Land Use Policy 58 (2016) 218–233

Contents lists available at ScienceDirect

Land Use Policy

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

The role of wildlife-associated recreation in private land use and conservation: Providing the missing baseline

Luke Macaulay

University of California, Berkeley, Department of Environmental Science, Policy & Management, 327 Hilgard Hall #3114, Berkeley, CA 94720-3114, United States

ARTICLE INFO

Article history:
Received 16 June 2016
Accepted 18 June 2016

Keywords:
Hunting
Fishing
Incentives
Grazing
Forest
Agriculture

ABSTRACT

Successfully integrating human activities with ecosystem conservation forms the foundation of sustainability and is key to maintaining biological diversity. This is especially important in privately-owned lands in the U.S., which harbor high levels of biodiversity yet are often vulnerable to habitat degradation and loss. This study analyzes recreation as a sustainable use on private property, focusing on wildlife-associated recreation, defined here as fishing, hunting and wildlife watching. Eighteen national surveys implemented by three U.S. government agencies spanning 1999–2013 were analyzed to provide baseline information and an assessment of the conservation impact of recreation. Results show that approximately 440.1 million acres of private land, ~22% of the contiguous land area of the U.S., are either leased or owned for wildlife-associated recreation. Land utilized for hunting accounts for 81% of that total. Approximately 33% of private forestland, 18% of private grazing land and 4% of private cropland is used to earn revenue from recreational activities. Annual spending for wildlife-associated recreation on private land is estimated at $814 million in day-use fees, $1.48 billion for long-term leases, and $14.8 billion to own land primarily for recreation (2011 dollars). Hunters own or lease properties of larger size classes than anglers or wildlife-watchers, indicating that hunting may provide a greater economic incentive for maintaining large unfragmented properties that provide a variety of conservation benefits. On grazing and cropland, landowners who earn income from recreation are significantly more likely to participate in government conservation programs ($p < 0.001$) and to pay for private conservation practices ($p = 0.08$). This provides support that recreation incentivizes conservation at higher rates than agricultural activities alone. Three policy measures that could further enhance conservation benefits of recreation are discussed.

1. Introduction

Habitat loss is a major source of biodiversity decline and extinction worldwide and is continuing at a rapid pace (Morcatty et al., 2013). In the U.S., private land accounts for approximately 60% of land area and harbors high levels of biodiversity due to historical homesteading patterns where land with more productive natural resources was settled and privatized first (Scott et al., 2001). These lands, which are integral to the conservation of biodiversity, are often the most vulnerable to habitat degradation and loss through land-use conversion and fragmentation (Knight, 1999; Maestas et al., 2003). One of the most significant innovations for protecting private land in recent decades has come in the form of conservation easements, which have culminated in placing 47 million acres under protection as of 2011 (Land Trust Alliance, 2011). Although a major achievement, this land area represents only 3.6% of private land in the U.S., suggesting that additional mechanisms to incentivize conservation of private land are warranted. This study examines recreation as one such possible mechanism, with a focus on wildlife-associated recreation, defined here as fishing, hunting, and wildlife-watching.

Since at least 1930, recreation has been highlighted as an incentive to better conserve U.S. private lands (Leopold, 1930). Leopold suggested that a private landowner who is able to earn revenue from hunting wildlife would be motivated to manage the land to support wildlife habitat and game populations. Since then, studies in various locales have shown that under the correct governance structures, payments for wildlife-associated recreation can improve habitat conservation (Dickson et al., 2009; Lindsey et al., 2007). For example, in England, landowners with hunting on their property maintained and planted more woodland and hedgerows than those who did not have hunting (Oldfield et al., 2003).

E-mail address: luke.macaulay@berkeley.edu

http://dx.doi.org/10.1016/j.landusepol.2016.06.024
0264-8377/

These studies illustrate the potential of recreation to enhance conservation outcomes, but a good understanding of the scale, distribution, and conservation effect of recreational use on private land across the entire U.S. remains an important research need. National estimates of wildlife-associated recreation released every five years by the U.S. Fish & Wildlife Service (USFWS) suffer from unreported and relatively large standard error estimates as well as lack of detail on private land estimates (USFWS, 2011, 2006, 2001). Additional studies have evaluated nationwide recreational use on agricultural lands but those studies exclude vast areas of forestland in the U.S. and don't evaluate the connection of recreation to conservation (Bagi and Reeder, 2012; Brown and Reeder, 2007). Drawing upon multiple years and multiple sources of surveys, this study remedies many of these problems and provides the most detailed and precise estimates available of private land recreation in the U.S.

This study assesses the land area, land use, property size, spending, regional variation, and conservation practices of private properties utilized for recreation in the U.S. In addition to evaluating habitat conservation practices, this study seeks to shed light on the anticipated effect of recreation on land fragmentation, which is a major threat to ecosystems (Saunders et al., 1991). For example, if the economic return from certain types of recreation is higher on large properties compared to smaller properties, then they could provide an economic incentive to reduce fragmentation of land.

2. Methods

2.1. Data sources

Data from three independently conducted national surveys was used to assess recreational use on private land in the U.S.: (1) the U.S. Fish & Wildlife Service National Survey on Fishing, Hunting & Wildlife Associated Recreation (referred to in the text as the "National Survey"), (2) the U.S. Department of Agriculture (USDA) Agricultural Resource Management Survey (ARMS), and (3) the U.S. Forest Service National Woodland Owners Survey (NWOS). The National Survey was used for most of the estimates in this study, and was supplemented with data from the ARMS and NWOS to shed light on the primary land use associated with recreation, the conservation practices associated with recreation, and the motivation of owning forestland (Table 1). For this study, private land is defined as land that is not owned by federal, state or local governments, and includes land under conservation easements and land in federal land retirement programs.

The National Survey evaluates only the subset of recreation that refers to fishing, hunting and wildlife-watching, which is referred to as "wildlife-associated recreation." The ARMS uses a broad definition of recreation, which includes activities such as horseback riding or farm tours, which may not require wildlife or be dependent on wildlife. Throughout the paper, recreational use estimates from the ARMS data that includes all recreational activities is referred to as "recreation broadly defined" or "all types of recreation." The NWOS gathers information on two recreational categories: (1) hunting and (2) recreation other than hunting, which could include any recreation activities such as horseback riding, driving all-terrain-vehicles, and fishing.

Section 3.2 evaluates land uses associated with recreation, focusing on forestland, grazing land and cropland. The ARMS data, which surveys grazing land and cropland operators, requires respondents to choose a primary use based on revenue, meaning these land use categories are mutually exclusive, even though some cropland could be grazed as a secondary use (and vice versa). In contrast, forestland and grazing land estimates come from separate surveys (NWOS and ARMS) and likely contain some overlap, as grazing can occur on forestland. The USDA estimates that approximately 10% of forestland is grazed, with remaining grazing land primarily occurring on rangelands (USDA NRCS, 2003). To take this into account, when combining the land use area estimates as a comparison to land area used for wildlife-associated recreation in Section 3.2, grazing land area is reduced by the 10% of forestland area that is estimated to be grazed in order to avoid double-counting. Although overlap between cropland and forestland is possible, these land uses tend to be less compatible and overlap is likely to be small.

2.1.1. The National Survey

The National Survey gathers information every five years about participation in and spending for fishing, hunting, and wildlife-watching in the U.S. It is a multistage probability sample with coverage in all 50 states that was conducted by the U.S. Census Bureau. Each survey year the population was independently sampled and asked identical questions about what recreationists pay to access or own private land.

This study uses the National Survey datasets collected in 2001, 2006, and 2011. The three survey years were pooled to improve the precision of estimates, increasing the sample size to a total of 93,725 observations with 4957 observations of individuals who leased, owned or paid fees to access private land for wildlife-associated recreation. Prior to pooling, some subsets of the data had fewer than 200 observations in a single year resulting in large standard error estimates for many of the estimated parameters (for example in 2011, there were only 175 respondents with hunting leases). Pooling across time sacrifices temporal detail in order to improve geographical understanding (Verma et al., 2009). An analysis of variables of interest revealed few significant differences over time. As such, pooling the data resulted in improved geographical precision with minimal loss of detail about changes over time. As a result, the results reported are estimates for an average year over the course of 2001–2011.

The National Survey evaluates day-use fees, leases, and ownership as ways in which individuals accessed private land for wildlife-associated recreation. Day-use fees are payments to access or use private land during single or multi-day trips. Leases are agreements for seasonal or year-round access to private land that are renewed on an annual or multi-year basis. Estimates of land ownership for wildlife-associated recreation include only those landowners who self-identify as owning the land *primarily* for wildlife-associated recreation. The survey questionnaire requested a single value for the amount spent to own land, which included mortgage payments, down payments, taxes and maintenance expenses. The inclusion of these various payments into a single amount combines disparate types of expenses into a single value, leading to wide variation in annual spending to own land and comparatively large standard error estimates (see Appendix B).

The U.S. Census Bureau, in administering the National Survey, employs quality control procedures throughout the planning, collecting, and processing of data to minimize error (U.S. Census Bureau, 2016). Nonetheless, the estimates in this manuscript could contain non-sampling error such as measurement error or non-response error. Response rates ranged between 66% and 90%, which is relatively high compared to many survey studies, minimizing the risk of non-response bias (Groves, 2006). (See Appendix C for survey questions and additional details of the analysis).

The USFWS reports written every five years on the National Survey contain some similar estimates as calculated in this study. However, the analyses in those reports and in this article differ in several ways: (1) the estimates in this manuscript are much more precise due to the pooling of three survey years, (2) the estimates in this article treat missing data by omitting missing values from calculations (generally a more supported method of dealing with missing data (Allison, 2002)), (3) the estimates in this manuscript