in West of Hudson counties, for instance, score higher in timber harvesting but lower in estate planning than East of Hudson residents. Other CAI studies have described this challenge as “hotspots and troughs,” and knowing where each occurs can help with planning (Kittredge et al. 2015).

How might the Forestry Program use spatial knowledge to become more efficient? Consider conservation easements. The Watershed Agricultural Council is starting its Forest Easements initiative. Where should marketing for this program take place?

Based on CAI, awareness of easements is highest among landowners who live downstate, especially in New York, Westchester, and Putnam Counties (Figure 4). Focusing easement marketing on landowners who live in those counties (but who own land upstate) could lead to greater success rates. Those owners would require less education about easements to decide whether one is right for them.

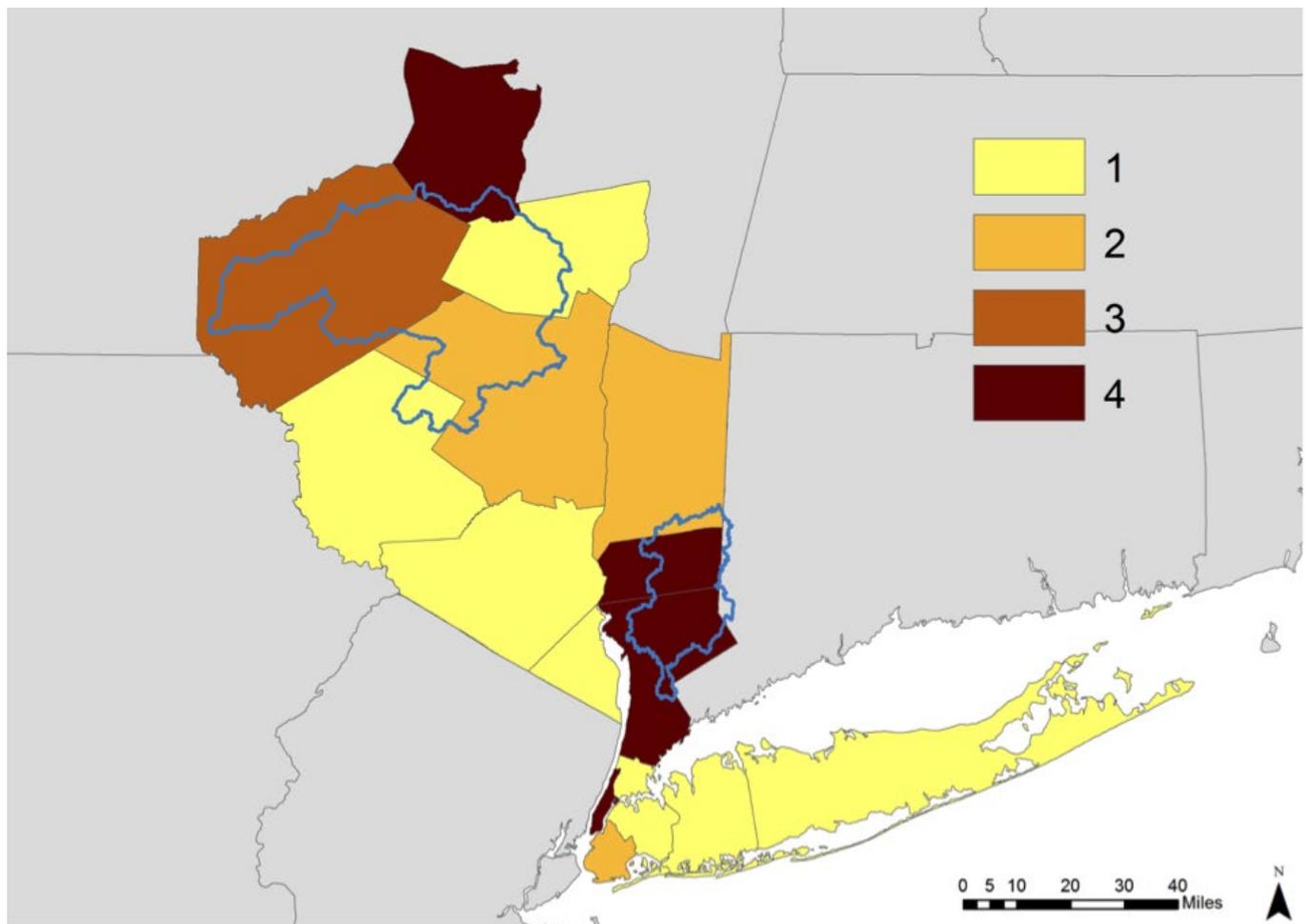


Figure 4. Average CAI scores (out of a maximum possible of 16) for conservation easements based on the counties where NYC Watershed landowners live.

4. Evaluate Programs over Time

Perhaps CAI’s most useful value is in long-term evaluation. Conservation decision making is not immediate. Enrolling in 480-a or harvesting timber may take even well-informed landowners months to complete, and selling an easement or planning for generational transfer both take years. Effective landowner education evaluation needs to look beyond simply whether someone completed a task. It must be able to discern the slow, incremental change of a landowner’s learning path.

CAI is well adapted to revealing this nuance. Its questions specifically target intermediate steps to conservation decisions, steps like gaining knowledge, meeting professionals, and considering an action.

More practically, CAI’s structure makes it a flexible and easily administered evaluation tool. As a modular, brief, and quantitative survey, CAI is ideally suited for pre- and post-testing and study of landowning populations through time. It can be conducted in mass mailings—like our initial use of it—or given to small, specific groups like the attendees of a workshop.

The final section of this paper lays out some ideas for transforming CAI from a research tool into the central piece of how the Forestry Program evaluates its landowner education work.

Ideas for Future Watershed CAI Use

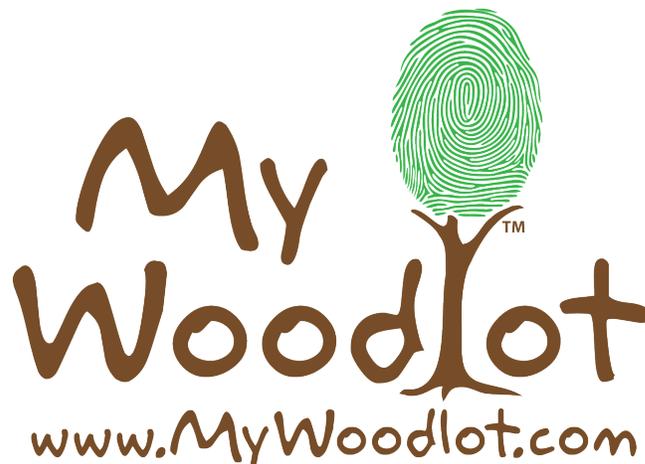
MyWoodlot

Our original purpose in doing CAI was to create a baseline for long-term evaluation of MyWoodlot, and we have achieved that purpose. Our survey has given us reliable data about Watershed landowners' conservation awareness prior to MyWoodlot's launch. We had an acceptable response rate, no indication of non-response bias, and scores and demographic trends that followed published CAI studies (Schnur et al. 2013, Van Fleet et al. 2012).

Future use of CAI connected to MyWoodlot is complicated. A pre-/post-test approach is undesirable, because new MyWoodlot users may be turned off by an initial barrage of questions. And without a pre-test, it will be hard to know whether subsequent CAI scores represent change in a landowner's conservation awareness.

An alternative is to periodically sample random MyWoodlot users and have them complete CAI. Over time this dataset could reveal whether those who have used MyWoodlot longer have higher CAI scores. This method has the advantage of being able to look at MyWoodlot users specifically, but it could be biased if those who use MyWoodlot longer are those who already had high conservation awareness to begin with.

A third possibility is to repeat the mass mailing approach we used for this study at 5- or 10-year intervals. This broad survey would have a more difficult time singling out MyWoodlot as the cause of any changes, though we do ask about landowners' familiarity with the site in CAI's Demographics section. At the least, a mass mailing could show whether a regional change in conservation awareness had occurred. A drawback to this method is that any such change is likely to happen gradually if at all, so early repetitions may not reveal significant differences from baseline data.



Master Forest Owner Visits

While passive outreach methods like MyWoodlot are popular information sources among landowners, in-person, in-woods conversations are also highly valued (Mercker and Hodges 2007, Kuipers et al. 2013). The Forestry Program’s primary method for encouraging this direct contact is through support for the Master Forest Owner (MFO) Program.

The MFO Program recruits landowners to receive training from Cornell University. These “MFOs” then volunteer to visit other landowners and provide advice on caring for the woods.

MFOs have significantly higher conservation awareness than other landowners. Schnur et al. (2013) found that MFOs averaged a CAI score of 38 compared with other landowners’ 15. This result suggests that MFOs in general have the knowledge base to give other landowners correct information.

Less clear from prior research, though, is how well MFOs deliver that information. CAI offers a way to find out. Landowners receiving an MFO visit could complete CAI in a pre-/post-test fashion, filling it out at the start of the visit and again at the end. The change in score would be an indicator of how much conservation awareness increased due to the MFO’s visit.

Even without this targeted evaluation, our CAI results support the MFO Program’s peer-to-peer approach. Landowners who knew someone who had considered or completed a conservation decision scored significantly higher on the familiarity and knowledge questions for that decision (Figure 5). For example, landowners who knew someone with an easement reported greater familiarity and knowledge of easements. This increase occurred regardless of whether the owner also knew a professional in that field.

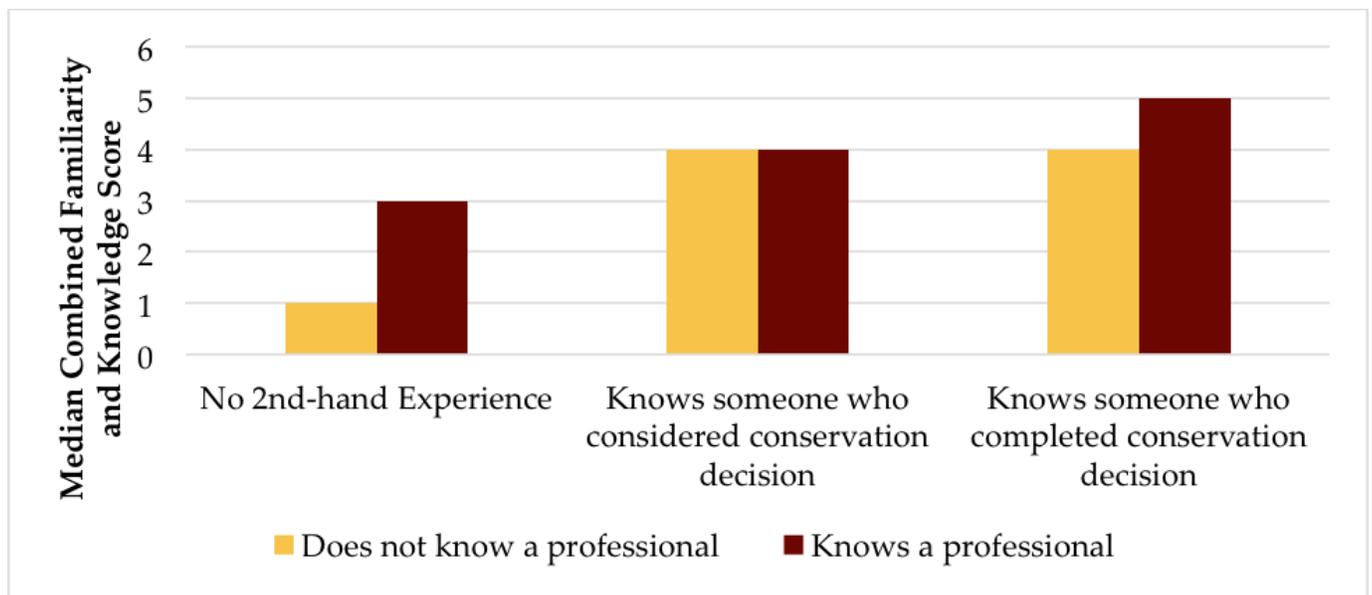


Figure 5. Landowners with secondhand experience had greater familiarity and knowledge with conservation decisions than those who didn’t, regardless of whether the owner also knew a professional.

Peer connections also correlate with on-the-ground action. Landowners who knew someone who had considered or completed a conservation decision were more likely to have considered or completed that decision themselves (Figure 6). Knowing a professional reinforced that likelihood.

Indeed, connections with both peers and professionals may be critical in motivating action on conservation decisions. In 83% of cases, landowners who lacked both second-hand experience and professional contacts hadn't even considered action themselves. Absent outside contacts, landowners took action on their own only 7% of the time.

By contrast, when landowners knew both other landowners and professionals, in almost 80% of cases they had at least considered taking action themselves. Even when they didn't know a professional, just knowing another landowner who had considered a conservation decision was enough in more than half of cases for a landowner to also consider that decision.

These results illustrate the potential value of the MFO Program for motivating landowner action. From Figure 3, few landowners reported firsthand experience with easements or 480-a. Recruiting and supporting more MFOs with easements or who are enrolled in 480-a could encourage more landowners to explore these possibilities.

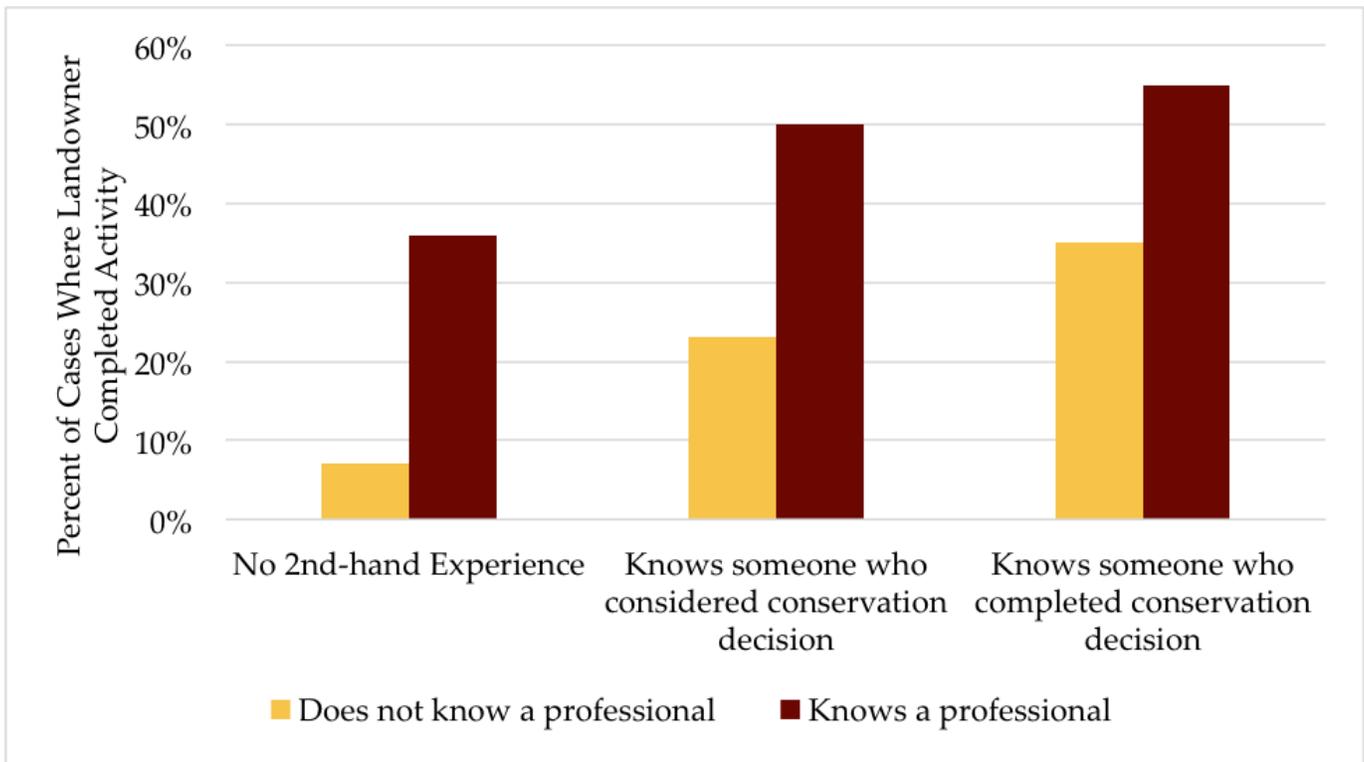


Figure 6. Landowners were more likely to have completed conservation decisions like enrolling in 480-a, harvesting timber, getting an easement, or engaging in estate planning when they knew another landowner who had completed those decisions. They were also more likely to complete conservation decisions when they had a professional contact.

Landowner Education Workshops

A pre-/post-test model like the one suggested for MFO Program evaluation could also apply to traditional workshops. Workshop participants could fill out CAI at the start and end of an event. Since CAI's conservation decisions represent choices that affect a woodlot's environmental benefits, it makes sense to use landowners' change in awareness of these decisions as a measure of a workshop's success.

One complication for evaluating workshops this way, though, is that workshops typically focus on something specific, and that subject may be unrelated to CAI's conservation decisions. This challenge can be addressed in two ways. The first is to administer CAI with no regard for workshop topic. If CAI's conservation decisions are those of highest priority, then other workshop topics are simply tools to get landowners in the door to also discuss these decisions. Landowners may not come to a workshop about timber harvesting, but they may show up for one about wildlife that then talks about harvesting as a tool to create habitat. This approach is already common in some Model Forest workshops, where a hike to look at, say, mushrooms results in landowners also seeing Best Management Practices.

A second, less rigid evaluation approach is to take advantage of CAI's modular design and develop new CAI sections for specific workshop topics. CAI's creators chose its four conservation decisions based on expert opinion, but these four may not be a complete list. For instance, CAI lacks modules on conservation decisions connected to water quality and invasive species, yet landowners' choices in these areas clearly influence the environmental values their lands provide.

CAI's modular design makes new sections straightforward to create. Each new section needs to represent a conservation decision a landowner could make. The section must then ask one of each type of awareness question: familiarity, knowledge, experience, and professional contacts. As long as a conservation decision can fit into this mold, it can become a CAI section.

Of course, part of CAI's successful design is its short length. Adding sections lengthens CAI and makes it harder to complete. For large deployments like the one we used, the original CAI is best. But for specific purposes like evaluating a workshop, more tailored CAI sections could be useful.

Many More Ideas

This paper summarizes the ideas Forestry Program staff developed after one CAI study. These ideas are certainly not exhaustive. It is the staff's hope that those who read this paper will come up with more ideas for how to use CAI to evaluate and improve the Forestry Program's initiatives. We welcome questions, comments, and suggestions at any time.

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1. Van Fleet et al. (2012)
2. Schnur et al. (2013)
3. CAI Focus on 480a
4. Interpreting CAI Scores

ANNEXES

Annex 1: Van Fleet et al.

Reimagining Family Forest Conservation: Estimating Landowner Awareness and Their Preparedness to Act with the Conservation Awareness Index

Tyler E. Van Fleet, David B. Kittredge, Brett J. Butler, and Paul F. Catanzaro

ABSTRACT

The Conservation Awareness Index (CAI) is a new, necessary survey instrument designed to assess family forest conservation progress. This article describes the rationale, development, and pilot testing of the CAI, which estimates family forest owner awareness (including familiarity, knowledge, and experience) of forest conservation options and sources of information. Administered to 500 randomly selected Massachusetts family forest owners and 64 benchmark landowners, results indicated instrument validity and revealed low conservation awareness among random respondents, especially regarding estate planning and conservation easements. Distance from land, education level, ownership size, and location were related to conservation awareness. Applications of the CAI include understanding family forest owner preparedness to make informed decisions about their land, improving outreach interventions, and measuring the spatial and social dynamics of conservation awareness over time.

Keywords: family forest owner, forest conservation, awareness, assessment

American forests are vast and diverse, driving powerful natural cycles and supporting myriad life forms and livelihoods. Fifty-six percent of all forests in the United States are privately owned by an estimated 11 million private forest owners, 92% of which are family forest owners (Butler 2008). Family forest owners (individuals, families, and trusts own-

ing 10–999 ac) control 62% of private forestland or 35% (262 million ac) of all US forests and their collective, uncoordinated decisions will determine the future condition and persistence this land. Our research generates new information about the conservation awareness of family forest owners to help increase private forest conservation.

Forest Benefits under Threat

Private forests provide vital ecosystem services related to water (Robles et al. 2008, Stein et al. 2009), air (Woodbury et al. 2007), and wildlife (Stein et al. 2009), and provision consumptive and nonconsumptive human benefits, including wood products (Smith et al. 2004), nontimber forest products (Butler 2008), recreation (Butler 2008), health, and well-being (Frumkin 2001, Chang et al. 2007). Accelerating rates of parcellation and conversion threaten the future of private forests and their benefits. Between 1993 and 2006 average family forest parcel size shrank from 25 to 20 ac in the northern United States (a 20-state region defined by the USDA Forest Service) and the number of family forest owners grew 19%, from 3.8 to 4.7 million (Butler and Ma 2011). In recent decades, US forest loss has increasingly been driven by conversion to developed uses (Alig 2007), with over 17 million forested ac converted to developed

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land between 1982 and 2007 (USDA 2009a).

As average parcel size shrinks and development pressure increases land values, timber harvesting revenues alone can not keep up with the costs (i.e., property taxes) of family forest ownership (D'Amato et al. 2010) and selling all or part of one's land becomes the primary way to generate income from it (Finley and Kittredge 2006). Forty-four percent of family forests are owned by people 65 years of age or older and 23% of family forests are owned by people who say they intend to sell or transfer their land in the next 5 years (Butler 2008). With a significant proportion of forestland poised to change hands in the near future, a growing number of family forest owners will decide whether or not it stays forested.

Conventional Metrics of Private Forest Conservation

Commonly, private forest conservation progress is estimated by tracking the number of acres and landowners with forest management plans (USDA 2009b) because it is assumed that owners with plans for their properties are prepared to make informed land decisions. Despite decades of program promotion, only 4% of US family forest owners have written forest management plans (Butler 2008) and the Forest Service reports that just 2% of the 130 million ac of private forests in the northern United States have plans (USDA 2009b). At this rate of adoption it will take 144 years for all private forest owners in this region to have plans (Kittredge 2009). Such low participation suggests a disconnect between formal management programs and most landowners' interests, raising doubts about the effectiveness of management plans at informing most landowner decisions and estimating broad-scale conservation progress.

Survey research indicates that for most landowners, their land meets their needs by providing privacy, scenery, and recreation, without active planning or management (Jones et al. 1995, Finley and Kittredge 2006, Bengston et al. 2009). Plans that include or emphasize active management are misaligned with these nonconsumptive values. Most family forest owners choose to forgo formal land planning because of its perceived irrelevance to their interests and instead only think about their land reactively when a decision needs to be made (Kittredge 2004). Consequently, these decisions are of-

ten made without adequate information or professional advice. In Massachusetts, e.g., 85% of landowners owning 79% of private forests are making critical land decisions without the guidance of management plans (Kittredge et al. 2008). We have developed a new tool for assessing landowners' awareness of land options that offers an alternative way to measure forest conservation progress.

Foundations of a New Forest Conservation Metric

The Conservation Awareness Index (CAI), measures family forest owner familiarity with land options and estimates their preparedness to make informed decisions about their land. Other research has focused on landowner attitudes and motivations to predict participation in conservation programs (Mercker and Hodges 2007, Fletcher et al. 2009) and policies (Janota and Broussard 2008), but no prior research has quantified private landowner awareness of available conservation tools, practices, and sources of information. The CAI is designed to measure awareness as a behavioral precursor rather than to directly report or predict proconservation behavior.

Behavioral theory supports the role of awareness and knowledge in producing behavioral change. According to the theory of bounded rationality (Simon 1991) and knowledge deficit theory (Schultz 2002), behavioral decisions are limited by information and knowledge. Consequently, acquiring knowledge about why or how to do something may compel behavioral change. Although most researchers agree that other factors influence behavior, such as intention, self-efficacy, emotion, and social context (Schneider and Cheslock 2003), awareness and knowledge remain foundational to decisionmaking. The awareness, knowledge, attitude, and practice behavioral change ladder (Anyagbunam et al. 2004) and the theory of planned behavior (Ajzen 1991) outline how basic awareness of a behavior leads to acquiring more knowledge about it, which may improve one's attitude toward it and ultimately lead to its adoption. Rogers' (2003) diffusion of innovations theory explains how new ideas and technologies spread through society when individuals first gain knowledge of the innovation, and then gather information about it, evaluate its merits, and finally implement and confirm it. Importantly, this theory stresses the influ-

ence of social norms and opinion leaders on innovation adoption. By assessing different components of conservation awareness, including elements of peer influence, the CAI is constructed to discern meaningful intermediate steps toward proconservation behavior and serves as an indicator of decision-making preparedness.

Methods

Study Area

The CAI was developed in central and western Massachusetts where most of the state's forestland is located and was pilot tested in six contiguous western Massachusetts towns recognized by organizations and government agencies for their large intact forests and high conservation value (Howell and Weinberg 2005; Figure 1).

Instrument Development

Structured interviews with key informants, including family forest owners ($n = 7$), conservation professionals ($n = 10$), and foresters ($n = 3$), helped identify essential conservation knowledge related to family forest owner decisions about the management and future of their land. Multiple sets of questions were drafted based on interview data and literature review and were then tested in a focus group environment. Four focus groups were held with 31 total family forest owners who collectively owned over 1,700 ac. Participants individually answered written trial questions and provided feedback during 90-minute discussion periods. Participants were randomly recruited from a mailing list of landowners (≥ 10 ac of forest) generated from property tax records and were compensated \$50/household.

The CAI

Designed to function like the Consumer Confidence Index (Ludvigson 2004), the CAI synthesizes responses to a small number of questions into a single indicator value that summarizes a complex concept. The CAI survey instrument comprises 16 questions that capture respondent awareness of forest conservation options and resources and indicates preparedness to make informed land decisions. Four subject categories represent key conservation decisions owners may likely face: (1) current use property tax reduction programs (CUTPs), (2) conservation easements (CEs), (3) timber harvest-

Table 1. Random respondent and nonrespondent responses to select CAI questions.

	Question 1. How many acres of woodland do you own in Massachusetts? (ac)		Question 2. Do you know someone who is or has been enrolled in a Chapter 61 current use program in Massachusetts?		Question 3. Do you know a local land trust?	
	Mean \pm SD	Median	Yes	No/don't know	Yes	No
Respondents (%)	54.6 \pm 73.8	28	43.7	56.3	36.3	63.7
Nonrespondents (%)	47.3 \pm 37.7	31	50.0	50.0	37.5	62.5

Familiarity responses were awarded from 0 (for “not heard of”) to 4 (for “a great deal”) points. Knowledge responses were awarded 1 point for every correct true/false answer, 0 points for “don’t know,” and –1 point for every incorrect answer. Experience responses were awarded 2 points for first- and secondhand completion of a conservation option, 1 point for first- and secondhand consideration of an option, and 0 points for “don’t know.” If a respondent indicated they or someone they knew had both considered and completed an option, 2 points, not 3, were awarded. Acquaintance with sources of information responses were awarded 4 points for indicating “yes” and providing an accurate name, 3 points for indicating “yes” and providing a nearly accurate name, 2 points for indicating “yes” and providing no name, 1 point for indicating “no” and providing a lead, 0 points for indicating “no” and providing no lead, and –1 point for indicating “yes” and providing an inaccurate name (e.g., naming a logger and assuming they were a forester). Name accuracy was determined based on expert knowledge. All blank responses received 0 points. This scoring algorithm produced maximum and minimum CAI scores of 64 and –20. A single CAI total score was generated for each respondent, along with four subject category subscores.

Demographic questions obtained respondent ownership acreage and tenure, proximity of residence to ownership, age, education level, and gender. A single open-ended question obtained the primary reason respondents owned their land and responses were coded and sorted into six landowner objective categories: Family, home, environment, noninstrumental (e.g., aesthetics and enjoyment), recreation, and investment.

Nonresponse Bias Analysis

Twenty-six randomly selected nonrespondents (equivalent to 10% of random respondents) were contacted via telephone and asked three CAI questions. Acreages of

random respondents and nonrespondents were compared using the nonparametric Wilcoxon’s rank-sum test (Wilcoxon) for two independent samples (Corder and Foreman 2009). The binomial proportions test was used to compare responses with the other questions.

Analyzing CAI Responses

The Shapiro-Wilk test was used to determine whether the CAI score data came from a normal distribution. Correlations between CAI scores and random respondent acreage (log transformed) and tenure were analyzed using the nonparametric, rank-based Spearman’s rho-statistic (Corder and Foreman 2009). Two nonparametric tests for independent samples were used to analyze differences in CAI scores among respondent samples, subject categories, and demographic classes. The Wilcoxon test compared mean score values and the Kolmogorov-Smirnov (KS) test compared score distributions (Corder and Foreman 2009). All reported percentages exclude respondents who did not answer the specific question, i.e., item nonresponse.

Results

Response Bias

No response bias was detected. Responses to the three selected CAI questions were not significantly different between the random respondent and nonrespondent samples (Table 1).

Respondent Demographics and Ownership Characteristics

Random and benchmark respondent demographics were similar, but benchmark respondents tended to own larger acreages (Table 2). The average random respondent owned 54.6 forest ac (range, 10–530 ac) for 19.7 years (range, 1–63 years), was 51–65 years old and male, had completed education beyond college, and lived on his/her land. By comparison, the average bench-

mark respondent owned 156.7 forest ac (range, 15–650 ac) for 24.4 years (range, 4–49 years), was 51–65 years old and male, had completed education beyond college, and lived on his/her land. Larger proportions of benchmark respondents lived on their land and had completed education beyond college.

The most commonly reported primary ownership objective was related to owning forestland as part of one’s home site. Forty-three percent of random respondents stated they own forestland because it is part of their home, farm, or vacation home, or because it provides privacy. Noninstrumental objectives, such as natural setting characteristics, affection, and enjoyment were the next most common (19%) ownership objectives.

The CAI captured variation in conservation awareness within both samples (Figure 3), with random respondents earning a mean CAI total score of 20.4 \pm 12.6 points (range, 0–55 points) and benchmark respondents earning 46.7 \pm 6.8 points (range, 27–60 points). Random respondent mean scores were significantly lower than corresponding benchmark mean scores (Wilcoxon, $P < 0.001$), and the samples’ score distributions were significantly different (Figure 4). Within the random respondent sample, subscore distributions were significantly different from one another except for CEs and EP (KS, $D = 0.0787$ and $P = 0.466$).

Random respondent familiarity with conservation options tended to be low (Figure 5). Most random respondents had either “not heard of” or reported “knowing nothing” about EP (61%), while nearly one-half of respondents had either “not heard of” or reported “knowing nothing” about CUTPs (42%) and CEs (45%). Familiarity with TH was greatest but 40% of random respondents still reported they had either “not heard of” or “knew nothing” about it.

Few random respondents answered the knowledge questions incorrectly (Figure 6).

Table 2. Random and benchmark respondent ownership and demographic characteristics.

	Random respondents (<i>n</i> = 267)	Benchmark respondents (<i>n</i> = 37)
Size (ac)		
Minimum	10	15
Maximum	530	650
Median	28	112
Mean	54.6	156.7
SD	73.8	151.8
Tenure (yr)		
Minimum	1	4
Maximum	63	49
Median	18	21
Mean	19.7	24.4
SD	12.8	12.9
	Random respondents (%)	Benchmark respondents (%)
Proximity (mi)		
Resident	53.7	78.8
<10	4.9	9.1
10–100	25	12.1
>100	16.4	0
Age (yr)		
<30	<1	0
30–50	21.6	14.3
51–65	49.4	45.7
66–80	24.9	40
>80	3.7	0
Education (highest level achieved)		
Some high school	1.7	0
High school graduate	16.9	2.9
Some college	15.3	2.9
College graduate	27.3	23.5
Education beyond college	38.8	70.6
Gender		
Female	33.9	42.9
Male	59.6	57.1
Multiple respondents	6.5	0

Instead, “don’t know” was the most common response to questions about CUTPs (52%), CEs (58%), and EP (51%). By contrast, more than one-half of the TH questions were answered correctly (53%).

Random respondents reported little first- or secondhand experience with the conservation options (Figure 7). Most respondents indicated no personal experience considering or completing CEs (90%), EP (84%), CUTPs (75%), and TH (71%). Although it was more common for random respondents to know someone else who had considered or completed conservation options, most respondents still reported no secondhand experience with EP (83%), CEs (77%), CUTPs (60%), and TH (54%).

Few random respondents were acquainted with sources of conservation information (Figure 8). Small proportions of respondents named an estate planner familiar with land conservation (1%), a state service forester (7%), a private forester (22%), or a local land trust (29%). The largest proportions of random respondents neither identi-

fied a source of information nor indicated how they would find out about one. Of those who did indicate how they would find out about one, the most common lead was the Internet, followed by local and state government, and then personal acquaintances.

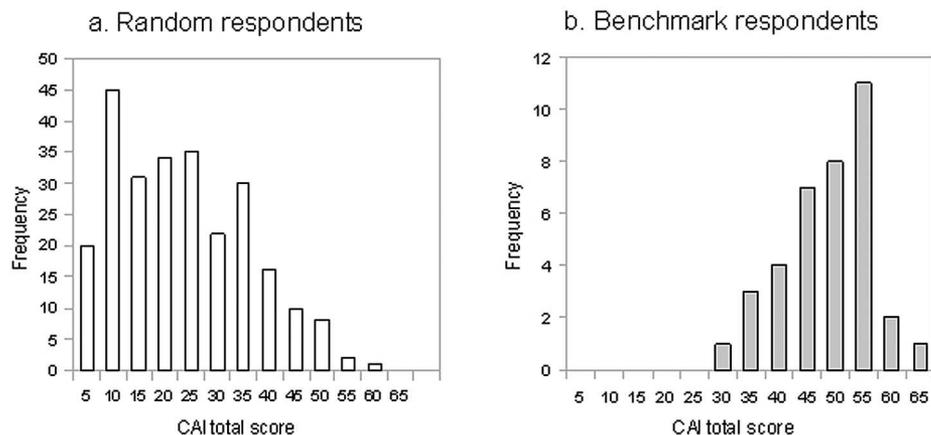


Figure 3. Random and benchmark respondent CAI total scores. The CAI captured variation in conservation awareness within both the random and the benchmark respondent samples. The distributions of total CAI scores were significantly different between the two samples (KS test, $D = 0.816$ and $P < 0.001$).

Some random respondent characteristics appeared to relate to CAI score, including distance from land and education level (Figure 9). Resident owner CAI total scores were on average higher and ranged more widely than those of absentee owners. Pairwise comparisons between landowner distance classes revealed that CAI score differences were attributable to particular subject category subscores. Resident owners had significantly greater awareness of CEs and TH than owners who lived 10–100 mi from their land (Wilcoxon, $W = 5338.5$ and $P < 0.001$ and $W = 5297$ and $P < 0.001$, respectively). Random respondents with education beyond college had somewhat significantly higher CAI total scores than high school graduates (Wilcoxon, $W = 1428$ and $P = 0.056$), which was largely attributable to their greater awareness of CEs and EP (Wilcoxon, $W = 1148.5$ and $P < 0.001$ and $W = 1071.5$ and $P < 0.001$, respectively).

Ownership acreage and location were related to random respondent CAI score. A moderate positive correlation between CAI total score and acreage was detected (Spearman’s rho = 0.462; $P < 0.001$), largely because of TH and CUTP subscores (Spearman’s rho = 0.484 and $P < 0.001$ and Spearman’s rho = 0.450 and $P < 0.001$, respectively). CAI total scores also varied significantly between some towns. For example, random respondents with land in Becket had significantly lower mean CAI total scores than those with land in either Middlefield or Worthington (Wilcoxon, $W = 706.5$ and $P < 0.001$ and $W = 1820.5$ and $P < 0.001$, respectively).

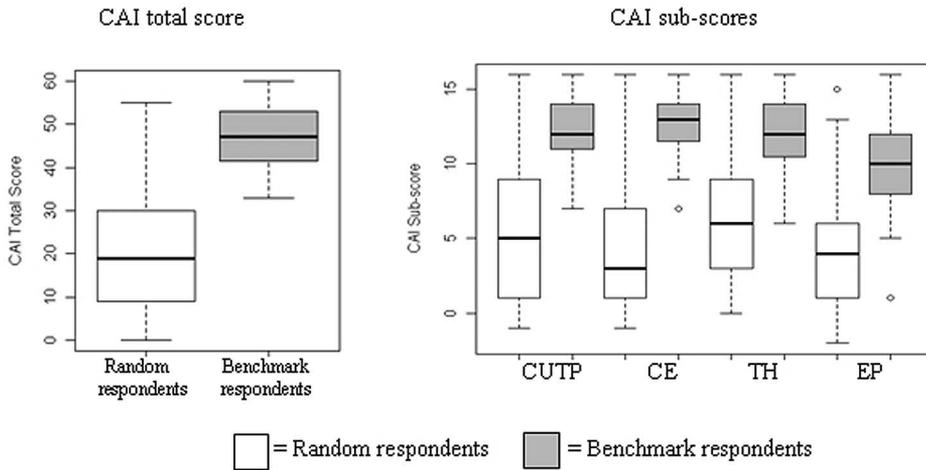


Figure 4. CAI scores differed significantly between samples. CAI total score and subscore means and distributions were significantly different between the random respondent and benchmark samples (Wilcoxon test, $P < 0.001$; KS test, $P < 0.001$). Subscore categories included CUTPs, CEs, TH, and EP.

Discussion

Instrument Validation

The CAI instrument captured variation in conservation awareness among individuals and between benchmark and random respondent samples. Variability was detected with every question, suggesting the usefulness of all questions in the instrument. Benchmark respondents scored significantly higher on the CAI; however, no one achieved a maximum score, indicating the CAI's accuracy and appropriate scaling. Random respondent CAI total scores and

subscores varied widely and most respondents had relatively low CAI scores. Random respondents exhibited significantly different awareness levels for most CAI subject categories (only CE and EP subscore distributions were similar), suggesting the subject categories are discrete and represent distinct topics of awareness.

Exploring Differences in Awareness

The CAI instrument detected widespread unawareness of the most important conservation options and resources available to family forest owners in Massachusetts.

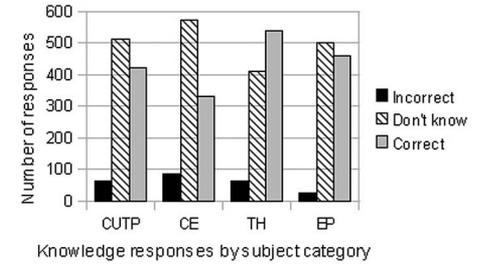


Figure 6. Random respondent knowledge of conservation options. Random respondent factual knowledge of conservation options was generally low. "Don't know" and incorrect responses outnumbered correct responses for CUTP, CEs, and EP, but more than one-half of the TH questions were answered correctly.

Random respondents were more uninformed than misinformed, with "don't know" responses far outnumbering incorrect responses. Awareness was highest for CUTPs and TH. CUTPs and TH represent relatively low-stakes decisions that may be made multiple times over the course of one's ownership and neither decision is necessarily permanent. Enrollment in a CUTP may be terminated and reinitiated and trees cut during timber harvest grow back. Both decisions produce immediate financial benefits (through tax savings or direct profit) compared with the uncertain or longer-term payback associated with CEs and EP. Harvesting timber and enrolling in CUTPs may be more visible decisions because timber harvests are posted and conspicuous and CUTPs yield attractive annual tax savings that may be discussed readily among landowners.

Some shared characteristics of CEs and EP may explain their similar CAI subscore distributions. Both are complex decisions involving long-term financial, family, and legal planning, as well as the expertise of multiple professionals. These decisions are made infrequently (often just once in a lifetime) and their details are typically kept private between individuals involved.

Low levels of conservation familiarity and knowledge are likely tied to low levels of experience. Few random respondents reported having any firsthand experience considering or completing the conservation options and only a modest increase in secondhand experience was detected. For example, 10% of random respondents had considered or completed a CE, while 24% knew someone else who had considered or completed one, indicating that landowners

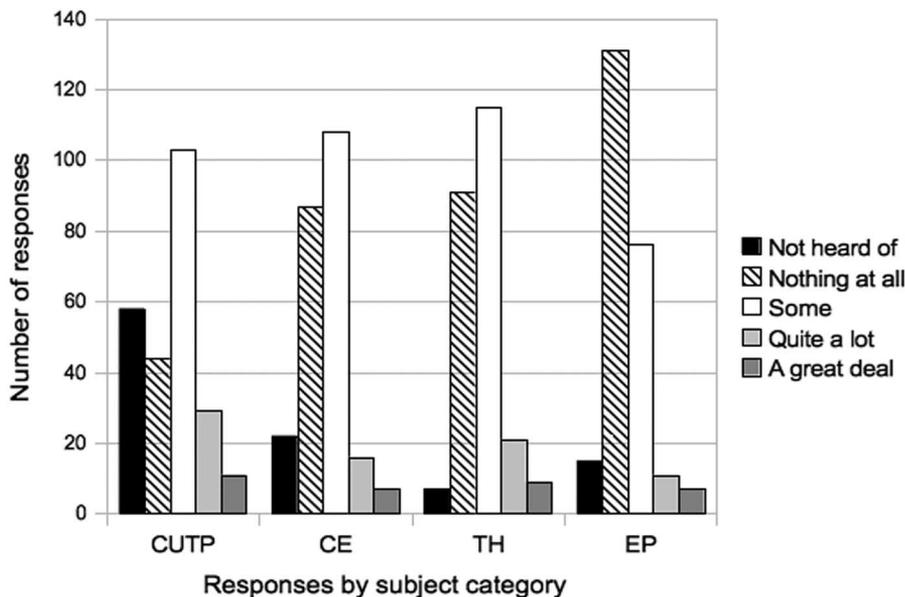


Figure 5. Random respondent familiarity with conservation options. Random respondent familiarity with conservation options was low. Close to one-half of all random respondents reported they had either "not heard of" or knew "nothing at all" about CUTPs (42%), CEs (45%), TH (40%), and EP (61%).

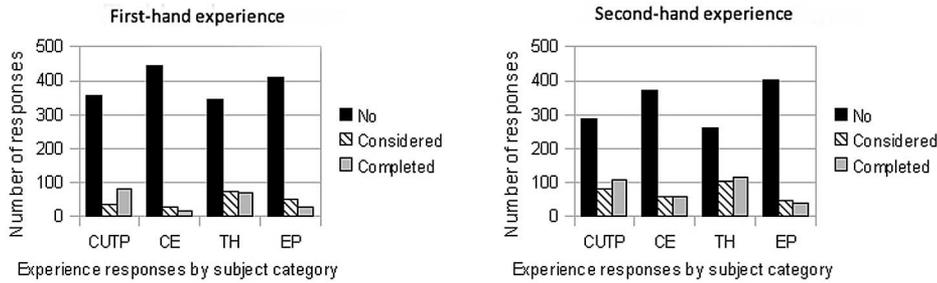


Figure 7. Random respondent experience with conservation options. Most random respondents reported having no firsthand experience with CUTPs (75%), CEs (90%), TH (71%), and EP (84%). Secondhand experience was slightly more common.

talk to one another about their land decisions. However, the dearth of experienced landowners limits the potential for inter-landowner communication. Notably, more random respondents reported first- or secondhand experience completing rather than just considering a CUTP, suggesting the program is appealing to landowners once they become aware of it.

Most alarming was the low level of acquaintance with sources of conservation information among random respondents. Because land decisions tend to be complex, lengthy, and infrequent, we might not expect most landowners to know detailed facts or have firsthand experience; however, it is paramount that landowners know where to turn for accurate information when a decision needs to be made. Our results suggest most do not have this awareness.

Respondent Characteristics Related to Conservation Awareness

Resident random respondents tended to have higher conservation awareness than absentee owners. Resident landowners may give more attention to the management and future planning of their land. We know many landowners primarily consider their forests as part of their home sites and resident landowners are daily reminded of the pleasures and responsibilities of their ownerships. Absentee owners may tend to be wealthier than resident owners, relieving some of the financial need driving some residents to consider TH or enrolling in CUTPs. Resident owners may know their neighbors and communities better than absentee owners, increasing their likelihood of knowing about conservation options through more robust local social networks.

Participant demographics revealed some important conservation awareness patterns. Neither age nor gender was associated with random respondent conservation awareness, but education level was positively associated with it. Significant differences in awareness (especially of CEs and EP) were detected between high school graduates and people who had graduated college or obtained education beyond college. Landowners with more formal education may be more familiar and comfortable with legal professionals who craft CEs and estate plans. These landowners may earn higher incomes, reducing their household's employment burden and freeing up hours and/or individuals to explore complex conservation options. Higher household income may also increase one's ability to pursue potentially costly conservation options, such as donating land or a CE or hiring an estate planner.

Land Characteristics Related to Conservation Awareness

The moderate positive association with CAI total score and acreage may be explained by the fact that larger acreages yield greater profits from TH, procure greater tax savings through CUTPs, and likely constitute more substantial family assets that motivate planning for future generations. This correlation was fairly weak, however, and it can not be assumed that large acreage owners are sufficiently aware of their options. Our results challenge the assumption that private forests will persist because the large acreage owners who control most of the forested landscape are especially well informed. In fact, many random respondents with large acreages were quite unaware of their conservation options. Increasing parcellation of large ownerships underscores the importance of educating owners of all acreages, especially small ones. Smaller acreages have fewer management options (fewer access options, less viable commercial timber volume, and diminished recreational values) and therefore edge closer to the ultimate decision to develop and convert from forest forever.

Our study indicates that land location may be relevant to conservation awareness level, with some towns having significantly higher mean conservation awareness than others. Spatially, CAI may relate to proximity to conservation activity (e.g., nearby CEs or TH) or amount of conservation land in a given area (e.g., number of acres in private easement or public conservation). The spa-

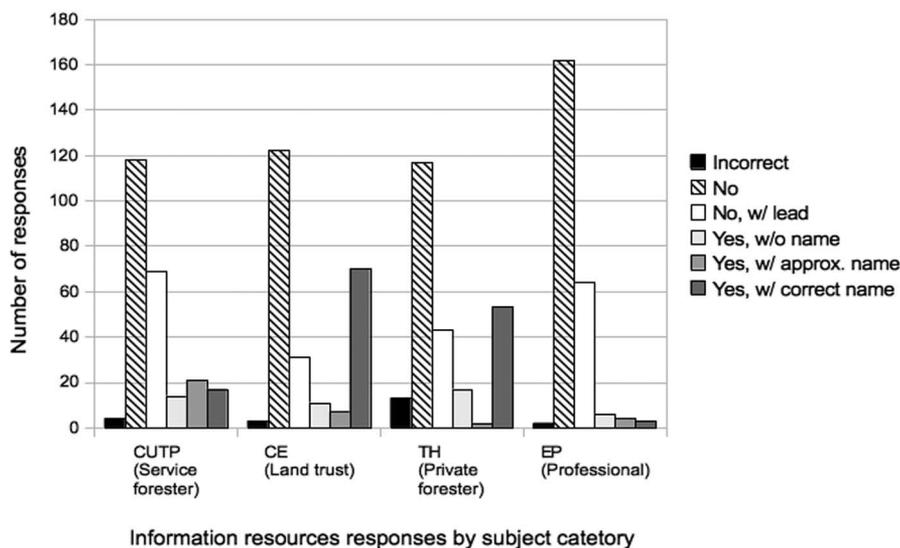


Figure 8. Random respondent acquaintance with sources of conservation information. Most random respondents were unacquainted with sources of information related to CUTPs (a service forester), CEs (a local land trust), TH (a private forester) and EP (an estate planner familiar with land conservation), and many did not indicate how they would find out about one ("no" versus "no, with lead").

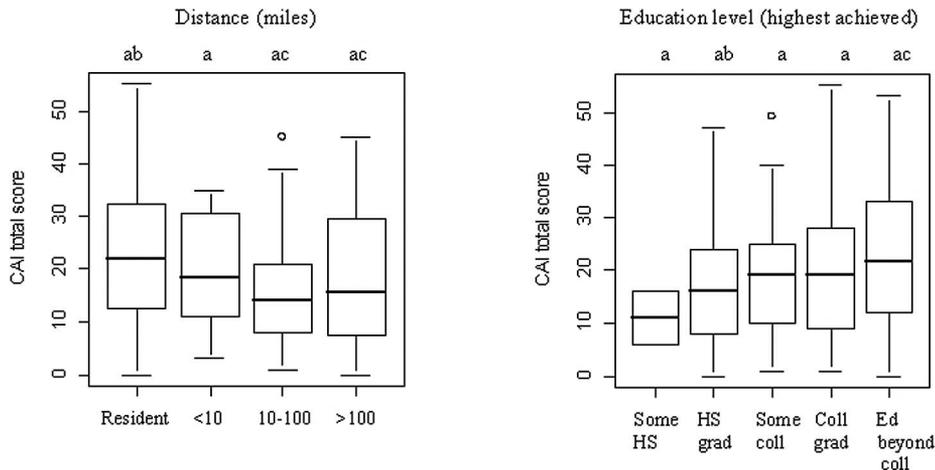


Figure 9. Random respondent characteristics related to conservation awareness. Living on one's land (resident) and achieving higher levels of education were associated with higher CAI total scores. Means with different letters are significantly different (Wilcoxon rank-sum test, $P < 0.05$).

tial relevance of CAI warrants much more investigation.

Study Implications and Future Applications

The CAI pilot deployment produced new, necessary information about family forest owner conservation awareness. Results indicate landowner conservation awareness is low, with the majority of random respondents in a fog about their land options. We have exposed critical information gaps (especially regarding CEs and EP) and discovered that acquaintance with sources of information is poor (especially with state service foresters and estate planners).

Our results suggest conservation awareness is not randomly distributed across the landscape. Future research should explore potential drivers of awareness, including spatial, social, economic, and political variables. Our CAI deployment illuminated landowner segments with especially low awareness, including absentee, small acreage, and less formally educated owners. These results may guide the development of targeted outreach to address the specific information needs of different landowner segments.

According to our results, private landowner outreach should incorporate peer learning, the Internet, and the interests of home-oriented landowners. Fewer than one-quarter of random respondents knew someone who had completed each conservation option and most did not know sources of information. Because landowners talk

with one another about land, periodic discussion forums should be organized to facilitate their exchange of experiences, questions, and concerns. In this setting, landowners become sources of information and support for one another (Snyder and Broderick 1992, Ma et al. in press). Random respondents indicated they would look for conservation information on the Internet, but very few provided specific websites. Web-based landownership resources should be developed to meet landowners where they are inclined to seek information. Because many random respondents considered their forests as features of their homes, more effective conservation outreach should appeal to homeowner interests and relate land care with home care information.

In the future, the CAI may be used to evaluate outreach outcomes and impacts. Assessing participant CAI before and after an outreach intervention may produce valuable data on program effectiveness and investment return. A fascinating extension of this application will be to investigate the diffusion of conservation awareness across the landscape and through social networks over time. Relating an individual or community's awareness level to behavior is a long-term research goal requiring longitudinal study. Although proconservation behavior is desirable, the more proximate objective is to empower informed decisionmaking among family forest owners.

This study confirms an urgent reality: family forest owners are largely unaware of conservation options that can assist them.

Although focusing a conservation message for landowners on the production of management plans may be effective for a documented small minority (Butler 2008), our results suggest that decades of prioritizing this approach through financial subsidies, cost sharing, and tax advantages is not effective at assisting most landowners. Too many of them neither have professionally prepared plans nor know where to turn for advice when faced with decisions about the future of their land. The CAI aligns with the interests and decisionmaking of most landowners and has the potential to improve how we understand and reach family forest owners across the United States. With the fate of forests and their benefits inextricably tied to the people who own them, estimating conservation awareness and responding strategically will be essential for achieving conservation success.

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Annex 2: Schnur et al.

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 wood-

land 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

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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

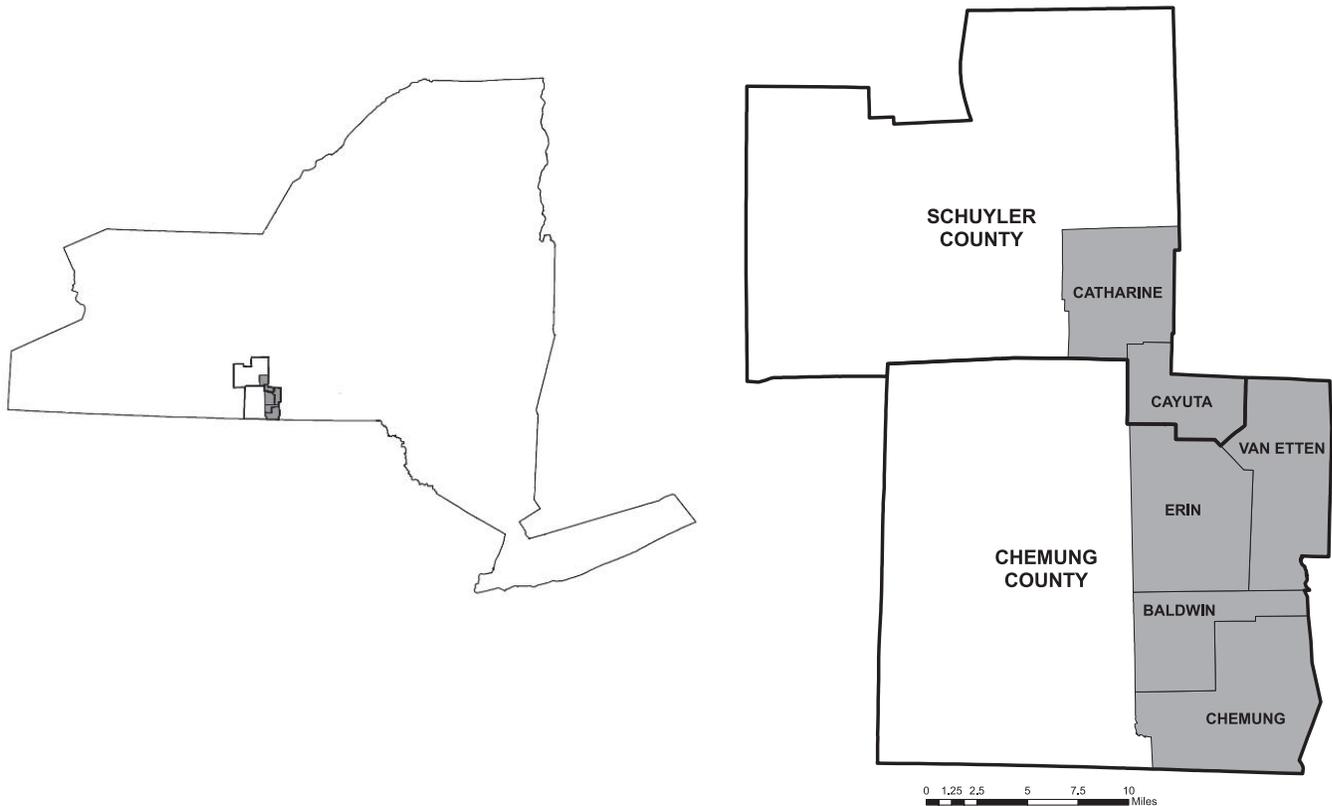


Figure 1. CAI New York study area, showing New York State and the six municipalities in Schuyler and Chemung counties.

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
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.

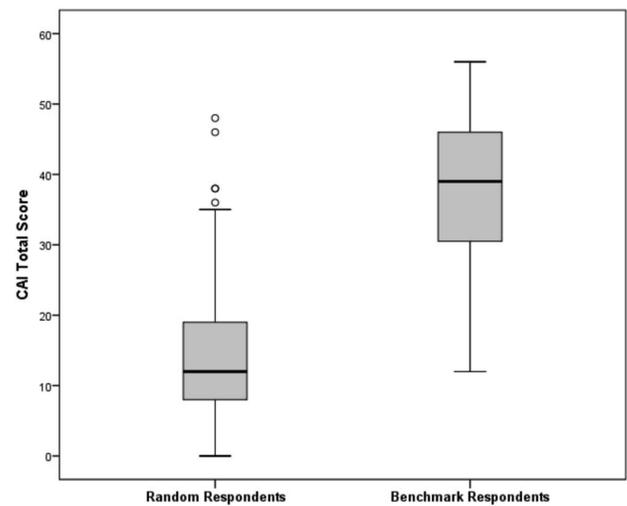


Figure 3. NY random and benchmark respondent CAI total scores. The CAI captured significantly different distributions of scores between the two samples (KS test, $D = 0.750$, $P < 0.001$).

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

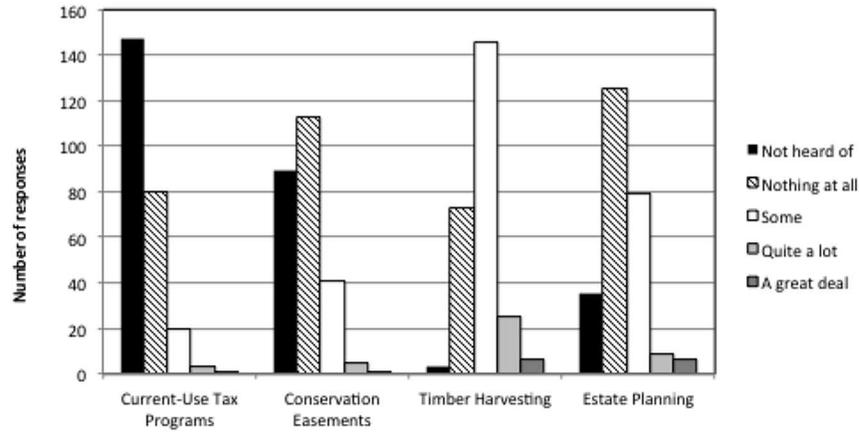


Figure 4. Random respondent familiarity with conservation options.

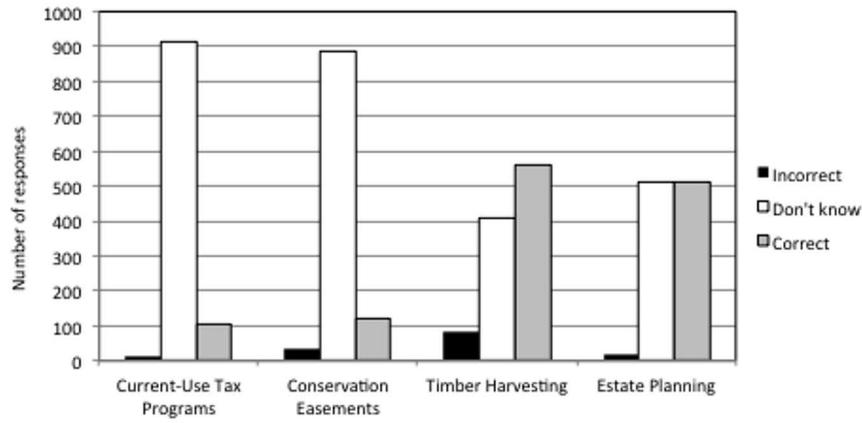


Figure 5. Random respondent knowledge of conservation options.

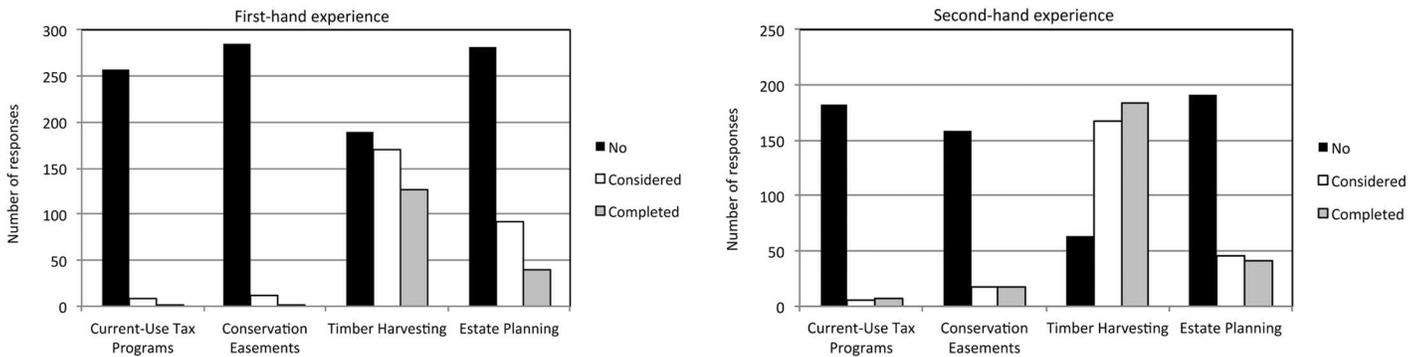


Figure 6. Random respondent experience with conservation options.

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

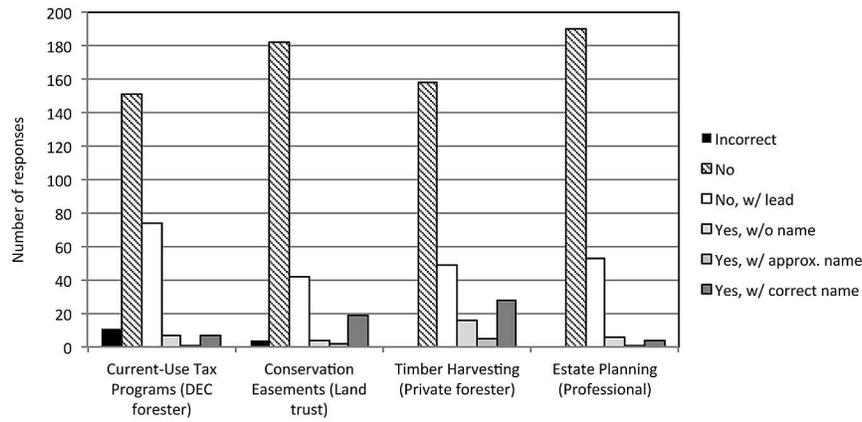


Figure 7. Random respondent acquaintance with sources of conservation information.

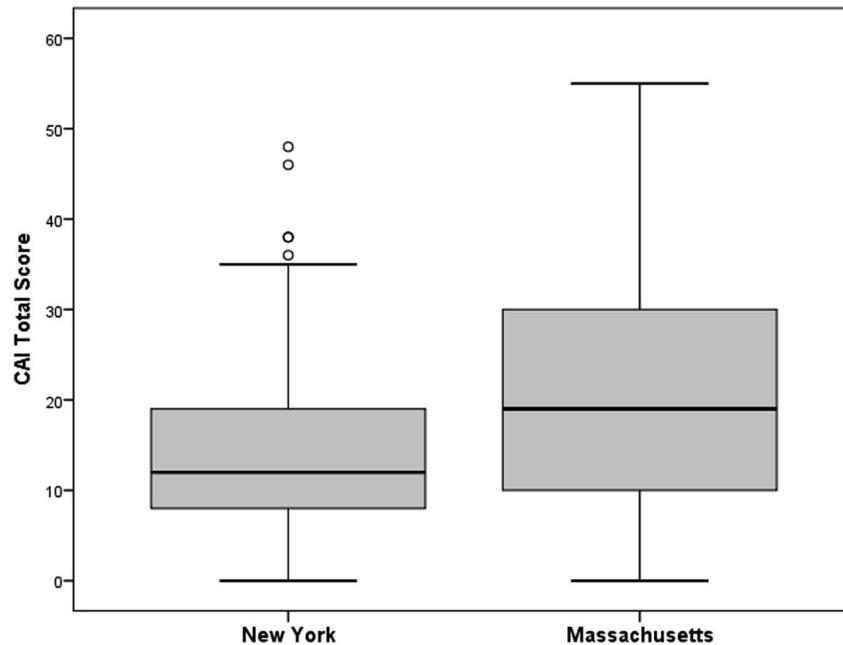


Figure 8. NY and MA random respondent CAI total scores. The CAI captured significantly different CAI total score means and distributions between NY and MA random respondents (WRS test, $P < 0.001$; KS test, $P < 0.001$).

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.

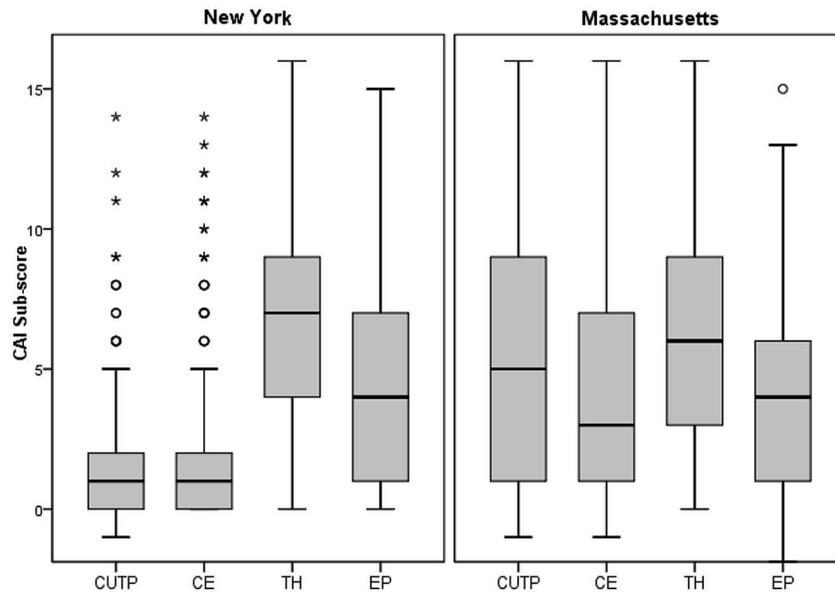


Figure 9. CUTP, CE, TH, and EP subscores for NY and MA random respondents. MA random respondents had significantly higher CUTP and CE subscores than NY respondents (WRS test, $P < 0.001$).

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 \pm SD (ac)	Median (ac)	Yes (%)	No/don't know (%)	Yes (%)	No (%)
Respondents	59.2 \pm 60.8	40	71.5	28.5	11.4	88.6
Nonrespondents	69.2 \pm 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 infor-

mation, 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.

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Annex 3: CAI Focus on 480-a

Conservation Awareness Index in the New York City Watershed: Does 480-a Eligibility Matter?

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January 2016

Purpose

At the November 2015 WAC Forestry Committee meeting, staff presented on Conservation Awareness Index (CAI) in the New York City Watershed. There was a question in the meeting about how CAI scores could be so low despite all the effort put into programs like the management plan program and conservation easements.

Staff suspected that the issue may relate to property size. This paper explores that possibility by splitting CAI responses based on eligibility for 480-a.

Why Might 480-a Eligibility Affect CAI?

CAI's minimum acreage to be surveyed was 10 wooded acres, but 480-a requires 50 contiguous wooded acres. Similarly, both conservation easements and timber harvesting often require larger acreages. Since part of the CAI score is based on landowners' actions, smaller-acreage landowners could have lower scores because their property size makes certain activities impossible.

Does 480-a Eligibility Affect CAI?

Yes. Landowners eligible for 480-a scored significantly better on CAI than those who weren't eligible (p-value < 0.001). Eligible landowners also scored significantly better on all 4 conservation decisions (Table 1).

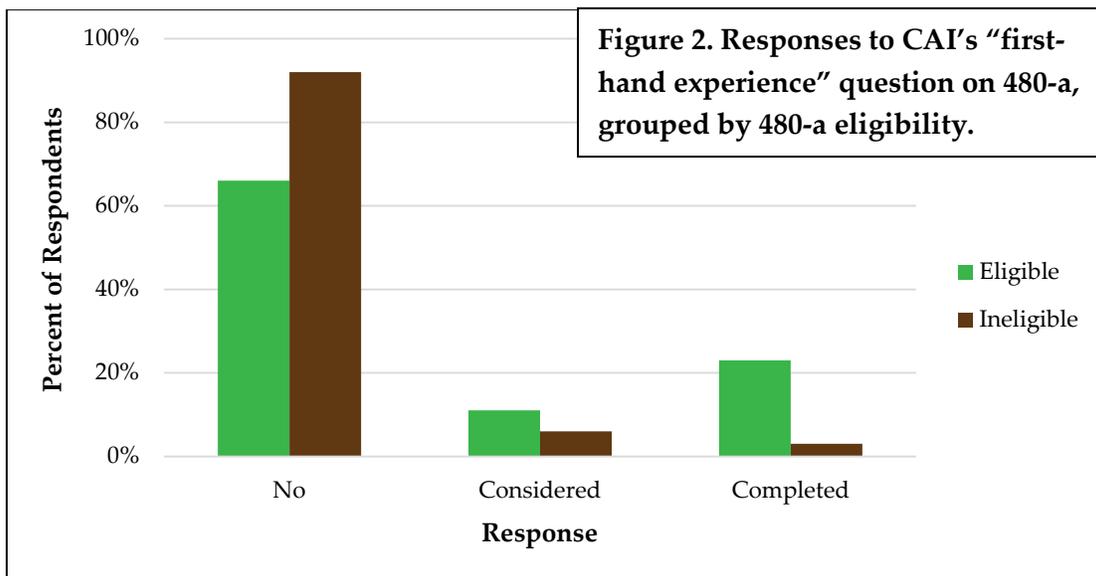
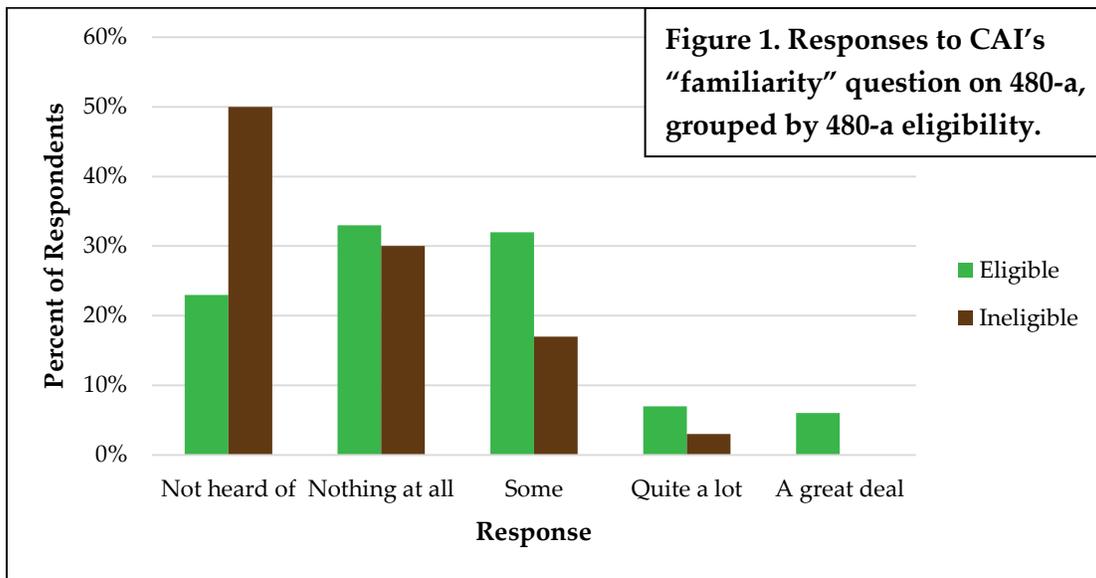
CAI Score Type	Median Score (480-a Eligible)	Median Score (480-a Ineligible)	p-value (anything < .05 is significantly different)
Total	19	12	< .001
480-a	3	1	< .001
Easements	3	1	< .001
Timber Harvesting	6	3	< .001
Estate Planning	6	5	.001

Table 1. Median CAI scores for NYC Watershed landowners eligible or ineligible for 480-a. Recall that CAI total scores have a maximum of 64, with each conservation decision having a maximum score of 16.

480-a eligibility mattered in particular for landowners' awareness of the 480-a program. Among eligible landowners, 56% reported that they either had "not heard of" or "knew nothing at all" about 480-a, compared with 80% of ineligible landowners (Figure 1).

Predictably, landowners who were ineligible for 480-a almost universally (92%) reported that they had no first-hand experience with it. Just 3% indicated they were in the program (Figure 2), which could result from minor errors in assessing who is eligible based on GIS or landowners owning larger properties outside the NYC Watershed.

By contrast, 23% of eligible landowners reported that they had enrolled in 480-a. This estimate is in line with GIS figures from county 480-a layers obtained from Delaware and Greene Counties.



Have WAC's Efforts Made a Difference?

Overall, WAC's CAI results mirrored those from Schnur et al. (2013), suggesting landowner education in the Watershed has been no better than in central New York. This generality breaks down, though, when we focus on larger properties. Schnur et al. reported no difference in 480-a CAI scores between landowners who were and weren't eligible for the program. We had the opposite result. This difference suggests that historic actions in the Watershed may have helped inform owners of larger parcels but were ineffective at reaching smaller landowners.

Although speculative, this reasoning makes sense for three reasons. First, most landowners own smaller parcels, and this distribution affects our sample. Our CAI response included 233 responses from 480-a eligible landowners, compared with 683 from ineligible owners.

Second, Watershed landowner outreach historically concentrated on larger properties. WAC's management plans, for instance, disproportionately went to owners with higher acreages. Less than 10% of Watershed landowners are eligible for 480-a, yet about 70% of WFMPs went to 480-a eligible landowners. Similarly, solicitation for easements under NYC's Land Acquisition Program focuses on properties with more than 200 acres (Joshua Gorman, pers. comm.).

Third, even among larger landowners, WAC's historic outreach tools—primarily management plans—were unable to reach a majority. WAC was able to produce about 80 plans per year, and each plan had a 10-year life, meaning WAC could keep current 800 plans at any given time. By contrast, the Watershed has approximately 2,600 landowners eligible for 480-a. Even ignoring the fact that some WAC plans went to 480-a ineligible landowners, WAC's total number of maintainable plans under its old system was less than a third of 480-a eligible landowners.

It comes as little surprise, then, that even in the NYC Watershed, a majority of landowners eligible for 480-a still know nothing about the program. Nor is it surprising that Watershed landowners have low CAI scores. Only with MyWoodlot's launch has the region gained a cost-effective tool to connect with Watershed landowners at a significant scale.

Far from raising concern about WAC's or the region's outreach efforts, the low scores from our CAI survey reinforce what we already knew: traditional management plans are ineffective at addressing the "144-Year Problem" described by Kittredge (2009). The results from our CAI survey add further credence to the Forestry Program's decision to abandon traditional management plans and focus on 480-a and MyWoodlot.

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Annex 4: Interpreting CAI Scores

Conservation Awareness Index: A New Cornerstone for Evaluating Forestry Program Landowner Education?

Supplemental Report: Interpreting CAI Scores

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May 2016

Purpose

The Watershed Forestry Program report *Conservation Awareness Index: A New Cornerstone for Evaluating Forestry Program Landowner Education?* was written to explain what Conservation Awareness Index (CAI) is and to inspire discussion about how the New York City Watershed region might use it to evaluate landowner outreach efforts. As that discussion has expanded, it has become necessary to look deeper into how CAI scores can be interpreted beyond the basic “higher is better.” The purpose of this supplemental report is to look into what different CAI scores mean and how they might change over time if outreach efforts are successful.

What Is a “Good” CAI Score?

With possible scores of -16 to 64, CAI offers a tremendous range for evaluating a landowner’s conservation awareness. But while a higher score is always better, the logical question can be asked: what is “good enough?”

Obviously there is some subjectivity in this question, and to date no published CAI study has attempted to answer it. What is included here is just that: an attempt that can be refined through future iterations of CAI.

Critical to keep in mind is that the goal of CAI is to assess landowners’ readiness to make informed conservation decisions. Thus, at the point where a landowner is able to make that decision—even if he or she chooses not to make it—that landowner can be considered to have a “good” CAI score.

To make an informed choice, familiarity and knowledge are musts. Therefore, to get a good CAI score, landowners should indicate that they know “quite a lot” about the conservation decision and be able to answer all four true/false questions correctly. These responses work out to a 3 on the Familiarity questions and a 4 on the Knowledge questions.

Because actually making the conservation decision is not part of the goal of CAI, landowners don’t need first-hand experience to get a good CAI score. However, given the importance of second-hand experience to motivating conservation decisions (see original CAI report under the section titled “Master Forest Owner Visits”), landowners should at least know someone who has considered the conservation decision. They should also have at least considered the decision themselves. Under the CAI scoring, these two responses work out to a score of 2 on the Experience questions.

Finally, landowners should know where they can go for professional help. They don't need the name of a specific individual, but they should know how to get that information (for example, contacting their local Department of Environmental Conservation office or using MyWoodlot.com). As a result, landowners only need a score of 1 on the Professional Contacts section to get a good score.

Combining these numbers, landowners should score a minimum of 10 out of 16 on each conservation decision. Over the entire CAI, a "good" score would thus be at least 40 out of 64.

Though arrived at through deduction, this "good" score aligns well with actual scores of benchmark landowners from other CAI studies. Schnur et al. (2013) reported that Master Forest Owners—volunteer landowners who receive training through Cornell University and then do outreach to other landowners—had average CAI scores of 38 out of 64. In Massachusetts, graduates of the Keystone Project—the state's equivalent of Master Forest Owner—scored on average 47 out of 64 (Van Fleet et al. 2012). Based on these results, a CAI score of 40 is a reasonable figure to aim for landowners to achieve.

Unfortunately, if 40 marks the minimum "good" CAI score, then both Massachusetts and New York have a long way to go. With average CAI scores for randomly selected landowners hovering in the 10-25 range depending on the study, forestry outreach still has a monumental task ahead to help landowners become aware of their conservation options.

Using the Good CAI Score to Assist Program Evaluation

While 40 provides a useful benchmark overall, the total CAI score is less useful from a program evaluation perspective. To make decisions, the Forestry Program needs to know where landowners have enough information and, more important, where they are struggling.

Fortunately, CAI makes this breakdown straightforward. Because we know the desired scores on each question type, we can look at individual CAI questions or conservation decisions and see whether landowners meet them. For instance, if we find that familiarity and knowledge of estate planning are high but that few landowners know anyone who has done it, we know that we can shift resources away from general estate planning outreach and focus on providing second-hand experience. For instance, we could hold woods forums on estate planning, recruit Master Forest Owners who have completed an estate plan, and write feature stories about those landowners for distribution on MyWoodlot and in other publications.

Being able to identify good CAI scores for each question will also help us watch for changes in response to outreach. Total CAI may not change significantly as a result of a brochure mailing about 480-a, but there may be a noticeable jump in the Familiarity and Knowledge questions in the Forest Tax Law section.

What Does “Success” Look Like When Using CAI As an Evaluation Tool?

Having determined that 40 is the benchmark for a “good” CAI score, the logical conclusion may be that “successful” outreach would yield CAI scores of 40 or above. While that may be a fine goal in the extreme long term, it is not achievable in the next ten years, even assuming perfect outreach.

Why is 40 not a useful success figure in the short run? The simple answer is that it takes time to build up awareness of any topic, let alone four complex conservation decisions. Even once that awareness is established, it can take months or years for a landowner to act on that awareness. In the New York City Watershed, for instance, it’s not uncommon for the easement process to take two years from initial contact to final closing. The landowner may well have perfect awareness of easements, but that landowner could receive a lower CAI score because they are still working through the process.

In the short run, then, successful CAI evaluations need not look to raise total scores to 40. Instead, merely seeing increases in the Familiarity and Knowledge sections of CAI would indicate success. These two sections are precursors to landowners taking action or learning about professionals, so it makes sense that they would increase first.

If in ten years the Forestry Program can raise Familiarity and Knowledge scores among Watershed landowners, the organization and the Watershed should count that as a remarkable success. Even if participation remains unchanged, this increased awareness will have set up the Watershed in the following ten years to focus on translating that knowledge into experience.

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