



Original Article

Emerald ash borer impacts on visual preferences for urban forest recreation settings



Arne Arnberger^{a,*}, Ingrid E. Schneider^b, Martin Ebenberger^a, Renate Eder^a, Robert C. Venette^b,
Stephanie A. Snyder^c, Paul H. Gobster^c, Ami Choi^b, Stuart Cottrell^d

^a Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences, Vienna, Austria

^b University of Minnesota, USA

^c USDA Forest Service, Northern Research Station, USA

^d Human Dimensions of Natural Resources, Colorado State University, USA

ARTICLE INFO

Keywords:

Cultural ecosystem services

Forest insects

Recreation

Trail preferences

Urban forestry

ABSTRACT

Extensive outbreaks of the emerald ash borer (*Agrilus planipennis*; EAB), an invasive forest insect, are having serious impacts on the cultural ecosystem services of urban forests in the United States and other countries. Limited experience with how such outbreaks might affect recreational opportunities prompted this investigation of visitors to a state park in St. Paul/Minneapolis, Minnesota, USA, where EAB damage is occurring. A photo-questionnaire solicited visitors' visual preferences for trail environments in a discrete choice experiment. Systematically manipulated digital images simulated different levels of EAB impact in combination with other physical and social attributes including trail-proximate EAB-related forest management responses, land use context of the viewscape beyond the trail environment, visitor types, and visitor densities. Results indicated that EAB impacts were significant but of lesser importance than surrounding viewscape development and visitor numbers. Specifically, respondents preferred dense trailside shrub vegetation and low trail user numbers and disliked viewsapes showing city buildings and removal of most ash trees. Results suggest that trail planning should not only consider near-view landscape impacts but also the visual quality of more distant viewsapes, and that urban forest managers need to be aware of how forest insect impacts and subsequent management responses affect recreation setting preferences.

1. Introduction

Urban forest managers today face an increasingly diverse array of land use goals and problems with both ecological and social dimensions. One such problem concerns invasive forest insect outbreaks, which have increased globally due to climate change, trade, and other factors (Herms and McCullough, 2014; Raffa et al., 2008; Straw et al., 2013). Of recent outbreaks, the emerald ash borer (*Agrilus planipennis*; EAB), a beetle native to Asia, is widely regarded as one of the most destructive forest pests ever seen in North America, where it has killed more than 10 million ash trees (*Fraxinus* spp.) since it was first identified in the mid-1990s (McCullough and Osborne, 2014; Kovacs et al., 2011). By 2016, EAB had spread to 28 US states (USDA Animal and Plant Health Inspection Service, 2016) across a number of land use types, including urban landscapes. In certain Michigan and Ohio sites,

EAB killed over 99% of the ash within a decade of its arrival (Klooster et al., 2013). Similarly, its projected impact in south-central and eastern Europe reveals an urgent need to address EAB management there (Straw et al., 2013; Valenta et al., 2015).

The ecological impacts of EAB have received much attention by urban forest researchers, but less is known about its social impacts, particularly on cultural ecosystem services such as recreation, tourism, and scenic beauty (Daniel et al., 2012; Jones 2016). Within this context, we know little about how EAB impact might influence urban forest visitors' recreation site preferences and choices. Thus, the question arises as to how accepting visitors are to changes in the forest landscape associated with EAB-impacts and concomitant management approaches. Even less is known about the magnitude of EAB impacts to visitor landscape preferences relative to other factors such as the land use context of the surrounding viewscape or the social aspects of

* Corresponding author at: Institute of Landscape Development, Recreation and Conservation Planning, Department of Spatial, Landscape and Infrastructural Sciences, University of Natural Resources and Life Sciences, Vienna, Austria.

E-mail addresses: arne.arnberger@boku.ac.at (A. Arnberger), ingridss@umn.edu (I.E. Schneider), martin.ebenberger@boku.ac.at (M. Ebenberger), renate.eder@boku.ac.at (R. Eder), venet001@umn.edu (R.C. Venette), stephaniesnyder@fs.fed.us (S.A. Snyder), pgobster@fs.fed.us (P.H. Gobster), choix667@umn.edu (A. Choi), Stuart.cottrell@colostate.edu (S. Cottrell).

<http://dx.doi.org/10.1016/j.ufug.2017.08.004>

Received 2 February 2017; Received in revised form 27 July 2017; Accepted 8 August 2017

Available online 24 August 2017

1618-8667/ © 2017 Elsevier GmbH. All rights reserved.

recreation such as crowding. To date, visitor trade-offs between biophysical characteristics, site management attributes, viewscales, and social factors have not been investigated in the context of EAB-impacted urban recreation landscapes. The few existing preference studies that do combine physical and social aspects of recreation areas have found that recreationists simultaneously integrate many of these factors in their site choices (Arnberger and Eder, 2015; Manning, 2007; Santiago et al., 2016; Van Riper et al., 2011). Therefore, stated choice approaches such as discrete choice experiments (DCE) (Louviere et al., 2000), which allow for the evaluation of multiple attributes simultaneously, are useful to examine preferences that visitors hold for varying levels of EAB impact, management practices, and spatial and social aspects of recreational areas. Unlike conventional univariate preference studies, a DCE approach allows the analysis of trade-offs among these forest recreation-related factors as visitors have to balance a complex set of physical and social factors to identify their most preferred forest trail setting. Gaining an understanding of relative preferences for urban recreation sites attributes can inform managers about how to address the recreational utility and quality of a site while managing for EAB.

This study employed an image-based DCE to simulate forest stands with varying levels of EAB outbreaks, different forest management practices, viewscales, and varying visitor uses to investigate forest visitors' visual preferences. Given the coupling of increasing infestation related to climate change and declining resources for urban forestry (Krajter Ostoic and Konijnendijk van den Bosch, 2015), understanding the relative importance of EAB infestation to recreation experiences is essential to inform resource allocation and management decisions of urban foresters and recreation managers. In this study, the term urban forests refers to trees in wooded areas in parks and preserves in an urban area. In addition to this methodological foundation, this study is also conceptually rooted in the psychophysical approach to landscape preference assessment (Daniel and Boster, 1976; Zube et al., 1982) and in socio-psychological theories of leisure dealing with crowding and user conflict (Jacob and Schreyer, 1980; Shelby and Heberlein, 1986).

1.1. Forest landscape preferences

Research on forest aesthetics finds people generally prefer trails within a landscape of mature trees and forest stands with an open structure (Edwards et al., 2012; Ribe, 1989; Ryan, 2005). Larger and near-view clearcuts, dense understory vegetation, high densities of small even-aged trees of the same species, fallow-appearing settings, and the presence of dead wood from timber harvesting or natural processes can negatively affect visitor preferences and associated perceptions of scenic beauty, management acceptability, and/or personal safety (Arnberger and Eder, 2015; Bjerke et al., 2006; Edwards et al., 2012; Hauru et al., 2014; Jorgensen et al., 2002; Ribe, 1990; Ryan, 2005; Tyrväinen et al., 2003). These forest preferences are not always homogeneous. van der Wal et al. (2014) found that the majority of their participants indicated a preference for intermediate to dense understory based on photographs of different forest stands in the UK. Edwards et al. (2012) suggest that preference is highest where understory density is neither very low nor high.

Although several studies have addressed the aesthetic consequences of insect infestations in coniferous forests (e.g. Buhyoff and Leuschner, 1978; McGrady et al., 2016), little is known about the influence of invasive insects on deciduous trees or associated forest management interventions on visitors' visual preferences (Sheppard and Picard, 2006). Landscape preference studies in the context of insect-impacted coniferous forests show public dislike of beetle activity (Buhyoff et al., 1986; Buhyoff and Leuschner, 1978; Sheppard and Picard, 2006). Research on gypsy moth infestation revealed an increased preference for broadleaved forest landscapes experiencing around 30–40% tree mortality, but a sharp decrease in preference for landscapes with higher mortality rates (Hollenhorst et al., 1993).

A range of urban forest management practices exist to treat insect infestations that are relevant to EAB depending on urban forest policy and budgets, progress of EAB infestation, and safety issues. If trees along trails are only slightly impacted by EAB, managers may decide to leave the trees as long as they pose no hazard to visitors, while continuing to monitor for potential safety hazards in the future. If trees are heavily impacted, the main strategy is removing trees along trails and recreational facilities if they pose a hazard to visitors because of falling dead trees or limbs (USDA Forest Service, 2011). For impacted trees not directly bordering the trail, managers may rely on sanitation cutting by removing only infested ash trees to avoid the further spread of the EAB. If infestation persists, larger open patches will eventually result in the forest because of permanent thinning of ash trees (Ryan, 2005).

Urban forestry strategies to reestablish a forest after an insect infestation include planting or reliance on natural succession. Planting considerations depend on timber production goals or the consideration of reestablishing larger trees within a short time. In the latter case, foresters plant new trees of several meters in height and fix these with a stake. This is a rather costly approach compared to natural rejuvenation. Further, forest management response decisions to insect infestation include whether and how much dead wood and cut trunks should be removed (Ryan, 2005). As such, the question arises as to which visual impacts associated with EAB management strategies and practices do urban forest visitors most and least prefer? Previous research reveals forest visitors have varying preferences for forest management practices in response to forest-insect impacts (Edwards et al., 2012; Gundersen and Frivold, 2008; Ribe, 1989, 1990; Ryan, 2005; Schlueter and Schneider, 2016). Schlueter and Schneider (2016) found five of the eight management approaches presented were acceptable to Minnesota state park visitors while the most acceptable were wood regulations, sanitation cutting, and progressive thinning. Three treatments were deemed unacceptable by the public visitors: chemical treatment, complete harvest, and doing nothing.

1.2. Viewscape preferences

While the immediate forest landscape is of concern to site managers and recreationists, it must also be recognized that the character of the viewscape surrounding a recreation site can also influence landscape preferences or trail choices. A viewscape or viewshed is a delineation of the totality of landscape elements visible from a given vantage point (Wilson et al., 2008) and with regard to this study refers specifically to the land uses visible beyond the immediate trail and associated forest environment of the recreation site. Previous studies have analyzed the visual permeability through vegetation (Herzog and Kutzli, 2002; Bjerke et al., 2006; Jorgensen et al., 2002; Tyrväinen et al., 2003) and identified the visual magnitude or sensitivity of landscape exposed to visitors as a function of distance and topography (Chamberlain and Meitner, 2013; Wilson et al., 2008). To date, few landscape preference studies have examined how visitor evaluations of forest settings are affected by what is seen in the surrounding viewscape (Ryan, 2005). Even less work has addressed the importance of viewscales in terms of visibility of near or far-view city scenes with high-rise residential structures or natural scenes for trail choices of urban recreationists compared to other social and physical characteristics of the trail environment (e.g., Wilson et al., 2008).

Visual impact assessment studies have predominantly found that landscape preferences decrease with increasing degrees of urbanization and that viewscales with buildings are less preferred than more natural ones (Dupont et al., 2016; Kaplan and Kaplan, 1989). Ryan (2002) assessed the visual impacts of urban sprawl on rural residents and found they perceived views of nature and nearby hills, woods, open fields, roadside vegetation and farms as extremely important to rural character compared to suburban residential categories and country roads. Similarly, Williams (2011) examined the public acceptance of rural land

Download English Version:

<https://daneshyari.com/en/article/6461740>

Download Persian Version:

<https://daneshyari.com/article/6461740>

[Daneshyari.com](https://daneshyari.com)