



Identifying the impacts of critical habitat designation on land cover change



Erik J. Nelson^{a,*}, John C. Withey^{b,e}, Derric Pennington^c, Joshua J. Lawler^d

^a Department of Economics, Bowdoin College, 9700 College Station, Brunswick, ME 04011-8497, United States and Center for Centre for Environmental and Climate Research, Lund University, Sölvegatan 37, S-223 62 Lund, Sweden

^b Department of Biological Sciences, Florida International University, 11200 SW 8th St., Miami FL 33133, United States

^c World Wildlife Fund–US and Institute on the Environment, University of Minnesota, 325 Learning & Environmental Sciences, 1954 Buford Ave, St. Paul, MN 55108, United States

^d College of the Environment, University of Washington, Box 352100, Seattle, WA 98195, United States

^e Current location: The Evergreen State College, 2700 Evergreen Parkway NW, Olympia, WA 98505, United States

ARTICLE INFO

Article history:

Received 20 October 2015

Received in revised form

23 November 2016

Accepted 9 December 2016

Available online 15 December 2016

JEL classification:

Q24

Q28

Q57

Keywords:

Endangered Species Act

Critical habitat

Opportunity cost

Land cover change

Matching analysis

ABSTRACT

The US Endangered Species Act (ESA) regulates what landowners, land managers, and industry can do on lands occupied by listed species. The ESA does this in part by requiring the designation of habitat within each listed species' range considered critical to their recovery. Critics have argued that critical habitat (CH) designation creates significant economic costs while contributing little to species recovery. Here we examine the effects of CH designation on land cover change. We find that the rate of change from 1992 to 2011 in developed (urban and residential) and agricultural land in CH areas was not significantly different compared to similar lands without CH designation, but still subject to ESA regulations. Although CH designation on average does not affect overall rates of land cover change, CH designation did slightly modify the impact of land cover change drivers. Generally, variation in land prices played a larger role in land cover decisions within CH areas than in similar areas without CH designation. These trends suggest that developers may require a greater than typical expected return to development in CH areas to compensate for the higher risk of regulatory scrutiny. Ultimately, our results bring into question the very rationale for the CH regulation. If it is for the most part not affecting land cover choices, is CH helping species recover?

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

The US Endangered Species Act (ESA) was enacted in 1973 with little controversy (Yaffee, 1982). However, over time landowners and industry leaders have become increasingly worried that complying with the Act's restrictions on economic activity in areas occupied by endangered species generates significant costs (Hayward et al., 2001). Despite these concerns, there are no comprehensive estimates of the economic opportunity costs created by the ESA either as a whole, or by specific provisions therein. An accurate measurement of *all* ESA-generated costs requires 1) a database of actions taken by public

* Corresponding author.

E-mail addresses: enelson2@bowdoin.edu (E.J. Nelson), witheyj@evergreen.edu (J.C. Withey), Derric.Pennington@wwfus.org (D. Pennington), jlawler@uw.edu (J.J. Lawler).

land managers, private landowners and developers, and industry in response to the rule and 2) a land and water use and management counterfactual—that is, a model of the US landscape over time without ESA-related restrictions on land and water use and management. Assessors of the ESA have neither of these. Many of the actions taken by landowners, developers, and industry in response to the rule have not been cataloged. Further, attempts to estimate actions taken and build a regulatory counterfactual are extremely difficult when regulated space is imprecisely known: for many listed species, current or historical ranges and habitat associations are not well-established.

Given these methodological challenges to assessing the cost of the entire ESA we focus on estimating some of the opportunity costs of one provision of the ESA, namely the designation of critical habitat (CH). This provision is one of the few parts of the Act that lends itself to cost analysis. According to the ESA, a CH designation is required for every species listed as threatened or endangered. CH is a subset of a species' geographic range, including currently unoccupied space, that regulating agency scientists deem essential to the recovery of the species (Plantinga et al., 2014). Crucially, spatial imprecision is not an issue in CH, because maps of the specific areas designated as CH are published in the *Federal Register*. By linking these CH maps with a spatially explicit panel dataset that measures some facet of landowner and land manager behavior on landscapes in and out of CH areas, we can measure some of CH's impact on landowner and land manager decision-making.

Here we use a nationwide, complete, consistent, and spatially explicit panel dataset of land cover to determine whether CH designations have prevented conversion to developed and/or agricultural land that would have otherwise occurred. Our hypothesis is that, *on average*, land development rates in areas designated as CHs have been lower than in similar areas within listed species' ranges, but without CH designation. This hypothesis is consistent with the notion that additional regulatory action and scrutiny in an area will generate additional land cover-related opportunity costs. To test this hypothesis we use matching methods to compare land cover change in land areas with CH designation (the treatment units) to land cover change in land areas without CH designation but still within listed species ranges (the controls). Following from our first hypothesis, we expect to find that drivers of land cover change have not had the same impact in treated areas versus their matched controls. Therefore, after estimating the average treatment effect of CH designation on land cover change rates, we use econometric techniques to explain what drives land cover change outcomes in CH areas vis-à-vis their matched controls.

Contrary to our expectations, we find that CH designation has not significantly affected subsequent land cover change compared to similar but untreated areas in landscapes affected by the ESA. Consistent with our expectations, we did find that the influence of several drivers of land cover change was slightly affected by CH treatment. However, given our overall findings, these differential impacts only affected land cover change on the margins. Therefore, we conclude that the land cover-related opportunity costs associated with CH designation are likely to have been small. Ultimately, our overall results bring into question the very rationale for the CH regulation. If it is for the most part not affecting land cover choices, is CH helping the species recover?

We have organized the rest of our paper as follows. In section 2 we provide additional background on the ESA and CH designation, and summarize the previous literature on the opportunity costs created by CH designation. In section 3 we describe the sources of our spatial data and our creation of control polygons. In section 4 we describe our identification strategy (i.e., how we match treatment units with controls), the covariates we used in our matching analysis, and the regression model we used to examine factors that influence land cover conversion rates in and out of CH areas. In section 5 we describe our results, and in section 6 we discuss our results and present our conclusions.

2. Background & literature review

2.1. The endangered species act and critical habitat designation

When the US Fish and Wildlife Service (FWS)¹ determine a species is at risk for extinction the species is listed under the ESA as either threatened or endangered. Then, the species' CH is (supposed to be) designated, and a recovery plan is prepared. Being listed affords the species regulatory protection, including prohibitions against actions that places the species in jeopardy (Section 7 of the Act) or results in the species' being "taken" (Section 9 of the Act).² The essence of these protections is that a listed species or its habitat cannot be harmed. The penalties for creating jeopardy or a taking (Section 11) include substantial civil (up to \$25,000 fine for each violation) and criminal (up to \$50,000 fine, forfeiture of equipment, and/or jail time) penalties. Over time the FWS has created mechanisms such as the Habitat Conservation Plan and the Safe Harbor Plan to give landowners, corporations, and agencies more flexibility in meeting their ESA-related requirements. Specifically, in return for agreed-upon and agency-approved habitat protection, management, and/or mitigation, landowners may be issued an incidental take permit (Section 10), which under certain conditions allows harm to a listed species.³ In addition there is a thorough consultation process (Section 7) that applies to federal agencies and anyone receiving federal funds for a

¹ Listing and CH decisions for marine species are overseen by the National Marine Fisheries Service.

² A "take" is defined in Section 3 of the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct," and has since been interpreted to include habitat modification that results in harm to listed species.

³ For a Habitat Conservation Plan to be approved, the FWS must find that, among other things, the applicant will to the maximum extent practicable, minimize and mitigate the impacts of such taking, the applicant "will ensure that adequate funding for the plan will be provided," the taking "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild," and the agency has received assurances as required that the plan will be implemented (Ryan and Schuler 1998). Other voluntary mechanisms currently allowed by ESA amendments and administrative rules include Safe

Download English Version:

<https://daneshyari.com/en/article/5104104>

Download Persian Version:

<https://daneshyari.com/article/5104104>

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