Journal of Forest Economics 21 (2015) 32–50

Contents lists available at ScienceDirect

Journal of Forest Economics

journal homepage: www.elsevier.com/locate/jfe

Valuing type and scope of ecosystem conservation: A meta-analysis

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ARTICLE INFO

Article history:
Received 23 August 2013
Accepted 12 December 2014

JEL classification:
Q57
Q51
Q24

Keywords:
Conservation economics
Willingness to pay
Meta-analysis
Preservation
Ecological restoration
Ecosystem services

ABSTRACT

Ecosystem conservation programs are increasingly incorporating both preservation and restoration strategies for ensuring the flow of ecosystem services from public lands. While preservation and restoration have similar end ecological objectives, differences in these conservation types may create systematic variation in willingness to pay (WTP) for their benefits. There has also been conflicting evidence of whether or not the amount, or scope, of conservation influences the demand for environmental improvements in manners consistent with neoclassical economics (greater value for more conservation). To investigate the sensitivity of conservation values to type and scope, we conducted a meta-analysis of existing evidence. We synthesized 127 data points from 22 primary studies that provided WTP estimates for preservation, forest restoration, and freshwater restoration conducted primarily on public lands. Estimates were derived from choice experiments, contingent rankings, and dichotomous choice contingent valuation studies for conservation programs in Europe, Canada, and the U.S. from 1987 to 2013. We found strong evidence for systematic variation of WTP depending on conservation type and scope. Values for preservation were greater than both forest and freshwater restoration; and freshwater restoration was valued greater than

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http://dx.doi.org/10.1016/j.jfe.2014.12.001

forest restoration. Meta-estimates were found to be sensitive to scope effects, as value increased with conservation intensity but at diminishing marginal rates. We provide quantitative policy analysis in the form of within-sample predictions of mean WTP for each conservation type and scope and conclude with recommendations.

Introduction

Conservation efforts on public lands are increasingly centered on holistic approaches that maintain and repair networks of connected ecosystems. Because many public lands have been degraded by past industrial extraction however, ecosystem conservation efforts are now comprised of both preservation and ecological restoration strategies.[1] Together, these conservation strategies aim to maintain or improve ecosystem structures, processes, and functions that ultimately produce biodiversity, clean drinking water, raw materials, recreational opportunities, and other services beneficial to humans. The myriad values that people hold for nature are tied to, and can be classified as diverse flows of services that ecosystems provide to mankind. These ecosystem services include provisioning services, such as timber for houses and other commodities, but are substantially comprised of non-market services such as climate regulation, provision of biodiversity, and spiritual inspiration (Pagiola et al., 2004). To the extent that decision criteria derived from economic paradigms (e.g., efficiency, or maximization of net present value) dominate planning and funding of public lands management, it is imperative that information derived from commodity and other markets are augmented with suitable information about the value of non-market goods and services provided by pristine or restored ecosystems. This broader ecosystem conservation approach requires novel scientific methods for understanding the impacts and benefits (Garber-Yonts et al., 2004).

Because values for changes in ecosystem services are not easily ascertained from market transactions, non-market valuation techniques are required. Stated preference methods are well suited for determining the demand and implicit prices for ecosystem conservation and changes in the production of services that result, due to their ability to capture existence and bequest values. However, the vast and often conflicting array of willingness to pay (WTP) estimates for ecosystem services, the cost of primary studies, and the need for timely availability of relevant estimates underscore the importance of meta-analyses. Meta-analysis provides a means to statistically quantify and integrate evidence from multiple primary studies of similar phenomena (Glass, 1976). Meta-regression analysis, or the regression of regressions, has been the preferred choice of quantitative syntheses in economics due to the ease of replication and sensitivity analysis of alternate model specifications (Stanley and Jarrell, 1989). Best practices for meta-analysis techniques in environmental valuation have been explored in general (Nelson and Kennedy, 2009) and more specifically for non-market valuation (Smith and Pattanayak, 2002). While there are a handful of meta-analyses that have synthesized willingness to pay estimates for individual or subsets of ecosystem services associated with preservation or restoration of certain ecosystem types, (e.g., Van Houtven et al., 2007; Lindhjem, 2007; Latinopoulos, 2010; Ojea and Loureiro, 2011), there have been no meta-analyses focused on synthesizing willingness to pay for various ecosystem conservation strategies. Additionally, there is mixed evidence as to the sensitivity of willingness to pay estimates to the amount of conservation. These two primary research interests need further assessment: (1) how the type of conservation (i.e., preservation or restoration) influences

[1] Ecological restoration refers to the re-establishment of the characteristics of an ecosystem that were prevalent before degradation. It involves the removal or amelioration of the factor causing environmental degradation and the re-establishment of key ecosystem components to influence the rate and direction of recovery (Benayas et al., 2009). Preservation is more of a hands-off approach and specifically refers to making land unavailable for development and exploitation.