



The Nelson A. Rockefeller Center at Dartmouth College

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VALUATION OF RECREATION INFRASTRUCTURE IN SOUTHERN WINDSOR COUNTY

An Economic Analysis of Outdoor Recreation Infrastructure in Weathersfield, West Windsor, and Windsor

Presented to the Southern Windsor County Regional Planning Commission

PRS Policy Brief 1718-04

February 28, 2018

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EXECUTIVE SUMMARY

The Southern Windsor County region in Vermont, which encompasses the towns of Windsor, West Windsor, and Weathersfield, contains many opportunities for those seeking outdoor recreation. Between Mount Ascutney, the wildlife areas, and the network of outdoor trails, the region offers a variety of recreational services. This variety is part of what brings thousands of hikers, hang gliders, mountain bikers, and other outdoor enthusiasts to the region every year. The purpose of this brief is to estimate the impact of all this activity on the local economy and what value recreation infrastructure adds to the region. The valuation consists of four value components: community enhancement, economic contribution, personal value of recreation, and environmental benefits. Through these categories, we show how the southern Windsor network of outdoor recreational assets affects property values, the local economy, and the quality of life of a region. This report values the outdoor infrastructure of these three towns at approximately \$52.4 million. This figure does not include the community enhancement value, which was estimated as a more than 20 percent increase in property value associated with being within two miles of Mount Ascutney Park. With this information, the Southern Windsor County Regional Planning Commission (SWCRPC) can determine the best ways to integrate these assets into a sound economic development strategy.

1. INTRODUCTION

Nearly 72 percent of Vermont residents participate in outdoor recreation each year, and an estimated one in seven jobs in the state depends on outdoor recreation.¹ Clearly a large part of the culture and the economy of the state, outdoor recreation is an important policy area for regional and town governments. The Southern Windsor County Regional Planning Commission is currently working with the towns of Windsor, West Windsor, and Weathersfield to develop their natural resources and outdoor recreation infrastructure. Some of the major natural resources in and around these towns include Mount Ascutney, West Windsor Town Forest, Sloughton Pond, the Connecticut River, and Little Ascutney Wildlife Management Area. On these sites, the towns and a nonprofit, Ascutney Outdoors, have built and maintained facilities and infrastructure to provide outdoor enthusiasts with a variety of activities, including hiking, camping, skiing, hang gliding, fishing, hunting, canoeing, and wildlife watching.²

In order for these towns to begin planning further development of this infrastructure, they need an estimate of the total value that their natural resources and recreation infrastructure currently add to their communities. This report aims to conduct an economic valuation of the natural resources and recreation infrastructure within the area of three towns, Windsor, West Windsor, and Weathersfield. Our specific focus will be on the value added by Mount Ascutney, West Windsor Town Forest, and the Wildlife Management Area.

1.1 Defining Terms

This report conducts an economic valuation. For our purposes, an economic valuation will consist of computing many of the economic benefits associated with the natural resources and recreation



infrastructure. Crompton (2010) distinguishes between “economic impact” studies and “economic significance” studies. Impact studies include cost analysis and calculate net benefits.³ By contrast, this report is an economic significance study and will calculate gross benefits. We cannot calculate net benefits because town budgets do not differentiate between outdoor recreation and other recreational facilities and programs.⁴ Furthermore, the lease agreement between West Windsor and Ascutney Outdoors states that Ascutney Outdoors will be responsible for maintenance costs with no assistance from the town.⁵ Thus, costs associated with the recreation infrastructure are covered by private citizens and not relevant to the towns as they decide to invest. It is also infeasible to calculate opportunity costs associated with the land given time and resource constraints.

Throughout the report, the three towns being discussed are Windsor, West Windsor, and Weathersfield, unless otherwise specified. “Southern Windsor” (county) will also be used to describe the three-town region. Recreation infrastructure will be defined as the facilities, trails, and other man-made additions to land for the purpose of outdoor recreation. The natural resources will be defined as the land on which the outdoor recreation infrastructure sits, which is set aside as a conservation easement and cannot be used for residential or industrial purposes.⁶

1.2 Report Structure and Summary

This report describes our valuation methodology and our findings. After an extensive literature review of resource and recreation valuations, we have broken down the total valuation into four components: community enhancement, economic activity, personal value of recreation, and environmental benefits.⁷ Section 2 defines community enhancement as the value added to the community when natural resources and recreation infrastructure are present. This includes the value of community identity and appealing scenery. This section outlines the procedure and results of our data collection and regression analysis on the impact of the natural resources on property values. Section 3 details all the ways in which recreation infrastructure contributes to the economy, specifically through increased tourism revenue and recreation consumption. Section 4 estimates the personal value that individuals receive from participating in outdoor recreation using the travel cost and opportunity cost methods. Section 5 covers the environmental benefits of maintaining natural resources and how value transfer analysis quantifies those benefits. Section 6 concludes.

2. COMMUNITY ENHANCEMENT

The presence of outdoor recreation infrastructure and natural resources often adds significant implicit value to neighboring communities. This non-use value is simply the value of the resources existing.⁸ Mountains, parks, and ponds contribute to the scenic landscape of a community, providing appealing views for residents. There is also the cultural value of having a community identity. A town may, for example, take pride in its proximity to and relationship with nature.⁹ A valuation of Southern Windsor recreation infrastructure and natural resources that focuses solely on direct use value neglects the benefits that many community members who do not ski or hike still receive. Thus, it is important to incorporate the community enhancement value into our valuation.



The implicit value of community enhancement cannot be observed; however, it can be quantified through its effects on property values in a hedonic pricing model.¹⁰ When the recreation infrastructure and natural resources in a town provide appealing views and strengthen community identity, the value of living in that town increases and consequently the price of real estate increases. We can measure the effect of Southern Windsor recreation resources by comparing the property values of homes located close to the amenities with those further away.

A previous real estate value analysis conducted by Bernstein et al. (2017) ran an OLS linear regression of ZIP code proximity to the Connecticut River on six relevant dependent variables, including real estate value.¹¹ In their regression, the dependent variable was derived from the ZIP code characteristics, and they assigned an indicator variable the value of zero, one, or two depending on the ZIP code proximity to the river. They also controlled for income in some of the regressions. Voigt et al. (2015) conducted a similar regression to determine the effect of Lake Champlain on property values in Vermont.¹² Their data was at the home transaction level and thus controlled for a greater number of variables including parcel size, retail and service establishments nearby, the presence of a garage, the percentage of vacant units in the block group, etc. Their proximity parameter was “*is within 100-m of Lake Champlain*” and assigned the indicator variable the value of one for yes or zero for no.

This study estimates a hedonic regression similar to those in Bernstein et al. (2017) and Voigt et al. (2015). Given the small scale of the natural resources we are valuing relative to the Connecticut River, house-level real estate data will be more precise than ZIP code-level data. The data points used in the regression analysis were taken from listings of recently-sold homes in the area on Zillow.com. Using a web scraping software, we pulled the address, sale price, date sold, and core features of all houses sold in the three towns and the surrounding areas over the past three years. After this data was gathered, the listings were limited to those that contained a viable address and information on bedrooms, bathrooms, sale price, year sold, and square footage. This process resulted in a sample size of 276 homes sold between 2015 and 2017.

Our OLS regression assessed the relationship between property values and distance to Mount Ascutney Park. The property value is approximated by the sale price, which we adjusted for inflation to January 2018 dollars. We chose to focus on the value added by Mount Ascutney because it is the most significant recreation site in the area by size. Assessing the value of the smaller resources would lead to omitted variables bias because there are numerous small parks and recreation areas scattered around the towns that would affect property values as well. Once we collected the household data, we used ArcGIS to calculate the linear distance of each address to Mount Ascutney Park. Figure 1 shows each data point and its location relative to Mount Ascutney Park. We organized the households into three groups: zero-to-two miles from the park, two-to-five miles from the park, and greater than five miles from the park. Since our conception of community value added is mostly aesthetic value, these groups were chosen based on their ability to see the park from the address. We used Google Maps street view and subjectively determined that at two miles away, individuals at the addresses could no longer see the mountain without a clearing and that at five miles away, the park was no longer discernable. Our regression contained a number of



controls for house characteristics: number of bedrooms, number of bathrooms, square feet, lot size, year built, and year sold. Town fixed effects controlled for unobservable characteristics of the towns that impact sales prices, including local school quality, neighborhood characteristics, and population density.

The regression model is as follows:

$$\ln \text{SellingPrice}_i = \beta_0 + \beta_1 * \text{DistBin2}_i + \beta_2 * \text{DistBin3}_i + X_i + u_i,$$

where *DistBin2* and *DistBin3* are dummy variables set equal to one if the house is between two and five miles of Mount Ascutney Park and if the house is greater than five miles from the park respectively. *lnSellingPrice* is the log of the property sale price, *X* represents a set of controls, and *u* is an error term capturing other variables affecting the property value. The model estimates cannot completely represent the causal effect of distance on property value because there are likely omitted variables that are correlated with both sale price and distance to Mount Ascutney. We cannot know how significant the bias is, but we are hoping that the control variables will account for most of the bias. It is most likely that this model reveals correlation rather than causation.

Table 1 shows the regression results. Column 1 shows the results of the regression using all the data; column 2 shows the estimates when only observing houses sold in 2017; and column 3 shows the estimates when observations with lot sizes greater than five acres are removed. Our reason for running the third regression is that we noticed unusually low house prices associated with lot sizes greater than five acres. We were not sure how accurate these data points were or how much noise they were bringing into the regression, so we omitted these data points from the set. The column 3 regression estimates that being within two miles of Mount Ascutney is associated with a 23.1 percent greater home value than being within two to five miles. This estimate is statistically significant at a 10 percent significance level. The same regression shows a 26.8 percent greater home value for homes within two miles of Mount Ascutney relative to those greater than five miles away. However, the confidence interval for this estimate is wide, and this result is not statistically significant. The high standard errors can be attributed either to the small sample size or to a possible correlation between distance to the park and house characteristics. The positive coefficients on bathrooms, square feet, and lot size are as expected; however, the negative coefficient on the number of bedrooms is surprising. One explanation is that when controlling for square feet, increasing the number of bedrooms means less living space or perhaps less kitchen space, which are also major factors in house prices. While this explanation is plausible, the counterintuitive coefficient does caution that there may be omitted variables bias.

The potential for omitted variables bias inhibits our ability to make a strong causal assertion. Most likely, these results reveal merely correlation. However, given the controls for major observable factors, we cautiously claim that proximity to Mount Ascutney positively affects property values. The relationship is likely driven by aesthetic value or a greater sense of community identity.



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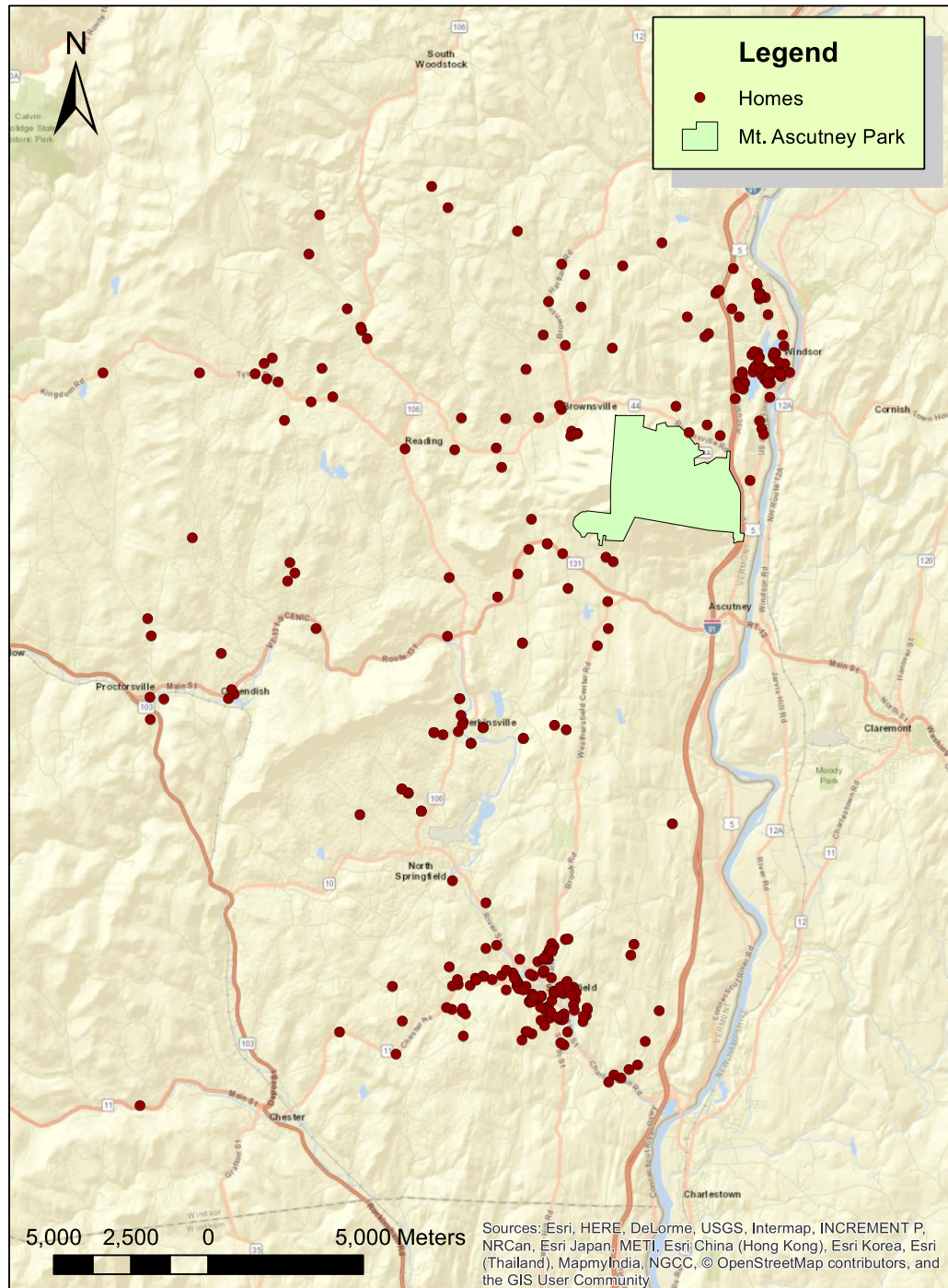


Figure 1. Map of Household Observations and Proximity to Mount Ascutney Park

Source: Created by the authors on ArcGIS software with public data from Zillow.com.



VARIABLES	(1) Log Price CPI-Adjusted	(2) Log Price CPI-Adjusted 2017 Data	(3) Log Price CPI-Adjusted Lot Size < 5acres
2-5 miles away	-0.162 [0.169]	-0.279* [0.166]	-0.231* [0.131]
5 or more miles away	0.196 [0.275]	-0.0374 [0.285]	-0.268 [0.171]
Beds	-0.111 [0.0846]	0.00857 [0.0865]	-0.168** [0.0810]
Baths	0.233*** [0.0744]	0.0939 [0.109]	0.238*** [0.0827]
Square Feet	0.000196 [0.000123]	0.000212 [0.000137]	0.000289*** [0.000100]
Lot Size	0.00624** [0.00254]	0.00915*** [0.00131]	0.00194 [0.0488]
Constant	11.20*** [0.291]	11.25*** [0.282]	11.21*** [0.282]
Observations	276	75	226
R-squared	0.469	0.713	0.411
Town Controls?	Yes	Yes	Yes
Year Built Controls?	Yes	Yes	Yes
Year Sold Controls?	Yes	Yes	Yes

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 1. OLS Estimates of the Effect of Proximity to Mount Ascutney on House Selling Price

3. ECONOMIC ACTIVITY

Recreation infrastructure can contribute to the local economy by promoting consumption and employment that might not otherwise occur. In this section, we evaluate the impact that outdoor recreation has on the economies of Windsor, West Windsor, and Weathersfield through increased tourism and consumption. Outdoor recreation can attract tourists from outside these towns, who inject money into the local economy during their visit. Furthermore, the recreation economy has a major presence in the towns by employing residents and providing local tax revenue.



3.1 Tourism

Outdoor recreation infrastructure can be a great way to attract tourists and spending. Activities such as hiking, mountain biking, and hang gliding offer many opportunities for personal enjoyment and physical activity for tourists. Thus, towns with outdoor recreation have often increased tourism revenue.¹³ Mount Ascutney State Park currently sees an average of 14,000-15,000 visitors per year, and out-of-state visitors account for roughly half of all visitors. In 2017, 8,264 visitors (55 percent of total visitors) came to the park from outside of Vermont.¹⁴ To put this in perspective, the total population for all three towns is 7,477.¹⁵ While we do not know exactly how many unique out-of-state visitors there were, this figure does give us an idea of how valuable outdoor recreation like Mt. Ascutney is for tourism in the area. These tourists add value when they spend money in the towns. Whether it be for hotels, meals, activity fees, or shopping, the revenue from tourism has significant impacts on the economy by providing revenue with which businesses can invest and by providing direct income for local residents. Spending on outdoor recreation activities alone likely supports numerous local jobs. Publicly available data shows that 51,000 jobs in Vermont are created by outdoor recreation and that these jobs pay a total of \$1.5 billion in wages and salaries.¹⁶

3.1.1 Visitor Night and Spending Estimates

To approximate the value added by tourism for outdoor recreational resources, we used the estimation model employed by the Vermont Department of Tourism and Marketing in its 2015 benchmark report.¹⁷ In summary, there are five categories of visitors: those who stay in hotels or commercial occupancy, those who have second homes, those who camp in parks, those who visit private homes, and those who take day trips. The Vermont Department of Tourism and Marketing report provides formulas and methods for calculating the total visitor nights of each category and offers estimates for the total spending per visitor night for each category. Table 2 shows the total visitor nights per category per year in Windsor, West Windsor, and Weathersfield and the per visitor night spending estimates. Appendix 1 details our methodology for calculating the visitor nights for the three towns.

Visitor Category	Visitor Nights	Spending Per Visitor Night	Total Visitor Spending
Commercial Occupancy	281,680	\$ 117.81	\$ 33,184,721
Second Homes	78,756	\$ 65.63	\$ 5,168,756
Campers	5,515	\$ 32.73	\$ 180,506
Private Homes	78,748	\$ 47.00	\$ 3,701,156
Day Trip	(days) 24,714	\$ 73.91	\$ 1,826,612
Total:	469,413		\$ 44,061,751

Table 2. Yearly Visitor Nights and Spending in Windsor, West Windsor, and Weathersfield

Source: Data provided by the Vermont Department of Tourism and Marketing (2017), SWCRPC Director of Planning Jason Rasmussen, Vermont Department of Taxes, and US Census Bureau modified by the authors.



One limitation in interpreting this finding is that it is impossible to know which tourists visited specifically for the outdoor recreation and which traveled to Southern Windsor for other reasons. The impact of outdoor recreation on tourism applies only to the tourists for whom recreation was their primary reason for visiting.¹⁸ Assuming visitors come to Southern Windsor for other purposes, one should view this calculation of approximately \$44 million in value added to the economy via tourism with some caution. We consider this result an upper bound.

3.1.2 Large-scale Outdoor Events and Tourism

In addition to our data analysis of visitors and tourism revenue, we also looked into the effect that large-scale outdoor events like the Vermont 50 have on tourism and the local economy. Such events are an example of how the outdoor recreation infrastructure in this area can be used effectively to boost visitation to the region.

The largest tourism event of the year in Southern Windsor County is the Vermont 50 Mountain Bike Race and Super Run at Mount Ascutney. Held on the last weekend of September, the event is a fundraiser for a local nonprofit. However, this nonprofit is not the only beneficiary of these races; the economic activity caused by this event provides a major boost in tourism and demand for services that extends across all of the Southern Windsor County region.

In 2016, 1,101 athletes participated in the main events: 617 in the mountain bike race, 217 in the 50-kilometer run, 184 in the 50-mile run, and 83 in the 50-mile team relay.¹⁹ This does not even include the number of children and adaptive athletes that participated in the bike races and fun runs the day before, nor does it include friends and family members that travel with the participants to support them. In general, a typical crowd for the event is around 1,500 people.²⁰ Of the 1,018 people who participated in the bike race, 50-kilometer run, and 50-mile run, only 242 of them were from Vermont, meaning state residents accounted for 23.8 percent of all participants. Of these 242 Vermonters, only 10 were from Windsor, West Windsor, or Weathersfield.²¹ Of course, there were many participants who came from nearby areas in Vermont (Woodstock, White River Junction) and New Hampshire (Lebanon, Hanover), but the vast majority of participants in the event came from well outside the Southern Windsor area.²²

As one might expect, this influx of people has a large impact on the local economy. As over a thousand people come through the area, hotels, restaurants, and retail stores see their demand rise precipitously. The event also includes a six-hour Vendor Fair that allows local businesses (OWL Energy Bar), nonprofits (Vermont Adaptive), and international corporations (Timex) to showcase their products in front of hundreds of non-residents. In addition to these companies, both Ascutney Trails and Ascutney Outdoors have booths in order to inspire future recreation tourism in the area.²³



3.2 Recreation Consumption

The most direct economic benefit that outdoor recreation infrastructure brings to an area comes from the money people spend to participate in outdoor activities. This benefit comes in two forms: the direct revenue collected from state and local governments as result of said activities (e.g., hunting licenses and entry fees) and the increase in economic activity for local businesses in the recreation economy (e.g., outdoor recreation equipment).

At the town level, the only recreation budget data we could access is for Windsor. In FY2017, expected revenues from recreation activities totaled \$105,000, an amount that has not changed in the FY2018 budget.²⁴ This number is not broken down further, so we do not know how much of that revenue comes from outdoor recreation. At the state level, outdoor recreation in Vermont accounts for \$505 million in state and local tax revenue.²⁵ We have also estimated the total revenue generated by the toll road at Mt. Ascutney. In 2015 and 2016, an average of forty cars per day used the toll road. With a three-dollar toll and a typical season of 200 days, the toll road averages revenues of \$120 per day, which amounts to around \$24,000 per year.²⁶

The economic benefits of recreation spending for local businesses can be quantified by the amount of consumer spending on recreation-based goods and services. According to the Outdoor Industry Association, outdoor recreation in Vermont typically generates \$5.5 billion in consumer spending annually.²⁷ In 2011 alone, Vermonters spent about \$292 million on hunting, \$288 million on nature watching, and \$131 million on fishing.²⁸ In addition, the member organizations of the Vermont Trails and Greenways Council earn a combined \$22.4 million in revenue each year.²⁹ Disaggregated data for Windsor, West Windsor, and Weathersfield are not available, but the state estimates provide a frame of reference for the potential business activity as a result of outdoor recreation infrastructure.

Our final valuation calculation does not contain estimates of recreation consumption for three reasons. First, we do not have precise data for the amount of consumption in our three focus towns. Second, much of the consumption is likely by tourists and therefore would be double counted. Finally, Crompton (2010) uses the “broken window fallacy” to argue that in economic valuations of recreation, local resident spending should be excluded from economic contribution calculations.³⁰ His reasoning for this is that without recreation activities, locals would still be spending their money on some sort of activity. Economists question the credibility of the broken window fallacy, so while we will not include recreation consumption in our valuation, one can make the case that the recreation economy in Southern Windsor does add value to the area.

3.3 Multipliers

Studies of the effects of spending on the economy often include a capture rate and spending multiplier.³¹ A multiplier represents the fact that when money is spent in a local economy, the recipient of that money will likely spend a portion in the economy as well.³² To start, one must calculate the direct effect of additional spending on the local economy. For every dollar spent by



a

consumer at a business, some percentage goes toward the local private sector, local employees, and local government taxes, and the rest goes toward private sector firms, employees, and government taxes outside the local economy.³³ This “capture rate” varies based on industry, firm size, and economy size.³⁴ Then as the money ripples through the economy, one has to take into account both the marginal propensity of employees and the marginal propensity of firms to spend their additional earnings in the local economy.³⁵ Clearly, constructing a town-wide sales multiplier from scratch requires professional economic skills and tools. However, a number of reports provide general estimates for multipliers based on economy size and industry (see Appendix 2).

Because of the complexity and inaccuracy of multipliers, our analysis of tourism revenue features two results: one in which we multiply the sum of the economic contribution by a capture rate and sales multiplier and one in which we do not.³⁶ These two results can serve as an upper and lower bound. We have chosen to use .737 as the capture rate and 1.2 as the sales multiplier. Multiplying the total visitor spending estimate of \$44,061,751 by these two values yields a total economic effect of \$38,968,212 from outdoor recreation.

4. PERSONAL VALUE OF RECREATION

Another key component of measuring the value of recreation infrastructure is the personal value of recreation that town residents and other users receive. Recreation provides many benefits beyond economic revenue such as improved physical and mental health, stronger relationships, personal enjoyment, and more.³⁷ These benefits constitute the personal direct-use value of recreation which users derive from using the ski ways, trails, and other recreation infrastructure. Although it can be difficult to quantify the personal value of recreation, there are strategies such as a travel cost analysis and opportunity cost analysis that can estimate the value that users place on recreational options.

4.1 What is the Travel Cost Method?

The travel cost method is a commonly used means of assessing the value people place on certain activities.³⁸ The theory behind the travel cost method is that the time and travel cost expenses that people incur to visit a site represent the price of access to the site.³⁹ The fact that people are willing to pay this cost implies that they value the activity at least this amount. Here there are two separate costs: the travel cost and the opportunity cost of the time spent at the amenity. The travel cost is calculated as the cost of traveling to the site (i.e., fuel expenses, tolls, etc.) plus the opportunity cost of the time spent traveling to the site (i.e., driving two hours to Mount Ascutney from New Hampshire). The time cost is calculated as the opportunity cost of the time spent at the amenity itself (i.e., hiking Mount Ascutney for three hours). As a result, one can measure the value of a visit to a site by analyzing how much total cost, travel cost plus time cost, a person incurs during the visit.⁴⁰ This metric estimates the value of the recreational services of the site in question as a whole. The preferred form of the travel cost method for our purposes is the zonal travel cost approach. The zonal travel cost approach creates zones of travel based on distance from the site and uses data on the number of visits to the site to estimate the total travel costs for each zone, and ultimately an estimate of the personal value of recreation.⁴¹



A previous zonal travel cost analysis conducted by Willis (1991) was used to estimate the personal value of forest recreation and serves as one inspiration for our model with Mount Ascutney.⁴² Willis uses a random sample of visitors interviewed at different recreation sites for data collection. He then employs a zonal travel cost model to value forest recreation. Traditionally, the travel cost method makes use of regression analysis and constructs a demand function to calculate consumer surplus as the area under the curve, just as Willis does. However, for our purposes we are simplifying this model by replacing the regression demand curve and consumer surplus analysis with a willingness to pay measure. This measure is represented by the total cost per trip that visitors from different zones pay to access the recreational services of recreation sites, namely Mount Ascutney. By using willingness to pay, we have a lower bound on the amount that visitors are willing to pay to access recreational services at a site and thus how much value they place on them. To then get an estimate, we can simply multiply the willingness to pay measure in each zone by the number of visitors from the zone, sum all the zones, and receive our personal value estimate.

4.2 The Travel Cost Method for Mount Ascutney

Using trail user data provided by the Upper Valley Land Trust, we constructed a personal value estimate using the travel cost method for Mount Ascutney.⁴³ Similar analyses for other recreational sites are not feasible due to a lack of data. However, Mount Ascutney is likely the most used and important recreation site in the area, hence it also probably provides the greatest personal value. We relied on survey data from a sample of 264 respondents that is assumed to be representative of the larger population visiting Mount Ascutney.⁴⁴ The data contains a breakdown of where respondents traveled from, the average time they spent at the mountain, the average group size, and the number of visitors from each town in Vermont and New Hampshire respectively as well as from states including Massachusetts, Connecticut, and Maine.

To implement the zonal travel cost methodology, we created four zones from which travelers come: Vermont, New Hampshire, Massachusetts/Connecticut, and Maine. We combined Massachusetts and Connecticut into one zone because of their similar distance to Mount Ascutney. We scaled the survey data by taking the percentages of visitors from each zone and multiplying by the total number of visitors to get the estimate of the total number of visitors from each zone. For Vermont and New Hampshire, we did this for each individual town in the survey that had at least one visitor to Mount Ascutney to get the aggregate numbers of visitors.

The travel costs associated with this method include the value of the time spent traveling to the site and back and the fuel cost of traveling to and from the site.⁴⁵ For our purposes, these are the only costs we are considering. We do not include other costs such as admission fees and cash travel costs such as tolls. The most common way of converting travel time into a travel cost in dollars is by comparing it to the average wage rate of the state.⁴⁶ We take 60 percent of Vermont's average wage rate as a travel time opportunity cost benchmark, also known as our opportunity cost wage rate. The reason for using 60 percent of the wage rate instead of 100 percent is that not all of the users of recreation are currently in the workforce, and 60 percent has been the estimate suggested by the literature.⁴⁷ The opportunity costs of time were calculated then as the product of the



opportunity cost wage rate and the total number of hours spent traveling to the site. The number of hours spent traveling to and from were found through Google Maps. For ME, we used the middle of the state as the starting point and Mount Ascutney as the destination and then recorded the round trip travel time. For MA/CT, we took the average travel time from the middle of each state as our zone values. We completed more specific data collection for VT and NH, using each individual town as a starting point and recording the town-level, rather than state-level, round trip travel times for Mount Ascutney. We used the travel time and distance from each individual town in VT and NH because we had more detailed town-level data.

Fuel travel costs are calculated most frequently by using the average national gas price per mile to calculate the cost of driving to a recreation site.⁴⁸ We used American Automobile Association 2017 statistics on the average price of gas per mile as our travel cost.⁴⁹ To find out the distance in miles that visitors from each zone traveled, we used Google Maps and selected the fastest route from each town in NH or VT to the site. For MA/CT, we used the center of the state to calculate the distance to the site and then took the average value for both states as the zonal distance. For ME, we used the center of the state as well as the starting point and then calculated the distance to the site. We then multiplied the travel cost by the distance traveled (in miles) from each individual town in Vermont and New Hampshire, and from the zones of Massachusetts/Connecticut and Maine to find the round trip distance travel cost.

Adding up the travel time and fuel costs, we obtained the total cost per trip for each zone and multiplied it by the number of visitors from each zone to obtain the valuation estimates. For Mount Ascutney using the travel cost method, our personal value estimate is \$1,147,572.

There are some limitations to this model. First, it does not include all travelers in the “other” category. These travelers may have come from states other than VT, NH, MA, CT, and ME, and from other countries, as well as for purposes beyond just visiting Mount Ascutney. As a result, we cannot reliably expect that they are paying the travel and time costs simply for the personal value they derive from visiting Mount Ascutney. Second, our assumptions of a representative sample and that the main purpose of these visitors coming to Vermont is to visit Mount Ascutney may not be entirely accurate. It may also be the case that tolls, admissions fees, etc. are significant additions to travel cost for Mount Ascutney or another recreation site, and that our valuation is actually an undervaluation. Hence this estimate should be taken as an estimate rather than a precise value.

4.3 Opportunity Cost Estimate for Mount Ascutney

The second piece of the personal value estimation assesses the opportunity cost of the time spent using the amenity. This model took the average number of hours spent at the site per group and multiplied that by the opportunity cost wage rate to calculate the opportunity cost of time spent at the site. For this opportunity cost estimate, our personal value estimate is \$388,292. Adding the estimates from 4.2 and 4.3 gives the total opportunity cost estimate, which is the travel cost plus the cost of the time spent at the site. This implies a total personal value of \$1,535,864.



4.4 Estimates for Other Recreation Sites

We were unable to obtain data similar to the visitor data for Mount Ascutney for sites such as the West Windsor Town Forest and Little Ascutney Wildlife Management Area. Although we are currently unable to offer an estimate of the personal value for these sites, they still provide personal value to visitors. The recreational services that each site provides the benefits beyond economic revenue mentioned earlier and should be taken into account in any recreational infrastructure valuation.

Additionally, we conducted an interview with Mr. Tim Morton, a Stewardship Forester at the Vermont Department of Forests, Parks & Recreation. Mr. Morton helps oversee the Little Ascutney Wildlife Management Area, an 860-acre recreation site located in the towns of Weathersfield and West Windsor.⁵⁰ In the interview, he said that the primary services offered by the site are its forestland areas, meadows, hunting woods, snow-trails, and wood roads. Mr. Morton identified three primary groups of visitors to the site: hunters, snow-trail users, and nature walkers. He said that the hunters are the biggest group of visitors and estimates that from early September to mid-December (the duration of the hunting season), there are about 2,000 total hunting visits to the site. Mr. Morton said that the snow-trail users come during the winter months, and he figures that they constitute about 1,000 visits. In regards to nature walkers, he said that they come throughout the year to walk through the woods, and he thinks that they also total about 1,000 visits. He said that he doesn't have a reliable estimate for the overall total number of visitors but that they almost entirely come from the Ascutney area and surrounding towns. Although we cannot derive a quantitative valuation from the interview with Mr. Morton, his insight into the main types of visitors to the site and where they mostly come from is valuable to understand the personal value that the services offered at the site provide.

4.5 Comparative Analysis of Recreation Value

One important finding from our literature review is a 2016 report produced by an environmental studies class at Dartmouth College in which students asked the question, "What can Mt. Ascutney do to create a comparative advantage by imitating the most successful organizational aspects of competition while leveraging their own unique resources and recreational offerings to revitalize West Windsor?"⁵¹ The students made four comparative analyses of the recreational services offered at Mount Ascutney by looking at Whaleback Mountain skiing in Enfield, NH, Magic Mountain skiing in Londonderry, VT, mountain biking at Killington Mountain Resort, and mountain biking at Kingdom Trails in East Burke, VT. The report concluded that only Killington topped Mt. Ascutney as a top destination for backcountry skiing and recommended that Mt. Ascutney start to provide services year round, instead of only during the winter season. The report makes many more recommendations from a comparative analysis lens that may be important information to learn about how the value people get from recreation in Southern Windsor and Mount Ascutney compares state-wide.



5. ENVIRONMENTAL BENEFITS

When outdoor recreation infrastructure is dependent on natural resources, as is the case with the hiking trails, camp sites, and boating locations in Southern Windsor, it provides additional non-use benefits. The existence and preservation of outdoor recreation infrastructure implies that there will be no residential or industrial development on that land. Preserving natural resources adds a host of environmental and ecological benefits.⁵²

For the Southern Windsor region specifically, the natural resources associated with the recreation infrastructure include forest parks, ponds, streams, and Mount Ascutney.⁵³ Forest ecosystems provide services such as protection of water quality, greenhouse gas sequestration, removal of air pollutants, storm water storage, soil retention, and refuge for animal species of interest to humans.⁵⁴ Rivers and ponds affect water quality and soil nutrients as well as provide a home to a number of animal species.⁵⁵

Ecosystem services do not yet have market value, so in order to estimate the economic benefits, we conducted a value transfer analysis. Value transfer is the process of compiling previous valuation estimates from different regions and applying them to a new target site.⁵⁶ For this study, we compiled a number of estimates of the value of ecosystem services per acre from temperate forests—the ecosystem of Mount Ascutney, the Wildlife Management Area, and the West Windsor Town Forest.⁵⁷ ArcGIS data provided by SWCRPC Director of Planning Jason Rasmussen reveals that there are approximately 5,710 acres of forest land between those three public land holdings.⁵⁸ Multiplying the total acres in our study area by a per acre benefit estimate will give us the total value of the ecosystem services from the outdoor recreation resources.

Our research yielded multiple studies that used complex economic models to create ecosystem value estimates. Mates and Reyes (2006) conducted a literature review and synthesized different studies to come up with their valuation estimates.⁵⁹ They value New Jersey forest ecosystem services per acre between \$1,409 and \$2,162. Southwick Associates (2011) concluded that ecosystem services per acre from forests value at \$1,014.⁶⁰ De Groot et al. (2012) estimate that temperate forests provide around \$1,219 per acre.⁶¹ Synthesizing these studies, we decided to use \$1,200 per acre as our ecosystem benefits estimate. Thus, the total ecosystem benefits brought by Mount Ascutney, the Wildlife Management Area, and the West Windsor Town Forest are approximately equivalent to \$6,852,000.

6. CONCLUSION

In order for the SWCRPC to make sound policy decisions regarding investments in outdoor recreation infrastructure, this report provides a valuation of the natural resources and recreation infrastructure of Mount Ascutney State Park and other public forest land in Windsor, West Windsor, and Weathersfield. The valuation was divided into four categories: community enhancement, economic activity, personal enjoyment, and environmental benefits. The total value added to the three towns for each category and in total is displayed in Table 3.



Valuation Category	Value Added
Community Enhancement	N/A
Economic Activity	\$ 44,061,751
<i>(with Capture Rate and Multiplier)</i>	\$ 38,968,212
Personal Enjoyment	\$ 1,535,864
Environmental Benefits	\$ 6,852,000
Total (without CR and Multiplier):	\$ 52,449,615
Total (with CR and Multiplier):	\$ 47,356,076

Table 3. Summary of Valuation Estimates

Our analysis estimates that the economic impact of the outdoor recreation infrastructure (primarily of Mount Ascutney) on Windsor, West Windsor, and Weathersfield is somewhere between \$47,376,076 and \$52,449,615, not including community enhancement. This result was formulated from estimations and imprecise models and should not be viewed as exact but merely a rough sense of the significance of the recreation infrastructure for the towns. Our analysis indicates that the current outdoor recreation infrastructure of the region provides significant value through tourism revenue, personal enjoyment, and environmental benefits. The tourism calculation must be considered an upper bound given that we do not know how many of the tourists traveled to the region primarily for the recreation infrastructure. While the model for assessing community enhancement is subject to many forms of potential bias, we also find a positive impact of proximity to Mount Ascutney Park on property values – likely on account of aesthetic views. The authors of this report do not opine on whether the infrastructure and natural resources demand further investment or expansion. Our hope is that these estimations provide context for local policymakers and stakeholders as they deliberate on the future of the outdoor recreation infrastructure and of southern Windsor County.



APPENDICES

Appendix 1. Tourist Visitor Nights Estimations

We derived the methodologies for estimating total visitor nights for each tourist category from the Vermont Department of Tourism and Marketing 2015 benchmark report.⁶²

The commercial occupancy visitor nights were calculated by multiplying the number of room nights in the three towns by 2.45, the estimate for the number of people per room according to the report. The number of room nights were calculated by dividing the total amount of hotel rooms revenue by the average room rate in Vermont according to the report. We calculated the rooms revenue by using the Vermont Department of Taxes town-level report of tax receipts for the meals and rooms tax.

Calculating the visitor nights for those with second home was simple. The US Census Bureau has publicly available data that shows the number of homes in each town for seasonal, recreational, or occasional use. The Vermont tourism report provides estimates for the number of visitor nights per second home.

Data provided by the SWCRPC gave us the number of visitor nights on public camp grounds. The report estimates that the number of visitor nights in private homes is approximately 68.5 percent of the number of visitor nights in commercial lodging. Day trip visitors are simply 30 percent of the number of hotel and second home visitors, which we calculated by dividing the hotel and second home visitor nights by the estimated visitor nights per visitor.

Appendix 2. Multiplier Estimates from Various Sources

According to Crompton (2010), in a recreation valuation analysis, “to derive direct effect, multiply total visitor spending by .8. For sales multipliers, use 1.2 for small rural areas, 1.4 for larger rural areas, 1.5 for moderate size communities, and 1.7 for state or metro area analyses.”⁶³

Posner and Ceroni estimate a 73.7 percent capture rate for the direct effect of recreation spending on the local economy. This estimate works well for our analysis because Barre, Vermont is a relatively similar setting to Windsor, West Windsor, and Weathersfield. Posner and Ceroni’s estimates for sales multipliers can be found in Figure 2 and are specific to each spending category.⁶⁴



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Spending category	Sales multiplier	Job multiplier	Income multiplier %	Tax multiplier %
Lodging	1.39	30	0.42	0.09
Restaurant	1.32	35	0.42	0.09
Groceries	1.28	32	0.50	0.07
Gas	1.28	7	0.13	NA
Other	1.3	30	0.44	0.07

Figure 2. Multiplier Estimates from Posner and Ceroni

Source: Posner and Ceroni, Potential Economic Impact of Outdoor Recreation in the Barre Town Forest, Vermont, 7.

Notes: The values in this table represent the change in sales, income, and tax revenue for every dollar change in direct sales. The job multiplier values represent the change in jobs for every million dollar change in direct sales.



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