



# Landowner conservation awareness across rural-to-urban gradients in Massachusetts



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## ABSTRACT

In many parts of the eastern US, the provision of ecosystem services depends on private land. In these regions, decisions about land management and conservation made by private landowners can have significant effects on habitat and other ecosystem services. Advancing permanent conservation of land can be particularly challenging in dynamic rural-to-urban landscapes facing development pressures. We estimated private landowner “conservation awareness” using a mail survey instrument to assess relative familiarity, knowledge, and experience with various conservation and land management options. Conservation awareness differed significantly by town, implying hotspots and troughs of awareness, potentially leading to significant geographical variation in landowner decision-making and long-term conservation futures. We were surprised to find that conservation awareness did not necessarily diminish in more suburbanized environments of our study area. Higher conservation awareness was related to enhanced conservation social capital at the town level as well as relative affluence. We suggest that low conservation awareness could represent a precursor to or symptom of eventual land use change and hence loss of habitat. As a result, conservation efforts should focus not only on biophysical aspects such as habitat connectivity and rarity, but also on the conservation awareness of owners of private land.

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## 1. Introduction

Non-industrial private landowners own more than one-half of the forestland in the United States (Stein et al., 2009) and up to 75% of the forestland in much of the eastern US (Smith et al., 2009). On unprotected, privately owned lands, the cumulative effects of land use and management decisions (e.g., subdivision, timber harvest) shape the regional landscape. Subdivision and conversion of forestland is one of the leading threats to private forests and the ecosystem services they provide (Stein et al., 2009). There are several resources to help landowners make informed decisions about management and conservation options for their land. While factors shaping the use of these options have been studied in rural areas (e.g., Kilgore et al., 2008; Ma et al., 2012a,b; Rickenbach et al., 2011; Van Fleet et al., 2012), little is known about forest landowners’ knowledge and behavior in more quickly developing areas with higher real estate values. The future and success of conserva-

tion in these rural-to-suburban transition zones depends on a strong understanding of this disturbance regime and potentially relevant mediating interventions across the urban-to-rural gradient.

## 2. Threats to private forests and landowner decision-making

The continued provision ecosystem services from private lands is challenged by development pressures and the dynamic nature of ownership (Stein et al., 2009; Knight, 1999). For example, the average tenure in Massachusetts is approximately 25 years (Butler, 2008). As land tenure changes, parcels tend to be subdivided into ever-smaller physical pieces or into the possession of multiple family members, both of which complicate future land use decisions and opportunities for coordinated cross-boundary management (Rickenbach et al., 2011; Finley et al., 2006; Kittredge, 2005).

These landscapes are characteristic for the northeastern United States (Butler, 2008) and are also typical of the so-called urban-rural interface that surrounds major metropolitan areas. These areas experience sprawl and often unplanned suburban and exurban growth (Stein et al., 2005). Social (demographics), political

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(local zoning), and economic (real estate values) factors combine to strongly influence the land use change trajectory in these areas from rural and undeveloped towards suburban or urban.

In response to this threat, Foster et al. (2010) call for the permanent protection of 70% of the remaining forest in the New England region (i.e., six northeastern states that vary widely in their degree of development) primarily through the use of conservation easements or restrictions on private land. Rissman et al. (2007) also describe ways that biodiversity could be protected on private lands through easements, and provide some cautionary notes on their use, and Meyer et al. (2014) describes the use of easements for conservation in northern New England states (Maine, New Hampshire and Vermont), in contrast to the three southern New England states (i.e., Massachusetts, Connecticut, and Rhode Island) with much higher degrees of development, and proximity to significant urban areas (Boston, New York City).

In addition to conservation easements, several other policy and legal tools exist to help prevent subdivision and promote voluntary forest conservation on private land (Kamal et al., 2014). For example, many U.S. states have property tax programs that provide financial incentives for protecting land; estate planning can facilitate the passage of land to future generations and avoid sell-off for tax purposes; and sustainable timber harvest can provide income to support ownership expenses.

Forest landowners are a diverse group with management practices linked to a variety of socioeconomic, demographic, and lifestyle characteristics (e.g., Erickson et al., 2002; Kendra and Hull, 2005; Kilgore et al., 2008; Raymond and Brown, 2011; Stevens et al., 2002). According to the theory of planned behavior, knowledge and training can influence beliefs and behavior (Ajzen, 1991). Thus, knowledge and awareness of these ‘conservation tools’ is necessary (though not sufficient) for the utilization of these options. It follows that the likelihood of decisions and actions that keep forest parcels (and ecosystems) intact is higher when landowners are aware of their conservation options and make informed decisions.

Recent studies of landowner attitudes and behaviors indicate that other peer landowners and local social connections can influence landowners’ knowledge and decision-making about their land. Rickenbach et al. (2011) discussed the need for informed “spanners” to connect landowners with needed information. Butler (2008) showed evidence of landowners relying on social sources of information (e.g., other landowners) rather than static written or electronic information. Landowner associations have been proven to be another effective way to disseminate information, both to members and non-members (Rickenbach, 2009). In some cases, landowners have shown a reluctance to work with trained professionals due to perceived arrogance, dissimilar management goals or philosophies, or matters of trust (Gootee et al., 2010) thus making more informal, social means of information gathering preferable. However, it can be challenging for landowners to find opportunities for information through informal, non-official, word-of-mouth channels. Opportunities for landowners to meet and exchange information and experiences with one another have been shown to be effective arenas to overcome these obstacles of trust and informal channels (Ma et al., 2012a,b). Informal landowner social networks have been documented as effective means by which conservation information is transferred (e.g., Kittredge et al., 2013; Sagor and Becker, 2014).

Areas that have strong formal and/or informal networks for transferring information about conservation can be viewed as having strong conservation social capital. Lin (2001) defines the concept of social capital as “resources embedded in social networks accessed and used by actors for actions.” Social capital is said to “enhance the outcome of actions” (Lin, 2001) by facilitating the flow of information and Putnam (2000) provides a wealth of

examples of how the quality of life is higher in communities where such social capital is abundant. Beyond the flow of information itself, social ties may lend credence or emphasis to the information, reinforcing its value or relevance. Social connections through capital also reinforce the information by seeing it or hearing it in different ways and contexts.

To better understand how the potential for conservation varies in areas with different patterns of development, we assessed forest landowners’ familiarity, knowledge, and experience with conservation tools and examined how this knowledge varies across rural to urban areas. Given the importance of social capital in decision-making, we also examined the extent to which towns in our study region have conservation social capital and the relationship between landowners’ awareness of conservation options and the conservation social capital in their town.

### 3. Study region and context: forests and forest owners in urban, suburban, and rural Massachusetts

Our study system includes 19 towns located along two 100 km transects that stretch westward from Boston, Massachusetts (Fig. 1). The transects were originally established as part of an earlier study of urban land use change and corresponding biophysical effects (e.g., Hutyra et al., 2011; Raciti et al., 2012). Development patterns, land uses, and human communities vary along the transects, providing an excellent opportunity to investigate the differences in conservation awareness among towns of varying densities, land uses, and degrees of development.

#### 3.1. Forests and forest owners in Massachusetts

Massachusetts is the third most densely populated state in the United States, and is at the northern end of the largely urban corridor that extends from Boston to Washington, DC. It is estimated that approximately 63% of the Massachusetts landscape is covered by forest (Smith et al., 2009), and 70% of it is owned by private families and individuals (Kittredge et al., 2008). Periodic analysis of land cover data shows that in Massachusetts as a whole, between 1981 and 1987, 21 hectares/day of open space were lost to development (MAS, 2014). By 1999, this had slowed to an estimated 18 hectares/day, and more recently in 2009 that conversion was estimated to be 9 hectares/day.

For ownerships of 1.2 or more hectares, mean size ranges from 4.7 ha (SE = 0.08) in the eastern third of the state, to 8.2 ha (SE = 0.17) in the central, and 9.9 ha (SE = 0.15) in the western portion of the state (Kittredge et al., 2008). This shift in ownership size from the more suburban east (i.e., near Boston) to the more rural western part of the state is coincident with lower population densities and a less developed landscape. For purposes of our study, we consider conservation on private lands in ownerships of 4 hectares (10 acres) or greater. Smaller ownerships are ineligible for some state and federal conservation programs, and 4 hectares is thought of, conventionally in forestry, as being the minimum viable unit of management. The average size for ownerships of 4 or more hectares in Massachusetts is 15.5 hectares.

Forest owners in Massachusetts show a consistently strong interest in appreciative, non-consumptive benefits from their land. Repeated studies show they place a high priority on privacy, aesthetics, recreation, wildlife, and nature protection over timber harvest and management (Belin et al., 2005; Finley and Kittredge, 2006; Finley et al., 2006; Rickenbach et al., 1998). In spite of professing little interest in harvesting or timber income, data indicate that some owners have timber harvested from their land (McDonald et al., 2006). Likewise, though they profess interest in wildlife and nature, private land is lost to development each year.

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