A HEDONIC PRICING MODEL OF THE EFFECT OF THE AMERICAN RIVER PARKWAY ON HOME PRICES IN SACRAMENTO COUNTY, CALIFORNIA, USA

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A Thesis

by

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Abstract

of

A HEDONIC PRICING MODEL OF THE EFFECT OF THE AMERICAN RIVER PARKWAY ON HOME PRICES IN SACRAMENTO COUNTY, CALIFORNIA, USA
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Joseph Karkoski, Jr.

My research has focused on an issue of great importance to current and future generations of residents of the Sacramento region – how do we maintain a natural resource, the American River Parkway, that people treasure in a time when public funds are so hard to come by? Current funding of the American River Parkway depends substantially on the County's general fund tax revenue sources (approximately $3 million) in a time when there are greater demands on and less of these revenues. Parkway safety patrols and maintenance activities are already being cut.

To answer this question I have turned to the plethora of research on the value of green space. Based on the insights provided by prior researchers, the hedonic price function that I have developed considers over seventy variables. These variables allow me to control for price variation due to structural, neighborhood, location, and time attributes. In a departure from most other research, I did not treat distance from the Parkway as a continuous variable, but as a dummy variable.

My data came from three primary sources – Multiple Listing Service (MLS) home sales data from January 2008 to June 2009 (almost 5,500 home sales), 2000 United States census data, and Parkway distance information for the homes sold provided by the

Sacramento Area Council of Governments (SACOG). The MLS data included all of the information on the structural attributes of the home, the location of the home, and the time the home was sold. The 2000 census data was the source of information on median household income and the number of detached single unit homes in the study area. The SACOG information was my primary source of Parkway proximity data, although missing proximity data was filled in with Google Earth™.

This approach allowed me to determine where the effect of the Parkway was no longer statistically significant (at greater than 1/3 mile), which I could then more readily apply to my policy analysis. I was able to determine that the positive benefits of the Parkway are only statistically significant in half of the zip codes evaluated. One zip code showed a negative relationship between Parkway distance and value, which is likely due to the co-location of significant dis-amenities (e.g., railroad tracks).

The combination of a high coefficient of determination (adjusted R^2= 0.872); statistical significance of many of the regression coefficients; and correctly anticipated direction of key variables suggests that one can have a high degree of confidence in the results. I was able to show that a log-semilog functional form was superior, although not significantly so from a log-linear form.

I was able to demonstrate a statistically significant effect on home value for properties located within 1/3 mile of the Parkway in six zip codes generally to the east of downtown and midtown Sacramento. I postulate that the lack of a significant positive effect in the other six zip codes included in the data set is due to co-located disamenities, relative lack of Parkway access, and more attractive nearby amenities that are further from the Parkway.

For those homes whose value was positively affected by Parkway proximity, the increase in value was large in magnitude, ranging from $15,000 to $150,000 or a 10%-40% increase when all other variables are held constant. The total value added to single unit detached properties due to proximity the Parkway is nearly $800 million.

Using conservative assumptions, I found that proximal home owners would only pay about 6% of the equivalent annual net benefit (EANB) to replace current general fund contributions or 15% of EANB to bring the Parkway up to best practice standards.

A policy decision to assess these proximal properties must be made in the context of the many restrictions Californians have imposed on raising tax revenue and a political and economic environment that will make any tax increase extremely challenging. A compelling policy narrative that provides a compelling reason for changing the revenue base of the Parkway from the general fund to property owners is needed to win sufficient political support. That narrative will need to focus on the fundamental fairness of having those who benefit from the Parkway pay for its upkeep.

The policy solution that I suggest is to form a Community Services District (CSD) for homes within one mile of the Parkway. The CSD would collect fees for those within one third of a mile of the Parkway as suggested by the results of my thesis. For those outside of the one third mile boundary, a smaller fee, equivalent to the cost of an annual parking pass, would be assessed. This smaller assessment will help distribute the cost by including a group of homeowners who are likely benefiting from proximity to the

Parkway, but to a degree that is not reflected in their homes' value. All property owners within the CSD would receive a free annual parking pass to ensure that they would be able to enjoy the Parkway that they are supporting. In addition, I recommend a voluntary fee be collected from cyclists who use the Parkway, but may be able to access it without living within the CSD.

The evidence is compelling that homeowners living close to the Parkway are deriving a great deal of value from ensuring the Parkway is well maintained and crime kept to a minimum. The self-interest of those property owners and fundamental fairness commend those homeowners to provide the funds needed to keep this jewel of the Sacramento region shining.

_______________________, Committee Chair
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My thesis would not have been possible without the help of the following people: as my primary advisor, Rob Wassmer provided me with the critical guidance I needed and important insights that vastly improved my work and pushed me to gain a better understanding of the work of other researchers upon whom I relied. Rob was also amazingly prompt in providing his feedback, which helped me stay on track. I also appreciated the comments of Ted Lascher, my second reader, who helped me produce a stronger and clearer thesis. Tina Glover, my PPA colleague, graciously provided the services of her staff at SACOG for the GIS work, without which, I would not have been able to complete my thesis.

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Chapter 1

INTRODUCTION

What value does a public greenway add to the homes of nearby residents? Is that added value enough that those receiving the benefit should contribute extra to the upkeep of the greenway, especially when parks maintenance budgets are being significantly cut? In this research, I will offer answers to these questions by evaluating the sale prices for over 5,000 homes in Sacramento County, California sold between January 1, 2008 and June 25, 2009. I will use a regression analysis to attempt to explain how differences in the sale price of homes relate to the factors (both positive and negative) that influence the sale price of the home. I am most interested in how (or whether) the selling price of homes is affected by proximity to the American River Parkway. ("Location, location, location!" as they say in the real estate business.) My regression analysis will also control for other key variables that influence home sale price (such as lot size and home size), so that I can isolate the influence of distance from the Parkway from other factors. To focus the policy analysis, I will limit my research to the portion of the Parkway over which the County has jurisdictional control (from Discovery Park to Nimbus Dam) and will not examine the section that is a State park.

If I find that Parkway proximity has a positive influence on home value, I will then estimate the aggregate increase in home value for all single-family homes within the Parkway's influence. I will compare the aggregate increase in value to the annual cost for maintaining the Parkway. This analysis will allow me to examine whether the current funding of Parkway maintenance appears fair and equitable or whether an alternative approach for financing Parkway maintenance would be more appropriate.

To provide context for my research, the remainder of the Introduction includes a history of the American River Parkway, with an emphasis on the funding of the Parkway; a summary of the benefits of the Parkway; a description of the governance of the Parkway, including the key non-governmental organizations that have been involved in developing the Parkway and funding its maintenance; a description of the financing of the Parkway and problems related to the budget; and a description of the material to be covered in the rest of this thesis.

History of the American River Parkway[1]

In the early part of the 20th century, much of the flood plain of the American River was held in private hands, however, seasonal flooding prevented commercial development near the river. Although portions of the flood plain were farmed or included sand and gravel operations, much of the riparian habitat remained in place. People came to enjoy the natural setting and river, but limited access gradually led to increased interest in a public parkway.

The first known reference to an "American River Parkway" dates to 1915, when Sacramento city planners conceived of a large, continuous park system along the American River. In the late 1920's Frederick Law Olmsted, Jr., the renowned naturalist and landscape architect (Wikipedia, 2009), proposed a parkway plan for the Sacramento

[1] This history of the American River Parkway comes from Dillinger, Littrell, & Smith (2005), unless otherwise noted.

River and its tributaries. In the late 1940’s, Olmsted submitted a proposal for Parkway development that focused on recreational opportunities.

In 1949, the “River Beautification Committee” was created to outline a plan to beautify and develop recreational facilities along the American River. The involvement of the Chamber of Commerce, as well as city and county governments, suggests early support of the business community for establishing a parkway. The Sacramento City Council acquired the first 82 acres, seventy-five of which was donated, in the River Park area with $200,000 from the State Park Commission.

Sacramento County did not begin its efforts in developing the Parkway until after it established the County Department of Parks and Recreation in 1959. The first park development director, William B. Pond, quickly found that their was strong support for a trail and paved path from the confluence of the Sacramento River to Nimbus Dam among hikers, horsemen and horsewomen, bicyclists, and naturalists. Although county supervisors endorsed the master plan for the Parkway, initial land acquisitions were expensive, which stalled development of the Parkway.

However, the County Planning Commission’s 1961 approval of a subdivision within 125 feet of the river rallied a diverse group of civic leaders, conservationists, and youth groups to oppose the plan. The Save the American River Association (SARA) was founded (by among others, the locally famous naturalist Effie Yeaw) and rallied the community to support the preservation of the river and adjacent habitat. Based on this popular support, the Sacramento County Board of Supervisors officially adopted the parkway plan in 1962 and dedicated more funds to land acquisition.

In just three years, the County was able to complete land purchases of three major parcels that became Discovery Park, Ancil Hoffman Park, and Goethe (now River Bend) Park. In addition to County funding for purchase of land or easement rights, funding came from the state Wildlife Conservation Board and the federal Urban Renewal Administration. Private funding contributed to the purchase of land, as well. SARA led a fund raising effort in which "certificates of ownership" were given to buyers of square yards of land and the Goethe family established a fund for land purchase.

Following a $12.6 million bond issue approved by the voters in 1972, both land acquisition and development of the Parkway accelerated. The contiguous bike trail was completed in 1980 with the completion of the Jedediah Smith Memorial bridge, which connected the upper and lower ends of the William B. Pond Recreation Area. Although the development of the major recreational features and land acquisition has been completed, the County Parkway plan includes 127 acres still in private hands for which there are currently no funds for acquisition.

Benefits of the Parkway

The American River Parkway provides the residents of the metropolitan area of Sacramento, California with unique recreational opportunities for an urban area. The Parkway is 23 miles long and provides easy access for fishing, rafting, and kayaking. The greatest use of the Parkway, however, comes from the thousands of people that walk, jog, bike, and ride their horses along the multi-purpose trail that runs through the Parkway. Sacramentans consider the Parkway to be a natural jewel of the Sacramento region that serves as an "urban oasis" to the many residents who enjoy its peaceful beauty

(Robertson, 2006). As might be expected with such a valuable regional asset, many Sacramento area residents favor living near the Parkway. Proximity to the American River Parkway is a key selling point for neighborhoods, such as Arden-Arcade and Fair Oaks (Sacramento Bee, 2007a, 2007b).

In two recent studies (The Dangermond Group, 2000, 2006), the County of Sacramento evaluated the financial needs of maintaining the Parkway. In those reports, the study authors identified economic and social benefits provided by the Parkway. Social benefits cited from the availability of recreational opportunities included "…individual health and happiness, family unity, educational opportunities, and lower levels of crime and substance abuse in communities." The 2006 Dangermond Group report cited studies suggesting that access to parks and open spaces improves the physical and mental health of nearby residents.

In addition to a qualitative assessment of the social benefits, The Dangermond Group (2006) estimated $364 million of economic benefits from Parkway visitations. However, there are several flaws in the methodology that call into question such a precise estimate. The Dangermond Group (2000) estimate was based on a 1985 study of visitation and spending, which was adjusted to account for an increase in visitation proportional to population increases, but was not adjusted to 2000 dollars. In the 2006 update (The Dangermond Group, 2006), the authors adjusted the 2000 estimate to 2005 dollars. Both methods assumed a multiplier of "2" to account for secondary economic activity and assumed half of the funds spent were subject to sales tax. In addition, both of the 2000 and 2006 estimates included money spent by the County on the Parkway, which would have likely been spent elsewhere.

Fuguitt and Wilcox (1999) note that calculating multiplier effects, as part of a cost-benefit assessment, is generally not appropriate in a stable macro-economy. The funds being spent on the project being analyzed would otherwise be used elsewhere and generate a similar set of secondary benefits. The "multiplier" benefits being calculated are, therefore, not a unique economic activity that will only occur if the project is in place. In addition, a proportional increase in visitation with population is unlikely, since the Parkway is near more established neighborhoods and much of the recent population growth in the region has been in areas removed from the Parkway (e.g., Natomas, Elk Grove).

I used a more conservative calculation of the economic benefits that did not adjust visitation proportionally to population increase from 2000 to 2006 and eliminated the assumed contributions from the multiplier effects, sales taxes, and County Parkway spending. With these adjustments and appropriately adjusting for inflation from 1985 to 2006 (multiplier of 1.874 rounding to four significant figures, US BLS, 2009), the total direct economic activity from the Parkway would be approximately $226 million in 2006 versus the $364 million estimate from The Dangermond Group (2006).

Interestingly, both The Dangermond Group study (2006) and the County of Sacramento's recent FY 2009-10 budget (County of Sacramento, 2009a, pp. H-179, H-180, H-184) mention the value of the Parkway to nearby property owners. Although the potential for assessing property owners to pay for Parkway maintenance was evaluated

(The Dangermond Group, 2006), there is apparently no evaluation of how close properties need to be to accrue value from Parkway proximity, nor is there an assessment of the total economic value gained by those property owners. The relationship between the property value increase for nearby property owners, who those proximal owners are, and the implications regarding potential assessments will be explored in Chapter 5.

Governance and Management of the Parkway

The general governance and maintenance of the Parkway falls under the County of Sacramento's jurisdiction (Dillinger, et al., 2005). However, some land is within the city of Sacramento's boundaries (e.g., Discovery Park and Paradise Beach) and some lands are held by Scout and Campfire organizations (Dillinger, et al., 2005). In addition to managing the land from Nimbus Dam east, the State also has title to the flood plain next to Cal Expo (Dillinger, et al., 2005).

Parkway services are also provided directly and indirectly through the efforts of a number of volunteer organizations. The American River Natural History Association primarily supports the Effie Yaew Nature Center through fundraising activities, recruiting volunteers, and providing docents (County of Sacramento, 2009b). The American River Parkway Foundation (ARPF) has as its mission fostering volunteer opportunities and raising funds to support the preservation and enhancement of the Parkway (ARPF, 2009). The ARPF sponsors a number of events that take advantage of the Parkways recreational opportunities, including a half marathon, annual social bike ride, and raft trip. In addition, ARPF is primarily responsible for organizing the annual "Great American River Cleanup".

The American River Parkway Volunteer Equestrian Trail Patrol (Trail Patrol) is a volunteer organization whose mission is to assist in the protection of park property and promote the safe use of the Parkway. The Trail Patrol both educates Parkway users and reports any activities requiring a response from emergency personnel (ARPVETP, 2009).

The Save the American River Association (SARA, 2009) is the primary public advocacy group concerned with protecting and enhancing the lower American River and Parkway. SARA concerns are focused on issues that could affect the wildlife habitat, fisheries, and recreational resources of the lower American River. Historically, SARA has been a driving force in raising funds to purchase land for the Parkway and in speaking out against development that could impact the aesthetic, wildlife, or recreational values of the Parkway (Dillinger et al, 2005). One of SARA's key issues currently is to provide adequate funding for the maintenance of the Parkway (SARA, n.d.).

Budget Shortfalls and Related Woes

Even before the current State economic crisis, the County of Sacramento conducted two financial needs analysis for the maintenance and improvement of the Parkway (The Dangermond Group, 2000; 2006). The Dangermond Group (2006) recommended that the County augment Parkway funds by $4.6 - $6.0 million per year over a ten year period to address an inadequate operating budget (25% of total additional funds needed); purchase equipment (4%); repair/replace facilities (11%); make capital improvements (35%); and acquire land (9%). During the time of the most recent Dangermond Report (Fiscal Year 2005-2006), the County's operating budget for the Parkway was approximately $5.9 million (The Dangermond Report, 2006).

The total fiscal year 2009/2010 budget to maintain the Parkway is around $6,800,000. Use fees (e.g., boat launch, vehicle parking) and leases associated with the Parkway currently bring in about $2,300,000 (County of Sacramento, 2009a). Around $3,000,000 comes from the County's general fund with the remaining $1,500,000 reimbursed by other County departments or other agencies. Although the amount is greater than in Fiscal Year 2005-2006, the County is not able to maintain the same level of service as in prior years. In a cost savings measure, the County Department of Regional Parks prohibited vehicle access to several Parkway areas in order to reduce maintenance costs and park ranger patrols to address a severe County general fund budget shortfall (County of Sacramento, 2009c). This is not the first time fiscal woes have threatened the Parkway. In 2004, the County of Sacramento threatened to close the Parkway due to budget woes (Bacher, 2004).

Although the aforementioned financial studies focused on improving the Parkway, the current budget crisis is raising concerns of significant negative impacts to the Parkway. The lack of maintenance at several access points is likely to result in an increase in litter that is not picked up, although Parkway users are being asked to carry out their trash (County of Sacramento, 2009b). A recent attack on a cyclist riding on the Parkway trail has raised concerns that such criminal activity will increase as park ranger patrols are decreased (Lindelof, 2009).

Given both the recent and ongoing nature of funding problems associated with maintaining and improving the Parkway, more stable and longer-term sources of funds are critically needed. This thesis builds on the studies commissioned by the County by quantifying the economic benefits accrued by homeowners near the Parkway and estimating a fair cost to those homeowners for those benefits.

Thesis Roadmap

After the introduction, Chapter 2 describes the literature on hedonic pricing models used to evaluate the effects of green belts and parks throughout the world and common characteristics of those models. Chapter 3 presents the methodology to be used to assess the aggregate effect of Parkway proximity on home value. The regression model will include the key variables commonly identified in the literature as effecting home value for which data are readily available. The regression model results are presented in Chapter 4, along with a discussion of adjustments made to the original model and potential problems with the model results. The statistically significant variables will be discussed, with an emphasis on those variables associated with Parkway proximity. The aggregate and median change in value of homes proximal to the Parkway will also be calculated. Additionally, the source of the data applied to the model is identified, together with key statistical descriptors. Chapter 5 includes discussion of key policy considerations, such as, how parks and green spaces can be and are funded in California; what it would take to establish a Parkway assessment district; potential boundaries for such a district; an appropriate assessment for the residential, single-family homes within the district based on the private benefit calculated in the regression analysis; and identification of some of the potential political obstacles and opportunities. Chapter 6 summarizes the results of the research and provides policy recommendations based on my analysis.

Chapter 2

LITERATURE REVIEW

The focus of this literature review is on hedonic pricing models applied to green belts and parks throughout the world. First, I examine historical perspective on the economic value of green space and public parks. After summarizing the basic model structure that other researchers have used to perform the regression analysis, I then include a description of general causal factors that are included in a hedonic pricing model of home value and the specific explanatory variables associated with green spaces and parks that other researchers have include in their studies. As part of the literature review, I examine the statistical significance of key variables and the magnitude of any significant effects.

The regression analysis can provide important insight into the effect, if any, of distance to the Parkway on home prices. However, the policy implications of the analysis will be heavily influenced by the "total willingness to pay" (TWP) of all homeowners effected by Parkway proximity. Therefore, the literature review will examine how other researchers have accessed TWP. The review concludes with a summary of the key features of hedonic pricing models of green space, as well as identification of the limitations of these efforts.

Historical Recognition of the Value of Parks

In the 19th century in the United Kingdom and the United States, there was disagreement as to whether public investment in parks was worth it from an economic perspective (Crompton, 2007). Frederick Law Olmsted, Sr., the "father" of Central Park in New York City, believed in the value that the park would create, despite concerns that the destitute would congregate in the park and decrease property values. Olmsted was able to demonstrate that, after payment of the debt the city incurred, the city realized an over $4 million annual “profit” due to increased tax revenue from the higher value properties in a seventeen year period (Crompton, 2007). Crompton (2007) also points out that it was common practice in the United Kingdom for the government to purchase more property than necessary for the park, so that it could realize a profit from selling the more valuable property adjoining the park. Despite the benefits of green space and parks that have been recognized for centuries, methods that are more sophisticated are being used to assess the economic value of parks and green spaces.

Functional Form of Hedonic Pricing Models

Despite the log-log functional form of the hedonic pricing model suggested by Fuguitt and Wilcox (1999), researchers have used a variety of multiple regression models including linear (Luttik, 2000, Nicholls & Compton, 2005), log-linear (Cho et al., 2006, Poudyal et al., 2009), log-log (Anderson & West, 2006, Tajima, 2003), or they have tried a combination of models to produce the best fit (Kaufman & Cloutier, 2006, Kong et al., 2007, Troy & Grove, 2008). Hobden, et al (2004) take a different tact altogether by comparing mean values of homes that match in all attributes, except for proximity to a green belt.

Adjusted R-squared values were generally high, ranging from 0.64 (Poudyal et al., 2009) using a log-linear model to 0.84 (Kaufman & Cloutier, 2006) using a log-log model. For those researchers using multiple models, there was little difference in the adjusted R-squared between model forms (Cho et al., 2006, Kaufman & Cloutier, 2006, Troy & Grove, 2008). As Studenmund (2006) points out, comparison of the adjusted R-squared between models of different functional form is not appropriate, since the dependent variables are different (e.g., untransformed vs. log transformed).

Troy and Grove (2006) point out that most researchers log-transform the price variable, since there is a presumed non-linear relationship between price and attributes. Nicholls and Crompton (2005) prefer a linear model, since they felt it was easier to interpret the results. One of the two models Kaufman and Cloutier (2006) used included the distance variables as an inverse function of home price.

General Explanatory Variables Common in Hedonic Pricing Models

In specifying their hedonic pricing models, researchers have identified categories of explanatory variables as key determinants in housing prices. Control of these other explanatory variables is important to isolate the pricing effect of the hedonic attribute of interest. Nicholls and Compton (2005) categorize attributes by those associated with home structure (e.g., size); neighborhood (socio-economic characteristics of residents); community (e.g., school); location (proximity to amenities); environmental attributes (e.g., view, pollution); and time related (e.g., month/year of sale; time on market). Luttik (2004), on the other hand, identifies only two general characteristics – structural and locality. Luttik's locality category includes features identified in Nicholls and Compton's community, location, and environmental attributes categories. Cho, et al. (2006) identify three broad categories, structural, neighborhood, and location, as well as identifying time related variables in their model (e.g., season of the home sale, interest rate).

In general, the structural variables considered are similar in the studies reviewed – square footage of living area, lot size, number of rooms, structure age (Cho et al., 2006, Nicholls & Compton, 2005, Troy & Grove, 2008). An exception is Kong (2007) who used housing clusters due to lack of specific structural information on Chinese dwellings. Some researchers evaluated very fine detail, including specifics such as number of garages and fireplaces (Nicholls & Compton, 2005).

When included, neighborhood socio-economic attributes generally rely on data for census blocks. Common attributes included median income, age, and crime rate (Anderson & West, 2006, Troy & Grove, 2008). Some researchers, who do not use socio-economic data, recognize the limitations of their analysis. They may be measuring the desirability of living in a more affluent neighborhood, rather than proximity to green space (Luttik, 2000).

Besides green space related variables, research on hedonic pricing has also included analysis of proximity to various amenities and disamenities. Distances to the business district, highways, and railroad tracks have been included (Tajima, 2003 ,Troy & Grove, 2008, Poudyal et al., 2009, Cho et al., 2006). Generally, researchers based their decisions on the number and type of explanatory variables to include in hedonic pricing models on data availability; whether the researcher used Geographic Information System (GIS) technology to create the necessary spatial information; and the time and resources available to conduct the research.

Despite some variability in general explanatory variables for house structure, neighborhood, and locality, researchers generally identified variables that were statistically significant at a confidence level of 90% or greater (see Table 1). However, Cho, et al. (2006) did not find the neighborhood variables housing density, unemployment rate, or vacancy rate to have a statistically significant impact on home price in their study in Knox County, Tennessee. In addition, Cho, et al. (2006) did not find distance to the railroad to be statistically significant. In their study of housing clusters in Jinan City, China, Kong, et al. (2007) did not find that travel time to the business center or distance to the nearest factory to be statistically significant.

Although many of the explanatory variables evaluated were statistically significant, it is worth asking – which general explanatory variables were important? For the discussion below, I will refer to Table 2 and will assume that the calculated elasticity is constant (% change in the independent (explanatory) variable for a 1% change in the dependent (home sale price) variable). By assuming the elasticity remains constant, I can make comparisons of the magnitude of the effect of different explanatory variables.

Structural Variables

The effect of lot size on price was positive in all the studies and effected price by between 0.02% and 0.11% for every 1% increase in lot size. How important the magnitude of the elasticity is also dependent on the range of the variable. For example, in Cho, et al. (2006), the mean lot size is about 26,000 square feet and the standard deviation is almost 70,000 square feet[2]. Since the elasticity of lot size is 0.021 in the Cho group's study, a lot four times (300% increase in size) larger than the mean lot size

[2] Of course, this suggests that lot size either does not have a normal distribution or some homes occupy negative space.

would only be 6% more expensive, holding all other variables constant. In contrast, Kaufman and Cloutier's (2006) study found an elasticity of 0.113 associated with lot size. Assuming a constant elasticity, the change in price associated with lot size from the mean (0.126 acres) to the largest lot (0.41) would be an increase of 25%.

Home size has an even greater effect on home price than lot size, with the calculated elasticity from 0.156 (Cho, et al (2006) in Knox County, Tennessee) to 0.973 (Tajima (2003) in Boston). Assuming constant elasticity, a doubling of home size would increase home price by anywhere from 15% to almost 100%. The age of the home has a negative effect on home price with elasticity ranging from -0.064 (Tajima, 2003) to -.350 (Cho, et al (2006).

Other common home structural variables examined included the number of bathrooms and the presence/absence (or number) of fireplaces. The elasticity the number of bathrooms ranged from 0.058 to 0.164 suggesting an influence on price similar to, if not greater than, lot size. However, the authors did not appear to have checked for multi-collinearity (i.e., the potential that a strong linear relationship exists) between independent variables. One would expect that as home size increases the likelihood of there being more bathrooms also increases. Therefore, the number of bathrooms (or number of bedrooms) could be a proxy for home size and the reported elasticity does not necessarily measure an independent effect of number of bathrooms on home value.

Similar reasoning does not necessarily apply to the presence or absence of a fireplace, since a fireplace does not necessarily occupy a great deal of space. As shown in Table 2, the presence of a fireplace increases home value by 4.5% to 13.9%. Where the number of fireplaces was included as a variable, the elasticity was 0.022. The relatively low elasticity is likely due to the differences in study location (Austin, Texas versus more northern cities).

Neighborhood Variables

The researchers' examination of neighborhood variables was less consistent between studies than the structural variables. Rather than using specific neighborhood attributes, Tajima (2003) used zip code dummy variables to distinguish between different Boston neighborhoods. All zip codes, except one, had a significant effect on price, with the effect ranging from -13% to +48%. In their study, Nicholls and Crompton (2005) separately examined three distinct neighborhoods in the Austin area, rather than specifying neighborhood attributes. Kaufman and Cloutier (2006) used distance to a park and two brownfield sites as their neighborhood attribute variables.

The other researchers (see Table 2) used a variety of socio-economic factors. Anderson and West (2006) use neighborhood variables as interaction terms with the greenspace variables, rather than evaluating the potentially independent effects of attributes such as crime, density, and income on home value. Although too complex to summarize here (thirty-six neighborhood/greenspace co-variables were analyzed), Anderson and West (2006) found significant effects of the neighborhood / greenspace proximity co-variables.

Cho, et al. (2006) did not find a significant effect associated with housing density or vacancy rate. However, the median income of the neighborhood had a relatively large, significant effect on home value (elasticity of 0.151). The unemployment rate had a relatively small effect on home value (elasticity of -0.003). Travel time to work had a surprisingly positive effect on home value (elasticity of 0.045), suggesting that the farther one travels to work from home, the more desirable the home. Although it is counter-intuitive that people would want to spend more time commuting, the travel time variable may be a proxy for more desirable suburban /rural neighborhoods that are farther from the urban center.

In contrast to Cho, et al. (2006), Poudyal, et al. (2009) found small, but statistically significant effects of population density (elasticity of 0.013) and vacancy rate (-0.050). In addition, Poudyal, et al. (2009) found a significant effect of poverty rate on home value (the elasticity of -0.150 is equal in magnitude, but opposite in sign to what Cho, et al. (2006) found for median income). Troy and Grove (2009) found a larger effect of median income on home value in their Baltimore, Maryland study (elasticity of 0.269).

Troy and Grove (2009) also found median age and percentage of high school graduates to have a significant effect on home value. Although Troy and Grove (2009) checked for multicollinearity by calculating the variance inflation factors, they did not examine the correlation coefficients between variables. Since income generally increases with age (greater earning power) and with education, it is likely that the median household income variable is highly correlated with both age and education factors.

Explanatory Variables for Green Spaces and Parks in Hedonic Pricing Models

The literature included a number of different approaches for defining green spaces and the variables associated with green spaces that might influence home price. Most research included variables representing the size of the park and distance from the park (Anderson & West, 2006, Cho et al., 2006, Hobden et al., 2004 , Kong et al., 2007, Poudyal et al., 2009, Tajima, 2003). Some research did not include precise size or location variables (Luttik, 2000).

The type of green space analyzed included substantial variation between researchers. Both parks and forests were included in the analysis conducted by Kong et al. (2007); parks/greenbelts only were evaluated by Kaufman and Cloutier (2006), Troy and Grove (2008), and Nicholls and Compton (2005); and several researchers included both parks and waterways in their models (Anderson & West, 2006, Cho et al., 2006, Hobden et al., 2004, Luttik, 2000, Poudyal et al., 2009, Tajima, 2003).

Despite the differences in variable definition, the researchers always found a positive value associated with proximity to parks and other green spaces[3]. To get a sense of the magnitude of the effect of green space proximity, I computed the percent change in home value if a home is moved from the mean distance to the mean plus two standard deviations away from the green space or water body[4] (see Table 2). In making the calculation, I assumed elasticity stayed constant. Two standard deviations was generally

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[3] Note that a negative elasticity indicates that the home value goes down as the distance from the green space increases, holding all other variables constant.

[4] If the distribution of distance of homes to green space were normal, two standard deviations would represent the 95% percentile of distance from the green space. For the studies providing the standard deviation, two standard deviations to the left of the mean would produce negative distances, suggesting that the distribution is skewed to the right (a positive skew).

equivalent to 2-3 times greater than the mean for the studies and green space distance variables evaluated.

For the three studies that evaluated proximity to a greenway, the drop in home value ranged from approximately 2% to almost 6%. Five studies evaluated the effect of small or neighborhood parks. The effect of moving the home ranged from rather small (less than 1% drop in home value) to almost 6%. In the two studies that included special or large parks, one study saw a price drop in the range of a small park or greenway and the other study had a rather large drop in home value (more than 12%). The effect of proximity to a lake, river, or waterbody was generally in the range of the effect of a park or greenway (a drop of 3%-6% in home value when the home was moved two standard deviations from the mean). The exception was the rather large price drop for the Boston study (almost 23%), which assessed distance from the Charles River. In general, the Boston study (Tajima, 2003) showed the largest impact of proximity to green space or river on home value compared to the other studies in Table 2.

Although using a different approach (t-test versus regression), Hobden, et al. (2004) found an increase in value of 2.8% for homes bordering greenways. Luttik (2000) used a two stage linear regression – first focused on structural attributes and a second regression on locality attributes (the precise variables and equations used were not clearly described). Luttik (2000) evaluated eight cities or regions in the Netherlands and up to nine green space variables (not all green space conditions existed in each town or region). Twenty-four of the thirty-eight tested cases demonstrated a statistically significant effect of the green space variable (e.g., park, woods, water body, green way). When significant, the home value increased by 4%-12% based on either proximity to or view of the green space amenity.

In addition to evaluating a distance to greenbelt variable, Nicholls and Crompton (2005) also looked at dummy variables based on quarter mile increments from the greenbelt entrance. Only one study area (Lost Creek) showed a statistically significant and large ($46,086) positive effect on price for homes within a quarter mile of the greenbelt entrance.

Overall, the above analysis suggests that the effect of green space on home value is generally fairly modest. Even a significant increase in distance from a park, green way, or water body appears to result in only a modest (generally 2% to 6%) decrease in home value.

However, there are a couple of important exceptions. Tajima (2003) found fairly significant effects of large parks and proximity to the Charles River (a 12% and 23% decrease in value, respectively, were calculated). It is important to note that the maximum distance from a large park was less than 1 kilometer and the maximum distance to the Charles River was 2.5 kilometers in Tajima's Boston. In contrast, Anderson and West (2006) modeled distances of up to 15-30 kilometers from the green space or water body study of the Minneapolis-St. Paul region. The calculated elasticity from Tajima's study (2003) for large parks and proximity to waterways were about 3.4 times and 6.1 times larger than the calculated elasticities found by Anderson and West (2006). The differences in elasticity may be caused as much by the greater differences modeled by Anderson and West (2006), rather than any significant differences in preferences for living near green spaces or water ways in the Minneapolis-St. Paul area versus Boston.

In other words, the positive effect on home value of living near a green space may drop off quickly with distance. Initially, home value may be highly elastic with respect to distance from green space, but that elasticity may drop to close to zero as the distance from the green space continues to increase. Since the green space/ water way elasticities calculated in Table 2 are based on the regression coefficients, which are an "average" for all distances, any significant effect on home value of being near green space could be diluted by the many homes that are not influenced at all by proximity to green space.

Luttik (2000) references a "pilot" hedonic pricing model (Fennema, et al. (1996)) that showed a 60% premium paid for homes within 400 meters of a park. As mentioned previously, in one of three Austin area neighborhoods evaluated, Nicholls and Crompton (2005) found an over $40,000 increase in home value for homes within a quarter mile of a greenway. Although limited, the evidence from these studies (including Tajima's (2003) work) suggests that the influence of green spaces on home value may be large in magnitude but spatially limited.

Calculating the Total Willingness to Pay

In their study of how the poor value environmental amenities in Bangkok and Jakarta, Crane, et al. (1997) use a two step process to first determine the hedonic function for the value of housing based on housing attributes and then determine individual demand based on household current income, permanent income, and household size as the primary variables representing consumer demand. Other researchers investigating the hedonic price of environmental amenities (EA) use a similar two-step process, which separates the calculation of the effect of the EA on property value from the influence of consumer characteristics on willingness to pay for that attribute. For example, Yusuf and Koundouri (2005) consider age, marital status, and education level of the head of household, in addition to household income, in their assessment of the desirability of piped water in Indonesia.

As discussed by Fuguitt and Wilcox (1999), the total willingness to pay function is used to estimate the total willingness to pay for a non-marginal (i.e., large) change in the environmental attribute. Regressing the calculated hedonic prices on the environmental and household attributes creates an inverse demand function. Relying solely on the hedonic price function to calculate total willingness to pay may lead to overestimation of the total willingness to pay for an environmental attribute (Fuguitt and Wilcox, 1999). It should be noted, as Freeman (1979) points out, that the inverse demand function cannot be calculated for an environmental attribute with a hedonic price function that is linear, since the marginal implicit price is constant. Similarly, the inverse demand function cannot be calculated for an environmental variable that is dis-continuous (e.g., an environmental attribute expressed as a dummy variable).

Interestingly, the literature I have reviewed generally does not indicate that “green space” researchers have tried (see for example Morancho, 2003) or been able to create an inverse demand function (Tyrväinen, 1997). Cho, et al. (2006) calculated an average implicit marginal price change for moving a home from one mile to 1,000 feet closer to specific local parks using their “local” hedonic regression model and found an average change in home value from -$662 to +$840 depending on the park. Kaufman and Cloutier (2006) use their inverse distance hedonic model to calculate the total value of converting brownfields to greenspace. They estimated the total increase in property value to be between $1 million and $7 million for homes within a half-mile of the brownfield.

Poudyal, et al. (2009) used a two-stage regression analysis to estimate demand for more park acres. The first stage involved developing hedonic price functions for four distinct submarkets in Roanoke, Virginia. The implicit prices of the different attributes estimated for the four submarkets were pooled to develop a city-wide demand function for park acres. The demand function accounted for the implicit price of park acres, socio-economic attributes, and the price of substitutes and complements (in this case park proximity and living area were used). In their analysis, Poudyal, et al. (2009) found that a 20% in park area in Roanoke would increase consumer surplus by $160 per household or a total of $6.5 million.

Literature Review Summary

A review of recent literature on the use of hedonic pricing models to determine the value of green space indicates that there can be significant variation in the general explanatory variables modeled; the variables representing green space; and the functional form of the model. Despite these differences and applications to areas throughout the world, research results suggest two common traits – there is a positive value to green spaces based on housing prices and the form of the regression model used does not seem to significantly affect the results. However, the magnitude of the effect of green space proximity may be significantly attenuated by including homes in the analysis that are so distant as to be negligibly influenced by the green space.

The literature review suggests that the primary considerations for this research should be: 1) to ensure that a robust suite of explanatory variables that could reflect home price differences based on locality should be included in the model (e.g., locality and neighborhood factors); 2) that the simplest model to interpret should be used (i.e., so it is easy to calculate the effect of the Parkway); 3) careful consideration should be given to the likely “sphere of influence” of the green space to avoid “diluting” the data set with a large number of homes that are too distant from the green space to be influenced by its proximity.

Finally, the cautions suggested by Fuguitt and Wilcox (1999) should be kept in mind when constructing the model and interpreting the results. A second stage of analysis is required to calculate aggregate willingness to pay based on estimates for each household. Although some researchers of environmental amenities have conducted this second stage of analysis, “green space” researchers have generally not accounted for consumer characteristics. In addition, if not careful in model construction, the hedonic price calculated by the researcher may include pecuniary effects (e.g., general changes in the property market) or unspecified effects of the attribute (e.g., lower or higher crime rates).

Table 1. Key Hedonistic Pricing Model Characteristics from Literature Review

Study / Study Area	**Functional Form(s)**	**General Explanatory Variables (Variables NOT Statistically Significant at >90% confidence level are CAPITALIZED)**	**Greenspace Variables**	**Greenspace Variables – Significance / Elasticity / Magnitude**
Anderson & West, 2006 Minneapolis-St. Paul, MN	Log-log	**Structural –** lot size; home size; bathrooms; age; fireplaces **Neighborhood (used as part of interaction variables)–** density; income; serious crime rate; population under 18; and population over 65 **Locality (used as part of interaction variables) -** distance to central business district.	size and distance - neighborhood park; special park; golf course; cemetery; lake; river (distance only) NOTES ON STATISTICAL SIGNIFICANCE – all greenspace variables, except size of special parks.	Neighborhood park − 0.0035 Special park − 0.0025 Golf course − 0.0060 Cemetery 0.0008 Lake − 0.0342 River − 0.0273 Elasticity - % change in price for 1% increase in distance from amenity.
Cho et al., 2006 Knox County, TN	Log-semilog	**Structural –** square foot; lot size; building age; # of bedrooms; garage/no; fireplace/no; brick exterior; swimming pool/no. Quality and condition of structure. **Neighborhood –** median housing value; HOUSING DENSITY; commute time; per capita income; UNEMPLOYMENT RATE; VACANCY RATE; urban v. rural **Locality -** Dummy variables for town and high school district; distance to downtown; DISTANCE TO RAILROAD	distances to water body; greenway; park; and size of park NOTES ON STATISTICAL SIGNIFICANCE – all greenspace variables, except size of parks.	Distance to: Water body - 0.020 Greenway - 0.015 Park - 0.007 Size of Park NS Elasticity - % change in price for 1% increase in distance from amenity or 1% increase in park size.
Hobden et al., 2004 Surrey, British Columbia	T-test of matching pairs	**Structural –** use type; sq feet; lot size; foundation type; # garage stalls; pool; other buildings; corner; water on lot; waterfront; age of	Bordering greenway (yes/no)	Significant based on t-test. Average increase in value $4,092 or 2.8%

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Study / Study Area	**Functional Form(s)**	**General Explanatory Variables (Variables NOT Statistically Significant at >90% confidence level are CAPITALIZED)**	**Greenspace Variables**	**Greenspace Variables – Significance / Elasticity / Magnitude**
		improvements. **Neighborhood –** N/A **Locality –** quality of view; assessment neighborhood NOTE – Regression analysis not conducted, so significance of each variable is unkown.		
Kaufman & Cloutier, 2006 Kenosha, WI	Log-log & log-linear	**Structural –** age; size of lot; sq footage; number of bedrooms; # bathrooms; house style - duplex/triplex **Neighborhood –** N/A **Locality –** distance to brownfields.	Distance to park.	Statistically significant (-0.024%) change in price for 1% increase in distance from park.
Kong et al., 2007 Jinan City, China	Linear & log-linear	**Structural –** housing clusters **Neighborhood – N/A** **Locality –** TIME TO BUSINESS CENTER, distance to university and FACTORY	Size /distance – park, plaza, forest NOTES ON STATISTICAL SIGNIFICANCE – size/distance variable significant for forest; not significant for plaza and park.	Park NS Plaza NS Forest 0.049 NS = not significant Elasticity – percent change in price for 1% increase in variable.
Luttik, 2000 Netherlands	Two stage linear regression	**Structural –** not specified **Neighborhood –** not specified **Locality –** not specified	Green strip, park, canal, lake (in residential area); park, lake, open space (bordering area); woods, lake, landscape diversity (regional)	24 cases evaluating different greenspace variables significant/ 14 cases not significant. When significant, home value increased 4%-12% based on proximity to or view of amenity.

Table 1. Key Hedonistic Pricing Model Characteristics from Literature Review

Study / Study Area	**Functional Form(s)**	**General Explanatory Variables (Variables <u>NOT</u> Statistically Significant at >90% confidence level are CAPITALIZED)**	**Greenspace Variables**	**Greenspace Variables – Significance / Elasticity / Magnitude**
Nicholls & Crompton, 2005 Austin, TX	Linear	**Structural –** Lot size, age, square feet, # stories, living rooms, bedrooms, fireplaces, garages, swimming pool **Neighborhood – N/A** **Locality -** clu-de-sac; corner; bridge to downtown; highway; gated community; view of power line.	On greenbelt, view of green belt; distance to greenbelt entrance; greenbelt w/in 1/2 mile;	On greenbelt $44,332 View of green belt NS Distance to entrance NS W/in ½ mile NS Results for "Barton" area. NS = not significant.
Poudyal et al., 2009 Roanoke, VA	Log-linear	**Structural –** sq foot; brick ext; bedrooms; AC; garage; fireplace; parcel size; age; season sold; stories; enclosed porch; roof structure **Neighborhood –** pop density; poverty level; vacancy rate; % black; median age; median income; % w/college degree **Locality -** distance to - school; public bus; airport; business district; railroad track	distance to - river or stream; nearest park; and size of park	River /stream 0.021 Park -0.016 Size of park 0.030 Elasticity – percent change in price for 1% increase in variable.
Tajima, 2003 Boston, MA	Log-log	**Structural –** sq. footage; rooms; bathrooms. Housing attributes - owner-occupied; parking; fireplace; age of building; # residential units. **Neighborhood –** zip code **Locality -** Distance from - harbor; highway; subway.	Distance from - large park; small park; river	Large park -0.085 Small park - 0.043 River -0.165 Elasticity – percent change in price for 1% increase in distance from feature.

Table 1. Key Hedonistic Pricing Model Characteristics from Literature Review

Study / Study Area	Functional Form(s)	General Explanatory Variables (Variables NOT Statistically Significant at >90% confidence level are CAPITALIZED)	Greenspace Variables	Greenspace Variables – Significance / Elasticity / Magnitude
Troy & Grove, 2008 Baltimore, MD	Log-log Box-Cox Spatially adjusted	**Structural –** square footage, parcel size, # bath rooms, structure age, structure quality **Neighborhood –** enter occupancy of house, median HH income in census block (CB), % HS graduates (CB), % owner occupied (CB), median age (CB), crime rate **Locality - di**stance to downtown, distance to interstate	Park proximity.	Elasticity -0.022 - percent change in price for one percent change in distance from park.

Table 2. Elasticity or Percent Effect of Key Variables Relative to Home Sales Price

Variable	Anderson & West, 2006	Cho et al., 2006	Kaufman & Cloutier, 2006	Nicholls & Crompton, 2005	Poudyal, et al., 2009	Tajima, 2003	Troy & Grove, 2008
Location	Minneapolis-St. Paul, MN	Knox County, TN	Kenosha, WI	Austin, TX	Roanoke, VA	Boston, MA	Baltimore, MD
Structural							
Lot size	0.098	0.021	0.113	0.109	0.041		0.022
Home Size	0.497	0.156	0.343	0.492	0.657	0.973	0.314
Age	-0.134	-0.350	-0.274	-0.154	-0.164	-0.064	-0.114
# Bathrooms	0.083		0.058	0.164		0.104	0.087
Fireplace	5.0%	6.20%		0.022	13.90%	9.10%	
Neighborhood							
Density	IT	NS			0.013		
Income /Poverty (Poudyal)	IT	0.151			-0.150		0.269
Travel time to Work		0.045					
Unemployment Rate		-0.003					
Vacancy Rate		NS			-0.050		
Distance to Greenspace							
On greenway				NS			
Greenbelt entrance w/in 1/2 mile				NS			
Greenway		-0.015 (-2.12%)	-0.024 (-3.89%)	-0.058 (-5.84%)^^			
Neighborhood/small park	-0.004 (-0.89%)	-0.007 (-0.90%)			-0.016 (-3.43%)	-0.043 (-5.90%)	-0.022 (-2.17%)^^
Special/large park	-0.025 (-3.79%)					-0.085 (-12.44%)	
Golf course	-0.006 (-0.72%)						
Cemetery	0.008 (1.52%)						
Lake	-0.034 (-6.30%)						

Table 2. Elasticity or Percent Effect of Key Variables Relative to Home Sales Price

Variable	Anderson & West, 2006	Cho et al., 2006	Kaufman & Cloutier, 2006	Nicholls & Crompton, 2005	Poudyal, et al., 2009	Tajima, 2003	Troy & Grove, 2008
Location	Minneapolis-St. Paul, MN	Knox County, TN	Kenosha, WI	Austin, TX	Roanoke, VA	Boston, MA	Baltimore, MD
River/Waterbody	-0.027 (-3.82%)	-0.020 (-2.79%)			0.021 (3.17%)	-0.165 (-22.68%)	

Elasticity = % change in price for 1% change in independent variable. NS – not statistically significant. IT – combined with other variables to create interaction terms. For dummy variables, the percentage change in price is shown when the dummy variable is "1". Shaded areas indicated variable not evaluated. Results of Nicholls & Crompton, 2005 shown for Lost Creek area only. For the green space variables, the percentage represent the change in price from a home at the mean distance and a home two standard deviations plus the mean from the green space. "^^" – percent change from doubling the distance.

Chapter 3

METHODOLOGY

In this section, I will describe the methodology that I will apply to determining the value of the American River Parkway as reflected in the home value of proximal single family residences. I will first briefly describe the general approach to deriving a hedonic price and calculating the total willingness to pay. I will then discuss my modifications to this general approach based on my review of the relevant literature and the policy context of my analysis.

General Hedonic Pricing Models and Calculation of Total Willingness to Pay

As discussed in the literature review, green space researchers use hedonic pricing methods to place a value on the "pleasure" (the hedonic price) one derives from a non-market good. If you enjoy parks and want ready park access, you would not, generally, go out and purchase a park. However, you could purchase property that gives you ready access to the park. The value that you place on that property would reflect both readily available market goods (e.g., certain home and lot size, number of bath and bedrooms), as well as a suite of non-market goods based on location – access to the park, crime rate in the neighborhood, quality of schools.

Fuguitt and Wilcox (1999) provide a general overview of the hedonic pricing method and some of the important limitations. They outline a two-step approach to calculating the total willingness to pay (WTP) for a given environmental attribute. The first step is to estimate the coefficient associated with the environmental attribute (EA) in a multiple linear equation in a log-log form. The form of the equation includes five broad categories representing characteristics of the house, lot, neighborhood, accessibility, and the non-market effect (Fuguitt, 1999):

Equation 1 $\ln(\text{Price}) = B_0 + B_1 \ln C_1 + B_2 \ln C_2 + \ldots + B_N \ln(EA)$

The second step is to derive a willingness to pay function (or inverse demand function) based on household characteristics. The hedonic price of the environmental attribute is calculated for each property using the coefficient, B_N, from Equation 1.

Equation 2 $R = B_N$ (Price / Environmental Attribute)

The willingness to pay is expressed as a function of the hedonic price as it varies with household characteristics (e.g., income, adult education level, ethnicity):

Equation 3 $\ln R = b_0 + b_1 \ln c_1 + b_2 \ln c_2 + \ldots + b_N \ln(EA)$

After determining the coefficients in Equation 3, the researcher 1) puts in the specific values for each household; 2) calculates the area under the household's demand curve for a non-marginal change in the environmental attribute; and 3) then sums the total demand for the non-marginal change across all households to calculate the total willingness to pay (Fuguitt and Wilcox, 1999). Fuguitt and Wilcox point out that many researchers fail to take the second step. Such an approach can lead to an overestimate of aggregate demand, since those researchers rely on an average "R", which does not necessarily reflect the willingness to pay of individual households. However, the functional form of this inverse demand function cannot accommodate discontinuous property attribute variables, such as dummy variables.

A linear model form would be preferable if the slope of the relationship between the independent and dependent variables is expected to be constant and the elasticity (percentage change in the dependent variable caused by a 1% increase in the independent variable) is expected to vary (Studenmund, 2006)[5]. A double log form (the natural log of both independent variables and dependent variable is taken) should be used if the elasticities between the independent and dependent variables are expected to be constant. For the double log form, the coefficients found represent the elasticities. A semi-log form, with one or more independent variables transformed, would be used if the effect of changes in the transformed independent variable on the dependent variable decreases as the independent variable gets larger. The semi-log form, with the dependent variable transformed, is useful in determining the percentage change in the dependent variable resulting from a unit change in the independent variable. An inverse functional form allows the effect of the independent variable on the dependent variable to approach zero as the independent variable increases. Given the variety of potential functional forms, Studenmund (2006) recommends that researchers choose the functional form that makes the most theoretical sense rather than relying on "performance" metrics, such as R^2.

Hedonic Pricing Methodology Applied to American River Parkway

Consistent with other research on the value of green spaces, I have chosen to examine the sale price of homes as my dependent variable. The sale price will incorporate the actual market value of many attributes of the home, including the value the buyer places on the location of the home. As discussed in the literature review, researchers are often able to "tease out" the portion of the sale price of residential homes

[5] The remainder of the discussion in this paragraph is based on Studenmund (2006).

that is associated with proximity to green space or parks. If any increase in home value appears significant, I will then be able to address the policy question of whether those home owners near the Parkway should contribute extra to the Parkway's upkeep.

The key issues from the literature review that influenced my approach and the functional form of my hedonic model included: 1) the apparent diminishing influence of green space proximity on home value in a relatively short distance; 2) the influence of neighborhood characteristics on the magnitude of the value of green spaces as reflected in the home price or even whether green space significantly effect home value; 3) the importance of using unique structural variables and avoiding structural variables that may be correlated with each other.

As described from the literature, there are many ways of broadly describing the key attributes that influence home values. For my model, I define the following causal model relating home selling price and attributes of the home (modified from Nicholls and Crompton (2006)):

Selling Price = *f* (Structural Attributes, Location Attributes, Neighborhood Attributes, Time Related Attributes)

I have further specified the broad causal attributes as functions of the following specific variables, for which I have data:

Structural Attributes = *f* (Home Size, Lot Size, Age of Home, Bathrooms, Bedrooms, Carport/No Garage or Garage, Fireplace/No Fireplace, Pool/No Pool, Roof Type [wood/other], Stories)

Location Attributes = *f* (Zip Codes Adjacent to Parkway; Within 1/4 mile of Parkway, Greater than 1/4 mile to Within 1/3 mile of Parkway, Greater than 1/3 mile to Within ½ mile of Parkway)

Neighborhood Attributes =*f*(Zip Codes Adjacent to Parkway, Median Household Income [Census Tract]; [Zip Code Adjacent to Parkway: Parkway proximity (1/4, 1/3, 1/2)])

Time Related Attributes = *f* (Month / Multi-Month Variables)

Substituting the specific variables for the broad attributes, the model becomes:

Selling Price = *f* (Home Square Feet, Lot Square Feet, Age of Home in Years, Number of Bathrooms, Number of Bedrooms, Carport/No Garage Dummy, Fireplace Dummy, Pool Dummy, Wood Roof Dummy, Number of Stories, 0-1/4 mile from Parkway Dummy, > 1/4-1/3 mile from Parkway Dummy, >1/3- 1/2 mile from Parkway Dummy, Set of Zip Code Dummies (excluding 95608 Zip), Median Household Income of Census Tract in which Home is Located, Month/ Multi-Month Variables; Set of Combined Zip Code: Parkway Proximity (1/4, 1/3, 1/2)] Dummies)

The rationale for the choice of the specific attributes and their expected affect on the selling price of the home are described below. Table 3 includes a summary of the variables used in my model runs together with the expected direction of the correlation coefficients.

Structural Attributes

As shown in Table 1, researchers commonly use the home size, lot size, and age of home to describe the structural attributes of the home. We would expect that as the size of the home increases, the selling price for that home would increase. Likewise, we would expect an increase in lot size to also increase the value of the home. The effect of the age of the home on value is less clear. Homes constructed during different time periods have architectural styles that may or may not have current appeal. It is quite possible that an older home (50+ years) or recently build home may be more desirable then one built 20-30 years ago. Therefore, I am uncertain of the effect of the age of the home on the selling price.

There were a number of structural attributes that I included that are likely correlated to some degree to home size. However, I will check for multicollinearity and I am not primarily interested in the effect of structural attributes on home values. Therefore, some degree of multicollinearity, which may reduce the statistical significance of the related structural variables, will not negatively affect the results that are of primary interest to me. I have included a variable to account for the number of bathrooms, with full bathrooms given a value of “1” and half bathrooms given a value of “1/2”. In addition, I have included a variable for the number of bedrooms. I expect that the value of a home will increase if it has more bathrooms and bedrooms, holding all other attributes constant.

In addition, my data set included information on the number of “stories” the home has. The available data identified the number of stories as “1”, “2”, or “3 or more”. I coded the “3 or more” stories as 3, which applies to only twenty-four of the almost 5,500 home sales. I have not included a “horse property” dummy variable, since only larger lots could be considered suitable for horses and I already have included a lot size variable.

I also selected other key structural attributes that might add or subtract value from the home. These additional structural attributes were selected based on the likelihood that they would be a unique feature of the home that would independently add or subtract from the value of the home and data availability.

For example, having a carport instead of a garage is likely to reduce the value of the home, since there is less storage space and vehicles are less protected from the elements and potential theft. A home with a fireplace is likely to have greater value, since a fireplace is generally a desirable amenity. In addition, a home with no fireplace likely has limited amenities. In other words, having or not having a fireplace may be a proxy for other home amenities that are not captured in the available data. The presence of a pool would likely be considered an improvement to the property that would increase its value. A wood roof has to be replaced every 20-30 years and poses a greater fire risk than roofs made from other materials that are longer lasting; therefore, a wood roof is predicted to reduce the value of the home.

I also had complete data available for each home that described the garage (e.g., number of spaces for cars); the heating and air system (e.g., central); construction (e.g., wood); floor covering (e.g., carpet); foundation (e.g, raised); energy features (e.g., ceiling fans, dual pane windows); the number of fireplaces; laundry (e.g., inside room); description of any pool (e.g., built-in); and descriptions of various utilities (e.g., septic vs. sewer). Limited or incomplete data was available for the builder; equipment (e.g., availability of cable TV); the direction the front of the home faces; description of the fireplace; kitchen appliances; landscape; recreational vehicle parking; security features (e.g., smoke alarms); style of the home; when the home was last remodeled.

Although some of these structural attributes that I did not include may independently influence the value of a home, I did not include these attributes in my model for three primary reasons:

1) I believe that most of the excluded attributes influence home selling price in combination rather than having a strong independent effect and these attributes are either captured directly or indirectly by the variables I have included in the model. For example, a larger home on a larger lot is generally more expensive and would likely have higher value kitchen appliances, floor covering, security features, etc.

2) My study is focused on the influence of the proximity of the American River Parkway rather than a study of the independent influence of various structural attributes on home value. My model includes the primary structural variables that other green space researchers have used, so additional minor structural attribute variables should not be necessary for my research purposes.

<u>Location Attributes</u>

The primary location attributes I am examining are proximity to the American River Parkway. I examine homes that are within a quarter mile of the Parkway (from 0 to 1/4 mile), homes within a third of a mile of the Parkway (>1/4 mile to 1/3 mile), and homes within a half-mile of the Parkway (>1/3 mile to 1/2 mile). Nicholls and Crompton (2005) used a similar approach by establishing quarter mile increments and found a significant positive effect on home value for the quarter mile variable in one of three neighborhoods. I would expect that proximity to the Parkway would increase home value. The effect will be strongest for those homes within a quarter mile of the Parkway and weaker for those homes from greater than a third of a mile to a half mile from the Parkway.

As discussed in the literature review above, the inclusion of homes that are far from any potential influence of a greenway likely “dilutes” the magnitude of any effect of the green space. I do not want a potentially large effect of the close proximity of the Parkway to be masked by the inclusion of a large number of homes that are not influenced at all by the Parkway. However, I will conduct a model run that includes a continuous distance from the Parkway variable for purposes of comparison to other research.

I am considering set distances from the Parkway, rather than using a continuous variable, in order to facilitate interpretation of the results and the policy implications. The distances I have chosen are based on the limited use of this approach by other researchers. I expect to find a statistically significant effect within a quarter mile of the Parkway and to find no statistically significant effect from a third of a mile to a half-mile from the Parkway. I am not certain whether there will be an effect from a quarter mile to a third of a mile.

As I will discuss further under policy considerations (Chapter 5), any potential Parkway assessment on residential property must be based on clearly established criteria. Examining set distances from the Parkway will help establish what the boundaries should be of any potential Parkway assessment district. Depending on the results using these initial increments, I will consider using other distance increments.

The zip code variables incorporate both location and neighborhood attributes. I have focused on zip codes that border the Parkway to avoid the issues previously discussed regarding including homes that would not be influenced by Parkway proximity. In addition to proximity to the Parkway, the location attributes incorporated into the zip code variable include proximity to downtown / business districts and proximity to highways. Since the influence of these other proximity related amenities/disamenities are not the focus of my research, the zip code variable should provide an adequate aggregate of the other attributes associated with location.

Neighborhood Attributes

The zip code variables also serve as a rough proxy for neighborhood attributes, such as socio-economic factors that could influence the desirability of a given area. Since zip code areas in a relatively dense urban area such as Sacramento cover a relatively small area, the zip code is expected to be sufficiently representative of neighborhood attributes (e.g., vacancy rate, school district) for purposes of my research. However, I have included median household income (at the census tract scale, which is a smaller geographic unit than zip code) as a more specific indicator of socio-economic conditions in the area in which the home is sold. By controlling for both zip code and median household income, I should be able to isolate the desirability of a given neighborhood from the desirability of living near the Parkway (i.e., I should be able to isolate any effect that is merely associated with the value of the area (a pecuniary effect) from the willingness to pay for a non-market good – proximity to the Parkway).

Finally, I have included interaction dummies for each zip code and distance to

Parkway combination[6]. As discussed in the literature review, the influence of green space on home value not only varies with distance, but also can depend on the neighborhood. Since the Parkway covers a rather large area (23 miles in length), the influence of Parkway proximity on home value may vary depending on the location along the Parkway. The interaction terms will allow me to compare the general influence (if any) of the Parkway on home value to any effects that may be more or less pronounced in different neighborhoods along the Parkway.

Taken collectively, Parkway:Zip Code interaction terms address the same conditions as the three Parkway distance dummy variables. Therefore, I will either use the three Parkway distance dummy variables or the thirty-six Parkway:Zip Code interaction dummy variables, but not both in the same regression analysis.

Time Related Attributes

The Sacramento area housing market was extremely volatile in 2008 (see Figure 1) with a 30% drop in home prices from January 2008 to January 2009 and continued volatility into 2009. Therefore, it is important to isolate the effect of when the home was sold from the other attributes of interest.

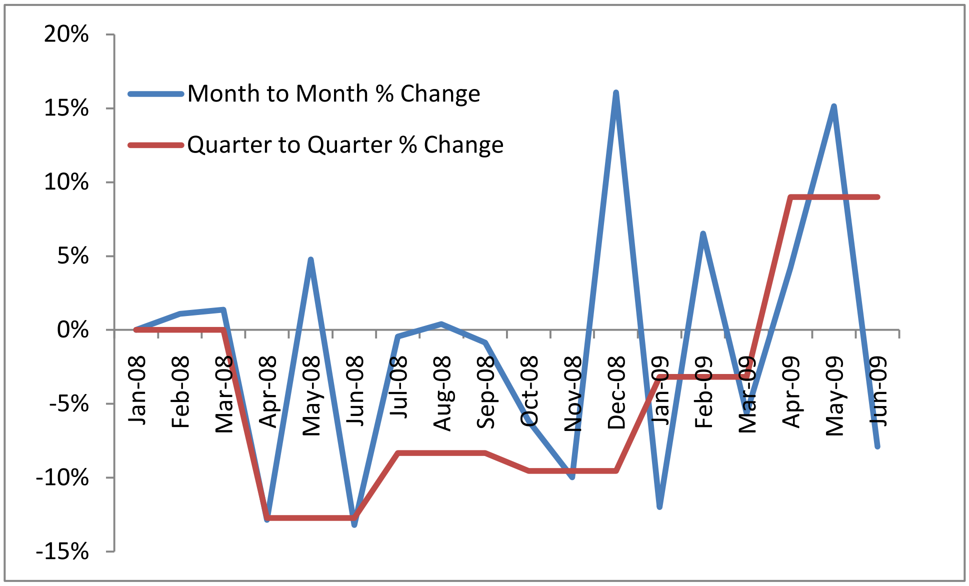
Initially, I considered using a quarterly time variable to account for this volatility. However, a close examination of the quarter to quarter median home price changes compared to the month to month changes indicates that significant within quarter

[6] For example, a home sold within a quarter mile of the Parkway in the 95608 would have a value of “1” for the 95608_QuarterMile dummy. All homes sold in other zip codes or outside of a quarter mile in the 95608 zip code would have a value of “0”.

volatility can occur (see Figure 1). In examining monthly median home price changes, home price changes were either relatively modest (less than 2%) or appeared to be fairly significant (4% to 16%). The more significant month-to-month temporal volatility could mask the influence of other variables or attribute to other variables effects of the timing of the home sale. If not taken into account, this "omitted variable bias" (Studenmund, 2006) can lead to incorrect estimates of the coefficients for the specified variables and decrease the explanatory strength of the model (i.e., the adjusted R^2 drops).

I, therefore, grouped months for which there were less than a 2% change in the median home sale price from month to month. Based on this approach, I am using dummy variables to represent the following multi- or single month groupings: January-March 2008, April 2008, May 2008, June 2008, July-September 2008, October 2008 through May 2009 are represented by single monthly dummy variables. June 2009 is not included, since one less dummy variable is specified than the number of conditions (Studenmund, 2006). The omitted condition "June 2009" forms the basis upon which all of the included conditions (January 2008-May 2009) are compared. The median home value for ten months is higher than the June 2009 median and the median home value for six months is below the June 2009 median. I expect the coefficients for the time variables to mirror the median home values relative to June 2009.

Figure 1. Temporal Changes in Median Home Prices for Select Zip Codes in Sacramento, California, January 2008-June 2009



Model Functional Form

The literature suggests that home prices will generally vary in a non-linear fashion based on key attributes (Fuguitt and Wilcox, 1999). Based on the literature review, there was not a clear preference for the functional form of the hedonic equation, although the majority of researchers used a log-log or left semi-log functional form. For key continuous structural attributes, such as lot size and home size, we would not expect a linear relationship between these variables and selling price. A small increase in size for a large home would be expected to have less "value" than the same size increase in a small home (e.g., a 200 square foot increase in home size for a 800 square foot home would be a 25% increase and for a 5,000 square foot home would be a 4% increase). The coefficients for a log-log model would represent the elasticity or percent change in the selling price for a one percent change in the attribute. A log-log functional form for the key continuous variables is more likely to mirror observed behavior in the market (i.e., small changes will greatly influence price when the attribute is small, but will have less of an effect on price as the variable increase).

For the dummy variables, Studenmund (213: 2006) suggests that the log of a dummy variable can be taken by having the dummy variable take on the values of 1 and "e" (the base of the natural log). Studendmund (2006) states that the interpretation of the coefficient of the dummy variable would remain the same as for a linear equation (presumably representing the slope). However, this approach appears to be unnecessarily complicated. The coefficient of an untransformed dummy variable in a semi-logarithmic equation can be easily interpreted as described by Halvorsen and Palmquist (1980).

Equation 4 % Change Price = 100 * {exp(coefficient of dummy) – 1}

The functional form of my hedonic pricing model will take the log of all continuous variables (including selling price), while dummy variables will not be transformed. My multiple regression model, therefore, has the following functional form for the selling price of homes sold from January 2008 to June 2009 in zip codes proximal to the American River Parkway :

Equation 5 **Ln (Selling Price)** = β_0 + β_1 Ln (Home Size) + β_2 Ln(Lot Size) + β_3 Ln(Age of Home) + β_4 Carport or Garage [D] + β_5Ln (Number of Fireplaces) + β_6Pool/No Pool[D] + β_7Roof Type[D] + β_8 Within 1/4 mile of Parkway[D] + $\beta_9$1/4 to 1/3 mile of Parkway[D] + β_{10}1/3 to 1/2 mile of Parkway[D], β_{11-21}Zip Codes (n=11)[D] + β_{22}Median Household Income by Census Tract + { β_{23-58}Zip Code:Parkway Proximity

Interaction Terms (n=36)[D] } + β_{59}January-March 2008 [D] + β_{60}April 2008[D] + β_{61}May 2008[D] + β_{62}June 2008[D] + β_{63}July-September 2008[D] + β_{64-71}October 2008…May 2009 (n=8)[D]

[D] = dummy variable; n=number of variables

Although the log-semilog[7] functional form seems to have a more solid theoretical basis, I will evaluate three other functional forms that have been used in the literature: linear-linear; linear-semilog; and log-linear. As discussed earlier, most researchers express greenway distance as a continuous variable. Therefore, I will also perform a model runs using the log-transformed distance to the Parkway and the inverse distance to the Parkway.

Missing Data

The SPSS™ linear regression analog has three options for dealing with missing data: 1) exclude cases listwise; 2) exclude cases pairwise; and 3) replace with mean. With "listwise" deletion, if any variable for an observation is missing, the whole observation is deleted. The choice of "pairwise" deletion results in the calculation of correlation coefficients between all pairs of variables for which data are available. The "replace with mean" option replaces any missing data with the mean value for that variable.

The literature is not unanimous in the choice of methodology for addressing

[7] "log-semilog" – the natural log of the dependent variable is taken and the natural log of all continuous dependent variables is taken. Dummy variables are not transformed.

missing data. Donner (1980) used a relatively simple analysis of a case of two independent variables and suggested that both the coefficient bias and variance associated with pairwise deletion was greater than the listwise or mean substitution approaches. However, Roth and Switzer (1995) point out that Monte Carlo studies of missing data have shown that pairwise deletion results in the least dispersion around the true scores and the listwise deletion results in the greatest dispersion. The results of using mean substitution were reported to be mixed – some researchers finding greater dispersion and some the least dispersion. Shafer and Graham (2002), however, generally dismiss the use of the three standard options used by SPSS™ in favor of more sophisticated techniques for estimating missing data.

My approach for addressing missing data is to use the pairwise deletion option. This option makes the maximum use of the available data, thus avoiding the problem of deleting a complete observation when only one variable is missing. The pairwise deletion method also avoids the problem of artificially creating a data point by substituting the mean. Mean substitution is undesirable, since it attenuates the calculated variance and, therefore, may result in a false finding of a statistically significant coefficient. However, I will evaluate each approach to addressing missing data to see if the regression results significantly change. I do not consider more sophisticated approaches to addressing missing data, since only about 10% of the observations are effected and the required software tools are not available to me.

Calculating Total Willingness to Pay

As discussed at the beginning of this chapter, developing an inverse demand function, as suggested by Fuguitt and Wilcox (1999), is not possible with discontinuous variables. However, to evaluate the potential policy implications of any added value due to Parkway proximity, I will need to estimate the total value added to homes influenced by the Parkway proximity and not limit my analysis to homes sold.

To calculate the aggregate value, I will make the following assumptions:

A. Any percent increase in home value from Parkway proximity found from the analysis of selling price applies to all homes within that area (e.g., a 20% increase in home value for homes sold within a quarter mile of the Parkway in the 95608 zip code would apply to all homes in that area).

B. The median price of homes sold within a given area (e.g., within a quarter mile of the Parkway in the 95608 zip code) is a good approximation of the median value of all homes in the area.

C. 2000 Census data on detached single housing units provide a good estimate of the current number of housing units in the study area.

D. The temporal distribution of homes sold in each area is similar.

Using the assumptions above, my method for calculating the aggregate added value of proximity to the American River Parkway consists of the following steps:

1. Calculate the percent change in selling price (using equation 4) for each Parkway proximity variable that had a statistically significant effect on selling price.
2. Calculate the median selling price for each area census tract in which the Parkway proximity variable had a statistically significant effect on selling price (Assumption D allows me to forgo normalizing home sale prices based on time

period sold prior to calculating the median).

3. Calculate the median increase in value for each area in which the Parkway proximity variable had a statistically significant effect on selling price:

   Equation 6 Median Increase in Value = % Change (from Step 1) x Median Value (from Step 2) / (100 + % Change[from Step 1])

4. Calculate the total value added by Parkway proximity for each area in which the Parkway proximity variable had a statistically significant effect on selling price (this number is considered the "Present Value" (PV)[8] of the Parkway with respect to single family residences). The total value for each area is the number of detached single unit homes in the area multiplied by the median value found in step 3. The number of detached single unit homes is estimated for each census tract in which a significant effect of Parkway proximity is found. The ratio of the number of homes sold in which Parkway proximity had a significant to the total homes sold in that census tract is multiplied by the total number of detached single family homes in that census tract per the 2000 census (e.g., 16 of the 29 homes sold in census tract 58.04 were within a quarter mile of the Parkway and the total number of single family detached homes is 879 – the estimated number of homes within a quarter mile of the Parkway in census tract 58.04 equals 16 / 29 x 879 = 485).

5. Calculate the "Equivalent Annual Net Benefit" (EANB) to the median valued

[8] Note that for purposes of this analysis, I am assuming there is a negligible additional cost associated with living near the Parkway. Since there is no cost, I do not compute the "Net Present Value".

home in each zip code for which the Parkway had a statistically significant effect and for all homes using the method outlined by Fuguitt and Wilcox (1999)

Equation 7 EANB = PV / Annuity Factor

Equation 8 Annuity Factor = $[1 – 1/(1+d)^T / d]$; where "T" is the time horizon in years and "d" is the discount rate.

As discussed by Fuguitt and Wilcox (1999), the discount rate can be viewed as the rate of return from the best alternative investment. Since I am evaluating the value associated with a private investment, I assume that the best alternative investment is in relatively conservative "AAA" rated corporate bonds and the time horizon ("T") is the average time a home in the area is held before it is sold. Since the EANB is calculated in present dollars, the discount rate is a "real" rate that must be adjusted for inflation. I, therefore, subtracted the average annual inflation rate (1999-2008) from the average annual bond rate (1999-2008) to get a real discount rate.

The EANB will be used to evaluate the policy implications and potential for a property assessment (Chapter 5).

Table 3. Variable Name, Description, and Expected Effect on Price

Variable	Description*	Expected Direction
STRUCTURAL ATTRIBUTES		
Age	Age of home in 2010 in years.	?
Bathrooms	Number of bedrooms – half baths counted as 0.5 bathrooms	+
Bedrooms	Number of bedrooms.	+
Carport	Dummy variable = 1 if home has a carport; 0 for a garage.	-
Fireplaces	Dummy variable = 1 if home has fireplace; 0 if it does not.	+
Home Size	The size of the living space of the home in square feet.	+
Lot Size	The size of the lot on which the home is located in square feet.	+
Pool	Dummy variable = 1 if home has a pool; 0 if it does not.	+

Table 3. Variable Name, Description, and Expected Effect on Price		
Variable	Description*	Expected Direction
Stories	Number of stories	+
Wood Roof	Dummy variable = 1 if wood roof; 0 if other material.	-
LOCATION ATTRIBUTES		
ParkwayQuarterMile	Dummy variable = 1 if home is located within ¼ mile of the boundary of the American River Parkway; 0 if the home is greater than ¼ mile from the boundary.	+
ParkwayThirdMile	Dummy variable = 1 if home is located > 1/4 to 1/3 mile of the boundary of the American River Parkway; 0 if the home is greater than 1/3 mile from the boundary or 1/4 or less from the boundary.	?
ParkwayHalfMile	Dummy variable = 1 if home is located > 1/3 to 1/2 mile of the boundary of the American River Parkway; 0 if the home is greater than 1/2 mile from the boundary or 1/3 or less from the boundary.	?
Parkway Distance	Distance from the American River Parkway in feet.	-
LOCATION/ NEIGHBORHOOD ATTRIBUTES		
ZipCode95628… ZipCode95864	Dummy variable = 1 if home sold in zip code; 0 if not sold in zip code. The zip code in the data set for which there is no dummy variable is 95608.	+/-[9]
ZipCodeXXXXX: Parkway[1/4,1/3,1/2]	Dummy interaction variable = 1 if home sold within area defined by combination of zip code and Parkway proximity; 0 if outside of the area.	+/?[10]
NEIGHBORHOOD ATTRIBUTE		
MedianHHIncome	The median household income is from the 2000 census and is associated with the census tract in which the home is sold.	+
TIME RELATED ATTRIBUTES		

[9] The zip codes represented by dummy variables are: 95628, 95670, 95742, 95815, 95816, 95819, 95825, 95826, 95827, 95833, 95864 (n=11). 95608 zip code omitted. Based on mean home sales price, the 95628, 95816, 95819, and 95864 zip codes are expected to be positive and the other zip codes (95670, 95742, 95815, 95825, 95826, 95827, and 95833) are expected to be negative.

[10] The 36 variables are a combination of the 12 zip codes in the data set and the three Parkway proximity dummy variables. Note that the “omitted condition” is defined by the homes sold outside of the ½ mile distance from the Parkway.

Table 3. Variable Name, Description, and Expected Effect on Price		
Variable	Description*	Expected Direction
January_March2008	Dummy variable = 1 if home sold in January through March 2008; 0 if sold in another month in 2008.	+
April2008,May2008, June2008, October2008… May2009	Dummy variable = 1 if home sold in individual month; 0 if sold in another month.	+ / -[11]
July_September2008	Dummy variable = 1 if home sold in July-September 2008; 0 if sold in another month in 2008.	+

11 Based on mean sale prices relative to June 2009, April 2008, May 2008, June 2008, December 2008 and May 2009 are expected to be positive and October 2008, November 2008, January 2009, February 2009, March 2009, and April 2009 are expected to be negative.

Chapter 4

DATA AND RESULTS

In this chapter, I describe the source of the data used for my research, as well as how I addressed missing and duplicate data. I also provide basic statistics for each of the variables with an assessment of key variables, including an analysis of the potential correlation between independent variables. In the rest of the chapter, I focus on presenting the results of my regression analysis and my calculations of the total increase in home value due to Parkway proximity.

Data Description

The Sacramento County homes sales data for January 2008 through June 2009 came from the multiple listing service (MLS: R. Wassmer, personal communication, September 8, 2009[12]). The MLS data set was the source of all information on the selling price, sales date, structural attributes, and address (including zip code). Staff from the Sacramento Area Council of Governments (T. Glover, personal communication, September 30, 2009) used a Geographical Information System to geocode the properties sold (i.e., establish the latitude/longitude of each property sold); provided the distance from the American River Parkway to each home sold; and provided 2000 census data related to each property based on the census tract in which the property was located.

The MLS data set did not include home sales data for the 95814 zip code, which covers downtown Sacramento. However, a review of the area map (The Thomas Guide,

[12] MLS data were provided to R. Wassmer by S. Herra on June 26, 2009 and represents single family homes sold.

2004) indicates that there are few residential neighborhoods near the Parkway in this zip code. Therefore, the lack of this sales data likely has a minimal impact on the regression results. In addition, the MLS data included a number of duplicates, some of which were filtered by SACOG (T. Glover, personal communication, September 30, 2009) and others that I filtered. Some properties that appeared twice in the data set had different sales date, so those observations were assumed to be valid (i.e., the home was sold twice). Other properties that appeared two or more times had the same sales date and other attributes were identical, although sometimes the home size differed slightly. These duplicate observations occurred primarily in the 95628 and 95670 zip codes. Since the duplicates were not random, the duplicate observations of properties with identical sales dates were removed from the data set.

There were approximately 420 properties out of the dataset that were not successfully geocoded. I used Google Earth™ to approximate the distance from the Parkway for use with the Parkway distance dummies and was able to make those approximations for 335 of the 420 properties for which that data was not available. For the missing census tract data, I identified properties sold near (within 10-15 homes) of the property that was not successfully geocoded. Through this method, I was able to identify census tracts for 230 of the 420 properties that were missing this information.

The census data I used (median household income) likely provides a good relative income measure for homes sold in established areas. However, the 2000 census would not provide representative data for areas that had a building boom in the last ten years. For example, although census tracts generally cover a population of 1,500 to 8,000

(United States Census Bureau, 2009), there were 515 homes sold in census tract 87.01 in Rancho Cordova. A review of the data showed the median age of those homes to be three. However, since the census tract includes the relatively well established and higher income Gold River area, the median household income associated with all 515 homes is fairly high compared to the rest of the Sacramento area (almost $85,000). Since this represents 10% of the home sales, this artifact could skew the estimated coefficient for median household income[13].

Data Statistics

Tables 4a and 4b provide summary statistics for each of the variables. For the continuous variables (those that can assume many values in an interval), the mean, standard deviation, minimum and maximum values, and number of missing values are presented. For the dummy variables, the number (and percentage) of observations for the respective dummy variable when it equals "1" are given.

Statistics for Structural Attributes

As can be seen from the statistics, there is a wide range of values for home size, lot size, and age of the home. An evaluation of the mean and standard deviation for these variables (as well as histograms in Appendix A) provides some insight into the characteristics of the area. The age of the homes sold suggests a "tri-modal" distribution with a large number of homes built around four years ago; about thirty-five years ago;

[13] Note that the homes in Gold River are in the 95670 zip code and the homes identified as being in Rancho Cordova are in the 95742 zip code. The median home sales in this census tract for both zip codes was comparable ($324,500 for 95670 and $314,900 for 95742).

and fifty-five years ago. This distribution likely reflects a series of building “booms” with a large number of homes built recently in the previously rural areas near Rancho Cordova. The home size distribution is closest to a bell shaped (normal) distribution with most of the homes of modest size between 1,000 and 2,000 square feet in size. The lot size distribution is close to a bell shaped curve with a few homes on rather large lots. However, most homes are on smaller lots between 5,000 square feet and 7,500 square feet (about 0.11 to 0.17 acres). The median number of bedrooms (three) and bathrooms (two) also suggest that most of the homes sold in the zip codes adjoining the Parkway are modest sized homes.

The other structural attributes expressed as dummy variables also help draw a picture of the typical home sold in the areas of interest. Over 75% of the homes have a fireplace, while over 90% of the homes have a garage. A little less than 20% of the homes have a pool and less than 10% of the homes have a wood roof.

The primary neighborhood attribute included in the hedonic pricing model is median household income by census tract. The median household income represents all households and not just single-family residences. The median of median household income of homes sold was $46,339, which is more than $1,000 lower than the state-wide median household income ($47,493; United States Census Bureau, 2002).

Since I intentionally limited my analysis to zip codes adjacent to the Parkway, it is not surprising that the number of homes within close proximity to the Parkway make up a substantial portion of my data set. Nine percent of the homes sold are within a quarter mile of the Parkway; a little over 3% are from a quarter to a third of a mile from the Parkway; and over 6% are from a third to a half-mile from the Parkway. In total, over 15% of the homes in the data set are hypothesized to have their value affected by the Parkway. The median distance of a home from the Parkway is a little over a mile.

With respect to the zip code and zip code/Parkway interaction variables, there are a couple of observations worth noting (Table 4b). Two of the twelve zip codes account for 30% of the home sales (95833 and 95670). The 95833 zip code is the Natomas area of Sacramento and the 95670 zip code is Rancho Cordova. Both areas experienced a great deal of growth during the real estate boom of early 2000. It is likely that the relatively high home sales in these areas could be a result of new homeowners unable to make mortgage payments due to bad loans or the downturn in the economy.

Since I have separately modeled the effect of Parkway proximity in individual zip codes, it is worth looking more closely at the zip code/Parkway proximity interaction variables. Out of the thirty-six zip code/Parkway proximity variables, six had no observations (the 95742 zip code; 95816/quarter mile and 95816/third mile; and 95825/third mile). In addition, there were seven zip code/Parkway proximity interaction terms that had eight or less observations. The other twenty-three interaction variables had 11 to 172 observations.

Appendix A (Tables A-1 through A-10) presents a complete list of the correlation coefficients for each pair of independent variables. I have evaluated the simple correlation coefficients to identify the potential for multicollinearity. Statistically significant correlations suggest the correlation is not random. The correlation coefficient indicates the magnitude (closer to “1” or “-1” the greater the correlation) and direction of the correlation (a negative value indicates the variables move in opposite directions and positive values indicate they move in the same direction).

Studenmund (2006) suggests that a simple correlation coefficient of 0.80 or greater suggests multicollinearity between the two independent variables. Although no variable pairs were greater than 0.80, the bedroom/bathroom; home size/bathroom; and home size/bedroom pairs all had statistically significant simple correlations of between 0.60 and 0.80.

Regression Results

The first set of regression models that I tested evaluated four basic functional forms of the hedonic model – linear (selling price)-linear (home attributes); log -linear; log –semilog; and linear-semilog. Studenmund (2006) points out that comparing the adjusted R squared between models is difficult, since the variables are transformed in some functional forms and not in others. In addition to the R squared, I have reported the variance inflation factors (VIF) and the statistical significance of the each of the coefficients. I will evaluate the different functional forms based on whether the model seems consistent with theory; whether key variables have a statistically significant effect on price, where expected; and whether the direction of the effect is as expected.

Evaluation of Different Functional Forms

As can be seen in Table 5, model performance as measured by the adjusted R squared is linear-semilog < linear-linear < log-linear < log-semilog. All of the models have fairly high adjusted R squared values with the log-semilog functional form having an adjusted R squared of 0.872.

The VIF is used to detect multicollinearity between independent variables, so the VIFs are equal for models in which the independent variables have the same functional form. Studenmund (2006) indicates that a common rule of thumb is that a VIF of greater than five indicates severe multicollinearity, however, Studenmund suggests that this number should be increased slightly as the number of independent variables increases. Only home size, when log transformed, had a VIF slightly higher than five, which was not unexpected given the high simple correlations between home size and the number of bedrooms and bathrooms. However, there is no reason to make a correction, since the coefficients for the number of bathrooms, bedrooms, and home size were all statistically significant.

With respect to predicting the direction and significance of regression coefficients, the performance of the four models was similar. For the ten structural attributes, the models all predicted statistically significant positive relationships between selling price and the number of bathrooms, home size, lot size, and the presence of a pool. The models were also consistent in predicting a negative relationship between price and age of the home, whether the home had a carport or no garage, and the number of stories the home has (which was opposite of the expected effect).

Interestingly, three of the models (all except log-linear, which did not identify a statistically significant relationship) predicted a negative relationship between home value and the number of bedrooms and a positive relationship between value and a wood roof, contrary to my expectations. The linear-linear and linear-semilog both predicted a negative relationship between the home sale price and the presence of a fireplace in the home, which diverged from my forecast and was the opposite of the relationship found for the log-linear and log-semilog models. The log-semilog functional form appears to be slightly superior in modeling the effect of the structural attributes, since nine of the ten coefficients were statistically significant at a 99% or greater confidence level; statistically significant coefficients were in the expected direction more often than the other models; and coefficients that diverged from the expected direction were consistent with findings of two other models.

In modeling the key attribute of interest, distance to the Parkway, each model form produced similar results in terms of direction and statistical significance. All four models predicted a positive statistically significant effect of location within a quarter mile of the Parkway at a greater than 99% confidence level. Three of the four models had a similar confidence level for homes located between a quarter mile and a third of a mile (the linear-linear model was significant at a 95% confidence level). None of the models predicted a statistically significant effect for homes located a third of a mile to a half-mile from the Parkway.

The models also were similar in their predicted direction and the statistical significance of the time related variables, although the log-linear model performed slightly better. For the variables representing the January through November 2008 time period, all models predicted that homes sold, on average, had a higher value then homes sold in June 2009. However, the actual mean value of homes sold in October and November 2008 were about $10,000 and $30,000 less, respectively, than homes sold in June 2009. The log-linear model was the only one that successfully predicted statistically significant (at a 90% confidence level) lower home value for homes sold in March and April 2009, relative to June 2009. All other models did not find a statistically significant difference between the month the home was sold and June 2009 sales for the January through May 2009 time frame.

All four models predicted a positive relationship between home sales price and median household income, as expected. For the zip code dummies, which reflect both neighborhood characteristics and proximity to amenities/disamenities, the four models were similar in their predictions of statistically significant difference from homes sold in the 95608 zip code. The log-linear model was slightly superior to the log-semilog model in that all eleven zip code coefficients were statistically significant at a 99% confidence level, whereas the log-semilog had one coefficient that was statistically significant at a 90% confidence level and the other ten significant at a 99% confidence level. The direction of the zip code effect was as predicted based on mean home sale values relative to the omitted 95608 zip code dummy, with the exception of the 95628 zip code. The mean home sales in the 95628 zip code were only slightly higher than 95608 (about $2,000), so the failure to predict the correct direction is not of concern.

The linear-linear and linear-semilog models did not produce statistically significant coefficients for the 95825 and 95815 zip codes, respectively. The linear-semilog model also predicted a higher value in the 95825 zip code, although the mean value of homes sold is about $150,000 less than the 95608 zip code.

In summary, the log transformation of home selling price appears to be the key determinant in terms of model performance. The log-linear and log-semilog models predicted the correct direction of time related attributes and zip code variables more consistently than the linear-linear and linear-semilog models. The log-linear model was slightly better than the log-semilog model in identifying significant differences for the time related variables and negligibly better in predictions related to the zip codes (a higher confidence level for one zip code variable). Since dummy variables are not transformed in either the log-linear or log-semilog models and there is limited difference between the two, there is no reason to choose one over the other based predictions for the zip code and time dummy variables. The log-semilog model was able to identify significant differences in two structural variables for which the log-linear model was not able to identify significant differences (the bedroom and wood roof variables). Therefore, the hedonic pricing scenarios described below for the neighborhood/Parkway interaction effects and options for addressing missing values are based on the log-semilog functional form of the model.

Neighborhood / Parkway Interaction Effects

As discussed above, all models identified a statistically significant increase in home value for homes within a quarter mile of the Parkway and homes from a quarter mile to a third of a mile from the Parkway. However, the aggregated effect of Parkway proximity may mask some important neighborhood differences. For convenience in interpreting the data, the Parkway proximity regression coefficients identified in Table 6 are expressed as a percent change (Table 7) per the method of Halversen and Palmquist (1980).

As shown in Tables 7 and 8, disaggregating the overall Parkway proximity effect by zip code reveals some substantial differences based on where the home is located along the Parkway. The value of Parkway is greatest for homes in the 95608 (Carmichael) area with a 40% ($150,000) increase in home value within a quarter mile of the Parkway and almost 25% ($72,000) increase from a quarter to a third of a mile. The value of Parkway proximity for the 95826 (College Greens/Rosemont) and 95864 (Arden) is also high, increasing home values by 20%-30%, all other home structure, location, and time of sale attributes held constant. For College Greens/Rosemont, this increase equates to $40,000-$55,000 and for Arden the increase in value is $133,000 to $154,000. Model estimates indicated more modest, although appreciable (almost 10% to 20%), increases in home value due to Parkway proximity occurred in the 95628 (Fair Oaks), 95670 (Rancho Cordova), and 95827 ("Mills") areas ($15,000-$42,000). All of these areas are east of Sacramento proper, have ready access to portions of the Parkway that include the bike trail or other Parkway amenities, and do not appear to be co-located near any features that would be considered a disamenity.

In a number of zip codes, there were no homes sold or not enough homes sold to measure an effect of proximity within a quarter to a third of a mile of the Parkway (95742, 95815, 95816, 95825). The 95833 zip code (Natomas) is the only zip code with a substantial number of observations for each Parkway proximity dummy, but showing no statistically significant effect within a third of mile of the Parkway and a slight negative effect for a third to half mile from the Parkway. Although homes within a half mile of the Parkway in the Natomas area have ready access to the Parkway, this proximal area is also bordered on the north and south by two major surface streets (W. El Camino Avenue and Garden Highway) that may depress the value of homes due to the traffic.

The 95819 zip code (East Sacramento) is the only area for which there was a fairly significant negative effect on home value of nearly -18% and -13% for homes within a quarter mile and from a third to a half mile distance from the Parkway (there was no significant difference found for the quarter to a third mile proximity variable). There are three likely explanations for this anomaly: 1) the Parkway is generally narrow, with limited access and no maintained trail in the area (with the exception of Paradise Beach, which is somewhat removed from the nearby neighborhood); 2) for much of the area an active railroad line runs within an eighth of a mile and parallel to the Parkway, which is likely considered a disamenity; and 3) the greater attraction of amenities that are farther removed from the Parkway (e.g., the shops along J Street and closer proximity to light rail stations).

Missing Values

As discussed in the methodology section, I used the “pairwise” approach to addressing missing values for the observations in the data set. However, I also evaluated the effect of using other SPSS^{TM} options for dealing with missing values, which include “listwise” and “mean”. The “pairwise” option resulted in a slightly better adjusted R squared (0.872) than the “listwise” (0.868) or “mean” (0.866). The lower R squared for the “listwise” approach is expected, since any observation with a missing value is removed. However, replacing missing values with the mean increased the number of observations by over 300, but slightly lowered the R squared.

However, the coefficients for the primary Parkway proximity variables were minimally affected by the different options for addressing missing values. The quarter mile Parkway coefficients were within 1% of each other. The coefficient for the variable representing a quarter to a third of a mile had greater variation (within 15% of each other), but would not result in a significant change in the estimated magnitude of the effect. All three approaches for replacing missing values did not find a statistically significant effect for Parkway proximity for homes located from a third of a mile to a half mile.

Parkway Proximity as a Continuous Variable

As will become evident below and in the next chapter, expressing Parkway proximity as a continuous variable would not allow me to use the results for policy evaluation. In addition, the results from my analysis using dummy variables for Parkway proximity, clearly demonstrate that the positive effect of the Parkway drops off quickly. However, I wanted to compare my results to the vast majority of the research that expresses the green space distance as a continuous variable.

When Parkway distance is log transformed (and the selling price is log transformed), the estimated coefficient represents elasticity. I found (Table 6) an average 0.045% decrease in home value for every 1% increase in distance from the Parkway. This result is within the range found by other researchers for different types of green spaces (see Table 2). It is greater than the effect found for Minneapolis-St. Paul; Knox County, Tennessee; Kenosha, Wisconsin; Roanoke, Virginia; and Baltimore, Maryland

and less than the effect of green space found for Austin, Texas and Boston, Massachusetts.

For the Austin and Boston studies, the mean distance to green space was between 2,600-5,200 feet and about 750-4,200 feet, respectively. In my data set, the mean distance to the Parkway was about 7,500 feet. Since my data set likely included more properties outside the influence of the Parkway, the computed "average" elasticity of Parkway distance was smaller in magnitude.

Using the computed elasticity, in lieu of Parkway proximity dummy variables, would suggest a decrease in home value of more than 8% by moving from the average distance to the average distance plus two standard deviations (i.e., from 7,500 feet to about 21,000 feet away). Since the various models runs using the Parkway proximity dummy variables suggest no or minimal effect of Parkway proximity past a third of a mile (1,760 feet), the use of a continuous variable can clearly provide misleading results regarding the magnitude and distance over which green space influences home value.

Total Willingness to Pay

As discussed in the Neighborhood/Parkway interaction section above, there were only six of the twelve zip codes for which Parkway proximity had a statistically significant effect. The other zip codes either had no home sales proximal to the Parkway, no statistically significant effect, or a negative effect that is likely due to other locational amenities/disamenities not taken into account.

Using the approach described in the Methodology chapter (under "Total Willingness to Pay"), I calculated the total home value attributed to Parkway proximity

(Table 8)[14]. I performed the calculation in two ways: 1) separately calculating the values for the two distance increments that had a statistically significant effect (<=1/4 mile; >1/4 mile to <=1/3 mile) and 2) calculating the values based on regression coefficients for a model run using only a <=1/3 mile Parkway proximity dummy variable.

Although the effect of Parkway proximity is limited to specific areas and over a short distance, the total value added is significant. There is quite a variation by zip code, with the total value ranging from $45 million to $316 million. Interestingly, the total value added for all zip codes with a significant effect does not differ greatly based on whether I used two variables or one variable to represent effects within a third of a mile of the Parkway. Both approaches resulted in a calculated added value of just over $790 million.

This estimated value of the Parkway (close to a billion dollars), which is just associated with single-family residences, is a staggering number. However, in order to examine the policy implications of this value, I need to equate that value to an annual benefit, as described in the methodology section. I used a very conservative approach to calculating the "Equivalent Annual Net Benefit". I assumed that, on average, homeowners proximal to the Parkway would not sell their homes for 26 years based on the number of homes sold (about 5,400) for the 18 month record I used and estimated number of homes in those zip codes (about 95,000). The steep decline in home prices suggests sluggish homes sales during this tough economic period and, therefore, would

[14] Note there was not a statistically significant effect found in the 95628 zip code for homes located greater than a quarter mile and within a third of a mile of the Parkway.

lead to an overestimate of the time people hold onto their homes. The annual rate of return a homeowner would earn with an alternate investment would be a modest 3.61% based on an average annual yield of “AAA” rated corporate bonds of 6.15% minus an average inflation rate 2.54%. These assumptions have the effect of lowering the equivalent annual net benefit relative to using a shorter time frame and higher discount rate.

Even with these modest assumptions, the annual benefit per home ranges from $900 to almost $10,000, depending on zip code. When all six zip codes are considered together, the value is from almost $2,500 to over $3,800 per home. For all single-family homes within a third of a mile of the Parkway, the aggregate annual benefit is over $47,000,000. Another way of looking at these benefits is as the amount of value that would be lost annually, if the Parkway was no longer perceived as an amenity or became a disamenity. The policy implications of this estimated benefit are discussed in the next chapter.

Table 4a. Descriptive Statistics					
Variable	Mean / Median: N (%) for Dummy =1	Standard Deviation	Maximum	Minimum	Missing Data (n)
SELLING PRICE	$258,760 /$220,000	$180,475	$2,700,000	$18,400	0
STRUCTURAL ATTRIBUTES					
Age (years)	38.8 / 40.0	22.4	130	1	132
Bathrooms	2.06/ 2.00	0.689	6.5	1	0
Bedrooms	3.29/ 3.00	0.772	7	1	0
Carport/No Garage	483 (8.9%)				3
Fireplace	4,162 (76.4%)				0
Home Size (sq ft)	1,646/ 1,472	692	6,800	513	0
Lot Size (sq ft)	8,081/ 6,970	5,293	108,464	436	35
Pool	952 (17.5%)				0
Stories	1.25/ 1.00	0.446	3	1	9
Wood Roof	403 (7.4%)				0
LOCATIONAL ATTRIBUTES					
ParkwayQuarterMile	481 (9.0%)				85
ParkwayThirdMile	178 (3.3%)				85
ParkwayHalfMile	330 (6.2%)				85
Parkway Distance (ft)	7,497/ 5,954	6,781	34,728	50	420
NEIGHBORHOOD ATTRIBUTES					
MedianHHIncome	49,968/ 46,339	17,975	97,501	21,302	190
TIME RELATED ATTRIBUTES					
January_March2008	555 (10.2%)				0
April2008	277 (5.1%)				0
May2008	358 (6.6%)				0
June2008	368 (6.8%)				0
July_September2008	1262 (23.2%)				0
October2008	414 (7.6%)				0
November2008	288 (5.3%)				0
December2008	210 (3.9%)				0
January2009	285 (5.2%)				0
February2009	241 (4.4%)				0
March2009	321 (5.9%)				0
April2009	306 (5.6%)				0
May2009	332 (6.1%)				0
June2009	225 (4.1%)				

Table 4b. Descriptive Statistics – Location/Neighborhood Attributes				
Variable	N (%) for Dummy =1			
		PARKWAY INTERACTION VARIABLE (Zip Code=1; Parkway Distance=1)		
ZIP CODE	Zip Code Only	1/4 Mile	1/3 Mile	1/2 Mile
Zip95608	608 (11.2%)	43 (0.8%)	20 (0.4%)	28 (0.5%)
Zip95628	479 (8.8%)	38 (0.7%)	23 (0.4%)	27 (0.5%)
Zip95670	836 (15.3%)	172 (3.2%)	45 (0.8%)	85 (1.6%)
Zip95742	447 (8.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Zip95815	583 (10.7%)	1 (<0.1%)	5 (0.1%)	31 (0.6%)
Zip95816	149 (2.7%)	0 (0.0%)	0 (0.0%)	8 (0.1%)
Zip95819	249 (4.6%)	40 (0.7%)	11 (0.2%)	19 (0.4%)
Zip95825	134 (2.5%)	3 (0.1%)	0 (0.0%)	2 (<0.1%)
Zip95826	508 (9.3%)	78 (1.5%)	24 (0.4%)	57 (1.1%)
Zip95827	331 (6.1%)	42 (0.8%)	18 (0.3%)	3 (0.1%)
Zip95833	798 (14.6%)	37 (0.7%)	27 (0.5%)	57 (1.0%)
Zip95864	328 (6.0%)	27 (0.5%)	8 (0.1%)	13 (0.2%)
No missing data for Zip Code variables; 85 missing data points for each ZipCode/Parkway interaction variable.				

Table 5. Regression Results

	Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels				Variance Inflation Factor (VIF)			
	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog
R Squared	0.786	0.857	0.873	0.738				
Adjusted R Squared	0.785	0.856	0.872	0.736				
Observations	5136	5136	5136	5136				
CONSTANT	53,540 (-12,157)	11.501 (0.034)	2.744 (0.194)	-2.952E6 (81,082)				
STRUCTURAL ATTRIBUTES								
Age (years)	-860*** (89.4)	-5.647E-3*** (2.51E-4)	-.145*** (.006)	-37,532*** (2,329)	2.951	2.951	3.049	3.049
Bathrooms	28,213*** (3,309)	7.115E-2*** (9.3E-3)	.137*** (.016)	47,227*** (6,543)	3.810	3.810	3.208	3.208
Bedrooms	-15,816*** (2,190)	2.960E-3 (6.16E-3)	-.047** (.019)	-46,767*** (7,755)	2.094	2.094	2.103	2.103
Carport/No Garage	-30,672*** (4,460)	-1.525E-1*** (1.25E-2)	-.142*** (.012)	-24,444*** (4,913)	1.177	1.177	1.163	1.163
Fireplace	-8,033** (3,180)	6.994E-2*** (8.94E-3)	.038*** (.009)	-15,092*** (3,640)	1.337	1.337	1.426	1.426
Home Size (sq ft)	151*** (3.68)	2.989E-4*** (1.03E-5)	.667*** (.020)	243,621*** (8,180)	4.747	4.747	5.267	5.267
Lot Size (sq ft)	5.89*** (.276)	1.117E-5*** (7.77E-7)	.154*** (.010)	87,767*** (4,046)	1.566	1.566	2.067	2.067
Pool	16,066*** (3321)	6.141E-2*** (9.34E-3)	.050*** (.009)	19,062*** (3,689)	1.165	1.165	1.170	1.170
Stories	-26,330*** (3,462)	-4.035E-2** (9.73E-3)	-.086*** (.014)	-10,813** (5,808)	1.742	1.742	1.864	1.864
Wood Roof	28,888*** (4,750)	3.113E-2 (1.34E-2)	.047*** (.013)	38,939*** (5,259)	1.132	1.132	1.129	1.129

Table 5. Regression Results

	Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels				Variance Inflation Factor (VIF)			
	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog
LOCATIONAL ATTRIBUTES								
ParkwayQuarterMile	32,099*** (4,420)	9.385E-2*** (1.24E-2)	.123*** (.012)	43,753*** (4,889)	1.168	1.168	1.163	1.163
ParkwayThirdMile	14,363** (6,692)	5.679E-2*** (1.88E-2)	.083*** (.018)	24,393*** (7,408)	1.052	1.052	1.050	1.050
ParkwayHalfMile	467 (5,023)	-2.238E-3 (1.41E-2)	.010 (.013)	8,506 (5,569)	1.067	1.067	1.068	1.068
NEIGHBORHOOD ATTRIBUTES								
MedianHHIncome	1.462*** (0.114)	7.066E-6*** (3.22E-7)	1.163*** (1.050)	73,114*** (6,438)	3.099	3.099	3.278	3.278
TIME RELATED ATTRIBUTES								
January_March2008	54,355*** (6753)	2.498E-1*** (1.9E-2)	.263*** (.018)	60,782*** (7,484)	3.056	3.056	3.055	3.055
April2008	55,979*** (7692)	2.425E-1*** (2.16E-2)	.248*** (.020)	59,388*** (8,526)	2.091	2.091	2.091	2.091
May2008	38,901*** (7271)	1.969E-1*** (2.04E-2)	.211*** (.019)	44,923*** (8,061)	2.377	2.377	2.378	2.378
June2008	49,587*** (7236)	2.044E-1*** (2.03E-2)	.218*** (.019)	55,473*** (8,021)	2.415	2.415	2.416	2.416
July_September2008	28,423*** (6168)	1.429E-1*** (1.73E-2)	.156*** (.016)	33,046*** (6,837)	4.958	4.958	4.960	4.960
October2008	21,102*** (7097)	9.716E-2*** (1.99E-2)	.106*** (.019)	25,531*** (7,867)	2.589	2.589	2.591	2.591
November2008	14,944** (7631)	3.877E-2* (2.15E-2)	.054*** (.020)	22,262*** (8,456)	2.135	2.135	2.135	2.135

Table 5. Regression Results								
	Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels				Variance Inflation Factor (VIF)			
	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog
December2008	9,033 (8225)	5.331E-2** (2.31E-2)	.061*** (.022)	13,619 (9,115)	1.836	1.836	1.836	1.836
January2009	-1,973 (7641)	-2.365E-2 (2.15E-2)	-.008 (.020)	4,782 (8,467)	2.119	2.119	2.119	2.119
February2009	-897 (7939)	-3.121E-3 (2.23E-2)	.004 (.021)	1,452 (8,797)	1.951	1.951	1.951	1.951
March2009	-5,810 (7447)	-3.801E-2* (2.09E-2)	-.026 (.020)	-1,743 (8,254)	2.252	2.252	2.252	2.252
April2009	-4,165 (7521)	-3.945E-2* (2.11E-2)	-.029 (.020)	846 (8,333)	2.196	2.196	2.195	2.195
May2009	-1,456 (7397)	-1.756E-2 (2.08E-2)	-.015 (.020)	2,206 (8,200)	2.293	2.293	2.294	2.294
LOCATION/ NEIGHBORHOOD ATTRIBUTES								
Zip95628	-36465*** (5470)	-1.198E-1*** (1.54E-2)	-.104*** (.014)	-35,188*** (6,049)	1.757	1.757	1.749	1.749
Zip95670	-43,149*** (4916)	-2.574E-1*** (1.38E-2)	-.243*** (.013)	-48,712*** (5,487)	2.299	2.299	2.332	2.332
Zip95742	-171,000*** (7189)	-5.845E-1*** (2.02E-2)	-.607*** (.019)	-171,112*** (7,981)	2.849	2.849	2.860	2.860
Zip95815	-33,595*** (6081)	-6.710E-1*** (1.71E-2)	-.567*** (.017)	-6,981 (7,239)	2.588	2.588	2.986	2.986
Zip95816	241,602*** (9030)	8.248E-1*** (2.54E-2)	.801*** (.024)	268,850*** (9,970)	1.588	1.588	1.576	1.576
Zip95819	233,246*** (7161)	6.861E-1*** (2.01E-2)	.657*** (.019)	239,926*** (7,799)	1.638	1.638	1.582	1.582
Zip95825	8,304	-7.808E-2***	-.039*	16,991*	1.271	1.271	1.290	1.290

Table 5. Regression Results

	Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels				Variance Inflation Factor (VIF)			
	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog	Linear-Linear	Log-Linear	Log-Semilog	Linear-Semilog
	(8505)	(2.39E-2)	(.023)	(9,499)				
Zip95826	-32,983*** (5487)	-2.140E-1*** (1.54E-2)	-.187*** (.015)	-37,342*** (6,093)	1.864	1.864	1.871	1.871
Zip95827	-61,278*** (6202)	-3.706E-1*** (1.74E-2)	-.337*** (.016)	-65,154*** (6,845)	1.607	1.607	1.594	1.594
Zip95833	-65,891*** (5177)	-4.197E-1*** (1.46E-2)	-.394*** (.014)	-71,310*** (5,758)	2.454	2.454	2.472	2.472
Zip95864	115,853*** (6033)	1.927E-1*** (1.7E-2)	.211*** (.016)	132,770*** (6,634)	1.508	1.508	1.485	1.485

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options

Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels						
	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
R Squared	0.873	0.877	0.873	0.871	0.869	0.867
Adjusted R Squared	0.872	0.876	0.872	0.870	0.868	0.866
Observations	5137	5137	4920	4920	5096	5450
CONSTANT	2.744*** (0.194)	2.855*** (0.196)	3.302*** (.214)	2.501*** (.197)	2.954*** (.200)	2.882*** (.194)
Neighborhood/ Location			-.045*** (.004)	19.37*** 3.103		
ParkwayQuarter Mile	.123*** (.012)				.121*** (.012)	.122*** (.012)
Zip95608Quarter		.341*** (.036)				
Zip95628Quarter		.100*** (.039)				
Zip95670Quarter		.105*** (.021)				
Zip95815Quarter		.014 (.224)				
Zip95819Quarter		-.195*** (.039)				
Zip95825Quarter		.200 (.132)				

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options						
Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels						
	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
Zip95826Quarter		.241*** (.028)				
Zip95827Quarter		.164*** (.037)				
Zip95833Quarter		-.002 (.038)				
Zip95864Quarter		.225*** (.046)				
ParkwayThird Mile	.083*** (.018)				.095*** (.018)	.081*** (.018)
Zip95608Third		.212*** (.051)				
Zip95628Third		.047 (.048)				
Zip95670Third		.074** (.035)				
Zip95815Third		.102 (.101)				
Zip95819Third		-.099 (.070)				
Zip95826Third		.191*** (.050)				
Zip95827Third		.129** (.055)				

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options						
Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels						
	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
Zip95833Third		-.032 (.044)				
Zip95864Third		.259*** (.081)				
ParkwayHalfMile	.010 (.013)				.017 (.013)	.008 .013
Zip95608Half		.059 (.044)				
Zip95628Half		-.056 (.045)				
Zip95670Half		.015 (.027)				
Zip95815Half		-.053 (.041)				
Zip95816Half		-.070 (.082)				
Zip95819Half		-.136** (.054)				
Zip95825Half		.480*** (.160)				
Zip95826Half		.144*** (.032)				
Zip95827Half		.009 (.130)				

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options

Unstandardized Coefficients, Standard Error (in parentheses), and Significance:
*** 99%; **95%; *90% Confidence Levels

	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
Zip95833Half		-.057* (.031)				
Zip95864Half		.073 (.064)				
Age (years)	-.145*** (.006)	-.148*** (.006)	-.148*** (.006)	-.140*** .006	-.145*** .006	-.115*** .005
Bathrooms	.137*** (.016)	.137*** (.016)	.136*** (.016)	.139*** .016	.132*** .016	.144*** .016
Bedrooms	-.047** (.019)	-.038** (.018)	-.051*** (.019)	-.053*** .019	-.044** .019	-.072*** .018
Carport	-.142*** (.012)	-.143*** (.012)	-.140*** (.012)	-.142*** .012	-.139*** .012	-.150*** .012
Fireplace	.038*** (.009)	.044*** (.009)	.039*** (.009)	.036*** .009	.040*** .009	.032*** .009
Home Size (sq ft)	.667*** (.020)	.642*** (.019)	.667*** (.020)	.675*** .020	.662*** .020	.718*** .019
Lot Size (sq ft)	.154*** (.010)	.161*** (.010)	.146*** (.010)	.152*** .010	.156*** .010	.131*** .010
Pool	.050*** (.009)	.043*** (.009)	.053*** (.009)	.057*** .009	.058*** .009	.052*** .009
Stories	-.086*** (.014)	-.087*** (.014)	-.083*** (.014)	-.084*** .014	-.077*** .014	-.084*** .014
Wood Roof	.047*** (.013)	.039*** (.012)	.048*** (.013)	.056*** .013	.054*** .013	.051*** .013

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options						
Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels						
	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
MedianHH Income	0.351*** (.015)	.350*** (.016)	.344*** (.016)	.369*** .016	.330*** .016	.314*** .015
Zip95628	-.104*** (.014)	-.075*** (.016)	-.112*** .015	-.105*** .015	-.080*** .015	-.076*** .014
Zip95670	-.243*** (.013)	-.220*** (.015)	-.261*** .014	-.226*** .013	-.227*** .013	-.221*** .013
Zip95742	-.607*** (.019)	-.582*** (.019)	-.556*** .020	-.613*** .020	-.608*** .020	-.509*** .018
Zip95815	-.567*** (.017)	-.549*** (.018)	-.582*** .018	-.559*** .018	-.561*** .017	-.580*** .017
Zip95816	.801*** (.024)	.831*** (.024)	.777*** .024	.793*** .025	.801*** .025	.770*** .024
Zip95819	.657*** (.019)	.750*** (.021)	.636*** .019	.660*** .019	.680*** .019	.656*** .019
Zip95825	-.039* (.023)	-.031 (.023)	-.043* .023	-.037 .023	-.024 .023	-.043* .023
Zip95826	-.187*** (.015)	-.207*** (.016)	-.199*** .015	-.174*** .015	-.166*** .015	-.170*** .015
Zip95827	-.337*** (.016)	-.328*** (.018)	-.349*** .017	-.323*** .017	-.315*** .017	-.314*** .016
Zip95833	-.394*** (.014)	-.360*** (.015)	-.417*** .014	-.388*** .014	-.374*** .014	-.367*** .014
Zip95864	.211*** (.016)	.218*** (.017)	.207*** .016	.210*** .016	.226*** .016	.225*** .016

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options						
Unstandardized Coefficients, Standard Error (in parentheses), and Significance: *** 99%; **95%; *90% Confidence Levels						
	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
January_ Mar2008	.263*** (.018)	.261*** (.018)	.262*** (.018)	.259*** .018	.266*** .018	.261*** .018
April2008	.248*** (.020)	.245*** (.020)	.247*** (.021)	.244*** .021	.241*** .021	.244*** .020
May2008	.211*** (.019)	.209*** (.019)	.213*** (.020)	.211*** .020	.213*** .020	.207*** .019
June2008	.218*** (.019)	.214*** (.019)	.217*** (.020)	.215*** .020	.216*** .020	.213*** .019
July_ September2008	.156*** (.016)	.155*** (.016)	.154*** (.017)	.154*** .017	.155*** .017	.151*** .016
October2008	.106*** (.019)	.104*** (.019)	.105*** (.019)	.103*** .019	.099*** .019	.101*** .019
November2008	.054*** (.020)	.051*** (.020)	.054*** (.021)	.053** .021	.042** .021	.048** .020
December2008	.061*** (.022)	.060*** (.022)	.060*** (.022)	.058*** .022	.059*** .022	.058*** .022
January2009	-.008 (.020)	-.012 (.020)	-.008 (.021)	-.011 .021	-.011 .021	-.012 .020
February2009	.004 (.021)	.002 (.021)	.000 (.022)	.001 .022	.003 .021	.002 .021
March2009	-.026 (.020)	-.027 (.020)	-.030 (.020)	-.029 .020	-.026 .020	-.031 .020
April2009	-.029 (.020)	-.031 (.020)	-.031 (.020)	-.033 .021	-.022 .020	-.032 .020

Table 6. Log-Semilog – Comparison of Different Parkway Location Variables & Model Options

Unstandardized Coefficients, Standard Error (in parentheses), and Significance:
*** 99%; **95%; *90% Confidence Levels

	3 Parkway Distance Variables	32 Zip Code/ Parkway Distance Variables	1 Parkway Distance Variable (LN Parkway Distance (feet))	1 Parkway Distance Variable (Inverse: 1/Parkway Distance (feet))	3 Parkway Distance Variables: Listwise	3 Parkway Distance Variables: Mean
May2009	-.015 (.020)	-.016 (.019)	-.017 (.020)	-.019 .020	-.017 .020	-.020 .020

Table 7. Percent Change In Home Value Due to Parkway Proximity Based on Estimated Coefficients in Table 6.

Number of Observations (N) in Parentheses.

Zip Code	Within 1/4 Mile	1/4 to 1/3 Mile	1/3 to 1/2 Mile	Within 1/3 Mile
Zip Codes Aggregated	13.1% (N=481)	8.7% (178)	NS (330)	
95608	40.6% (43)	23.6% (20)	NS (28)	34.5% (63)
95628	10.5% (38)	NS (23)	NS (27)	8.6% (61)
95670	11.1% (172)	7.7% (45)	NS (85)	10.1% (217)
95742	NA (0)	NA (0)	NA (0)	NA
95815	NS (1)	NS (5)	NS (31)	NS(6)
95816	NA (0)	NA (0)	NS (8)	NA
95819	-17.7% (40)	NS (11)	-12.7% (19)	-14.8%(51)
95825	NS (3)	NA (0)	61.6% (2)	NS
95826	27.3% (78)	21.0% (24)	15.5% (57)	23.2%(102)
95827	17.8% (42)	13.8% (18)	NS (3)	16.5%(60)
95833	NS (37)	NS (27)	-5.5% (57)	NS
95864	25.2% (27)	29.6% (8)	NS (13)	25.5%(35)

Table 8. Total Increase In Home Value Due to Parkway Proximity for Zip Codes with a Positive Effect Based on Estimated Coefficients in Table 6.

Number of Observations (N) in Parentheses.

Median Selling Price	95608	95628	95670	95826	95827	95864	All 6 Zip Codes
<=1/4 Mile	$520,000	$444,500	$230,875	$257,500	$214,950	$663,000	
>1/4 to <=1/3 Mile	$378,500	$395,000	$220,000	$230,000	$226,950	$672,500	
<=1/3 Mile	$500,000	$420,000	$225,000	$250,000	$222,500	$663,000	
Percent Increase in Home Value due to Parkway Proximity							
<=1/4 Mile	40.6%	10.5%	11.1%	27.3%	17.8%	25.2%	
>1/4 to <=1/3 Mile	23.6%	0.0%	7.7%	21.0%	13.8%	29.6%	
<=1/3 Mile	34.4%	8.5%	10.1%	23.2%	16.5%	25.5%	
Median Increase in Value							
<=1/4 Mile	$150,156	$42,238	$23,067	$55,222	$32,480	$133,447	
>1/4 to <=1/3 Mile	$72,270	$0	$15,729	$39,917	$27,521	$153,596	
<=1/3 Mile	$128,106	$33,066	$20,596	$47,151	$31,566	$134,642	
Number of Homes							
<=1/4 Mile	1,712	1,110	3,726	1,643	1,014	988	10,074
>1/4 to <=1/3 Mile	755	671	2,392	431	429	333	3,645
<=1/3 Mile	2,466	1,781	2,333	2,074	1,443	1,321	13,719
Total Value Added to Single Family Detached Homes Due to Parkway							
(a) <=1/4 Mile	$257,015,482	$46,864,310	$83,236,235	$90,725,064	$32,929,641	$131,846,788	$642,617,519
(b) >1/4 to <=1/3 Mile	$54,537,628	$0	$16,119,608	$17,212,714	$11,817,883	$51,193,454	$150,881,288
Sum (a) + (b)	$311,553,110	$46,864,310	$99,355,843	$107,937,778	$44,747,524	$183,040,242	$793,498,807
<=1/3 Mile	$315,946,720	$58,884,280	$95,426,416	$97,797,534	$45,558,242	$177,902,733	$791,515,925
Equivalent Annual Net Benefit Per Home (26 years/ 3.6% Discount Rate)							
<=1/4 Mile	$8,986	$2,528	$1,380	$3,305	$1,944	$7,986	$3,817
>1/4 to <=1/3 Mile	$4,325	$0	$941	$2,389	$1,647	$9,192	$2,478
<=1/3 Mile	$7,667	$1,979	$1,233	$2,822	$1,889	$8,058	$3,453
Equivalent Annual Net Benefit All Homes (26 years/ 3.6% Discount Rate)							
<=1/3 Mile	$18,908,438	$3,524,043	$5,710,977	$5,852,881	$2,726,521	$10,646,931	$47,369,791

Chapter 5

POLICY IMPLICATIONS

There are clearly significant economic benefits for people who live near the Parkway and those homeowners are currently not paying their fair share to maintain that benefit. So how do we get that fair share contribution in a political environment that is complicated by constraints Californians have established on public financing; the local politics of financing the Parkway; and other policy alternatives (facts and solutions) which may be consistent with or contrary to my findings? In this Chapter, I will examine public policy theories in the context of my results to put forward a policy solution that is fair and will help preserve the value of the American River Parkway.

Local Financing in California

Proposition 13, passed in 1978, significantly restricted how local governments could generate revenue to provide public goods and services. Property taxes were capped at 1% of the assessed value and allows only a 2% annual increase in the assessed value until the property is sold, at which time the property is assessed at its current market value (Rueben and Cerdán, 2003). The legislation implementing Proposition 13 resulted in state control over how these local property taxes are distributed. Essentially, state legislation resulted in the consolidation of the local property tax revenue at the county and then distributed those revenues to the local governments within the county based on the proportional distribution in place in 1975-76 (Rueben and Cerdán, 2003). In addition, Proposition 13 required a 2/3 vote to pass tax increases for special-purpose use (e.g., funding parks) (Rueben and Cerdán, 2003).

Proposition 218, passed in 1996, requires any general tax increase (e.g., sales tax) to be put to the voters and receive majority approval. Proposition 218 also requires any property related assessment or fee to win a 2/3 majority of the voters or a majority of the property owners (Rueben and Cerdán, 2003). These constraints on raising revenue come into play in different ways depending on the option pursued.

In the 2008 American River Parkway Plan (ARPP: County of Sacramento, 2008), the County identified several different options for raising funds through different taxes, fees, or assessments. The potential "taxes" include a special tax, parcel tax, or adding on to the sales tax. "Special" taxes include dedicating a portion of the Transient Occupancy Tax to the Parkway or pursuing legislation to create a broad special tax (County of Sacramento, 2008). The County of San Mateo has special authorization to impose a 0.125% or 0.250% transactions and use tax to support park and recreation acquisition and maintenance (California Senate, 2007).

A Community Facilities District for the Parkway could be established per the provisions of the Mello-Roos Act of 1982 (California Government Code §53313 (d)). Sacramento County (or a Joint Powers Authority) would need to establish the criteria by which taxes would be levied to different parcels and the maximum amounts (California Government Code §53312.7 (a)(4)). The County could also establish a benefits assessment district for those parcels that "benefit" from the Parkway. The fee would be based on the proportional benefit derived from the Parkway by each parcel in the assessment district (California Streets and Highways Code §22572 (c)).

The ARPP also includes the possibility of increasing the sales tax to pay for Parkway improvements, acquisition, and maintenance. Although California law limits such a tax to either a 1/4 or 1/2 percent, the County suggested that pursuing special legislation to allow imposition of a smaller tax (1/8 percent) might engender broader support (County of Sacramento, 2008).

The tax revenue options above have some unique features that need to be considered when evaluating which approach to take. The creation of a broad special tax or add-on to the sales tax dedicated to the Parkway would be considered a "special" tax requiring a 2/3 majority of county-wide voters. The assessment associated with a Mello-Roos Community Facilities District (CFD) would require a 2/3 majority vote from registered voters within the CFD's boundary. In contrast, a parcel tax established through a benefits assessment district would require a majority vote of property owners. The vote of the property owners would be weighted based on the relative amount that they would be expected to pay (County of Sacramento, 2008).

Public Policy Theories Applicable to Passing a New "Parkway" Tax

There are two public policy analytical frameworks that I will briefly summarize that are especially relevant to establishing an effective strategy for financing the Parkway and evaluating the likelihood of success – the "Multiple Streams" model of Kingdon (1995), as extended by Zahardias (1999) and the importance of the "narrative" in policy forums as described by Roe (1994).

The "Multiple Streams" model (as described by Zahardias, 1999) posits that public policies are established as a result of interactions between problems, solutions, and politics that are effectively joined together and advanced by policy entrepreneurs. These policy entrepreneurs are able to identify when a "window of opportunity" opens for which the politics are just right to advance a particular solution to a public policy problem.

Zahardias (1999) notes that the multiple streams model is most helpful when conditions of ambiguity exist. Such conditions are especially common in large organizations (or in dealing with public policy issues that involve multiple governmental organizations with overlapping responsibilities). The characteristics of these organizations (or multi-organizations) when it comes to addressing public policy problems include fluid participation; unclear preferences; and confusing organizational processes (Zahardias, 1999).

Participation is fluid since the time and effort that different actors and organizations put into the policy issue varies and changes. Such fluid participation is especially true of elected government leaders and high-level civil servants who are dealing with many different problems demanding their attention. In addition, the preferences of decision makers is generally unclear and may appear contradictory – e.g., a desire not to raise taxes, but to maintain needed services. Finally, the process for getting things done (once some sort of policy preference is articulated) can be made difficult by confusing legal requirements and turf battles or lack of clarity over who should take the lead in moving the preferred solution forward.

Applying the Multiple Streams model to funding the American River Parkway can provided some important insights. For example, we can define the problem in relatively simple terms – funding for the Parkway is inadequate and comes primarily from an unstable funding source – the general fund. However, the problem becomes more complicated when we ask – funding of what?

Using the figures in the ARPP, the annual budget for the Parkway is $6.7 million, but a recent funding study identified over $8.5 million of additional annual expenditures to bring the Parkway up to a "best management practice" level for operations, maintenance, repair, land acquisition, and capital improvements (County of Sacramento, 2008). The ARPP identifies eight categories of measures to be implemented with available funding, including activities related to the Parkway's natural resources, recreational use, commercial use, public safety, and land acquisition. Although most organizations interested in the Parkway could probably reach agreement that funding is a "problem", there is likely a diversity of opinion as to which Parkway activity should receive priority for any available funding.

The Parkway Plan (County of Sacramento, 2008) describes a number of options for raising revenue to solve the funding problems. Relatively minor contributions to the Parkway budget are expected to come from mitigation fees and the possibility of expanding user fees (e.g., a voluntary bicycle pass). The primary focus of long-term solutions to the funding problems is on ways of generating stable tax revenues. The Parkway plan also indicates that the County's Recreation and Parks Commission would be the primary entity to prioritize funding of the implementation measures.

In 2005, the County formed two groups to look at long-term funding of the Parkway – a Steering Committee of staff and an elected officials "2 X 2" Committee

(Baker and Bellas, 2009). The County expanded these committees to include other local government and stakeholder representatives. The “2 X 2” Committee included elected officials from the County and cities of Sacramento, Rancho Cordova, and Folsom. The Steering Committee included representatives from these local governments, as well as Cal Expo and the American River Parkway Coalition.

These committees have apparently come to conceptual agreement on how to proceed with long-term funding of the Parkway.[15] They have agreed on establishing a benefit assessment district and establishing an American River Parkway Joint Powers Authority (JPA) Agreement between the County of Sacramento, city of Folsom, city of Rancho Cordova, and possibly the city of Sacramento. The JPA would conduct the special assessment proceedings and manage any funds generated from the assessment district or other sources (Baker and Bellas, 2009).

The politics stream of the Multiple Streams model can be thought of as the “broader political discourse within which policy is made” (Zahariadis, 1999). There are a couple of major themes of that discourse that will influence the outcome of establishing a long-term funding source for the Parkway. One is the generally poor state of California’s budget and the feeling of almost 80% of Californians that the budget situation is a “big problem”. Another is the relatively low approval ratings of the Governor and legislature (20%-30%), which may well translate into generally negative feelings towards government officials. Finally, Californians feel we are in a severe to moderate recession

[15] Their proposal appears to be for the whole Parkway, including the State recreation area. However, it is unclear how funding generated from a County assessment would go to the State Recreation Area.

and we are in for continued financial bad times over the next twelve months (survey results from Baldassare, et al, 2009).

On the local level, a survey conducted in 2004 to determine the level of support for long-term funding of the Parkway fell short of the two-thirds requirement to pass a tax (Baker and Bellas, 2009). In addition, there appears to be some ambivalence on the part of the city of Sacramento to participating in a JPA due to city budget concerns (Baker and Bellas, 2009).

Although these indicators of the political climate work against a new Parkway tax, nearly 90% of Californians are also concerned that the State's budget cuts are going to lead to cuts in services provided by their local government (Baldassare, et al, 2009). This concern may make residents more inclined to look at local solutions to maintaining services. Another trend that may (counter-intuitively) favor a Parkway tax is the recent severe declines in home value in – nearly 50% in five years based on home sales in Sacramento (Trulia, 2009). Although property owners may be disinclined to pay more taxes, they may do so if there is a clear link to maintaining or increasing property values.

In applying the Multiple Streams model to Parkway financing, we can see that two of the three streams are clearly converging – the problem and solutions streams. The funding studies conducted for the County (The Dangermund Group, 2006) and the reductions in general tax revenue clearly indicate a problem in maintaining the Parkway and funding efforts to implement best practices. The solutions have been well articulated in the American River Parkway Plan and the County and its partners have certainly brought clarity to the process for pursuing funding through the formation of a JPA and benefits assessment district. However, the politics stream is highly uncertain as to whether the necessary support could be generated to pass a benefits assessment.

To address this political uncertainty, I will now turn to examining the importance of the “narrative” in advancing public policy solutions. As described by Roe (1994), a policy narrative is a story with a beginning, middle, and end if it is presented as a scenario and, if presented in the form of an argument, includes premises and conclusions. These narratives can be a powerful force, since they tend to stabilize assumptions for decision makers in the face of uncertainty and polarization. A powerful narrative can resist change, even in the face of contradictory empirical evidence (Roe, 1994).

Roe (1994) suggests four steps to analyzing the policy narrative – 1) identifying the stories that are being told about the issue; 2) identifying the counterstories (stories that run counter to the dominant narrative) and nonstories (e.g., critiques that repudiate the policy, but do not offer a solution or alternative); 3) comparing the two sets of narratives (stories vs. counterstories and nonstories) to create a metanarrative; and finally 4) determining if the metanarrative helps reframe the issue in a way that makes it more amenable to typical policy analysis. In other words, the metanarrative provides a framework for making sense of the competing stories, which helps reduce the complexity and uncertainty around the issue. At that point, typical analytical tools (e.g., empirically based economic analysis) are more likely to influence the policy outcome, since the results can be placed within the greater context of the story being told about the policy issue.

Given the narrative policy analytical framework, what "metanarrative" might we create to advance long-term, stable funding of the Parkway? The primary stories in favor of Parkway funding will likely take the form of an argument and a scenario, such as those described below.

The argument is that the Parkway is jewel of the Sacramento region that needs to be maintained and enhanced. The Parkway increases the quality of life of residents by providing a beautiful setting for exercise, enjoying nature, and spending time with friends and family. The Parkway results in additional economic activity and enhanced property values in the hundreds of millions of dollars. All of these social and economic benefits are provided for less than $10 million a year and are threatened by the reliance on an unstable and uncertain funding source – general funds from property and sales taxes. Therefore, it is critical to establish a dedicated revenue stream to ensure that the Parkway can be maintained for current residents and future generations of Sacramentans. It is only fair that those who benefit from the Parkway's proximity (nearby landowners) and those who generate greater maintenance costs through their use of the Parkway bear the primary financial responsibility for maintaining and enhancing the Parkway. The scenario would paint a picture of what will happen in the absence of a stable, adequate funding source. The general fund cuts have already led to a reduction in patrols by park rangers and a reduction in Parkway maintenance activities. Given the State's budget and the impact on the County's general fund, further reductions are likely. Over time, the lack of available law enforcement and maintenance activities will result in increases in criminal activity and the amount of trash. The Parkway will gradually change from a “jewel” to a lump of coal as families and other residents no longer feel safe coming to the Parkway and its natural beauty is sullied by trash.

The counter story to the above argument and scenario will be that the Parkway plan does much more than maintain the Parkway. The plan represents a significant, unnecessary expansion of Parkway features and services that appeal to certain vocal interests, but provide no larger benefits to Sacramento residents at large. Although we are in a rough economic time, as soon as the economy rebounds, general fund revenues will be adequate to maintain the Parkway at present levels.

The other story will be an argument that focuses on the undesirability of additional taxes. In an economic time in which property values are going down, it does not make sense to further tax those properties. To get the economy going, we need to keep money in the hands of the people rather than giving it to government. There are a number of volunteer organizations that can help with Parkway cleanup and keep an eye out for illegal activity. If we see problems in the Parkway with trash or crime, we can consider funding alternatives when economic times are better. This is just the wrong time to increase taxes.

The counter story to this narrative is that there is already evidence of problems with the Parkway, since maintenance and patrols have been reduced resulting in the closure of a number of access points. In addition, the incremental cost to property owners will be much less than the likely decrease in their property values, if the nearby Parkway becomes an attractive nuisance rather than a desirable place to recreate and relax.

Proposed "Parkway" Funding Solution and Implementation Approach

Given the results from my regression analysis, what would a property assessment look like for single-family homes that are benefiting from proximity to the Parkway? To simplify the discussion, I focus on the implications of the benefit for homes within one third of a mile of the Parkway in the six zip codes for which a positive benefit was found (Table 9). As discussed in the Introduction, about $3 million of the Parkway's budget comes from the general fund and about an additional $6 million annually would be needed to fund the identified needs. For purposes of this analysis, I will look at replacing all of the general funds with a property assessment to meet current needs and will look at a general fund replacement scenario plus paying for two-thirds of the additional needs with a property tax assessment (a total of $7 million).

Table 9. Estimated Assessment for a Median Valued Single-Family Household and Percent Increase in Property Taxes for Homes within One Third of a Mile of the American River Parkway.

	$ 3 million		$7 million	
	Amount	% Increase	Amount	% Increase
95608	$486	10.9%	$1,133	25.5%
95628	$125	3.6%	$292	8.4%
95670	$78	3.8%	$182	8.8%
95826	$179	8.1%	$417	19.0%
95827	$120	5.7%	$279	13.4%
95864	$510	7.6%	$1,191	17.8%
% EANB		6.3%		15%
ROI		1479%		577%

An examination of Table 9 illuminates some of the challenges and opportunities for moving a Parkway funding proposal forward. The challenge is related to the benefits being limited to a relative limited number of homes proximal to the Parkway. Relying on these homes to fund current Parkway needs (about $3 million) or future needs (about $7 million) places a greater tax burden on those households then they currently experience. Assuming a property tax burden of 1% of the assessed value, a Parkway assessment results in a defacto increase in property taxes of 3.6% to 10.9% to raise $3 million and 8.4% to 25.5% to raise $7 million. However, in the context of maintaining the value of an investment, the cost is only about 6.3% (to raise $3 million) or 15% (to raise $7 million) of the annual benefit received by proximal property owners (Equivalent Annual Net Benefit – EANB). From the investment perspective, this equates to a 577% or 1479% annual return on investment (ROI).

Given the context of the policy narratives that would be told, those opposed to the Parkway assessment will certainly focus on the increase in property taxes. Since taxpayers are rarely presented with taxes as an investment with returns that can be quantified and assessed, funding proponents will be have a hard time advancing the concept that the investment returns are significant. However, there is clearly a fairness issue involved. The County's general fund coffers are maintaining the investment that proximal homeowners have made and it is only fair that they should pay for the cost of maintaining their investment.

In addition to assessing nearby home owners, there would appear to be four primary options to address the funding gaps – 1) continue to rely on the County's general fund; 2) assess nearby commercial and multi-unit residential properties benefiting from Parkway proximity; and 3) include properties that are not receiving a quantifiable benefit from Parkway proximity in the assessment; and 4) create user fees for those not currently paying. The first option is the current approach; exploring the second option will require the efforts of a consultant or another graduate student working on their thesis; so I will focus on incorporating the third and fourth options into a policy proposal.

In structuring my proposal, I take into consideration the need to generate sufficient revenue; keep the costs per household low; and apply the assessment to households that are likely to make use of the Parkway, even if the value placed in such use is not reflected in the home price.

As shown in Chapter 3, the median distance of a home from the Parkway is approximately one mile. According to the 2000 census data, there are almost 95,000 single unit detached households in the twelve zip codes proximal to the Parkway. Table 10 provides different options for raising revenue from homes in these zip codes that were not shown to have their value positively affected by proximity to the Parkway. I look at both establishing a set assessment per home ($25, $50, or $75) or trying to generate sufficient revenue, assuming $3 million is collected from homes within 1/3 mile of the Parkway in the zip codes in which the proximal effect is positive. One set of scenarios evaluates assessing homes within one mile of the Parkway and the other set evaluates applying the assessment to all homes within the zip code proximal to the Parkway.

Assuming $3 million would be generated from homes within a third of a mile of the Parkway, the additional $4 million needed could be generated by assessing homes within a mile $119 per home. Assessing all homes within the proximal zip codes would require a fee of $49 per home. The $119 fee is in the range of the assessment for homes whose value is positively affected by proximity to the Parkway.

Table 10. Potential Assessments for Single Unit Detached Homes Outside of 1/3Third Mile of the American River Parkway in Zip Codes (excluding 95814) adjacent to the Parkway.

Homes w/in 1 Mile (33,666 Homes > 1/3 Mile)		All Homes (81,051 Homes > 1/3 Mile)	
Fee Per Home	Revenue Generated	Fee Per Home	Revenue Generated
$25	$841,646	$25	$2,026,271
$50	$1,683,293	$50	$4,052,543
$75	$2,524,939	$75	$6,078,814
$119	$4,000,000	$49	$4,000,000

As discussed earlier in this Chapter, a successful campaign to establish a stable revenue source will require the problem, solution, and politics streams to converge to provide a window of opportunity to get voter approval. Although the problem is fairly well defined and different funding solutions are available, the politics stream is generally unfavorable for raising revenue through taxes.

Based on my analysis above, I propose an approach that will not generate all of the revenue needed for the Parkway, but will produce a substantial source of funding and should be palatable for those who will need to vote on the proposal. My recommended proposal is structured as follows:

1) Generate $3 million in revenue for those single unit detached homes whose value is positively affected by Parkway proximity (within 1/3 mile of the Parkway for zip codes 95608, 95628, 95670, 95826, 95827, 95864). This equates to a little over 6% of the annualized benefit these homeowners receive due to the increase in their home value from proximity to the Parkway.

2) Assess $50 per home for all single unit detached homes within one mile of the Parkway in all zip codes adjacent to the Parkway (generating $1.7 million dollars generated annually). The $50 fee is equivalent to the annual cost of a parking pass.
3) Provide all property owners in #1 with 2 free parking passes annually and a waiver of any applicable event fees (for small events).
4) Provide all property owners in #2 above with 1 free parking pass annually.
5) Generate additional revenue through proportional assessments to multi-unit dwellings with similar benefits to single unit property owners.
6) Establish a Community Facilities District for the properties to be assessed.
7) Establish voluntary users fees (e.g., for cyclists) that could be promoted through bike shops and cycling clubs and could include waiver of the cost of a parking pass.[16]

The above approach has three features that should open up the “politics” stream and support a positive policy narrative: 1) those who benefit the most from the Parkway are paying the most (appeals to a sense of “fairness”); 2) everyone who is assessed gets a tangible benefit equivalent in value to the assessment; and 3) the benefits provided (parking passes and event fee waiver) should result in greater use and appreciation of the Parkway, which should enhance the long-term support of the Parkway. A Community

[16] A voluntary user fee is not suggested for walkers, runners, or equestrians, since these user groups will either be paying a parking fee or be located close enough to the Parkway that they will be paying a property assessment.

Facilities District is suggested since non-property owners will get to vote and direct benefits to property owners do not need to be established. A benefits assessment district could only assess those who are receiving a benefit. Since those assessments (as shown in Table 9) would be limited to a small group of people paying a high amount relative to their current property tax rate, trying to establish a benefits assessment district has a lower chance of success.

Finally, the above proposal should allow the County and other Parkway supporters to create the most positive "metanarrative" possible. Parkway supporters will be able to say that the new assessments to maintain and improve the Parkway ($3 – $7 million) are much smaller than the annual economic benefits (over $250 million) and the increase in value of nearby homes (nearly $800 million). The proposed assessments are shifting the costs of the Parkway primarily from the general public to those benefiting most from the Parkway. The proposal also is structured to ensure that this shift does not result in paying twice for the same service – the new assessments are coupled with the added benefit of free parking passes and use fee waivers.

Failing to stabilize the revenue stream for the Parkway will have dire consequences as nearby residents and Parkway users watch as crime increases and the Parkway becomes filled with trash. Relying on the County's general fund is no longer an option and takes funding away from critical services that have no alternative funding source. A policy solution, along the lines of what I have proposed, is imperative if we are to maintain the Parkway as the natural "jewel" of the region and one of its most important economic engines.

Chapter 6

SUMMARY

My research has focused on an issue of great importance to current and future generations of residents of the Sacramento region – how do we maintain a natural resource, the American River Parkway, that people treasure in a time when public funds are so hard to come by? To answer this question I have turned to the plethora of research on the value of green space. Prior researchers have clearly demonstrated the value of green space and provided a relatively straightforward economic methodology – development of a hedonic price function – to tease out the increase in home value due to proximity to parks from other variables that effect home selling price.

Based on the insights provided by prior researchers, the hedonic price function that I have developed considers over seventy variables. These variables allow me to control for price variation due to structural, neighborhood, location, and time attributes. Key structural attributes I considered included the typical – home size, lot size – as well as features that are only occasionally modeled – the presence of a garage or pool. Zip codes and median household income were used to evaluate neighborhood differences and monthly time steps were considered individually or in small aggregates (2-3 months grouped together) to account for the significant price fluctuations during the time period of my study (January 2008-June 2009).

In a departure from most other research, I did not treat distance from the Parkway as a continuous variable, but as a dummy variable. This approach allowed me to determine where the effect of the Parkway was no longer statistically significant (at greater than 1/3 mile), which I could then more readily apply to my policy analysis. By creating a Parkway distance/zip code interaction variable, I was able to determine that the positive benefits of the Parkway are only statistically significant in half of the zip codes evaluated. One zip code showed a negative relationship between Parkway distance and value, which is likely due to the co-location of significant dis-amenities (e.g., railroad tracks).

The combination of a high coefficient of determination (adjusted R^2= 0.872); statistical significance of many of the regression coefficients; and correctly anticipated direction of key variables suggests that one can have a high degree of confidence in the results. I was able to show that a log-semilog functional form was superior to, although not significantly so, a log-linear form. In addition, I was able to demonstrate that using a pairwise approach to addressing missing data was the most appropriate of the three methods available. Finally, a comparison of my results to other research suggested my results are in a comparable range in predicting the effect of green space on home value, based on an evaluation of cases in which the mean distance from the green space amenity was similar.

Given the strong model results, I was able to apply the results to a calculation of the total value added to homes proximal to the Parkway. I performed this calculation only for homes in zip codes in which there was a statistically significant effect. The increase in value ranged from 10%-40%, when all other variables are held constant, and leads to the conclusion that the Parkway increases proximal home value by nearly $800 million.

Since it is important to compare the added home value to the annual cost of maintaining the Parkway, I computed the equivalent annual net benefit (EANB) using conservative assumptions of the discount rate (3.6%) and average length of time (26 years) the home would be held before it was sold. Even with these conservative assumptions, I found that proximal home owners would only pay about 6% of the EANB to replace current general fund contributions or 15% of EANB to bring the Parkway up to best practice standards.

However, policy decisions that can lead to higher taxes for a certain group of people are not based solely on a rationale assessment of costs and benefits. Such decisions must be made in the context of the many restrictions Californians have imposed on raising tax revenue and a political and economic environment that will make any tax increase extremely challenging.

Despite these challenges, policy theories can provide some insight on a potential solution. Of primary importance is the development of a compelling narrative that supports changing the revenue base of the Parkway from the general fund to property owners. That narrative will need to focus on the fundamental fairness of having those who benefit from the Parkway pay for its upkeep. After all, the County's general fund is not used to maintain home values by supporting home landscaping and maintenance, so it should not be relied upon to maintain benefits for private property owners.

The policy solution that I suggest is to form a Community Services District (CSD) for homes within one mile of the Parkway. The CSD would collect fees for those within one third of a mile of the Parkway as suggested by the results of my thesis. For those outside of the one third mile boundary, a smaller fee, equivalent to the cost of an annual parking pass, would be assessed. This smaller assessment will help distribute the cost by including a group of homeowners who are likely benefiting from proximity to the Parkway, but to a degree that is not reflected in their homes' value. All property owners within the CSD would receive a free annual parking pass to ensure that they would be able to enjoy the Parkway that they are supporting. In addition, I recommend a voluntary fee be collected from cyclists who use the Parkway, but may be able to access it without living within the CSD.

In summary, the evidence is compelling that homeowners living close to the Parkway are deriving a great deal of value from ensuring the Parkway is well maintained and crime kept to a minimum. The self-interest of those property owners and fundamental fairness commend those homeowners to provide the funds needed to keep this jewel of the Sacramento region shining.

APPENDIX

Table A-1. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Structural Attributes versus Structural, Locational, Neighborhood, and Time Related Variables)

Variable	Age	Bath-rooms	Bed-rooms	Carport	Fire-place	Home Size	Lot Size	Pool	Stories	Wood Roof
STRUCTURAL ATTRIBUTES										
Bathrooms	-.565**									
Bedrooms	-.407**	.656**								
Carport	.322**	-.221**	-.147**							
Fireplace	-.163**	.267**	.221**	-.185**						
Home Size (sq ft)	-.458**	.796**	.647**	-.167**	.322**					
Lot Size (sq ft)	.119**	.162**	.125**	.011	.140**	.312**				
Pool	-.053**	.221**	.143**	-.053**	.141**	.238**	.210**			
Stories	-.380**	.568**	.406**	-.094**	.052**	.530**	-.043**	.092**		
Wood Roof	.010	.089**	.018	-.039**	.111**	.141**	.129**	.134**	.023	
LOCATIONAL ATTRIBUTES										
ParkwayQuarterMile	-.015	.056**	.017	-.060**	.069**	.052**	.056**	.132**	.011	.101**
ParkwayThirdMile	-.003	.027*	.028*	-.026	.026	.028*	.019	.047**	.010	.085**
ParkwayHalfMile	.066**	-.029*	-.030*	-.016	-.007	-.023	.057**	.010	-.062**	.030*
NEIGHBORHOOD ATTRIBUTES										
MedianHHIncome	-.424**	.455**	.320**	-.223**	.333**	.556**	.091**	.184**	.281**	.144**
TIME RELATED ATTRIBUTES										
January_March2008	-.033*	.018	.014	-.024	.032*	.037**	.002	-.022	.002	.025
April2008	.034*	-.009	-.014	.004	-.009	-.008	.014	-.025	-.006	.014
May2008	-.010	.015	.002	.014	.013	.026	-.001	.001	.022	.007
June2008	.021	.000	-.016	.001	.022	-.010	.007	.009	-.007	-.040**
July_September2008	-.005	-.008	.005	.011	.023	-.010	-.014	.021	.002	.008

Table A-1. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Structural Attributes versus Structural, Locational, Neighborhood, and Time Related Variables)

Variable	Age	Bath-rooms	Bed-rooms	Carport	Fire-place	Home Size	Lot Size	Pool	Stories	Wood Roof
October2008	.009	-.029*	-.017	-.024	-.025	-.024	-.024	-.004	-.024	.020
November2008	.032*	-.025	-.016	.007	-.040**	-.032*	-.014	.010	-.019	-.004
December2008	-.002	.008	.037**	-.002	-.005	.022	.020	.003	.001	-.002
January2009	-.022	.010	.024	-.007	.007	.015	-.005	-.008	.005	-.003
February2009	.001	-.018	-.013	.002	-.032*	-.021	.000	-.007	-.007	-.020
March2009	-.022	-.004	-.008	.018	-.011	-.010	-.013	-.008	.016	-.002
April2009	.006	.017	.003	-.006	.012	-.007	.029*	.010	-.005	-.002
May2009	.005	.015	-.012	-.012	-.015	.016	.022	-.002	.015	-.005

Table A-2. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Structural Attributes versus Locational/Neighborhood Variables)

Variable	Age	Bath-rooms	Bed-rooms	Carport	Fire-place	Home Size	Lot Size	Pool	Stories	Wood Roof
Zip95608	.035**	.065**	.052**	.004	.124**	.100**	.219**	.144**	-.053**	.129**
Zip95628	-.016	.093**	.063**	-.033*	.074**	.122**	.264**	.135**	.070**	.053**
Zip95670	-.101**	-.003	-.007	-.081**	.046**	-.045**	-.076**	-.005	-.041**	.041**
Zip95742	-.419**	.335**	.321**	-.093**	.116**	.432**	-.066**	-.020	.245**	-.084**
Zip95815	.305**	-.311**	-.210**	.239**	-.396**	-.278**	-.057**	-.148**	-.154**	-.071**
Zip95816	.305**	-.099**	-.158**	.119**	-.063**	-.052**	-.116**	-.068**	.054**	-.026
Zip95819	.270**	-.130**	-.149**	.028*	.031*	-.040**	-.071**	-.040**	.005	.015
Zip95825	.114**	-.117**	-.065**	.080**	-.018	-.075**	-.002	-.026	-.056**	-.013

Table A-2. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Structural Attributes versus Locational/Neighborhood Variables)										
Variable	Age	Bath-rooms	Bed-rooms	Carport	Fire-place	Home Size	Lot Size	Pool	Stories	Wood Roof
Zip95826	-.023	.003	.041**	-.065**	.046**	-.095**	-.070**	.002	-.067**	-.069**
Zip95827	-.087**	.015	.045**	-.055**	.040**	-.061**	-.051**	-.038**	-.037**	-.063**
Zip95833	-.252**	.049**	-.019	-.060**	-.068**	-.087**	-.160**	-.054**	.115**	-.040**
Zip95864	.144**	-.009	-.018	.019	.090**	.078**	.178**	.087**	-.093**	.111**
Zip95608Quarter	-.002	.065**	.031*	-.021	.036**	.088**	.065**	.119**	.024	.112**
Zip95608Third	.016	.027	.025	-.009	.034*	.034*	.051**	.053**	-.028*	.077**
Zip95608Half	-.007	.042**	.007	.013	.022	.055**	.136**	.028*	-.006	.030*
Zip95628Quarter	-.011	.096**	.038**	-.019	.037**	.119**	.207**	.073**	.090**	.028*
Zip95628Third	-.028*	.058**	.035*	-.011	.023	.066**	.059**	.015	.066**	.059**
Zip95628Half	-.004	.033*	.018	-.013	.009	.051**	.066**	.030*	.043**	.031*
Zip95670Quarter	-.032*	-.013	-.016	-.024	.028*	-.010	-.013	.051**	-.034*	.088**
Zip95670Third	-.027*	.004	-.005	-.022	.018	.003	-.022	.039**	.003	.077**
Zip95670Half	.025	-.011	-.032*	-.030*	.050**	-.027*	.002	.017	-.055**	.028*
Zip95742Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Half	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95815Quarter	.031*	-.021	-.023	-.004	-.024	-.014	-.002	-.006	-.008	-.004
Zip95815Third	.039**	-.033*	-.011	.033*	-.054**	-.017	-.012	-.014	-.004	-.009
Zip95815Half	.070**	-.065**	-.057**	.053**	-.061**	-.044**	-.013	-.035*	-.038**	-.012
Zip95816Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]

Table A-2. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Structural Attributes versus Locational/Neighborhood Variables)

Variable	Age	Bath-rooms	Bed-rooms	Carport	Fire-place	Home Size	Lot Size	Pool	Stories	Wood Roof
Zip95816Half	.057**	-.038**	-.052**	.022	-.035*	-.031*	-.029*	-.018	.000	-.011
Zip95819Quarter	.065**	-.054**	-.046**	-.027*	.028*	-.029*	-.020	-.017	-.044**	.009
Zip95819Third	.040**	-.021	-.022	.000	.025	-.003	-.012	.012	-.007	.003
Zip95819Half	.052**	-.059**	-.047**	.003	.011	-.026	-.021	-.019	-.020	.020
Zip95825Quarter	-.006	.010	-.019	-.007	.013	.009	-.025	.031*	.022	.024
Zip95825Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95825Half	.006	-.001	-.007	-.006	.011	.003	.002	-.009	-.011	.032*
Zip95826Quarter	.003	.019	.033*	-.033*	.017	-.009	-.026	.039**	.013	-.016
Zip95826Third	.001	-.002	.019	-.020	-.014	-.017	-.012	-.013	-.015	-.018
Zip95826Half	.015	.006	.027*	-.020	-.019	-.021	-.009	.020	-.006	-.022
Zip95827Quarter	-.022	.018	.030*	-.028*	.030*	-.004	-.008	.043**	.002	-.025
Zip95827Third	-.016	.015	.033*	-.018	.025	.002	-.009	.008	.025	-.004
Zip95827Half	-.007	-.002	.001	-.007	-.005	-.008	-.005	-.011	-.013	-.007
Zip95833Quarter	-.028*	.004	-.046**	.005	-.017	-.053**	-.022	-.038**	.034*	-.023
Zip95833Third	.008	-.011	-.009	.005	-.022	-.029*	-.014	.002	-.005	-.010
Zip95833Half	.014	-.058**	-.003	-.020	-.044**	-.061**	-.020	-.028*	-.055**	-.029*
Zip95864Quarter	.004	.068**	.049**	-.013	.040**	.098**	.042**	.107**	-.023	.082**
Zip95864Third	.006	.032*	.017	-.012	.022	.051**	.041**	.021	-.022	.045**
Zip95864Half	.001	.087**	.036**	-.016	.028*	.101**	.107**	.038**	.006	.089**

Table A-3. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational and Neighborhood Variables versus Locational, Neighborhood, and Time Related Variables)

Variable	ParkwayQuarterMile	ParkwayThirdMile	ParkwayHalfMile	MedianHHIncome
LOCATIONAL ATTRIBUTES				
ParkwayThirdMile	-.058**			
ParkwayHalfMile	-.080**	-.047**		
NEIGHBORHOOD ATTRIBUTES				
MedianHHIncome	.118**	.065**	-.006	
TIME RELATED ATTRIBUTES				
January_March2008	.000	-.007	-.012	.051**
April2008	-.007	-.005	.016	.004
May2008	.030*	.010	-.011	.022
June2008	.001	.008	-.007	.010
July_September2008	.010	.002	.000	.006
October2008	.001	-.002	.002	-.026
November2008	.000	.003	.013	-.034*
December2008	-.009	-.016	.021	-.012
January2009	-.021	.003	-.008	-.008
February2009	.002	-.005	.016	-.014
March2009	-.024	.002	.001	-.016
April2009	.002	-.005	-.009	-.011
May2009	.000	-.003	.001	-.002

Table A-4. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational and Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	ParkwayQuarterMile	ParkwayThirdMile	ParkwayHalfMile	MedianHHIncome
Zip95608	-.022	.001	-.022	.009
Zip95628	-.009	.028*	-.005	.196**
Zip95670	.183**	.054**	.078**	-.034*
Zip95742	-.094**	-.055**	-.077**	.585**
Zip95815	-.107**	-.048**	-.012	-.485**
Zip95816	-.053**	-.031*	-.005	-.050**
Zip95819	.055**	.014	.014	.049**
Zip95825	-.037**	-.029*	-.030*	-.128**
Zip95826	.074**	.016	.070**	-.035*
Zip95827	.034*	.031*	-.056**	-.051**
Zip95833	-.063**	.002	.018	-.109**
Zip95864	-.005	-.011	-.022	.091**
Zip95608Quarter	.286**	-.017	-.023	.073**
Zip95608Third	-.019	.330**	-.016	.034*
Zip95608Half	-.023	-.013	.283**	.028*
Zip95628Quarter	.269**	-.016	-.022	.103**
Zip95628Third	-.021	.354**	-.017	.090**
Zip95628Half	-.022	-.013	.278**	.080**
Zip95670Quarter	.580**	-.034*	-.047**	.102**
Zip95670Third	-.029*	.496**	-.024	.056**
Zip95670Half	-.040**	-.024	.496**	.008

Table A-4. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational and Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	ParkwayQuarterMile	ParkwayThirdMile	ParkwayHalfMile	MedianHHIncome
Zip95742Quarter	.[a]	.[a]	.[a]	.[a]
Zip95742Third	.[a]	.[a]	.[a]	.[a]
Zip95742Half	.[a]	.[a]	.[a]	.[a]
Zip95815Quarter	.044**	-.003	-.003	-.019
Zip95815Third	-.010	.165**	-.008	-.043**
Zip95815Half	-.024	-.014	.298**	-.108**
Zip95816Quarter	.[a]	.[a]	.[a]	.[a]
Zip95816Third	.[a]	.[a]	.[a]	.[a]
Zip95816Half	-.012	-.007	.151**	.016
Zip95819Quarter	.276**	-.016	-.022	.023
Zip95819Third	-.014	.245**	-.012	.016
Zip95819Half	-.019	-.011	.233**	.025
Zip95825Quarter	.075**	-.004	-.006	.020
Zip95825Third	.[a]	.[a]	.[a]	.[a]
Zip95825Half	-.006	-.004	.075**	-.010
Zip95826Quarter	.387**	-.023	-.031*	-.042**
Zip95826Third	-.020	.338**	-.016	-.020
Zip95826Half	-.033*	-.019	.405**	-.023
Zip95827Quarter	.283**	-.016	-.023	.024
Zip95827Third	-.018	.313**	-.015	.017
Zip95827Half	-.007	-.004	.092**	.006

Table A-4. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational and Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	ParkwayQuarterMile	ParkwayThirdMile	ParkwayHalfMile	MedianHHIncome
Zip95833Quarter	.266**	-.015	-.021	-.045**
Zip95833Third	-.022	.384**	-.018	-.041**
Zip95833Half	-.033*	-.019	.405**	-.038**
Zip95864Quarter	.227**	-.013	-.018	.079**
Zip95864Third	-.012	.209**	-.010	.049**
Zip95864Half	-.015	-.009	.193**	.048**

Table A-5. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Time Related Variables versus Time Related Variables)

Variable	January_March2008	April2008	May2008	June2008	July_Septmber2008	October2008	November2008	December2008	January2009	February2009	March2009	April2009	May2009
January_March2008													
April2008	-.078**												
May2008	-.089**	-.061**											
June2008	-.091**	-.062**	-.071**										
July_September2008	-.185**	-.127**	-.146**	-.148**									
October2008	-.097**	-.066**	-.076**	-.077**	-.157**								
November2008	-.080**	-.055**	-.063**	-.064**	-.130**	-.068**							
December2008	-.067**	-.046**	-.053**	-.054**	-.110**	-.057**	-.047**						
January2009	-.079**	-.054**	-.062**	-.063**	-.129**	-.067**	-.055**	-.047**					
February2009	-.072**	-.050**	-.057**	-.058**	-.118**	-.062**	-.051**	-.043**	-.051**				
March2009	-.084**	-.058**	-.066**	-.067**	-.137**	-.072**	-.059**	-.050**	-.059**	-.054**			
April2009	-.082**	-.056**	-.065**	-.066**	-.134**	-.070**	-.058**	-.049**	-.057**	-.052**	-.061**		
May2009	-.086**	-.059**	-.068**	-.069**	-.140**	-.073**	-.060**	-.051**	-.060**	-.055**	-.064**	-.062**	

Table A-6. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Time Related Variables versus Locational/Neighborhood Variables)

Variable	January_March2008	April2008	May2008	June2008	July_Septmber2008	October2008	November2008	December2008	January2009	February2009	March2009	April2009	May2009
Zip95608	-.015	.024	.005	.009	-.016	.011	-.013	-.010	.019	-.003	-.019	.020	-.003
Zip95628	.018	.034*	-.014	-.011	.023	-.018	-.021	.002	-.006	-.016	-.017	-.011	.021
Zip95670	.008	-.020	.019	-.021	.003	.024	.004	.005	-.020	-.005	-.007	-.009	.002
Zip95742	.017	-.011	.010	.005	.007	-.020	-.008	.000	.008	-.002	.025	-.018	-.023
Zip95815	-.026	.004	.006	-.013	-.018	.004	.027*	.023	-.007	.021	.007	.008	-.021
Zip95816	.011	.023	.015	.018	-.012	.003	-.009	.002	-.024	.002	-.008	-.016	-.010
Zip95819	.028*	-.003	-.001	.011	-.020	-.013	-.008	-.026	.004	.009	.005	-.011	.029*
Zip95825	-.018	.017	-.004	-.005	.000	.013	.000	-.001	.027*	.000	.006	-.003	-.011
Zip95826	.015	-.014	.007	.007	.001	-.018	.017	-.008	.007	.011	-.005	-.010	-.005
Zip95827	-.020	-.010	-.030*	.002	.010	.017	.015	-.007	.002	.013	.005	.008	-.004
Zip95833	-.014	-.015	-.016	-.004	.004	.022	.009	-.007	.008	-.013	.022	.021	.014
Zip95864	.004	-.009	.001	.021	.015	-.038**	-.025	.025	-.014	-.009	-.014	.005	.007
Zip95608Quarter	-.010	-.011	.027*	.034*	-.010	.006	-.002	-.018	.007	.011	-.023	.005	-.005
Zip95608Third	-.011	.014	-.016	.008	-.005	-.006	.027	-.012	.013	.002	-.015	-.002	.010
Zip95608Half	.001	.031*	-.019	-.009	-.028*	.008	-.017	.026	.006	-.003	.004	.005	-.007
Zip95628Quarter	.001	.021	.014	.022	.006	-.008	-.010	-.005	-.010	-.018	-.012	-.011	.007

Table A-6. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Time Related Variables versus Locational/Neighborhood Variables)

Variable	January_March2008	April2008	May2008	June2008	July_Septmber2008	October2008	November2008	December2008	January2009	February2009	March2009	April2009	May2009
Zip95628Third	-.022	-.002	.006	.016	-.002	.003	-.003	.002	-.003	.014	.008	-.016	.007
Zip95628Half	.011	-.004	.002	-.019	.030*	.000	-.017	-.014	-.005	.010	-.018	-.017	.015
Zip95670Quarter	.002	-.003	.042**	-.015	.020	.000	-.010	.002	-.019	.002	-.019	-.008	-.019
Zip95670Third	-.004	-.021	.042**	.000	.003	.004	.006	-.008	-.012	-.010	-.006	-.005	-.006
Zip95670Half	-.013	.005	-.016	.008	-.006	.014	.030*	.005	-.010	-.006	.012	.001	-.013
Zip95742Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Half	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95815Quarter	-.005	-.003	-.004	-.004	-.007	.047**	-.003	-.003	-.003	-.003	-.003	-.003	-.003
Zip95815Third	-.010	.049**	-.008	-.008	.012	.014	-.007	-.006	-.007	-.007	-.008	-.007	-.008
Zip95815Half	-.018	.016	.000	-.011	.022	-.022	.004	.010	.004	.031*	-.009	-.008	-.009
Zip95816Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Half	.003	-.009	-.010	.009	.002	-.011	.013	-.008	-.009	.015	-.010	.011	.011
Zip95819Quarter	.014	.000	.003	-.015	-.001	.000	.009	.005	-.011	.002	-.022	-.002	.005
Zip95819Third	-.002	-.010	-.012	.004	-.005	.002	-.011	-.009	.008	-.010	.041**	-.011	.006

Table A-6. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Time Related Variables versus Locational/Neighborhood Variables)

Variable	January_March2008	April2008	May2008	June2008	July_Septmber2008	October2008	November2008	December2008	January2009	February2009	March2009	April2009	May2009
Zip95819Half	.001	-.014	.022	.021	-.003	-.017	-.014	-.012	.000	.033*	-.002	.000	-.002
Zip95825Quarter	.018	-.005	-.006	-.006	.006	.023	-.006	-.005	-.006	-.005	-.006	-.006	-.006
Zip95825Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95825Half	-.007	-.004	-.005	-.005	.012	-.006	-.005	-.004	-.005	-.004	-.005	.037**	-.005
Zip95826Quarter	.016	-.014	-.020	-.002	.011	.000	.013	-.016	.014	.019	.002	-.009	-.011
Zip95826Third	-.001	-.014	.020	.007	-.006	-.018	-.001	-.013	.012	.030*	-.003	-.002	-.003
Zip95826Half	.001	.001	.009	-.013	.000	.004	.024	.026	-.008	-.013	-.003	-.025	.012
Zip95827Quarter	-.023	.009	-.006	.001	-.004	.006	-.002	.004	-.011	.012	-.013	.042**	-.005
Zip95827Third	.012	-.013	-.015	-.003	.022	.008	.001	-.012	.001	-.013	.000	-.014	-.001
Zip95827Half	.018	-.005	-.006	-.006	-.013	-.007	-.006	.036**	-.006	-.005	-.006	-.006	-.006
Zip95833Quarter	-.006	-.019	-.013	-.004	-.014	.001	.011	-.017	-.020	-.018	.036**	.019	.045**
Zip95833Third	.011	.008	-.008	.002	.005	.000	-.005	.000	.007	-.015	.004	.017	-.018
Zip95833Half	-.017	.001	-.013	.008	-.010	.018	.000	.007	.008	.013	-.003	.006	.012
Zip95864Quarter	-.007	.008	.024	.002	-.002	-.020	-.005	.027	-.005	-.015	-.007	-.017	.015
Zip95864Third	.003	.013	-.010	-.010	-.021	-.011	-.009	.017	-.009	-.008	-.010	.032*	.011
Zip95864Half	.008	.023	.002	-.013	.000	-.014	-.012	-.010	-.012	-.011	.036**	.004	-.012

Table A-7. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95608	Zip95628	Zip95670	Zip95742	Zip95815	Zip95816	Zip95819	Zip95825	Zip95826	Zip95827	Zip95833	Zip95864
Zip95628	-.110**											
Zip95670	-.151**	-.132**										
Zip95742	-.106**	-.093**	-.127**									
Zip95815	-.123**	-.107**	-.147**	-.103**								
Zip95816	-.059**	-.052**	-.071**	-.050**	-.058**							
Zip95819	-.078**	-.068**	-.093**	-.065**	-.076**	-.037**						
Zip95825	-.056**	-.049**	-.068**	-.047**	-.055**	-.027*	-.035*					
Zip95826	-.114**	-.100**	-.136**	-.096**	-.111**	-.054**	-.070**	-.051**				
Zip95827	-.090**	-.079**	-.108**	-.076**	-.088**	-.043**	-.056**	-.040**	-.082**			
Zip95833	-.147**	-.129**	-.176**	-.124**	-.143**	-.069**	-.091**	-.066**	-.133**	-.105**		
Zip95864	-.090**	-.079**	-.108**	-.076**	-.088**	-.042**	-.055**	-.040**	-.081**	-.064**	-.105**	
Zip95608Quarter	.254**	-.028*	-.038**	-.027*	-.031*	-.015	-.020	-.014	-.029*	-.023	-.037**	-.023
Zip95608Third	.173**	-.019	-.026	-.018	-.021	-.010	-.013	-.010	-.020	-.016	-.026	-.015
Zip95608Half	.205**	-.022	-.030*	-.022	-.025	-.012	-.016	-.011	-.023	-.018	-.030*	-.018
Zip95628Quarter	-.030*	.273**	-.035**	-.025	-.029*	-.014	-.019	-.013	-.027*	-.022	-.035**	-.021
Zip95628Third	-.023	.212**	-.028*	-.020	-.023	-.011	-.014	-.010	-.021	-.017	-.027*	-.017
Zip95628Half	-.025	.230**	-.030*	-.021	-.025	-.012	-.016	-.011	-.023	-.018	-.030*	-.018

Table A-7. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95608	Zip95628	Zip95670	Zip95742	Zip95815	Zip95816	Zip95819	Zip95825	Zip95826	Zip95827	Zip95833	Zip95864
Zip95670Quarter	-.064**	-.056**	.434**	-.054**	-.063**	-.031*	-.040**	-.029*	-.058**	-.046**	-.076**	-.046**
Zip95670Third	-.033*	-.028*	.219**	-.028*	-.032*	-.016	-.020	-.015	-.030*	-.023	-.038**	-.023
Zip95670Half	-.045**	-.039**	.303**	-.038**	-.044**	-.021	-.028*	-.020	-.041**	-.032*	-.053**	-.032*
Zip95742Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95742Half	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95815Quarter	-.005	-.004	-.006	-.004	.039**	-.002	-.003	-.002	-.004	-.003	-.006	-.003
Zip95815Third	-.011	-.009	-.013	-.009	.088**	-.005	-.007	-.005	-.010	-.008	-.013	-.008
Zip95815Half	-.027*	-.024	-.032*	-.023	.219**	-.013	-.017	-.012	-.024	-.019	-.032*	-.019
Zip95816Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Half	-.014	-.012	-.016	-.012	-.013	.229**	-.009	-.006	-.012	-.010	-.016	-.010
Zip95819Quarter	-.031*	-.027*	-.036**	-.026	-.030*	-.015	.393**	-.014	-.028*	-.022	-.036**	-.022
Zip95819Third	-.016	-.014	-.019	-.014	-.016	-.008	.205**	-.007	-.015	-.012	-.019	-.011
Zip95819Half	-.021	-.018	-.025	-.018	-.021	-.010	.270**	-.009	-.019	-.015	-.025	-.015
Zip95825Quarter	-.008	-.007	-.010	-.007	-.008	-.004	-.005	.150**	-.008	-.006	-.010	-.006
Zip95825Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95825Half	-.007	-.006	-.008	-.006	-.007	-.003	-.004	.122**	-.006	-.005	-.008	-.005
Zip95826Quarter	-.043**	-.038**	-.051**	-.036**	-.042**	-.021	-.027*	-.019	.378**	-.031*	-.051**	-.031*

Table A-7. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95608	Zip95628	Zip95670	Zip95742	Zip95815	Zip95816	Zip95819	Zip95825	Zip95826	Zip95827	Zip95833	Zip95864
Zip95826Third	-.022	-.019	-.026	-.019	-.022	-.011	-.014	-.010	.195**	-.016	-.026	-.016
Zip95826Half	-.037**	-.032*	-.043**	-.031*	-.036**	-.018	-.023	-.016	.323**	-.026	-.043**	-.026
Zip95827Quarter	-.031*	-.027*	-.037**	-.027	-.031*	-.015	-.020	-.014	-.029*	.348**	-.037**	-.022
Zip95827Third	-.021	-.018	-.024	-.017	-.020	-.010	-.013	-.009	-.019	.227**	-.024	-.015
Zip95827Half	-.008	-.007	-.010	-.007	-.008	-.004	-.005	-.004	-.008	.093**	-.010	-.006
Zip95833Quarter	-.030*	-.026	-.035*	-.025	-.029*	-.014	-.018	-.013	-.027*	-.021	.200**	-.021
Zip95833Third	-.025	-.022	-.030*	-.021	-.025	-.012	-.016	-.011	-.023	-.018	.171**	-.018
Zip95833Half	-.037**	-.032*	-.043**	-.031*	-.036**	-.018	-.023	-.016	-.033*	-.026	.248**	-.026
Zip95864Quarter	-.025	-.022	-.030*	-.021	-.025	-.012	-.016	-.011	-.023	-.018	-.030*	.282**
Zip95864Third	-.014	-.012	-.016	-.012	-.013	-.007	-.009	-.006	-.012	-.010	-.016	.153**
Zip95864Half	-.017	-.015	-.021	-.015	-.017	-.008	-.011	-.008	-.016	-.013	-.021	.196**

Table A-8. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95608 Quarter	Zip95608 Third	Zip95608 Half	Zip95628 Quarter	Zip95628 Third	Zip95628 Half	Zip95670 Quarter	Zip95670 Third	Zip95670 Half	Zip95742 Quarter	Zip95742T hird	Zip95742 Half
Zip95608Third	-.005											
Zip95608Half	-.007	-.004										
Zip95628Quarter	-.008	-.005	-.006									
Zip95628Third	-.006	-.004	-.005	-.006								
Zip95628Half	-.006	-.004	-.005	-.006	-.005							
Zip95670Quarter	-.016	-.011	-.013	-.015	-.012	-.013						
Zip95670Third	-.008	-.006	-.007	-.008	-.006	-.007	-.017					
Zip95670Half	-.011	-.008	-.009	-.011	-.008	-.009	-.023	-.012				
Zip95742Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]			
Zip95742Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]		
Zip95742Half	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	
Zip95815Quarter	-.001	.000	.000	-.001	.000	.000	-.002	-.001	-.002	.[a]	.[a]	.[a]
Zip95815Third	-.003	-.002	-.002	-.003	-.002	-.002	-.006	-.003	-.004	.[a]	.[a]	.[a]
Zip95815Half	-.007	-.005	-.006	-.006	-.005	-.005	-.014	-.007	-.010	.[a]	.[a]	.[a]
Zip95816Quarter	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95816Half	-.003	-.002	-.003	-.003	-.003	-.003	-.007	-.004	-.005	.[a]	.[a]	.[a]
Zip95819Quarter	-.008	-.005	-.006	-.007	-.006	-.006	-.016	-.008	-.011	.[a]	.[a]	.[a]
Zip95819Third	-.004	-.003	-.003	-.004	-.003	-.003	-.008	-.004	-.006	.[a]	.[a]	.[a]

Table A-8. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95608 Quarter	Zip95608 Third	Zip95608 Half	Zip95628 Quarter	Zip95628 Third	Zip95628 Half	Zip95670 Quarter	Zip95670 Third	Zip95670 Half	Zip95742 Quarter	Zip95742T hird	Zip95742 Half
Zip95819Half	-.005	-.004	-.004	-.005	-.004	-.004	-.011	-.005	-.008	.[a]	.[a]	.[a]
Zip95825Quarter	-.002	-.001	-.002	-.002	-.002	-.002	-.004	-.002	-.003	.[a]	.[a]	.[a]
Zip95825Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
Zip95825Half	-.002	-.001	-.001	-.002	-.001	-.001	-.004	-.002	-.002	.[a]	.[a]	.[a]
Zip95826Quarter	-.011	-.007	-.009	-.010	-.008	-.009	-.022	-.011	-.015	.[a]	.[a]	.[a]
Zip95826Third	-.006	-.004	-.005	-.005	-.004	-.004	-.011	-.006	-.008	.[a]	.[a]	.[a]
Zip95826Half	-.009	-.006	-.008	-.009	-.007	-.007	-.019	-.010	-.013	.[a]	.[a]	.[a]
Zip95827Quarter	-.008	-.005	-.006	-.008	-.006	-.006	-.016	-.008	-.011	.[a]	.[a]	.[a]
Zip95827Third	-.005	-.004	-.004	-.005	-.004	-.004	-.011	-.005	-.007	.[a]	.[a]	.[a]
Zip95827Half	-.002	-.001	-.002	-.002	-.002	-.002	-.004	-.002	-.003	.[a]	.[a]	.[a]
Zip95833Quarter	-.007	-.005	-.006	-.007	-.005	-.006	-.015	-.008	-.011	.[a]	.[a]	.[a]
Zip95833Third	-.006	-.004	-.005	-.006	-.005	-.005	-.013	-.007	-.009	.[a]	.[a]	.[a]
Zip95833Half	-.009	-.006	-.008	-.009	-.007	-.007	-.019	-.010	-.013	.[a]	.[a]	.[a]
Zip95864Quarter	-.006	-.004	-.005	-.006	-.005	-.005	-.013	-.007	-.009	.[a]	.[a]	.[a]
Zip95864Third	-.003	-.002	-.003	-.003	-.003	-.003	-.007	-.004	-.005	.[a]	.[a]	.[a]
Zip95864Half	-.004	-.003	-.004	-.004	-.003	-.004	-.009	-.005	-.006	.[a]	.[a]	.[a]

Table A-9. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95815 Quarter	Zip95815 Third	Zip95815 Half	Zip95816 Quarter	Zip95816 Third	Zip95816 Half	Zip95819 Quarter	Zip95819 Third	Zip95819 Half	Zip95825 Quarter	Zip95825 Third	Zip95825 Half
Zip95815Third	.000											
Zip95815Half	-.001	-.002										
Zip95816Quarter	.[a]	.[a]	.[a]									
Zip95816Third	.[a]	.[a]	.[a]	.[a]								
Zip95816Half	.000	-.001	-.003	.[a]	.[a]							
Zip95819Quarter	-.001	-.003	-.007	.[a]	.[a]	-.003						
Zip95819Third	.000	-.001	-.003	.[a]	.[a]	-.002	-.004					
Zip95819Half	.000	-.002	-.005	.[a]	.[a]	-.002	-.005	-.003				
Zip95825Quarter	.000	.000	-.002	.[a]	.[a]	.000	-.002	-.001	-.001			
Zip95825Third	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]		
Zip95825Half	.000	.000	-.001	.[a]	.[a]	.000	-.002	.000	-.001	.000	.[a]	
Zip95826Quarter	-.002	-.004	-.009	.[a]	.[a]	-.005	-.011	-.006	-.007	-.003	.[a]	-.002
Zip95826Third	.000	-.002	-.005	.[a]	.[a]	-.002	-.005	-.003	-.004	-.001	.[a]	-.001
Zip95826Half	-.001	-.003	-.008	.[a]	.[a]	-.004	-.009	-.005	-.006	-.002	.[a]	-.002
Zip95827Quarter	-.001	-.003	-.007	.[a]	.[a]	-.003	-.008	-.004	-.005	-.002	.[a]	-.002
Zip95827Third	.000	-.002	-.004	.[a]	.[a]	-.002	-.005	-.003	-.003	-.001	.[a]	-.001
Zip95827Half	.000	.000	-.002	.[a]	.[a]	.000	-.002	-.001	-.001	.000	.[a]	.000
Zip95833Quarter	-.001	-.003	-.006	.[a]	.[a]	-.003	-.007	-.004	-.005	-.002	.[a]	-.002
Zip95833Third	.000	-.002	-.005	.[a]	.[a]	-.003	-.006	-.003	-.004	-.002	.[a]	-.001

Table A-9. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95815 Quarter	Zip95815 Third	Zip95815 Half	Zip95816 Quarter	Zip95816 Third	Zip95816 Half	Zip95819 Quarter	Zip95819 Third	Zip95819 Half	Zip95825 Quarter	Zip95825 Third	Zip95825 Half
Zip95833Half	-.001	-.003	-.008	.[a]	.[a]	-.004	-.009	-.005	-.006	-.002	.[a]	-.002
Zip95864Quarter	.000	-.002	-.005	.[a]	.[a]	-.003	-.006	-.003	-.004	-.002	.[a]	-.001
Zip95864Third	.000	-.002	-.004	.[a]	.[a]	-.002	-.004	-.002	-.003	-.001	.[a]	.000
Zip95864Half	.000	-.002	-.004	.[a]	.[a]	-.002	-.004	-.002	-.003	-.001	.[a]	.000

Table A-10. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95826 Quarter	Zip95826 Third	Zip95826 Half	Zip95827 Quarter	Zip95827 Third	Zip95827 Half	Zip95833 Quarter	Zip95833 Third	Zip95833 Half	Zip95864 Quarter	Zip95864 Third
Zip95826Third	-.008										
Zip95826Half	-.013	-.006									
Zip95827Quarter	-.011	-.006	-.009								
Zip95827Third	-.007	-.004	-.006	-.005							
Zip95827Half	-.003	-.001	-.002	-.002	-.001						
Zip95833Quarter	-.010	-.005	-.009	-.007	-.005	-.002					
Zip95833Third	-.009	-.004	-.007	-.006	-.004	-.002	-.006				
Zip95833Half	-.013	-.006	-.011	-.009	-.006	-.002	-.009	-.007			
Zip95864Quarter	-.009	-.004	-.007	-.006	-.004	-.002	-.006	-.005	-.007		

Table A-10. Correlation Coefficients for Pairwise Comparisons of Independent Variables (Locational/Neighborhood Variables versus Locational/Neighborhood Variables)

Variable	Zip95826 Quarter	Zip95826 Third	Zip95826 Half	Zip95827 Quarter	Zip95827 Third	Zip95827 Half	Zip95833 Quarter	Zip95833 Third	Zip95833 Half	Zip95864 Quarter	Zip95864 Third
Zip95864Third	-.006	-.003	-.005	-.004	-.003	-.001	-.003	-.003	-.004	-.003	
Zip95864Half	-.006	-.003	-.005	-.004	-.003	-.001	-.004	-.004	-.005	-.004	-.002

Figure A-1. Histogram of Age of Homes

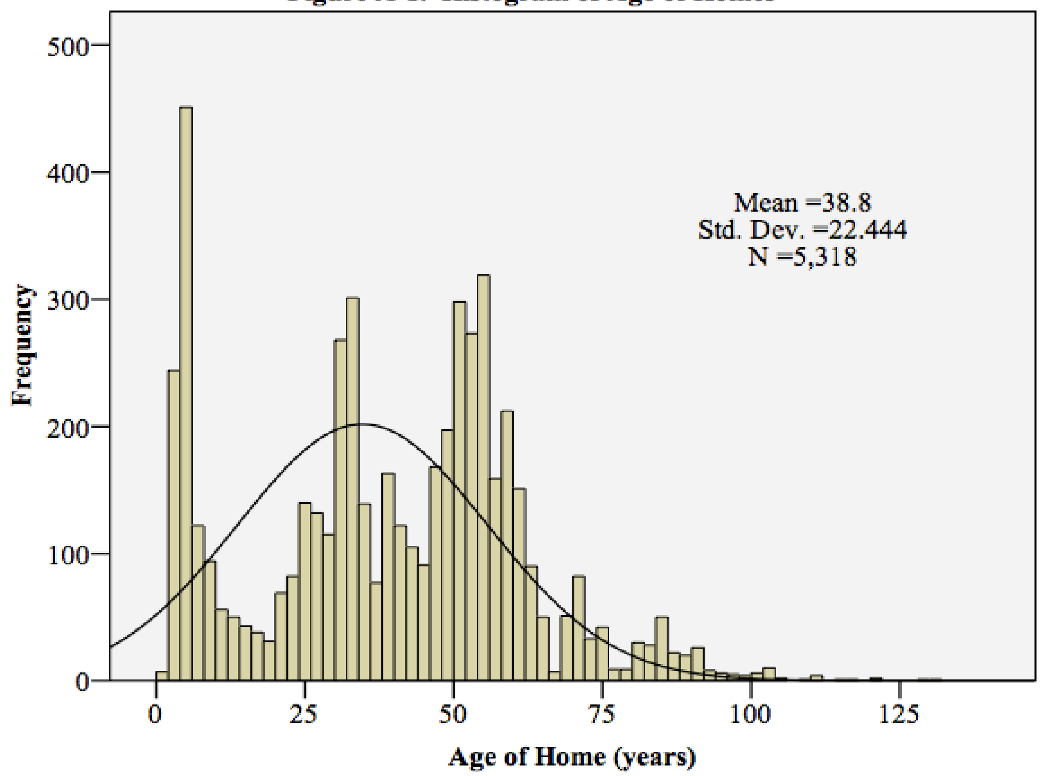


Figure A-2. Histogram of Home Size

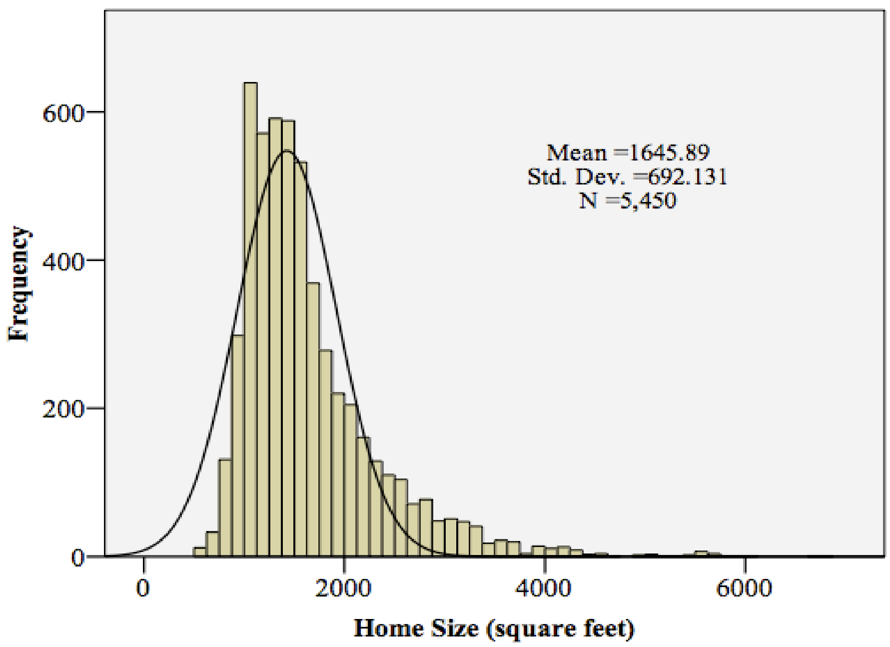


Figure A-3. Histogram of Lot Size

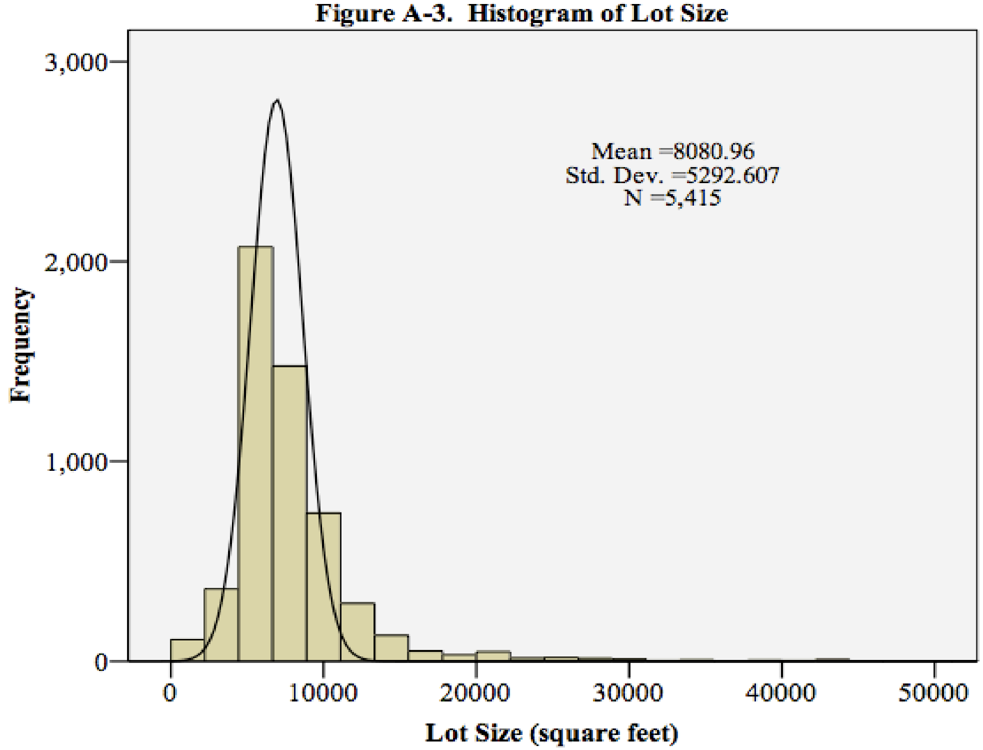
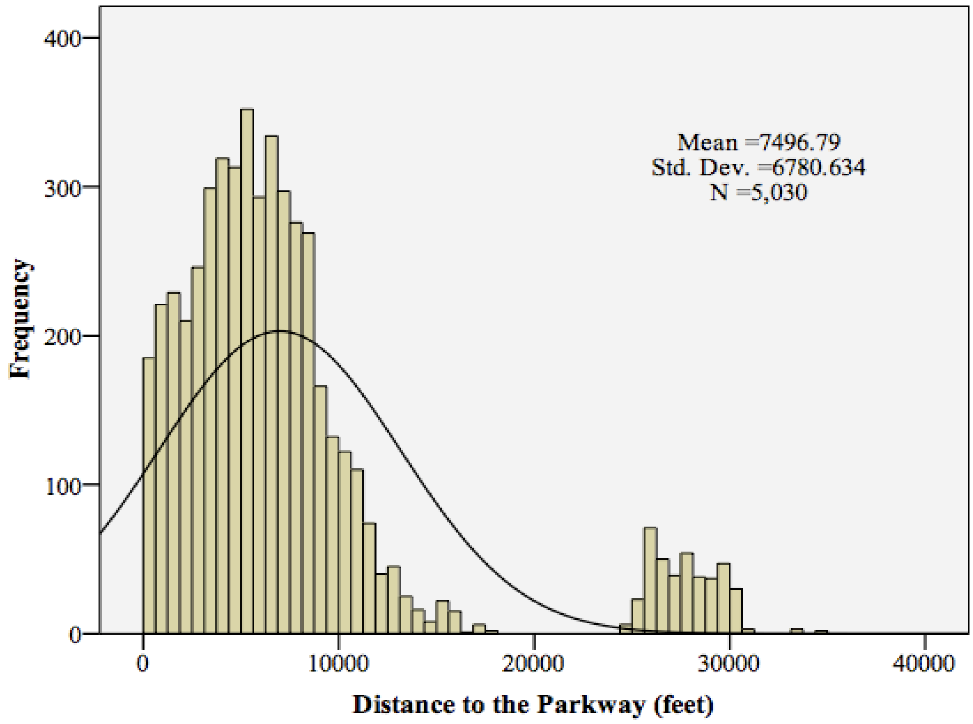


Figure A-4. Histogram of Distance of the Home Sold to the Parkway



BIBLIOGRAPHY

Anderson, S. T., & West, S. E. (2006). Open space, residential property values, and spatial context. *Regional Science and Urban Economics, 36*, 773-789.

ARPVETP (American River Parkway Volunteer Equestrian Trail Patrol). (2009). About us. Retrieved on September 26, 2009 from http://www.arphorsepatrol.org/Information.htm .

ARPF (American River Parkway Foundation). (2009). American River Parkway foundation. Retrieved on September 26, 2009 from http://www.arpf.org/ .

Bacher, D. (2004, January 17). Budget cuts threaten to close American River Parkway. Retrieved May 17, 2009 from http://dissidentvoice.org/Jan04/Bacher0117.htm.

Baker, J. & Bellas, L. (2009). Proposed American River Parkway joint powers authority agreement. Inter-department correspondence from the county of Sacramento Department of Parks and Recreation to the Recreation and Parks Commission for the agenda of September 24, 2009.

Baldassare, M., Bonner, D., Paluch, J., & Petek, S. (2009). *PPIC statewide survey: Californians & their government: September 2009*. San Francisco, CA: Public Policy Institute of California.

California Senate. (2007). Revenues and responsibilities: an inventory of local tax powers. December, 2007.

Cho, S.-H., Bowker, J. M., & Park, W. M. (2006). Measuring the contribution of water and green space amenities to housing values: an application and comparison of spatially weighted hedonic models. *Journal of Agricultural and Resource Economics, 31*(3), 485-507.

County of Sacramento. (2008). *Sacramento County American River Parkway Plan*. County of Sacramento, Municipal Services Agency, Planning and Community Development Department.

County of Sacramento. (2009a). Fiscal year 2009-10 proposed budget: Volume II: Section H – municipal services agency. Retrieved September 2, 2009 from http://www.budget.saccounty.net/information-announcements/SAC_Budget_DF_0910PropBudget .

County of Sacramento. (2009b). Park support organizations. Retrieved September 26, 2009 from http://www.msa2.saccounty.net/parks/Pages/VolunteeringSupportOrganizations.aspx .

County of Sacramento. (2009c, September 1). County prepares to close some vehicle access points to American River Parkway closures approved in June to help balance hard-hit budget. Retrieved on September 14, 2009 from http://www.msa2.saccounty.net/parks/Pages/default.aspx .

Crane, R., Daniere, A., & Harwood, S. (1997). The contribution of environmental amenities to low-income housing: a comparative study of Bangkok and Jakarta. *Urban Studies*, *34* (9), 1495-1512.

Crompton, J. L. (2007). The role of the proximate principle in the emergence of urban parks in the United Kingdom and in the United States. *Leisure Studies*, *26*(2), 213-234.

Dillinger, W.C., Littrell, E. & Smith, F. (2005). *The lower American River : prehistory to parkway* (P.J. Hayes, Ed). Carmichael, CA : American River Natural History Association, 2005.

Donner, A. (1980). The relative effectiveness of procedures commonly used in multiple regression analysis for dealing with missing values. *The American Statistician*, *36* (4), 378-381.

Fennema, A.T., Veeneklaas, F.R., & Vreke, J. (1996). Meerwaarde woningen door nabijheid van groen (Surplus value of dwellings in the vicinity of green areas). Stedebouw en Ruimtelijke Ordening 3, 33-35.

Freeman, III, A.M. (1979). Hedonic prices, property values and measuring environmental benefits: a survey of the issues. *The Scandinavian Journal of Economics*, *81* (2), 154-173.

Fuguitt, D., & Wilcox, S. J. (1999). *Cost-benefit analysis for public sector decision makers* (1st ed.). Westport, CT: Quorum Books.

Halvorsen, R. and Palmquist, R. The interpretation of dummy variables in semilogarithmic equations. *The American Economic Review*, *70* (3), 474-475.

Hobden, D. W., Laughton, G. E., & Morgan, K. E. (2004). Green space borders- a tangible benefit? Evidence from four neighbourhoods in Surrey, British Columbia, 1980-2001. *Land Use Policy, 21*, 129-138.

Kaufman, D. A., & Cloutier, N. R. (2006). The impact of small brownfields and greenspaces on residential property values. *J Real Estate Finan Econ, 33*, 19-30.

Kingdon, J.W. (1995). *Agendas, alternatives, and public policies* (2nd ed.). New York: Harper Collins.

Kong, F., Yin, H., & Nakagoshi, N. (2007). Using GIS and landscape metrics in the hedonic price modeling of the amenity value of urban green space: a case study in Jinan City, China. *Landscape and Urban Planning, 79*, 240-252.

Lindelhof, B. (2009, September 20). Attack on bicyclist spurs warning on American River bike trail. [Electronic version]. *Sacramento Bee*.

Luttik, J. (2000). The value of trees, water and open space as reflected by house prices in the Netherlands. *Landscape and Urban Planning*, *48*, 161-167.

Morancho, A.B. (2003). A hedonic valuation of urban green areas. *Landscape and Urban Planning*, *66*. 35–41.

Nicholls, S., & Crompton, J. L. (2005). The impact of greenways on property values: evidence from Austin, Texas. *Journal of Leisure Research, 37*(3), 321-341.

Poudyal, N. C., Hodges, D. G., & Merrett, C. D. (2009). A hedonic analysis of the demand for and benefits of urban recreation parks. *Land Use Policy*, 9.

Robertson, B.A. (2006, November 26). A day in the life of the parkway. [Electronic version]. *Sacramento Bee*.

Roe, E. (1994). *Narrative policy analysis: theory and practice*. Durham, NC and London: Duke University Press.

Roth, P.L. & Switzer, F.S. (1995). A Monte Carlo analysis of missing data techniques in a HRM setting. *Journal of Management*, *21* (5). 1003-1023.

Rueben, K.S., & Cerdán, P. (2003). *Fiscal effects of voter approval requirements on local* *governments.* San Francisco, CA: Public Policy Institute of California.

Sacramento Bee (2007a, May 17). Arden: living near the American River Parkway .Retrieved May 17, 2009 from http://www.sacbee.com/968/story/179591.html.

Sacramento Bee (2007b, May 17). Fair Oaks:This rolling hills community is located along the American River Parkway. Retrieved May 17, 2009 from http://www.sacbee.com/968/story/179623.html.

SARA (Save the American River Association). (2009). Who we are. Retrieved on September 27, 2009 from http://www.sarariverwatch.org/about.htm

SARA (Save the American River Association). (n.d.). American River Parkway supplementary funding mechanism - a brief summary of the JPA supplemental funding status. Retrieved on September 27, 2009 from http://www.sarariverwatch.org/about.htm

Schafer, J.L. & Graham, J.W. (2002). Missing data: our view of the state of the art. *Psychological methods, 7* (2), 147-177.

Studenmund, A.H. (2006). *Using econometrics: a practical guide*. (5th ed.). Boston, MA; Pearson Education.

Tajima, K. (2003). New estimates of the demand for urban green space: implications for valuing the environmental benefits of Boston's Big Dig project. *Journal of Urban Affairs*, *25*(5), 641-655.

The Dangermond Group. (2000). *American River Parkway: financial needs study.* Prepared for: American River Parkway Funding Group; Sacramento County Regional Parks Recreation and Open Space Department. Submitted August 10,

2000. Sacramento, CA: Author.

The Dangermond Group. (2006). *American River Parkway: 2006 financial needs study update*. Prepared for County of Sacramento Department of Regional Parks. Submitted August 10, 2000; updated June 2006. Sacramento, CA: Author.

The Thomas Guide. (2004). *Sacramento county including portions of Placer, El Dorado, & Yolo counties: street guide*. Skokie, IL: Rand McNally.

Troy, A., & Grove, J. M. (2008). Property values, parks, and crime: A hedonic analysis in Baltimore, MD. *Landscape and Urban Planning*, *87*, 233-245.

Trulia. (2009). Sacramento market trends. Retrieved on November 14, 2009 from http://www.trulia.com/real_estate/Sacramento-California/market-trends/.

Tyrväinen, L. (1997). The amenity value of the urban forest: an application of the hedonic pricing method. *Landscape and Urban Planning*, *37*, 21l-222.

US BLS (United States Bureau of Labor Statitistics). 2009. CPI [consumer price index] inflation calculator. Accessed on September 2, 2009 from http://www.bls.gov/data/inflation_calculator.htm .

United States Census Bureau. (2002). California 2000: census 2000 profile. C2KPROF/00-CA. U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau. Issued August 2002.

United States Census Bureau. (2009). Geographic definitions – census tract. Retrieved on November 28, 2009 from http://www.census.gov/geo/www/geo_defn.html#CensusTract .

Wikepedia (2009). Frederick Law Olmsted, Jr. Retrieved on November 28, 2009 from http://en.wikipedia.org/wiki/Frederick_Law_Olmsted,_Jr.

Yusuf, A.A. & Koundouri, P. (2005). Willingness to pay for water and location bias in hedonic price analysis: evidence from the Indonesian housing market. *Environment and Development Economics*, *10*, 821–836.

Zahariadis, N. (1999). *Ambiguity & choice in public policy: political decision making in modern democracies*. Washington, DC: Georgetown University Press.