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Conservation land acquisition lists and nearby property values: evidence from the Florida Forever programme

Agencies throughout the world are implementing plans to preserve open spaces. The demand to preserve open space is often justified based on the value of the amenities associated with the land. However, many times open space is valued most for what it is not: the absence of negative externalities associated with development of the open space. Florida has the most ambitious programme for acquiring conservation land of any state or nation in the world. Using evidence from Florida, this study determines whether being added to a conservation land acquisition list affects nearby property values. The Florida Department of Environmental Protection claims that being on the list should not trigger any changes in property values. The results of the hedonic regression models contradict this claim and provide evidence that being added to the conservation acquisition list (perceived as permanently undevelopable and publicly owned at some point in the future) does cause a positive increase in nearby property values for at least some of the open space projects analysed in this study.

Keywords: open space, environmental economics, property values, hedonic

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Introduction

Plans to preserve and conserve open space have been and continue to be implemented throughout the world. The United States leads the way in these efforts as is evident from the fact that 76 per cent of land conservation ballot measures were successful, resulting in the passage of 1,596 open space initiatives from 1988 to 2008 (Mazmanian and Kraft, 2009). The decision to preserve open space is often justified based on the value of the amenities associated with the land. For instance, open space provides opportunities for recreation, fitness, wildlife viewing, pleasing views and ecological benefits. However, rather than being valued for what it is, open space may more often be valued most for what it is not: the absence of negative externalities associated with development of the open space.

Florida has the most ambitious programme for acquiring conservation land of any state or nation in the world. Florida established funding to preserve its unique heritage in the late 1960s. In 1990 Florida established the Preservation 2000 programme. This was a ten year programme that raised USD 300 million per year to protect more than 1.7 million acres (688,000 hectares) of land. The Florida Forever programme, which replaced Preservation 2000, is the state's newest land conservation programme and includes a wider range of environmental goals (FDEP, 2012).

Federal, state and local government agencies, conservation organisations or private citizens may be project sponsors and nominate a property for the state to purchase. The Acquisition and Restoration Council, consisting of nine members representing a variety of state agencies, evaluates all nominated projects and selects projects to be put on the Florida Forever acquisition list[1]. The Governor and Cabinet then approve the list of recommended projects. The Division of State Lands negotiates with owners and buys lands, with the consent of the Governor and Cabinet, on behalf of the people of Florida. The Division of State Lands receives about USD 105 million annually to buy land. However, this is not enough money to buy all projects on the Florida Forever acquisition list.

The purpose of this study is to determine if being added to the Florida Forever land acquisition list affects nearby single-family home values. It adds to the literature by investigating whether the '*potential'* of land being publically owned and permanently undevelopable at some point in the future affects nearby residential property values. That is, does being put on a conservation list impact nearby home values because of the possibility that in the future the land *might* be publicly owned and undevelopable. The Florida Department of Environmental Protection (FDEP) claims that being on the list should not trigger any changes in property values (FDEP, 2012).

Property values and open space

The literature on the relationship between open space and property values is developed. Previous empirical investigations on the value of open space generally find that open space increases the value of nearby properties. However, there is a great deal of inconsistency in their findings partly due to the fact that different open space measures (distance to open space, size of open space, percentage of open space etc.), different locations, and different time periods are used to analyse the impacts.

The first set of studies, by Cheshire and Sheppard (1995), Geoghegan *et al*. (1997), Opaluch *et al*. (1999), Bolitizer and Netusil (2000), Lutzenhiser and Netusil (2001), Morancho (2003), Anderson and West (2006), Sander and Polasky (2009), and Jiao and Liu (2010), are preliminary open space studies. They tend to use either a percentage of open space in the surrounding area variable or a dummy variable indicating open space is within some distance.

Cheshire and Sheppard (1995) study local housing markets in Great Britain and find a positive valuation of open space in both Reading and Darlington. However, the capitalised hedonic price of accessible open access land was lower in Reading than in Darlington, as expected. Reading has abundant open space and extensive park areas. There are large areas of unbuilt land, even close to the centre of town.

[1] The members of the Acquisition and Restoration Council represent the Department of Community Affairs, Department of Environmental Protection, Division of Forestry of the Department of Agriculture, Florida Fish and Wildlife Commission, and the Division of Historical Resources of the Department of State.

Geoghegan *et al*. (1997) go beyond the traditional variables used to explain residential values and hypothesise that the value of a parcel is also affected by the patterns of surrounding land uses. The authors include variables for the percentage of open space (per cent forestry and agriculture). The marginal contribution of more open space in one's immediate neighbourhood is positive and significant. On the other hand, the estimated coefficient for the percentage of open space in a larger buffer is negative and significant. Therefore, all else held constant, more forestry and agriculture in the larger measure of area around a housing transaction leads to a decrease in selling price.

Opaluch *et al*. (1999) analyse data on residential housing transactions in order to estimate the value that people attach to various environmental attributes. The hedonic method is used to analyse data comprised of all real estate transactions in 1996 in the town of Southhold on Long Island, NY. The authors use an open space dummy variable indicating whether a parcel's border is within 25 feet (7.6 metres) of an open space parcel. The analysis revealed that a parcel located next to open space has, on average, 12.8 per cent higher per-acre value than a similar parcel elsewhere. These results confirm the results of Geoghegan *et al*. (1997) that open space in one's immediate neighbourhood is valued.

Bolitzer and Netusil (2000) use hedonic methods to examine the effect of open space proximity on single-family home sale prices in the Portland, Oregon metropolitan area from 1990 to 1992. Only those open spaces that were located within 1500 feet (457 metres, 7.5 blocks) from each single-family home sale were considered. The open space dummy variable and the size of the open space variable were both positive and statistically significant.

Lutzenhiser and Netusil (2001) seek to estimate the impact of proximity to different open space types on a home's sale price in Portland, Oregon. Natural area parks, on average, have the largest statistically significant effect of USD 10,648 on a home's sale price, holding all other factors constant. The size of a natural area park that maximises a home's sale price is estimated to occur at 258 acres (104 hectares). Natural area parks are found to have a positive and statistically significant effect on a home's sale price for all seven zones that range in size from 200 to 1500 feet (61 to 457 metres).

Morancho (2003) use a sample of 810 houses in Castellon, Spain and find an inverse relationship between selling price and its distance from an urban green area. On average, for every 100 metres a house is located from an open space means a drop of approximately ESP 300,000. However, the results show that view of a park or garden and size of the open area are not significant.

Anderson and West (2006) use data from Minneapolis–St. Paul metropolitan area to analyse the effects of proximity to open space on sales price. They find that urban residents in dense neighbourhoods near the central business district place substantial value on proximity to open space, while suburban residents do not appear to value open space as highly. The authors find that the value of proximity to open space is also higher in high-income areas, high-crime areas and for families with children.

Sander and Polasky (2009) use 2005 single family home sales in Ramsey County, Minnesota and find that decreasing distance to the nearest open space feature (park, trail, lake, stream) increases home sale price. The authors find that road distance to parks is important whereas straight line distance to trails is important.

Jiao and Liu (2010) study the impact of open space proximity on residential housing transactions in Wuhan, China. Proximity to the Changjiang River recreation area, East Lake, and city level parks (large with many recreational functions) exert positive impacts on price. However, proximity to other lakes and rivers and district level parks (smaller in size and function) did not have a significant impact on price.

The second set of studies, by Irwin and Bockstael (2001), Smith *et al*. (2002), Geoghegan (2002), Irwin (2002) and Chamblee *et al*. (2011), expand the literature by exploring the hypothesis that the value of open space will depend on whether or not the open space is developable or undevelopable.

Irwin and Bockstael (2001) find that price is increasing in the proportion of surrounding land that is publicly owned. The proportion of conservation land that is privately owned is also found to be increasing in price. However, the proportion of privately owned and developable open space within a parcel's neighbourhood is found to have a negative but insignificant effect on price.

Smith *et al*. (2002) estimate hedonic price functions over nearly 30 years in order to evaluate whether the distinctions between fixed and adjustable land uses help in measuring the value of open space amenities. The authors claim that it is not only the amount of open space that is important, but whether the land use is perceived as fixed. The effect of fixed land uses on a nearby site is expected to be consistent across individuals and time, while the effect of adjustable land uses is expected to vary across individuals and time. However, the results for the fixed land use of protected public land are negative, but statistically insignificant. This result is puzzling and needs to be investigated further. Either way, this study is a major contribution to the literature in that it explores the issue of the permanency of the environmental entity.

Geoghegan (2002) develops indices to calculate the amount of 'developable open space' and 'permanent open space' that surrounds each parcel within a 1600 kilometre radius. The estimated coefficients on both permanent open space and developable open space are positive, with the estimated coefficient on permanent open space being over three times the magnitude as the estimated coefficient on developable open space, as hypothesised. However, only the estimated coefficient on permanent open space is statistically significant at the 5 per cent level. These results suggest that individuals value permanent open space more than developable open space, as they are willing to pay more to live near permanent open space, all else being equal.

Irwin (2002) uses residential sales data from a region in central Maryland and distinguishes open space by whether the land is preserved or is developable; by land ownership (privately vs. publicly held preserved open space) and land use type (cropland, pasture and forests that are developable). The results indicate that both the privately owned conservation lands and public, non-military open space had a positive and significant effect relative to developable pastureland. Specifically, the conversion of one acre (0.4 hectares) of developable land to privately owned conservation land increased the residential value of the mean property by USD 3,307. The conversion of one acre to publicly owned, non-military land increases the residential value by USD 994.

Chamblee *et al*. (2011) use data from North Carolina to analyse land prices before and after nearby conservation activity. The results show that vacant land that shares a border with a parcel on which a conservation restriction is placed increases value by 46 per cent. The benefit declines with distance. Land owners tend to value conservations with easements more than parcels with other conservation activities reflect the market's perception that conservation easements are more permanent.

Methodology

Estimating the value of open space is difficult because many of the services provided by open spaces are not directly traded in the market. However, many non-market valuation techniques are available to estimate the value of such unpriced goods. One method, the hedonic property price technique, uses observations on property values to infer value for non-traded goods such as proximity to open space. This technique is used in this study to estimate the amenity value of open space to nearby property owners.

Even though there are rarely markets for environmental goods, such as open spaces, their effect on market prices can often be measured by virtue of being 'bundled' to a market good. The most common example of a market good is real estate. When a household purchases a house, they implicitly buy an entire bundle of amenities such as public schools, police protection, parks, transportation, air and water quality, and scenic views. Hedonic regression analysis is typically used to estimate the marginal contribution of individual characteristics to the total value of the property. Therefore, using regression techniques, the hedonic pricing method can identify what portion of property value differences can be attributed to environmental differences, such as the proximity to open space.

Most research using hedonic pricing to value environmental goods is based on a theoretical model presented in Rosen's 1974 article (Mahan *et al*., 2000). Rosen (1974) shows how market equilibrium is characterised when perfectly-competitive profit-maximising producers and utility-maximising consumers choose the amounts of differentiated products to produce and consume. Freeman (1993) provides a review of the basic theory of hedonic prices in the context of the housing market as follows:

Assume that each individual's utility is a function of that person's consumption of a composite commodity X, a vector of location-specific environmental amenities Q, a vector of structural characteristics of the house that the person occupies denoted by S, and a vector of the characteristics of the neighbourhood in which the home is located denoted by N. That is, the utility an individual who owns property is given by

$$u = u(X, Q_i, S_i, N_i) \tag{1}$$

Assume that preferences are weakly separable in housing characteristics and other goods, which allows the demand for characteristics to be independent from the prices of other goods. Also assume that the housing market is in equilibrium, that is, that all individuals have made their utility-maximising residential choices given the prices of alternative housing locations and that these prices. Prices are assumed to be market-clearing, given the existing stock of housing and its characteristics. Under these assumptions, the price of the i^{th} residential location can be described as a function of structural, neighbourhood and environmental characteristics of that location. That is,

$$P_i = P_i(S_i, N_i, Q_i) \tag{2}$$

This is known as the hedonic price function and will be the basis for the empirical analysis. Each individual will maximise utility subject to the budget constraint:

$$M - P_i - X = 0 \tag{3}$$

where M is income. The price of X is scaled to USD 1. A typical first-order condition for the optimal choice of environmental amenity q can be written as:

$$\frac{(\partial u/\partial q)}{(\partial u/\partial X)} = \frac{\partial P_i}{\partial q} \tag{4}$$

The left hand side of the equation represents the marginal rate of substitution between the environmental attribute and the composite good, that is, the marginal willingness to pay for the environmental attribute. The right hand side of the equation is the implicit price of a characteristic. Therefore, the partial derivative of the hedonic price function with respect to any characteristic yields its marginal implicit price. For example, if q is the distance to a open space, then the first partial derivative represents the additional amount that must be paid to be located an additional unit closer to the open space (Mahan *et al*., 2000). However, it is important to note that while implicit price and marginal willingness-to-pay information for characteristics at the optimal choice is estimated under this method, the entire willingness-to-pay function for the individual is not directly revealed (Freeman, 1993).

Data

The variable name abbreviations and definitions used in the study can be found in Table 1. Nine Florida Forever open space projects were analysed. The name, location, size and the year the open space was added to the acquisition list appear in Table 2 along with means for selected variables. A data set is constructed separately for each of the Florida Forever open space projects. Each data set consists of single-family home sales that occurred within a ten mile (16 kilometre) radius of each open space project both two years before and two years after the open space was added to the acquisition list. It should be noted that each project is in a different location with different population densities and real estate markets. Therefore, the number of observations in each of the data sets varies greatly. The real estate property data was obtained from Florida Department of Revenue's (DOR) property tax records. These data are compiled each year by the DOR under a statutory provision requiring the auditing of records from each of the 67 county's property

Table 1: Variable name abbreviations and definitions used in this study.

Variable name	Description
Independent variable	
ln P	Log of selling price of a residential property
Structural variables	
LOT	The size of the lot (acres)
TLA	Total living area of the single-family home (1000 of square feet)
AGE	The age of the single-family home
Neighbourhood variables	
medINC	Median income in 1999 in the census tract where the property is located (USD 1,000)
BLCK	% of the population that is black in the block group where the property is located
HISP	% of the population that is Hispanic in the block group where the property is located
RENT	% of the population that is a renter in the block group where the property is located
Access variables	
dCBD	Distance from the property to the central business district (miles)
dCOAST	Distance from the property to the coast (miles)
Wetland variables	
dOPEN	Distance from property to the Florida Forever Open Space Project (miles)
dBEFORE	Distance from property to the Florida Forever Open Space Project if the sale occurred before the Florida Forever Open Space was put on the acquisition list, otherwise 0 (miles)
dAFTER	Distance from property to the Florida Forever Open Space Project if the sale occurred after the Florida Forever Open Space was put on the acquisition list, otherwise 0 (miles)
Other variables	
year	Dummy variable indicating the year of sale
county	Dummy variable indicating the county location of the property

Table 2: Florida Forever land information and means for selected variables.*

	Big Bend Swamp	Charlotte Harbor Flatwoods	Dade-Round Hammock	Dade-Madden Hammock	Econ St. Johns	Green Swamp	Lake Wales Ridge Scrub**	Longleaf Pine	Northeast Florida Blueway
Location	Osceola	Charlotte & Lee	Dade	Dade	Seminole & Volusia	Lake & Polk	Polk	Volusia	Flagler & St. Johns
Size (acres)	64,471	22,673	44	61	16,820	288,114	81	4,301	27,538
Year Added	2000	1992	1995	1995	1995	1992	1992	1993	2002
P	111,661	97,190	68,957	102,713	110,568	33,388	67,023	68,293	213,611
LOT	0.53	0.27	0.43	0.19	0.3	0.37	0.28	0.61	0.29
TLA	1.724	2.15	1.604	1.638	2.062	2.005	1.776	1.374	2.257
AGE	14.42	23.58	11.74	25.27	9.53	13.7	4.52	22.98	9.55
medINC	41.21	40.875	33.31	47.258	54.482	43.095	40.579	37.453	54.121
BLCK	1.61	8.02	29.08	26.86	6.42	6.76	7.57	6.67	9.25
HISP	11.12	8.43	37.28	40.57	15.75	8.72	24.03	9.12	4.88
RENT	22.34	22.34	32.86	21.32	23.08	21.34	23.66	21.31	23.77
dCBD	22.04	9.49	12.37	12.97	11.25	17.74	30.25	36.18	24.73
dCOAST	34.24	11.79	9.85	7.28	25.52	38.83	46.69	19.6	4.86
dOPEN	6.33	7.07	4.99	7	6.33	4.97	6.33	6.93	5.33
N	3,949	3,792	703	35,968	29,288	18,043	4,460	2,403	49,144

* All other descriptive statistics not listed are available upon request from the author.
** This project is on the top priority list of the U.S. Fish and Wildlife Service.

tax master file. The data are maintained as a part of a large database that includes information of the two most recent selling prices and dates (month and year), as well as a limited set of property and owner characteristics for every parcel in the state of Florida from 1995 to 2005. Actual sales prices of individual properties are preferred to other forms of data on property values such as assessed, appraised on census tract estimates because sales come closest to reflecting equilibrium prices.

Several socioeconomic variables were obtained from the U.S. Census of Population. The following variables are included as a measure of neighbourhood quality: MEDINC, the median household income of the census tract where the property is located in 1999; BLCK, the percentage of the population that is African-American in the block group where the property is located; HISP, the percentage of the population that is Hispanic in the block group where the property is located; and RENT, the percentage of the population that is a renter in the block group where the property is located.

Additional access variables were added to each parcel using GIS techniques. Firstly, the straight line distance to the coast from each parcel was included. Also, the distance from each parcel to the central business district was added. Most importantly, the straight line distance from each parcel to the edge of the Florida Forever open space project was included.

Estimated models

Least squares regression analysis is used to estimate the hedonic price models. While defining the hedonic price function is relatively straightforward theoretically, as described above, practical application has some challenges such as the selection of functional form. Many functional forms have been proposed and used for hedonic property models. Theory only suggests that the first derivative of the hedonic price function with respect to the characteristic in question be positive (negative) if the characteristic is desirable (undesirable). Properties of the second derivative cannot be deduced from the general features of the model (Freeman, 1993). Goodness of fit has traditionally been the basis of selecting functional form.

The functional form used in this study was chosen based upon the following process. Firstly, plausible functional forms were identified which reflect the price-distance gradient consistent with the effect of open space on nearby properties[2]. Each of the models was estimated and then compared using a goodness of fit criterion. To conduct this analysis, all of the same independent variables are included in all models. Thus, the only variation is whether sales price is transformed and the manner in which the distance measures are transformed. The R^2 of the models with P as the dependent variable are not directly comparable to those models with as the dependent variable. A technique suggested by Wooldridge (2000) is used to obtain an alternative R^2 measure for models with ln P that are comparable[3]. A simple log-linear model was found to provide the superior fit when using single-family home sales data. As a result, the following equation will be estimated:

$$\begin{aligned}\ln P = \alpha &+ \beta_1 LOT + \beta_2 TLA + \beta_3 AGE + \beta_4 INC \\ &+ \beta_5 BLCK + \beta_6 HISP + \beta_7 RENT + \beta_8 dCBD \\ &+ \beta_9 dCOAST + \beta_{10} dBEFORE + \beta_{11} dAFTER \\ &+ \beta_{12} yrsale + \beta_{13} county\end{aligned} \quad (5)$$

The structural variables in this model include total living area of the home, lot size and age of the home. The per cent Black population, per cent Hispanic population, and per cent renters in the neighbourhood were all included to control for neighbourhood characteristics of the property. The access variables in the model included both distance to the coast and distance to the central business district.

Of particular interest are the Florida Forever Open Space Project variables (*dBEFORE* & *dAFTER*) in the model. Firstly, *dBEFORE* is equal to the distance from the property to the Florida Forever Open Space Project if the sale occurred before the open space project was put on the acquisition list and otherwise is 0. On the other hand, *dAFTER* is equal to the distance from the property to the Florida Forever Open Space Project if the sale occurred after the open space project was put on the acquisition list. Finally, the difference between the coefficients on *dAFTER* and *dBEFORE* will be evaluated to investigate how the act of putting a parcel of land on the Florida Forever acquisition list impacts nearby property values.

Two sets of dummy variables are included in the model. Firstly, year of sale dummy variables are included. These time dummies are included in order to control for factors that uniformly affect the parcels over time. Secondly, if needed, a county dummy variable is included in order to control for county fixed effects. County dummy variables are only needed if the parcels that are within a ten mile (16 kilometre) radius of the open space land are located in two or more counties. When county dummies are included, the model accounts for unobserved heterogeneity across counties.

Two final estimation issues that need to be considered are whether a correction for heteroscedasticity or multicollinearity is necessary. Heteroscedasticity occurs when the error terms are not constant across observations. Diagnostic tests rejected the null hypothesis of homoscedasticity for all estimated models. As a result, White's heteroscedastic-consistent covariance matrix estimator is used to correct the standard errors for heteroscedasticity where the form is unknown (White, 1980). While this approach yields consistent estimates, it is not asymptotically efficient. Multicollinearity occurs when two or more independent variables are highly correlated. Correlation matrices of for each data set revealed that most pairwise correlations were low and all were below 0.8 in absolute value. In Dade-Round Hammock, Dade-Madden Hammock, Econ St. Johns, and Lake Wales Ridge Scrub the correlations between distance to the central business district and distance to the coast had correlations close to 0.8 in absolute value. However, the variance inflation factors were assessed in each model and multicollinearity is not a concern.

Results and discussion

Model (5) was estimated separately for each of the nine selected Florida Forever Open Space Projects in order to find the impact of each of these open spaces on nearby single-family home property values (Table 3). All of the structural variables are statistically significant and the signs of their coefficients appear reasonable. *Ceteris paribus*, a 1000 square foot (93 m^2) increase in total living area will increase the value of a house by between approximately 32 and 48 per cent for houses surrounding each of the nine open spaces. A one acre (0.4 hectare) increase in lot size will increase the home price by between 1 per cent in the area surrounding Green Swamp and 13 per cent in the area surrounding Dade-Madden Hammock. The coefficient on the age variable is negative and significant in all models indicating that the older the home, the lower the home value; *ceteris paribus*.

The results of the neighbourhood variables are mixed which is expected as they should depend on the characteristics of each individual area surrounding each of the open space projects. The coefficient on median income is positive in all models that are statistically significant indicating that all else being constant, if median income in the census tract where the home is located increases, the price of the home will also increase. Median income is not a significant predictor of home price in the area surrounding Dade-Round

[2] The following functional forms were considered: $P = f(DIST)$, $\ln P = f(DIST)$, $P = f(DIST{+}DIST^2)$, $P = f(\ln(DIST))$, $\ln P = f(\ln(DIST))$, $P = f(1/DIST)$, $\ln P = f(1/DIST)$

[3] This involved predicting P from the log model given the predicted value of. The square of the correlation between predicted and actual price can be compared to the R2 of the non-log model. The largest value is used to determine the model with the superior fit.

Table 3: Single-family home hedonic regression results.

Dependent Variable = ln P	Big Bend Swamp	Charlotte Harbor Flatwoods	Dade-Round Hammock	Dade-Madden Hammock	Econ St.Johns	Green Swamp	Lake Wales Ridge Scrub	Longleaf Pine	Northeast Florida Blueway
LOT	0.0477***	0.0224*	0.1158***	0.1307***	0.0607***	0.011**	0.0481***	0.0548***	0.0572***
	(16.45)	(1.91)	(4.87)	(14.05)	(11.68)	(2.01)	(5.83)	(7.61)	(4.87)
TLA	0.4285***	0.3534***	0.3227***	0.382***	0.4224***	0.3685***	0.4389***	0.558***	0.4504***
	(49.62)	(41.00)	(9.26)	(83.05)	(111.91)	(73.29)	(43.96)	(24.99)	(168.39)
AGE	-0.0055***	-0.0084***	-0.0102***	-0.003***	-0.0076***	-0.0056***	-0.0121***	-0.0066***	-0.0038***
	(-21.10)	(-16.13)	(-6.53)	(-20.03)	(-52.09)	(-28.21)	(-23.17)	(-17.15)	(-24.83)
medINC	0.0022***	0.0115***	0.0016	0.0062***	0.004***	0.0045***	-0.0008	0.002***	0.0049***
	(3.52)	(18.31)	(0.95)	(41.49)	(25.80)	(15.04)	(-1.21)	(42.55)	(47.04)
BLCK	0.0033	-0.0023***	-0.0063***	-0.0042***	-0.0013***	-0.0022***	-0.0026***	-0.0032***	-0.009***
	(1.14)	(-6.12)	(-3.34)	(-48.36)	(-4.75)	(-7.42)	(-5.43)	(-6.64)	(-38.04)
HISP	-0.0014**	-0.0027***	-0.0067***	0.0006***	-0.0053***	-0.0075***	-0.0037***	-0.0034***	-0.0307***
	(-2.03)	(-5.08)	(-4.32)	(4.85)	(-28.72)	(-14.91)	(-8.94)	(-6.14)	(-44.96)
RENT	-0.0015***	0.0008**	0.0001	0.0005***	0.0009***	0.0009***	-0.0008***	0.0003	0.005***
	(-3.41)	(2.06)	(0.05)	(4.70)	(9.13)	(3.40)	(-3.64)	(0.72)	(50.11)
dCBD	-0.0087***	0.0126***	0.0551	0.00002	-0.0052***	-0.0053***	0.0009	-0.0075*	-0.004
	(-4.06)	(6.12)	(1.59)	(0.03)	(-5.02)	(-4.03)	(0.57)	(-1.68)	(-1.42)
dCOAST	-0.00003	-0.0575***	0.0001	-0.0127***	0.0131***	0.013***	0.0008	-0.0057	-0.0267***
	(-0.02)	(-8.75)	(0.00)	(-11.13)	(8.65)	(12.01)	(0.45)	(-1.56)	(-51.18)
dBEFORE	0.001	0.0237***	-0.0058	-0.0112***	0.0014	0.0052***	0.0424***	-0.0147***	0.0106***
	(0.27)	(4.76)	(-0.69)	(-11.03)	(1.30)	(3.68)	(14.93)	(-2.72)	(10.91)
dAFTER	0.0004	-0.0069*	0.0049	-0.0145***	-0.0112***	0.0018	0.0399***	-0.0107**	0.008**
	(0.13)	(-1.67)	(0.96)	(-16.58)	(-10.88)	(1.73)	(17.21)	(-2.30)	(2.47)
Constant	10.84***	9.96***	9.92***	10.76***	10.62***	7.54***	7.97***	10.77***	10.76***
	(124.17)	(216.46)	(25.88)	(502.63)	(263.05)	(247.59)	(76.24)	(45.49)	(470.56)
adj-R2	0.8413	0.7626	0.5882	0.7249	0.8344	0.9284	0.9793	0.7649	0.8222
N	3,949	3,792	703	35,968	29,288	18,043	4,460	2,403	49,144

Estimated coefficients and t-statistics for the time and county dummies have been omitted from this table.
*, **, *** indicate significance at the 10%, 5%, and 1% level by a two-tailed test, respectively.

Hammock and Lake Wales Ridge Scrub. The results of the neighbourhood racial composition variables are fairly consistent across all models. The coefficients on BLCK are negative and significant for all models except Big Bend Swamp (which is positive and insignificant). Similarly, the coefficients on HISP are also negative and significant for all models except for Dade-Madden Hammock (which is positive and significant)[4]. These results indicate that, all else being equal, if the percentage of Black population or Hispanic population increases by 1%, the value of a home is expected to decrease by less than 1% in most of the models. Finally, the results of the renter variables are mixed and the impact on property value, if any, depends on the specific location.

The results of the access variables are mixed and discussed next. It is expected that the coefficient on the *dCOAST* variable will be negative indicating that property values will decrease further from the coast[5]. However, this result is only obtained for five of the nine open space areas and only three of those are statistically significant. Specifically, for Charlotte Harbor Flatwoods, Dade-Madden Hammock, and Northeast Florida Blueway (all Florida coastal counties with properties an average distance of less than 12 miles (19 kilometres) from that coast) distance from the coast impacts property value. On the other hand, four of the nine open space areas show a positive coefficient on the *dCOAST* variable indicating that property value decreases closer to the coast. However, this positive coefficient is only significant for Econ St. Johns and Green Swamp (areas that are between an average of 25 to 39 miles (40 to 63 kilometres) from the coast).

There is no consensus about the expected sign on the *dCBD* variable for every open space area. Each result should depend on the particular characteristics of the city closest to each open space area. Big Bend Swamp (Orlando), Econ St. John (Orlando), Green Swamp (Lakeland), and Longleaf Pine (Orlando) reveal that the price-distance gradient coming off of the nearest city (all in the south central Florida area) is negative and significant indicating that with increasing distance from central city, home value will decrease by between an half to three-quarters of a per cent for each mile; *ceteris paribus*. On the other hand, Charlotte Harbor Flatwoods (Ft. Meyers) reveal that the price-distance gradient coming off Ft. Meyers is positive and significant indicating that with increasing distance from the central city, home value will increase, all else being equal. Finally, Dade-Round Hammock (Miami), Dade-Madden Hammock (Miami), Lake Wales Ridge Scrub (Lakeland), and Northeast Florida Blueway (Jacksonville) are all insignificant indicating that distance from the central city does not impact house price.

The primary focus of this analysis is on the role and significance of the Florida Forever open space variables. A positive coefficient on *dBEFORE* indicates that the open space area was considered a negative attribute before it was put on the Florida Forever land acquisition list. Charlotte Harbor Flatwoods, Green Swamp, Lake Wales Ridge Scrub, and Northeast Florida Blueway are all considered negative externalities by nearby homeowners. For example, all else being equal, for each additional mile a home is located away from

[4] This result is not surprising due to the fact that Hispanic is the majority race in this area of Dade county.

[5] A negative sign on distance variables is interpreted as a positive marginal value for that characteristic. Property value increases as distance becomes less.

Table 4: Abbreviated single-family home hedonic regression for *DIFF* coefficient.†

Dependent Variable = ln P	Big Bend Swamp	Charlotte Harbor Flatwoods	Dade-Round Hammock	Dade-Madden Hammock	Econ St.Johns	Green Swamp	Lake Wales Ridge Scrub	Longleaf Pine	Northeast Florida Blueway
DIFF	-0.0005	-0.0306***	0.0107	-0.0033***	-0.0127***	-0.0035*	-0.0026	0.004	-0.0085***
	(-0.16)	(-5.58)	(1.08)	(-3.92)	(-18.10)	(-1.94)	(-1.14)	(0.92)	(-11.04)

† This coefficient and t-statistics on DIFF are from a separate regression in which BEFORE and AFTER are combined into one variable. This variable is interacted with a dummy variable for whether the sale occurred after the Open Space Project was put on the acquisition list. The coefficient and t-statistic reported is for the interaction, which indicates the difference between the coefficients for AFTER and BEFORE. All Other Variables from the model have been omitted for the table.
*, **, *** indicate significance at the 10%, 5%, and 1% level by a two-tailed test, respectively.

Table 5: Summary of results.

	Big Bend Swamp	Charlotte Harbor Flatwoods	Dade-Round Hammock	Dade-Madden Hammock	Econ St.Johns	Green Swamp	Lake Wales Ridge Scrub	Longleaf Pine	Northeast Florida Blueway
Before	no impact	negative externality	no impact	positive externality	no impact	negative externality	negative externality	positive externality	negative externality
After	no impact	positive externality	no impact	positive externality	positive externality	no impact	negative externality	positive externality	negative externality
Change	no significant change	significant increase in value	no significant change	significant increase in value	significant increase in value	significant increase in value	no significant change	no significant change	significant increase in value

Charlotte Harbor Flatwoods, price will increase by 2.37 per cent. On the other hand, a negative coefficient on *dBEFORE* indicates that the open space area was considered a positive attribute before it was put on the Florida Forever land acquisition list. Dade-Madden Hammock and Longleaf Pine are consistent with this result and are considered positive externalities by nearby homeowners. For example, for each additional mile a home is located from either Dade-Madden Hammock or Longleaf Pine, price will decrease by about 1 per cent, all else being equal. Finally, the coefficient on *dBEFORE* is not statistically significant for Big Bend Swamp, Dade-Round Hammock, and Econ St. Johns indicating that these areas do not affect nearby homeowners before they were added to the Florida Forever acquisition list.

Similarly, a positive coefficient on *dAFTER* indicates that the open space area was considered a negative attribute after it was put on the Florida Forever land acquisition list. Lake Wales Ridge Scrub and Northeast Florida are still considered negative externalities after they are put on the list. For example, house price will decrease by approximately 4% for each additional mile a home is located from Lake Wales Ridge Scrub, all else being equal. However, as we will explore, the relevant question is whether these open space areas become less of a negative externality once they are put on the list. On the other hand, a negative coefficient on *dAFTER* indicates that the open space area was considered a positive attribute after it was put on the Florida Forever land acquisition list. Charlotte Harbor, Dade-Madden Hammock, Econ St. Johns, and Longleaf Pine are all considered positive externalities after they are put on the acquisition list. For example, house price will increase by about 1 per cent for every mile away from Longleaf Pine, all else being equal. Big Bend, Dade-Round Hammock, and Green Swamp all have insignificant coefficients on *dAFTER* indicating that these open spaces do not impact nearby property values even after put on the acquisition list.

The previous results showed how nearby homeowners valued the open spaces both before and after they were added to the Florida Forever land acquisition list. However, the more important question investigates *the change* in nearby single family home prices. That is, does merely being placed on the acquisition list and the perception of an open space being permanent in the future cause a change in nearby property values? Again, the FDEP claims that being on the list should *not* trigger any changes in property values. In Table 4, the coefficient on *DIFF* is from a separate set of regressions in which *dBEFORE* and *dAFTER* are combined into one variable, *dOPEN*. This variable is interacted with a dummy variable for whether the sale occurred after the Open Space Project was put on the acquisition list (*AFTER*). The coefficient and t-statistic reported for *DIFF* is for the variable *AFTER*dOPEN*, which indicates the difference between the coefficients for *dAFTER* and *dBEFORE*. A negative coefficient on *DIFF* indicates that being put on the acquisition list resulted in an increase in property value and a positive coefficient on *DIFF* indicates that being put on the acquisition list resulted in a decrease in property value.

Table 5 provides a summary of these results. It can be seen that single family home values near Charlotte Harbor Flatwoods, Dade-Madden Hammock, Econ St. Johns, Green Swamp, and Northeast Florida Blueway Open Space Projects all significantly increased in value after being put on the acquisition list. That is, after being put on the list these open space lands, now perceived as undevelopable and publically owned in the future, resulted in an increase in nearby property values. These results for these five open space projects contradict the claim made by the FDEP. On the other hand, Big Bend Swamp, Dade-Round Hammock, Lake Wales Ridge Scrub, and Longleaf Pine show no significant change in nearby property values after being put on the acquisition list which supports the claim made by the FDEP.

Conclusion

This study has empirically investigated the impact of Florida Forever Open Spaces on nearby property values, specifically nearby single-family homeowners, for nine

Florida Forever Projects on the land acquisition list in the State of Florida. The purpose of the study was to determine whether being added to the Florida Forever acquisition list significantly changes the value of the open space to nearby property owners.

The results indicate that for five out of the nine open space projects nearby homeowners valued the open space significantly more after it was put on the Florida Forever land acquisition list. It is important to note that just because nearby homeowners valued the majority of Florida Forever open space in this study significantly more after they were put on the acquisition list does not mean that they perceived the open spaces having a positive marginal value. For example, Northeast Florida Blueway is still considered to be a negative externality after being added to the list, just a less negative attribute than before it was added to the list. The remaining four open space projects in the study did not show a significant change in value to nearby property owners after being put on the list.

Therefore, the results do provide some evidence that contradicts that claim made by the FDEP. For five of the open space projects in the study, just perception of the land being permanently undevelopable and publicly owned at some point in the future (being added to the list) triggers a positive change in value to nearby property owners. Further investigation is needed to determine the characteristics of the open space projects that in fact show a positive change in value versus those characteristics open space projects that show no change in value to nearby homeowners.

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