



Analysis

Amenity values of proximity to National Wildlife Refuges: An analysis of urban residential property values



Xiangping Liu^{a,1}, Laura O. Taylor^{a,*}, Timothy L. Hamilton^{a,2}, Peter E. Grigelis^b

^a Center for Environmental and Resource Economic Policy, North Carolina State University, Campus Box 8109, Raleigh, NC 27695, USA

^b Office of Policy Analysis, U.S. Department of the Interior, 1849 C St NW Washington, DC 20240, USA

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ABSTRACT

This research quantifies the property value benefits of National Wildlife Refuges near urban areas on the eastern coast of the U.S.A. Our approach is made possible through access to confidential U.S. Census data identifying property values surrounding all refuges with high geographic resolution. Results from hedonic property value models suggest that the amenity values of refuges located near urbanized areas are capitalized into the value of homes in very close proximity, averaging \$11 million per refuge. These capitalized values add directly to the local tax base and are considerable complements to the annual economic value created by the refuge system.

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1. Introduction

The U.S. federal government manages over 693 million acres of public lands for a variety of purposes ranging from timber production and livestock grazing to the provision of public recreational opportunities, preservation of historical and cultural resources, and species and habitat protection. Among the U.S. federal land-management agencies, the U.S. Fish and Wildlife Service (USFWS) is somewhat unique because it has an explicit mission to conserve fish, wildlife, plants and their habitats. To help fulfill this mission, the USFWS manages the National Wildlife Refuge system, a network of over 550 refuges in 50 states that encompass more than 150 million acres of permanently protected open space. The guiding management principles of the refuge system are centered on the conservation of species and habitat, while also allowing for compatible recreational use. Along the eastern U.S., many refuges are located near coastal and other highly-urbanized areas which creates a unique set of challenges for the USFWS. Coastal populations have steadily increased over the past several decades resulting in dense population centers and increased development pressures on undeveloped lands. The increased opportunity costs associated with the permanently protected open

space near urbanized areas can result in vigorous debates between management agencies and local communities whose desired outcomes for the land may be different than maintained open-space (for a more general discussion of these issues see Duffy-Deno, 1998; Lewis et al., 2002).

While the benefits associated with recreational opportunities that many refuges afford have been recognized by local communities and USFWS (see Carver and Caudill, 2007), a common concern expressed by local government officials is that refuges reduce the local tax base since refuge lands are not subject to property taxes. Local jurisdictions do receive direct payments from the USFWS to offset the reduction in property tax revenues for federally owned land, although these payments are usually quite small.³ What is typically not recognized by local communities is that permanently protected open space can directly benefit local communities by increasing the value of nearby residential land, and thus also indirectly support the tax base.

As with other types of open space, refuges could positively affect nearby property values. The permanent nature of refuges provides protections against future development and preservation of valuable ecosystem services (e.g., esthetic amenities). The positive influence of proximity to open space on property values has long been recognized in the literature (see McConnell and Walls (2005) for an extensive literature review), and refuges can be expected to offer these same benefits. The potential impacts of refuges on nearby residential properties may be particularly apparent in densely populated areas of the eastern U.S. where people may place a premium on being located near permanently protected refuge lands (Anderson and West, 2006;

* Corresponding author. Tel.: +1 919 513 3761.

E-mail addresses: xiangping.liu@economics.gu.se (X. Liu), laura_taylor@ncsu.edu (L.O. Taylor), t.laurence.hamilton@gmail.com (T.L. Hamilton), Peter_Grigelis@ios.doi.gov (P.E. Grigelis).

¹ Present address: Department of Economics, University of Gothenburg, P.O. Box 640, SE 405 30 Gothenburg, Sweden.

² Present address: Department of Economics, University of Richmond, 28 Westhampton Way, Richmond, VA 23173, USA.

³ Local jurisdictions receive direct payment in lieu of taxes according to the Refuge Revenue Sharing Act (see <http://www.fws.gov/refuges/realty/rrs.html>).

Cho et al., 2008). While it is difficult to fully ascertain the degree to which refuge spillover benefits could replace tax revenues associated with alternative development of refuge lands, quantifying the magnitude of in-situ refuge benefits is an important component of the overall economic value of the nation's systems of preserved open space.

In this research, the potential economic benefits of the refuge system along the eastern U.S. are estimated. A unique database of parcel-level housing data around every refuge near urbanized areas is assembled which allows us to take a 'programmatic view' and estimate the average effect of proximity to a refuge across all refuges under the USFWS jurisdiction. Our approach is unique in the hedonic valuation literature on open space as previous studies typically choose a relatively small geographic area such as a county or single urban area and explore the impacts of diffuse open space as it is distributed across the landscape (e.g., Acharya and Bennett, 2001; Anderson and West, 2006; Bark et al., 2009; Bolitzer and Netusil, 2000; Cho et al., 2009; Geoghegan et al., 2003). Our programmatic approach is made possible with access to confidential micro-level census data from the 2000 U.S. Census. The confidential data provides detailed information on housing characteristics and owner-assessed values for a one-in-six sample of all households in the U.S. and importantly, identifies the location of each house at a very fine geographic resolution. The comprehensive geographic coverage of the data combined with its fine spatial resolution allows us to investigate the influence of all managed lands under the USFWS jurisdiction while accurately measuring other important spatially varying features such as transportation corridors, water bodies, and other forms of open space besides refuges. By identifying the benefits specific to a comprehensive set of open space lands under one agency's jurisdiction, we provide quantitative evidence that is directly useful for federal analysis of an important system of permanently protected open spaces.

Hedonic price models are estimated and indicate that refuges provide substantial benefits to homeowners in urbanized areas. Homes located in very close proximity to a refuge (<0.5 mi) and within eight miles of an urban center are estimated to be valued between approximately five and ten percent higher than homes further away. The capitalized value of these benefits is estimated to average \$11 million per refuge for homeowners located within 0.5 mi of a refuge and within eight miles of an urban core. Capitalized values are estimated to be as high as \$50 million for individual refuges located in densely populated areas (all estimates are in 2010 dollars). These capitalized values can translate to property tax revenue increases of up to \$1 million per annum for local jurisdictions given tax rates as high as 20–30 mils in many states (e.g., Florida, New York and New Jersey). For comparison, Carver and Caudill (2007) estimate the net economic value of recreational visits to all refuges (with more than 1500 visitors per year) in the northeast and southeast regions to average approximately \$2 to \$3 million per refuge. Thus it would appear that the property value benefits associated with refuges have the potential to be a significant component of the overall annual economic value generated by the refuge system.

2. Data

The National Wildlife Refuges included in this research include all those along the eastern U.S. which are also within close proximity to urbanized areas.⁴ As compared to other regions in the U.S., the east coast is home to many refuges that are proximate to areas with sufficiently dense housing to expect that the provision of open space would be capitalized into nearby residential land values.⁵ Specifically,

⁴ For additional information on the U.S. National Wildlife Refuge System see <http://www.fws.gov/refuges/> (last accessed April 30, 2013).

⁵ This requirement is supported by Boyle et al. (2002) who conduct a case study of four refuges and are not able to robustly identify impacts for the refuges that are located in more rural areas.

the sample of refuges includes those that have a boundary within two miles of an urban area boundary (as defined by the U.S. Census) and were established before 2000, the year in which the housing data used in the analysis are recorded.⁶ There are 59 refuges located in 15 eastern states that met these requirements. Collectively, these refuges encompass more than 360,000 acres of permanently protected open space.

Summary statistics for the 59 refuges are reported in Table 1. The refuges are delineated by the administrative service region in which they are located. The northeastern service area includes all coastal states from Virginia northward, while the southeastern service area includes North and South Carolina, Georgia and Florida. As indicated in Table 1, there is considerable heterogeneity in refuge size across the sample, and on average, refuges tend to be larger and established more recently in the southeast as compared to the northeast. The majority of refuges are open to the public, and approximately 20% include roads for automobile touring. Visitation rates of refuges were also provided by the USFWS and show considerable heterogeneity.

Data on individual housing units surrounding each refuge in our sample are obtained through access to confidential census micro-data at the Triangle Census Research Data Center. The micro-data contain the individual responses of homeowners to the U.S. Census Long Form. The Long Form was distributed to one in six households in the 2000 census and collected information on the household's dwelling including the owner's assessment of the dwelling's value and a number of property features such as the number of rooms and the age of the home. Importantly, the micro-level survey responses are geographically identified by their census block, the smallest spatial unit designated by Census. Census blocks roughly represent a physical "block" as defined by streets, roads, rivers, or other natural boundaries, but do vary some in geographic size and population due to the spatial nature of the features that define them. The ability to geographically identify individual homes by their census block location allows us to measure each home's proximity to a refuge with reasonable accuracy. Census further aggregates blocks into block-groups and tracts, which are meant to represent populations that have similar characteristics — i.e., "neighborhoods".⁷

We expect the impacts of proximity to a refuge to be highly localized, and thus our final sample of housing units includes only those whose census block centroid is within 3 mi of a refuge. This selection criterion results in a total of 87,568 individual housing units being available for analysis surrounding the 59 refuges. The number of housing units around any single refuge varies from 4660 to 18,134 homes.

Definitions and summary statistics for a few key housing characteristics are reported in Table 2. The mean housing value is substantially higher in the northeast as compared to the southeast (\$195,000 vs. \$114,000 in 2000 dollars), although the number of rooms and bedrooms is similar across the northeast and southeast samples. Not surprisingly, mean population density is substantially lower in southeast than in the northeast, however, the occupancy status and the percent that are detached single-family homes are similar across the samples. The mean distance of housing to a refuge boundary is approximately 1.5 mi in the northeast and 1.7 mi in the southeast, which is not surprising given our sample selection criteria that homes must be within

⁶ An urban area is defined by U.S. Census as contiguous, densely settled census block groups and census blocks that meet minimum population density requirements and that together encompass a population of at least 50,000 people. Geospatial information for the U.S. Census defined urban areas is publicly available from the U.S. Census website (see http://www.census.gov/geo/www/ua/ua_2k.html for more details, last accessed February, 2013). Refuge boundaries were provided directly by the USFWS.

⁷ Block groups generally represent 600 to 3000 individuals and tracts are aggregations of block groups to populations generally between 1500 and 8000 people.

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