Journal of Forest Economics 19 (2013) 61–77

Contents lists available at SciVerse ScienceDirect

Journal of Forest Economics

journal homepage: www.elsevier.de/jfe

Heterogeneous nonmarket benefits of managing white pine bluster rust in high-elevation pine forests

James R. Meldrum [a,*], Patricia A. Champ [b], Craig A. Bond [c]

[a] Institute of Behavioral Science, University of Colorado, Boulder, CO, United States
[b] USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO, United States
[c] Rand Corporation, 1200 S. Hayes St, Arlington, VA 22202-5050, United States

ARTICLE INFO

Article history:
Received 3 November 2011
Accepted 24 October 2012

JEL classification:
H40
Q23
Q51

Keywords:
Invasive species management
Attitudes
Nonmarket valuation
Contingent valuation
Cluster analysis
Factor analysis

ABSTRACT

This article describes a nonmarket valuation study about benefits of managing the invasive disease white pine blister rust in high-elevation forests in the Western United States. Results demonstrate that, on average, households in the Western United States are willing to pay $154 to improve the resiliency of these forests. Factor analysis shows that long-run protection of the forests dominates recreation in motivating support. Cluster analysis suggests three groups of survey respondents: those indifferent to the program and not willing to pay, those wanting to protect the future of the high-elevation forests, and those wanting to protect both the forests and related recreational opportunities.

Introduction

As the rate and extent of global travel and trade has increased over the past century, so too has the threat posed by non-native species to the ecological sustainability of many forested ecosystems (Holmes et al., 2009; Liebhold et al., 1995). Each year, invading alien species cause approximately $120 billion in costs and losses to agriculture, forestry, and public health in the United States, $4.2 billion of which is due to losses in timber value alone (Pimentel et al., 2005). Nonmarket impacts, not included in these estimates, are likely even greater (Holmes et al., 2008, 2009; Kramer et al.,

* Corresponding author at: Institute of Behavioral Science, University of Colorado at Boulder, Box 483 UCB, Boulder, CO 80309-0483, United States.
E-mail address: james.meldrum@colorado.edu (J.R. Meldrum).

1104-6899/$ – see front matter
http://dx.doi.org/10.1016/j.jfe.2012.10.001

2003; Rosenberger et al., 2012, Appendix C). Though these losses clearly are substantial, resources for managing forests are constrained, and government agencies carefully weigh whether the benefits of potential management options justify the costs. For example, in response to a variety of threats to whitebark pines, the Natural Resources Defense Council recently petitioned to have the species listed under the protection of the Endangered Species Act. The U.S. Fish and Wildlife Service reviewed the case and announced that although "there is sufficient scientific and commercial data to propose listing throughout its range," it will devote its resources to other priorities at this time (U.S. Fish and Wildlife Service, 2011). Another important consideration when weighing forest management options is public acceptance.

One of the most serious threats facing the whitebark pine is the disease white pine blister rust (WPBR). This disease is caused by the non-native fungus *Cronartium ribicola*, which threatens the high-elevation white pine species collectively known as five-needle pines. The fungus was introduced to Vancouver, Canada, in the early 20th century and now has spread across much of the natural range of high-elevation forests in Western North America (Burns et al., 2008; Liebhold et al., 1995). These forests include some of the oldest living organisms on Earth and are associated with many important ecosystem services, including wildlife habitat, watershed regulation, and recreational opportunities (Mattson et al., 1992; Petit, 2007; Robbins, 2010; Samman et al., 2003; Tomback and Kendall, 2001; U.S. Fish and Wildlife Service, 2011).

Though mountain pine and other bark beetle outbreaks have received substantially more press in recent years in the Western United States, WPBR has the potential to be more damaging to the long-run health of high-elevation forests. The disease impairs a forest's natural ability to recover from disturbances, including the native beetle outbreaks. It degrades forest resiliency by attacking white pines at all life-cycle stages (Burns et al., 2008; Logan and Powell, 2001). Further, the fungus likely will continue to spread regardless of attempts at either eradication or containment, due to a complex lifecycle involving multiple hosts and airborne dispersal (Liebhold et al., 1995; Maloy, 1997). The slow growing cycles of high-elevation white pines mean that the chances of success for any potential treatment plans will not be known for many years (Burns et al., 2008; Schoettle and Sniezko, 2007). However, treatments focused on increasing the frequency of genetic rust resistance across the high-elevation forests' range show promise for improving the forests' resiliency to the disease (Bond et al., 2011; Burns et al., 2008; Kinloch, 2003; Samman et al., 2003; Schoettle and Sniezko, 2007; Schwandt, 2006).

Thus, government agencies recognize the problems facing high-elevation white pine forests, and knowledge about treatment options exists. However, proposed resilience-based treatments for WPBR are costly (Burns et al., 2008; Schoettle and Sniezko, 2007), and as with many invasive species issues (Holmes et al., 2008), there is little understanding of the social benefits of such treatments. Though many aspects of market and nonmarket values related to managing forests have been studied extensively (see Sills and Abt, 2003; Barrio and Loureiro, 2010 for a broad introduction), a gap remains in the literature for information directly pertinent to the context of WPBR management in nontimber forests. Specifically, although numerous valuation studies over the past few decades have addressed the nonmarket values related to managing forest pests, including several studies pertaining to invasive insects (e.g., Haefele et al., 1992; Holmes and Kramer, 1996; Jakus and Smith, 1992; Miller and Lindsay, 1993; Moore et al., 2011), very few studies address the effects of forest diseases or pathogens.

This study fills that gap, using contingent valuation (CV) to estimate the public benefits of managing the invasive species causing WPBR in high-elevation five-needle pine forests. As such, it presents the first nonmarket valuation of the benefits of managing a forest invasive fungus, and the first nonmarket valuation of managing a forest invasive species in the Western United States. Recent research (e.g., Bestard and Font, 2010; Hynes et al., 2011) recognizes that CV, rather than attribute-based choice experiment approaches, is more appropriate for holistically valuing a policy, particularly when the policy will be implemented across a large spatial scale. In addition, the CV methodology is well-established, and a precedent for its use in nonmarket research, policy decisions, and Natural Resource Damage Assessment has been set (Boyle, 2003; Carson et al., 2001; Rosenberger and Smith, 1997).

This study also incorporates measures of relevant attitudes into the estimation of willingness to pay (WTP) using factor and cluster analysis. Attitudes toward forest health, disturbance, and the management thereof vary substantially across society yet are not well understood (Flint et al., 2009; McFarlane