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Simulating changes in forest recreation demand and associated economic impacts due to fire and fuels management activities

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Abstract

The objective of this study is to simulate the linkages from fire and fuels management activities to changes in forest recreation demand, and ultimately to regional economic impacts. Using available survey data collected in New Mexico (United States) during the summer of 2001, a pooled travel cost and contingent behavior model of forest recreation demand is developed. An endogenously stratified truncated Poisson model is used to estimate consumer surplus and predict changes in recreation visits under different fire and fuels management scenarios. Using the econometric results on the predicted changes in recreation demand, regional Input–Output models, at both the state (New Mexico) and local (southwestern New Mexico) level, are constructed to simulate the varying regional economic impacts of three different fire and fuels management scenarios. For comparison, we also simulate the regional economic impacts, at both the state and local level, of forest closure scenarios during a significant part of the summer recreation season in New Mexico.

Keywords: Contingent behavior; Travel cost method; Fire; Fuels management; Input–Output model; Regional economic impacts

1. Introduction

Fuel loads in the forested areas of the western United States have reached historic levels as decades of aggressive fire suppression have allowed dense growth of trees, underbrush and other fuel materials (Madsen, 2002; Kovacs, 2001; USDA, 2001a). Millions of acres of forest across the western United States are suffering from insect infestation and drought that have increased the risk of catastrophic fire to levels not seen since the 1900s (Locke, 1997). The economic effect of wildland fire has become an increasingly important issue as land managers seek to change a century of forest management policy in order to reduce the risk of catastrophic fire and improve overall forest health. One important area of concern is the impact of fire on forest recreation demand and the associated effects on regional economies.

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The objective of this study is to simulate the linkages from fire and fuels management activities to changes in forest recreation demand, and ultimately to regional economic impacts. Using available survey data collected in New Mexico (NM), USA during the summer of 2001, a pooled travel cost and contingent behavior model of forest recreation demand is developed. An endogenously stratified truncated Poisson model is used to estimate consumer surplus and predict changes in recreation visits under different fire and fuels management scenarios. Using the econometric results of the predicted changes in recreation demand, regional Input–Output (I–O) models, at both the state (NM) and local level (southwestern NM) are constructed to simulate the varying one-time regional economic impacts of three different fire and fuels management scenarios. For comparison, we also simulate the one-time regional economic impacts, at both the state and local level, of forest closure scenarios during a significant part of the summer recreation season in New Mexico. The paper proceeds as follows: Section 2 provides background discussion on: the effects of fire suppression and exclusion from wildlands; contingent behavior and recreation demand modeling; and I–O methodologies. Section 3 describes the survey data set, its origination, limitations and descriptive statistics. Section 4 presents the recreation demand models, and Section 5 provides the estimation results. Section 6 discusses the I–O modeling and results, and Section 7 provides conclusions and discussion of future research.

2. Background

2.1. Fire history

The fire suppression and exclusion policy as symbolized by Smokey the Bear has left western U.S. forests prime for catastrophic fire. It is estimated that there is one-third more biomass accumulating in forests than there has been in the past 10,000 years (Nixon, 1995, 3). The increasing levels of biomass, dead wood and overly dense stands of trees like Douglas fir, add to the spread of disease and further increase the risk of catastrophic fire. Additionally, in dry western forests, the area may not re-grow for over 1000 years (Nixon, 1995, 3).

The 2000 fire season was characterized by a significant increase in the number and intensity of wildland fires. Approximately 123,000 fires burned more than an estimated 8.4 million acres of wildland during the 2000 fire season alone. The damage from the 2000 fires was more than twice the 10-year national average. More than 30,000 fire personnel were active at one time during 2000, costing the Federal government more than US$2 billion in fire-fighting expenditures alone (USDA, 2001a, 4). In 2002, the U.S. Department of Agriculture's (USDA) Forest Service (USFS) fire fighting expenditures for New Mexico were nearly US$24 million; US$554,734 was spent to rehabilitate and restore fire-damaged ecosystems; and US$15.746 million was spent on hazardous fuels treatments in New Mexico (USDA, 2001a).

In addition to the physical costs associated with fires, additional economic costs are incurred when forests are closed due to extreme fire danger. In the summer of 2000 nearly all of New Mexico's five forests were closed for at least 1 month, and many were closed for nearly half of the summer recreation season. In 2002, the forests in New Mexico and Arizona were again closed for significant portions of the summer season due to fire danger. The economic cost of these closures has been little investigated by researchers. In fact, the USFS does not even publish internally or externally the length or impact of the closures. The costly effect of catastrophic fire in both ecological and economic terms requires land managers to modify policies concerning fire management (Daerr, 2000; Madsen, 2002; USDA, 2001a; Hesseln, 2000).

2.2. Recreation demand and regional economic impacts

Fire, forest closures, fire and fuels management activities can all have significant impacts on the recreational use of National Forest lands. These impacts create a need to understand the expected effects on forest recreation demand and the associated regional economic impacts.

As outlined in the 1990 Strategic Plan for the USFS, under plans pursuant to the National Forest Management Act of 1976, rural economic development and quality of life considerations must be included in all