A Comparison of Park Valuation Methods

A Thesis

Presented in Partial Fulfillment of the requirements for the

Degree of Master of Landscape Architecture

with a

Major in Landscape Architecture

in the

College of Graduate Studies

by

Jeffrey Charles Stiltz

May 2014

Major Professor: Gary Austin, MLA

Authorization to Submit Thesis

This thesis of Jeffrey Stiltz, submitted for the degree of Master of Landscape Architecture and titled "A Comparison of Park Valuation Methods", has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor: ____________________________ Date: ____________________
Gary Austin, MLA

Committee Members: ____________________________ Date: ____________________
Philip Watson, PhD

____________________________ Date: ____________________
David Paul, PhD

Department Administrator: ____________________________ Date: ____________________
Stephen Drown, MLA

Discipline's College Dean: ____________________________ Date: ____________________
Mark Hoversten, PhD

Final Approval and Acceptance by the College of Graduate Studies:

____________________________ Date: ____________________
Jie Chen, PhD

Abstract

A Comparison of Park Valuation Methods uses modified methods of deriving economic value from the Trust for Public Land and National Recreation and Parks Association parkland economic valuation methods. The methods used are determined to be conservative and more realistic then the aforementioned. The City of Coeur d'Alene, Idaho is the test city to weigh the validity of cities with less supporting data. The Modified Economic Valuation method values are: property values, tourism values, heath benefit values, stormwater quantity and quality values, air benefit values, and real revenue and expenditure values. With all values added, the city of Coeur d'Alene had nearly no real change in revenue, residents save a couple hundred dollars, businesses showed to benefit the most, and developers were identified with the most potential for a return from parks. Additionally, a meta-analysis was ran to determine the property value.

Acknowledgements

I would like to thank Gary Austin for the support and mentorship he has given over the years at the University of Idaho, which played a direct role in my education and this thesis. Without his guidance during my research and writing, I would not have been able to approach my thesis as comprehensively as I have. I would also like to thank my committee members, Dr. Philip Watson, for his insight and guidance on economics, and Dr. David Paul for his guidance and knowledge on the health field and instilling my desire to pursue understanding of statistics.

In addition I'd like to acknowledge and thank Steve Drown in his support of the topic as an extension of my education in Landscape Architecture which has compelled me to pursue unique experiences in the field, Dr. Toru Otawa for his inspiration to pursue knowledge and experience in Geographic Information Systems, and Krystal Flack for the administration support throughout the many years at the University of Idaho.

Table of Contents

List of Graphics

Chapter 1: Introduction

Figure 1.1: McEuen Park Playground, Coeur d'Alene, Idaho

Photograph Found Online: "McEuen Park Playground, Coeur d'Alene, Idaho". N.d. Parks Department, City of Coeur d'Alene. *cdaid.org/parks*. Web. 14 May 2014.

Since the creation of city public parks as a nature preserve and recreational area in urban environments, the importance of these parks are still not fully understood today. Only recently has the benefits of city public parks are observed and documented, which have direct influences on the community in where these parks are. The public park has evolved over the centuries due to the culture of it's creators, but still the necessity of these parks are as important to urban cultures as ever, which requires further research in understanding the social, ecological, and economical effects. Since the industrial revolution and the emergence of city sprawl, city public parks have been culturally designated the natural and recreational area in the city. With the culture of America becoming an urban nation, Frederick Law Olmsted and other 19th century park visionaries viewed parks as not "amenities" but as necessities providing recreation, inspiration, and individual reemergence into natural settings (Sherer 5). Since the culture of establishing a city park in every American city gained it's momentum, understanding the reasons why communities have gained these benefits have come to question in order to maximize these benefits.

The benefit of public parks serves many different groups and for different reasons, but a successful park benefits individuals, groups, and the community in many different ways. City public parks have demonstrated their value with tourism, increase in property values, aesthetics, nature conservancy, recreation, and community social interaction. Recently, identification of imperceptible benefits have been identified and researched such as; social equality, health benefits, air pollution control, stormwater management, economic revitalization, reduction of heat island effect, and crime reduction. These benefits have positive results to a community, and understanding and researching these inputs will only increase the effectiveness of current and future park planning.

The benefits of a city public park has economic effects that are important to the economy of the community. These effects include, but not limited to: increase in revenue from property taxes, increases in tourism revenue in the local community, and economic development and revitalization. An article in The Dirt, on the American Society of Landscape Architects (ASLA) website, highlighted the success of economic stimulus of Highline Park in Lower Manhattan of New York City, which created real estate investment and economic development (Green). The Trust for Public Land also highlights multiple parks that shape the city identity and create a vacation destination for tourists, such as the River Walk in San Antonio, Texas and Chain of Lakes in Minnesota (Sherer 19).

Benefits are also seen from the ecological perspective. These benefits include: increases in biodiversity, positive effects of the urban hydrologic cycle, carbon and pollution sequestration, and reduction in heat island effects. According to the National Parks and Recreation Association, parks are proven to improve water quality, protect ground water, prevent flooding, improve the quality of the air, and produce wildlife habitat (Why Parks 2). The Trust for Public Land states that the value of green space and the associated vegetation have a noticeable application in economic terms from productions and savings in: air pollution control, oxygen production, erosion control, temperature regulation, and water filtration (Sherer 7).

Social benefits are also achieved for the community in many ways, such as, creating strong social ties, learning opportunities, crime reduction, recreational opportunities, and health benefits, thus all increasing personal well being and reflecting positively on other aspects of life (Figure 1.1). The National Parks and Recreation Association details their social importance as a reflection of the quality of life in the community, lowers crime, reduces at risk youth, and a sense of community (Why Parks 3). The Trust for Public Land states the crime reduction and community social interaction, but also looks at child development from playgrounds itself that creates positive development of the communities for children (Sherer 21). Health benefits are looked at by both agencies that focus on the increase of the exercise that open space and recreation promote that reduce risk of diseases and the removal of pollutants that have negative health effects.

Economically valuating these benefits is one approach to evaluate or justify the success of a city public park or city park system. With a valuation tool, park designers, park organizations, and park patrons have another means to advocate to the city, state, and national government, community organizations, the business community, the health and services community, the environmental community, and the non-park users. Currently, two national level agencies produce an economic valuation calculator: The Trust for Public Land and the National Recreation and Parks Association. Both valuation methods have strengths and weaknesses both in application and input factors, which will be the focus of this research to identify and improve upon current nationally recognized models.

City Park Modified Land Values will show the real costs, intangible cost, and amenity improvement associated to park land that makes them more desirable to be developed in a manner appropriate in community decisions. The calculation methods are designed to work for both a single park or a multiple park system and addresses different groups in the reporting.

References:

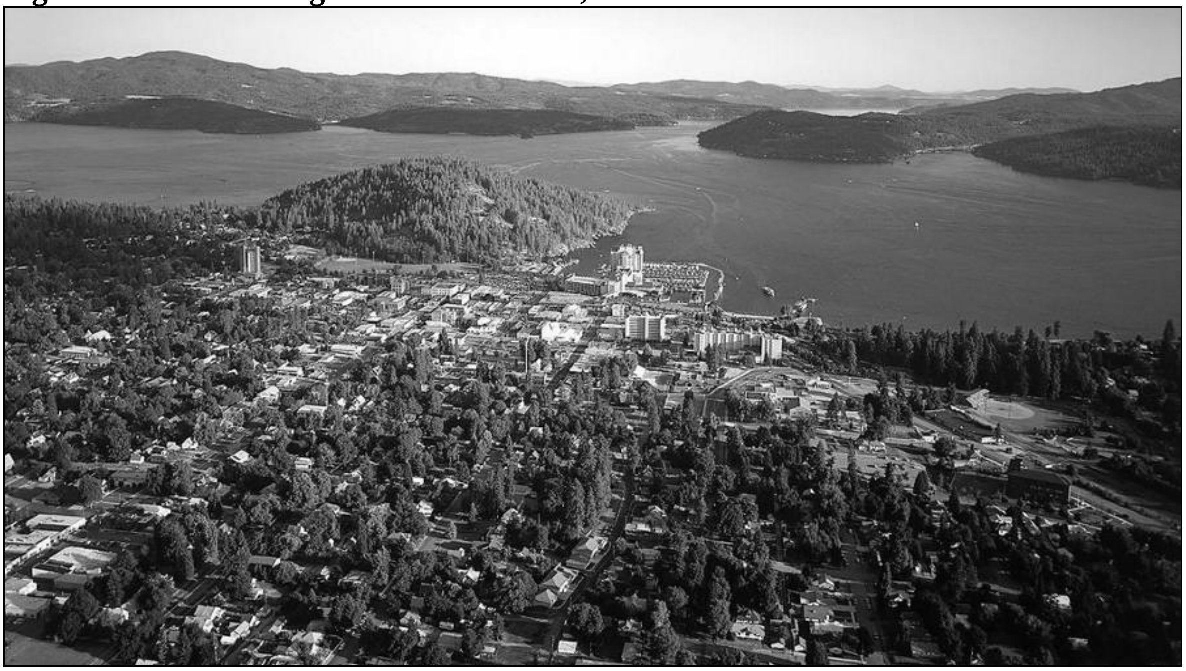
Green, Jared. "The Dirt." *The Dirt*. WordPress.com, 28 Aug. 2009. Web. 11 Nov. 2013. <http://dirt.asla.org/2009/08/28/the-economic-benefits-of-parks/>.

National Recreation and Parks Association. "Why Parks and Recreation Are Essential Public Services." *National Recreation and Parks Association*. Kansas Recreation and Parks Association, 23 Feb. 2012. Web. 11 Nov. 2013. <http://ks-krpa.civicplus.com/DocumentCenter/Home/View/43>.

Sherer, Paul M. Benefits of Parks: "Why America Needs More City Parks and Open Space." *Trust for Public Land*. San Francisco, CA: Trust for Public Land, 2006. Print.

Chapter 2: Property Values

Figure 2.1: Aerial Image of Coeur d'Alene, Idaho



Photograph Found Online: "Aerial Image of Coeur d'Alene, Idaho". N.d. Parks Department, City of Coeur d'Alene. *cdaid.org/parks*. Web. 5 May 2014.

The economic amenity that property values provide is beneficial to the local economy, homeowners, and city government, and is a resource that creates a demand in the local economy. The value of property is also a recipient of the benefit that urban parks provide. The property value is spatially fixed in comparison to parks. Property value is the most influential of the contributions for both private property and parks.

Chapter 2.1: Methods currently used

Hedonic (Property) Value is the pricing method that the Trust for Public Land (Trust for Public Land, 2009 1) uses to valuate revenue generated from nearby property increases due to park proximity. Hedonic value is derived from Rosen's Hedonic Prices model that is "defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them" (Rosen 35). In addition, Tung-Leong Chin states that, "In the economic context, it refers to the utility or satisfaction one derives from the consumption of goods and services" (3). The method can be used "to estimate economic values for ecosystem or environmental services that directly affect market prices" (Ecosystem Valuation) and is applied by the Trust for Public Land to estimate the economic value of a park or park system.

The Trust for Public Land begins by identifying properties within a zone of influence and calculates the taxable value of those parks and taxes from sold properties over the course of a year (Trust for Public Land, 2009 1). According to the four studies referenced in this research (Trust for Public Land, 2009 1), the proximate value ("nearby-ness") is measured for distances up to 2,000 feet and varies according to the quality of the park. However, due to 'interests in being conservative', the Trust for Public Land considers only the first 500’ to evaluate properties near parks. Once the value of the properties are gathered, the additional value represented as a percentage increase in property value is applied to determine the taxable value because of park proximity. The Trust for Public Land acknowledges the large number of studies that demonstrate that excellent parks add up to 15% of the proximate value and problematic parks can reduce the value by 5%, for a mean of 5%. This percentage is used by the organization until a park quality methodology can be established. Two of four studies conducted by the Trust for Public Land used a five year regression analysis of properties within 500’ in order to arrive at the 4.84% (City of Seattle 7) and 3.33% (Recreation System of Mecklenburg 6) tax revenue attributable to parks. The studies compiled the total value of properties sold during the prior year to estimate the sales value attributable to parks and retained by sellers. This was done by taking the percentage of the proximate value added to the total value of properties sold within 500’ of a park minus the state excise tax. The Trust for Public Land acknowledges that this is a conservative estimate because: small parks (under one acre) were not assessed, properties between 500’ and 2,000’ were excluded. Nor does the Trust for Public Land include potentially significant commercial property proximate values (Trust for Public Land, 2009 1). According to an analysis using a geographic information system (GIS), 226 of 425 of Seattle's maintained parks are less than one acre in size (Seattle). Similarly in Denver, 29 of 214 parks are less than one acre (City of Denver). The Trust for Public Land states that "hedonic value" is positively applied to properties value near parks and find that buyers will pay more for a home near a park (Trust for Public Land, 2009 1).

According *to A Critical Review of Literature on the Hedonic Price Model*, there are advantages and disadvantages to using hedonic price model for valuation. One controversy is market segmentation. Some claim that hedonic price studies do not apply and are considered uniform, although, in practice several types of market segmentation exist (Chin, Chau 3). Another disadvantage outlined in *Spatial Heterogeneity in Hedonic House Price Models: the Case of Austria* points out that the current Hedonic Price Model focuses on the spatial homogeneity. This supports Dubin and the understanding that spatial effects should be taken into account when estimating hedonic price functions (Helbich, et al 3).

Proximity effect is the valuation method that the National Recreation and Parks Association PRORAGIS calculator uses for its analyses in the EcoBenefit Calculator (PRORAGIS). This input focuses on the value that comes from the value percentage increase in private homes that are adjacent to passive parks (EcoBenefits: Measuring). The

National Recreation and Parks Association support for this technique comes from Dr. John L. Crompton, Department of Recreation, Park and Tourism Sciences, Texas A&M University, in research articles including *The Impact of Parks on Property Values: a Review of the Empirical Evidence* (Crompton 8). The research by Dr. Crompton establishes that the foundation of his valuation method of proximity effect is hedonic pricing. This is defined as the value of the non-market resource (a park) inferred by the prices of goods actually traded in the market-place (surrounding residential properties) (8). Dr. Crompton summarized his research in a winter 2007 research publication in *California Park & Recreation Society*, which the EcoBenefit calculator draws from (Measuring the Economic Impact). This publication identifies the proximate principle which supports the proximate effect. Demonstrated by approximately 20 studies the "proximate effect is substantial up to 500-600 feet (typically three blocks). In the case of community sized parks over (say) 30 acres, the effect may be measurable out to 1500 feet, but 75% of the premium value generally occurs within the 500-600 foot zone" (Measuring the Economic Impact). The studies, that Compton cite, suggest that a 20% positive increase is attributable to those properties. Dr. Crompton adds to that "like all other goods, the premiums that people are prepared to pay to be proximate to a park or open space is influenced by the available supply. If such amenities are relatively abundant, then the premiums will likely be relatively small or non-existent. Thus, in rural areas where there is plentiful open space, the incentive to pay a premium to be close to a park is likely to be lower than in densely populated urban areas where open space is rare. Similarly, if homes in an area have large private yards, then it is likely that premiums will be lower than in areas with little private space because privately owned yard space may act as a partial substitute for public park space" (Crompton). The EcoBenefits Calculator takes the number of homes abutting passive parks times the property value to gain a net total value times the property tax rate times the selected benefit transfer set proximity effect (10%, 12.5%, 15%, 17.5%, or 20%). This calculation accounts for the tax effect, but doesn't include Dr. Crompton's other findings on the area effect of supply (availability) and demand (abundance of existing open space). Also not included is a clear definition of proximity effect that one is to use. Finally, Dr. Crompton's research takes into account the proximate effect distance of 500-600', but the EcoBenefit Calculator does not incorporate this except for the consideration of 'homes abutting passive parks" (PRORAGIS).

Chapter 2.2: Property Value Meta-Analysis

Benefit transfer is the means to "use existing data or information in settings other than for what it was originally collected" (Champ et al, 445). This technique can be used in the decision and policy making process as an estimate of values when there is a lack of input data or when an economic study is too costly. A benefit transfer is often used by decision making when there are time constraints and limited resources. Champ, Boyle, and Brown suggest that there is a broader scope of opportunities to use a benefit transfer including to "determine if original research is warranted" (446). The recent research in benefit transfer builds models that identify the differences of data collected, across multiple sites in a study or data collected from different sources (Champ et al, 447).

Champ, Boyle, and Brown define the benefit transfer as "the adaptation of information derived from the original research in a different context", also defined as the study site (447). When the application site in question has no information, the application of measures from the study site will derive estimates for the application site under the assumption the value can substitute. Champ, Boyle, and Brown define the measures of the study site as V_S, and the measures of the applicable site as V_P, which derive estimates for the applicable site j from the study site i, thus study site values (V_{Si}) become the transfer values (V_{Ti}) when applied to the study site j (447):

$$V_{Si} \blacktriangleright V_{Ti}$$

There are many methods of applying the benefit transfer to property values, but the approach chosen is the functional transfer. This method applies inputs through a statistical function that applies the original research to the study site (Champ et al, 448). Specifically, the function transfer method is a meta-regression analysis function transfer which summarizes and synthesizes outcomes from several studies (Champ et al, 467). The benefit of using a meta-regression analysis is to explain statistically the variation in multiple empirical studies. These variations include, but are not limited to, valuation method, survey method, geographic location, etc. (Champ et al, 467). The dependent variable in the study is the summary statistic for each individual study; value estimates, elasticity, or other measure. The independent variables are the characteristics of the model, survey design, and original data.

Studies were selected for a meta-regression analysis function transfer. These included studies used by the Trust for Public Land, the National Recreation and Parks Association, and studies that focused on the influence of urban parks on property values. The studies were then master coded to contain 204 fields covering 3 categories that contained the independent and dependent variable in each study (steps 1 and 2). The summary statistic that would become the dependent variable is the overall percentage increase in property value from each study (step 3). The dollar estimates were adjusted for inflation to be based upon 2012 dollars (step 4). Identification of the independent variables is the next step of the model (step 5).

Next, the regression analysis is applied to explain the variation in the dependent variable across the studies using the independent variables (step 6). The summary data for the Coeur d'Alene parks are then added and matched with as many variables as possible (Step 7). The prediction of the Coeur d'Alene parks summary statistics are multiplied by the regression coefficients (step 8) to produce a tailored estimate. The final step is to aggregate the tailored estimate by multiplying it by the total number of units.

A meta-analysis regression model was conducted to identify the significance of previous hedonic regression analysis studies, and to determine the significant determinants of property values premiums. The data set used contained 204 inputs of hedonic regression for urban park dependent hedonic pricing. These were taken from 19 studies (primarily the studies reported by Dr. Crompton) that indicated the values used by the Trust of Public Lands and National Recreation and Parks Association in their park economic valuation methods.

The meta-analysis regression model equation is given in:

$$\ln(y_{i)} = \alpha + \beta_S X_{Si} + \beta_C X_{Ci} + \beta_R X_{Ri} + u_i$$

The dependent variable (y) is the value change of property values. Subscript i is an index for the 202 observations, α is a constant term, $\beta_{S},\ \beta_{C},\ \beta_R$ are the coefficient of the explanatory variables and u is the regression residuals. X_S is the study characteristics (study year, sample size, cost pricing) X_C is the physical statistics (distance range of valuation and median household income in 2012 dollars), and X_R is the natural amenity index (natural amenity rank and score).

Using the computer program Stata, in which a robust linear regression was used to allow for a variation of equation-level scores, such as scores produced from the hedonic regression studies. The program "produces estimators for ordinary data (each observation independent), clustered data (data not independent within groups, but independent across groups), and complex survey data from one stage of stratified cluster sampling" (Stata).

The values for R^2 (= 0.498) are acceptable and comparably higher than previous meta-analysis studies (Ghermandi, 13).

The model return a Prob>F = .0046 indicating that this model for average percentage increase is significant. The other models run using other price indicators as the dependent variables were not statistically significant. Additionally, this model was the only one that returned an almost significant p-value, for medium home income (0.089, MedhoIncome) indicating this model may be the best to work with (Table 2.2.1). This was also diagnosed with the Sharpio-Wilk test (*p* value = 0.960) indicating that it does not reject the assumption of normally distributed residuals and White's test of heteroskedasticity (*p* value = 0.2135).

Table: 2.2.1: Results of the Meta Regression of Property Premiums

PctAverage	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
StudyYear	0.2097744	0.1681827	1.25	0.238	-0.160393	0.579942
SampleSize	0.0001169	0.0002134	0.55	0.595	-0.000353	0.0005866
MarginalAve	6.445236	5.045392	1.28	0.228	-4.659596	17.55007
MedHoIncome	-0.000442	0.0002371	-1.87	0.089	-0.000964	0.0000795
NatAmenScore	-1.410412	3.154545	-0.45	0.663	-8.353519	5.532695
NatAmenRk	2.553479	6.787329	0.38	0.714	-12.38533	17.49229
Distance	4.703807	2.784079	1.69	0.119	-1.42391	10.83152
Constant	1.526792	28.47969	0.05	0.958	-61.15659	64.21017

The results of the meta-analysis indicate a discrepancy in the in the distance and constant coefficient, since distance should have a negative correlation and the constant should have a higher intercept value if in fact hedonic regression models where true. The study year has a slight positive coefficient indicating that the newer studies have larger estimates than earlier studies. Additionally, the Natural Amenity Index Rank has a slightly negative coefficient which would only be indicative of negative correlation of too much amenity value.

This model shows the lack of supporting data of this meta-analysis to these hedonic regression values. Its advisable to accept the null hypothesis that price premium increases as distance to the park decreases. The small amount of sample data and studies focusing on hedonic property values based on urban parks is assumed to be the issue and this could be alleviated by expanding upon this small field of study to include studies that include rural areas, urban open spaces, and/or commercial buildings.

Chapter 2.3: Modified Property Value Benefit Method

The Modified Property value assumes that the hedonic regression models and figures from the Trust for public lands are appropriate for economic valuation of property value. Both the Trust for Public Land Hedonic (Property) Value and the National Recreation and Parks Association PRORAGIS EcoBenefit Calculator Tax Benefit/Proximity Effect have advantages and disadvantages as valuation methods. The Trust for Public Land Hedonic (Property) Value focus is on a city or regional scale. The effect size requires overlapping buffers from multiple parks, the property values within 500’, and researched based proximity effect of 5% (a conservative estimate). The National

Recreation and Parks Association PRORAGIS EcoBenefit Calculator Tax Benefit/Proximity Effect focus can be either an individual park or a city or regional scale. This method features a method of including the actual property tax rate for the area of interest, and an easier interface for calculation methods. If advantages of both valuation system are combined, disadvantages removed, and the goal of making the valuation realistic and easy to use for individual parks and city or regional park systems, the the valuation equation is:

Value of Properties within 500’ x (City Tax Rate) = Tax Revenue x 20% Proximity rate = Property Value benefit

Properties within 500’ are still included with no changes due to the research consensus. The tax revenue is used instead of the Trust for Public Land Hedonic (Property)

Table: 2.3.1: Estimated Property Tax Revenue Benefit from City Parks

Property Tax Revenue	Properties near City Park	Properties near Landings Park	Combined Average	Average Estimate
Average Home Price	$448,578.96	$153,446.23	$295,646.55	$222,204.00
Proximity Benefit[1]	$89,715.79	$30,689.25	$59,129.31	$44,440.80
Property Tax Rate[2]	$521.42	$178.36	$343.66	$258.29
Parcels	53	57	110	2104
Total Value	$27,635.39	$10,166.75	$37,802.14	$543,436.12

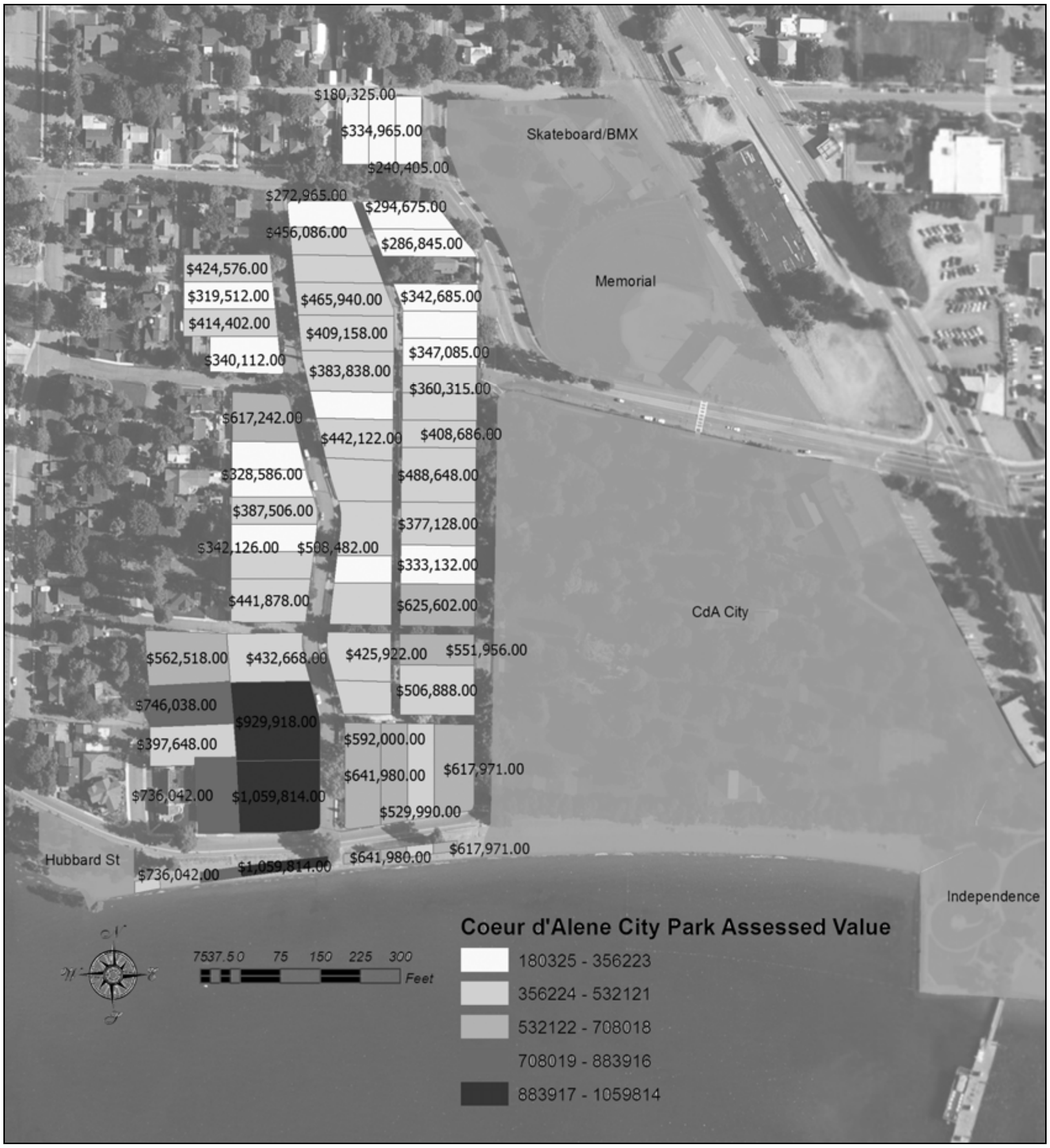
Sources: Assessor's Office Kootenai County, Idaho

[1] Benefit transfer of the park value of 20% from NRPA PRORAGIS EcoBenefits Calculator

[2] Property tax rate of 0.005811937

Value proximate value to be realistic in determining real benefits in any context. The base proximity rate is the maximum extent of benefit based upon the research by Dr. Crompton (2001).

Figure 2.3.2: City of Coeur d'Alene Park Assessed Property Values, Coeur d'Alene, Idaho



The property tax revenue economic contribution from parks is determined by the increase in property values because of proximity to city parks. This effect is applied to residential parcels identified and inventoried with GIS within 500’ of parks. The 20% of the property value is determined to be the benefit parks provide, using the NRPA figure and supported in the meta-analysis, and is applied to the property values. No benefit is applied to properties more than 500' due to the meta-analysis determination of no

Figure 2.3.3: Legacy Place Park Assessed Property Values, Coeur d'Alene, Idaho

correlation after 2000' and not statistically significant correlations within 500-2000'. Table 2.3.1 shows an example of the proximity tax revenue benefit of two Coeur d'Alene parks compared (Figure 2.3.2 and Figure 2.3.3) to the estimate of the average property value of all residential parcels within 500 feet of Coeur d'Alene parks. The Average Estimate is the estimate value that the city of Coeur d'Alene gains through property taxes because of the presence of parks. The increased benefit value of the property is only calculated in the tax rate to simulate the tax revenue generated because of the proximity to a park. The additional tax revenue is an economic contribution to the city, but also an expenditure for the resident.

References:

"Assessor's Office Kootenai County, Idaho." *Kootenai County, Idaho*. Kootenai County, Idaho, n.d. Web. 30 Mar. 2014. <http://kcgov.us/departments/assessor/>.

Champ, Patricia A, Kevin J. Boyle, and Thomas C. Brown. *A Primer on Nonmarket Valuation*. Dordrecht: Kluwer Academic Publishers, 2003. Print.

Crompton, John L. "The Impact of Parks on Property Values: a Review of the Empirical Evidence." *Journal of Leisure Research*. 33.1 (2001): 1-31. Print.

Crompton, John L. "Impact Of Parks & Open Spaces On Property Values." *California Park & Recreation Society*. California Park & Recreation Society, Winter 2007. Web. 09 Dec. 2013. <http://www.cprs.org/membersonly/Winter07_PropertyValues.htm>.

Chin, Tung-Leong, and K W. Chau. "A Critical Review of Literature on the Hedonic Price Model." *International Journal for Housing Science and Its Applications*. 27.2 (2003): 145. Print.

Ghermandi, A., J. C. J. M. van den Bergh, L. M. Brander, H. L. F. de Groot, and P. A. L. D. Nunes (2008), The economic value of wetland conservation and creation: A Meta-Analysis, Fondazione Eni Enrico Mattei Working Pap., 238, 20 pp.

"Geographic Information Systems." *GeospatialDENVER, the City's Program*. City and County of Denver, 2013. Web. 30 Nov. 2013.

Helbich, M, W Brunauer, E Vaz, and P Nijkamp. "Spatial Heterogeneity in Hedonic House Price Models: the Case of Austria." *Urban Studies*. (2013). Print.

King, Dennis M., Ph.D, and Marisa J. Mazzotta, Ph.D. "Hedonic Pricing Method." *Ecosystem Valuation*. US Department of Agriculture, Natural Resources

Conservation Service, and National Oceanographic and Atmospheric Administration, 2000. Web. 04 Dec. 2013.

"Measuring the Economic Value of a City Park System." *Measuring The Economic Value Of A City Park System*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>.

National Recreation and Parks Association. "PRORAGIS." *PRORAGIS, Park and Recreation Operating Ratio and Geographic Information System*. National Recreation and Parks Association, 2011-2013. Web. 11 Nov. 2013. <http://www.nrpa.org/PRORAGIS/>.

National Recreation and Parks Association. "EcoBenefits: Measuring the Economic Benefit of Local Parks." *PRORAGIS EcoBenefits, EcoBenefits Calculator, Measuring the Economic Benefit of Local Parks*. National Recreation and Parks Association, 2011-2013. Web. 09 Dec. 2013. <http://www.nrpa.org/PRORAGIS/Eco-Benefits/>.

Rosen, Sherwin. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy*. 82.1 (1974). Print.

"Seattle." *Seattle*. City of Seattle Parks, 25 May 2011. Web. 30 Nov. 2013. <https://data.seattle.gov/dataset/City-Of-Seattle-Parks/kxj9-se6t>.

StataCorp. 2013. *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP

The Trust for Public Land. "The Economic Benefits of Seattle's Park and Recreation System." *Seattle Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." *Mecklenburg County Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

Chapter 3: Tourism Benefits

Figure 3.1: The Taste of the Coeur d'Alene's

Photograph Found Online: "The Taste of the Coeur d'Alene's". N.d. Parks Department, City of Coeur d'Alene. *cdaid.org/parks*. Web. 5 May 2014.

Park tourism impacts are important for the local economy since outside revenue stimulates local businesses which increases the sales tax revenue and provides a portion of the funding for parks. The Trust for Public Land and National Parks and Recreation Association have identified that economic valuation of these impacts is needed to estimate to revenue influx. The Modified Tourism Economic Impact uses this to address use in smaller cities or single parks.

Chapter 3.1: Current Models

Tourism economic contribution from parks is identified as one revenue generator for a city or county by the Trust for Public Lands. In order to estimate the contribution, it is necessary to know the number of park tourists and their spending (Trust for Public Land, 2009 3) The benefit gained from tourism is easier to calculate when focusing on the income generated from outside sources than from residents since economists treat that as a shift in spending and not "new" revenue (Recreation System of Mecklenburg County 7). The calculation method used by the Trust for Public Lands for tourism value is: first, the estimation in the number of park tourists, which is reduced to estimate only park tourists who came because of the parks (Trust for Public Land, 2009 3). Next, that number is divided into day visitors (who spend less) and overnighters (who spend more), multiplied by the average spending per tourist per day. Finally, an estimation of tax revenue is applied by multiplying park tourism spending by the tax rate (Trust for Public Land, 2009 3). In the study, *The Economic Benefits of Seattle's Park and Recreation System,* the total amount of tourist spending is reduced by half to model the tourist spending is spent in Seattle itself (The Economic Benefits of Seattle's 9). Additionally, all business and conference visitors are removed from the calculation. Finally, added to the model is the consideration that 35% of every dollar is considered by economists as profit (Trust for Public Land, 2009 3). The advantage of Trust for Public Land Tourism Value method is that it accounts for two types of visitors and identifies the difference in spending (between day and overnight) between them. Also, accounting for only half of the spending is reasonable since most out-of-town tourist spending is solely in the park. A disadvantage of using this calculation may be the assumption that 35% of every dollar is profit and that the resulting profit is not calculated with tax. Furthermore considering this figure as additional revenue but not a direct return in city/county revenue may be a problem.

The Tourism Benefits identified in the National Recreation and Parks Association PRORAGIS EcoBenefit Calculator, highlights special events and attractions hosted by the parks and recreation department that result in the increase of revenue generated by spending on travel, meals, and lodging by tourists (EcoBenefits: Measuring). The support of this input comes from Dr. Crompton's *Measuring the Economic Impact of Park and Recreation Services*

(Coder 3). Within the monograph, the formula used is: number of visitors x average spending per visitor x multiplier (Coder 3). Dr. Crompton outlines the four steps in the formula as: "(1) define who qualifies as a visitor; (2) estimate the number of visitors attracted to the community by the park and recreation event or facility; (3) estimate the average level of spending of visitors in the local area; and (4) determine the ripple effects of this new money through the community by applying appropriate multipliers" (Coder 3). The calculation used in the National Recreation and Parks Association PRORAGIS EcoBenefit Calculator is simply: the number of park visitors that are tourists times the average spending per tourist (PRORAGIS). The calculation method is basic and of questionable validity since there are many averages and tourist estimates that could be wrong if not supported by local research. Unless extensive calculation is used as outlined by Dr. Crompton in *Measuring the Economic Impact of Park and Recreation Services,* the resulting inputs only show the revenue generated from tourism without identifying the destination of the revenue. Is the revenue generated applied to the local economy? If so, is that figure already accounted for in economic reports? Is there a tax revenue that is generated from this and how does it apply to other parts of the PRORAGIS EcoBenefit Calculator? For example, can one realistically add property tax revenue to tourism benefit to imply economic income in the public and private markets? Additionally, unlike the Trust for Public Land method, the average spending per tourist doesn't account for the difference of spending between day tourists and overnight tourists.

Chapter 3.2: Modified Tourism Economic Impact

The Modified Tourism Impact addresses the problem of identifying tourists that visit a city for the purpose of visiting the city parks. Well known urban parks attract tourists who visit cities primarily to make use of the park spaces. Central Park in New York City, NY and

Olympic Sculpture Park, Seattle, WA are two examples of this kind of park. Some cities do not have nationally or regionally recognized park amenities to draw those tourists. In this case methods other than applying the percentages of tourists that the Trust for Public Lands identifies in their studies. One alternate approach is to account for the events that take place in parks. Many smaller cities hold annual events within the park spaces which would not have occurred if those park spaces did not exist.

The City of Coeur d'Alene hosts an annual Ironman triathlon competition that requires the use of the City Beach and a significant portion of the North Idaho Centennial Trail for the swimming and distance running events. These Coeur d'Alene venues are ideal

Table 3.2.1: Economic Impact of Park Events

Measure	Chamber of Commerce Estimate Total (2013)	Iron Man Person/Day (3 days) (2013)	National Statistics Person/Day[3]
Iron Man Visitors[2]	14,100	$165.48	$240
Iron Man Visitors[1]	4,000	$583.33	-
Economic Revenue[1]	$7-8,000,000.00	-	$10,152,000
	Coeur d'Alene Parks Estimate		
McEuen Park Visitors (1 Event)[3]	15,000	-	-
McEuen Park[3] (estimate)	$3-4,000,000[3]	-	$3,600,000

[1]Wilson, Steve. "Archive for May, 2013." *North Idaho Business Journal RSS*. North Idaho Business Journal, 28 May 2013. Web. 17 Mar. 2014. <http://nibusinessjournal.com/2013/05/>.
[2]Dolan, Maureen. "Rooms for Race Nights." *Coeur D'Alene Press*. N.p., Aug. 2013. Web. 17 Mar. 2014. <http://www.cdapress.com/news/local_news/article_b8a89dfb-057b-59cd-a2ee-7923eff7c92f.html?mode=jqm>
[3]"McEuen Make over offers Economic Promise." *Lake City Development Corporation*. Lake City Development Corporation, Aug. 2012. Web. 17 Mar. 2014. <http://lcdc.org/about/newsletter-archives/august-newsletter/>.

for this event. These park properties attract and accommodate out of town visitors. The City of Coeur d'Alene estimates that the Ironman event creates $7-8 million in economic revenue for the city (*North Idaho Business Journal RSS*). Table 3.2.1 identifies the economic value of events, which were then compared to an estimate for McEuen Park for validity. McEuen Park is currently being constructed and estimated to be another attractant and host for events for the city (McEuen Make over offers Economic Promise) (Figure 3.1). The Iron Man event also pays $75,000 in sponsorship fees for the event (Hasslinger). This cost would also not occur if there we're no event and should be applied in this model. This method is ideal for the use in individual parks because it allows adjustments for the instances were no tourism economic impact may occur, e.g. small neighborhood parks. This economic impact applies to businesses in the city as a benefit because of the park tourism, but further research would needed to understand the areas and businesses this applies to.

References:

Coder, Rim D. "Identified Benefits of Community Trees and Forests." *Warnell School of Forestry and Natural Resources*. The University of Georgia, Oct. 1996. Web. 11 Dec. 2013. <warnell.forestry.uga.edu/service/library/for96-039/for96-039.pdf>.

Hasslinger, Tom. "The Impact of Ironman." *Coeur D'Alene Press*. N.p., 11 Mar. 2012. Web. 17 Mar. 2014. <http://www.cdapress.com/news/local_news/article_dbd1195e-9047-56c6-a244-bb2778b417fd.html>.

"McEuen Make over offers Economic Promise." *Lake City Development Corporation*. Lake City Development Corporation, Aug. 2012. Web. 17 Mar. 2014. <http://lcdc.org/about/newsletter-archives/august-newsletter/>.

National Recreation and Parks Association. "EcoBenefits: Measuring the Economic Benefit of Local Parks." *PRORAGIS EcoBenefits, EcoBenefits Calculator, Measuring the Economic Benefit of Local Parks*. National Recreation and Parks Association, 2011-2013. Web. 09 Dec. 2013. <http://www.nrpa.org/PRORAGIS/Eco-Benefits/>.

The Trust for Public Land. "The Economic Benefits of Seattle's Park and Recreation System." *Seattle Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." *Mecklenburg County Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

The Trust for Public Land. "Measuring the Economic Value of a City Park System." *Measuring The Economic Value Of A City Park System*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>.

Chapter 4: Health Benefits

Figure 4.1: Jogging in Central Park

Photograph Found Online: Gruban, Patrick."Jogging in Central Park". 10 Oct. 2006. originally posted to Flickr as IMG_9038. *http://commons.wikimedia.org*. Web. 14 May 2014.

Health benefits from physical activity are very important to the well being of an individual and improve their quality of life on many different aspects. This improvement of quality of life translates to mental, physical, and emotional levels that are realized by themselves and their community (Figure 4.1). Parks play an important role in urban settings by allowing such activities to take place which stimulate the human need for outside recreation and nature interaction on a daily and convenient manner within the urban boundaries. This interaction can be valued also in an economic benefit to both the individual and health sector. The economic value translates as a positive benefit to not just the individual as a cost savings, but the public and private organizations that absorb the costs resulting from avoidable poor health. Since this benefit is the result of a city park system, the only benefit gained is the cost savings to the individual and cost savings of organization supplemented health costs, e.g. business, local governments, federal programs. The health benefit provided by parks in an economic benefit is a modified method of the two current models by the Trust for Public Land and the National Recreation and Parks Association.

Chapter 4.1: Health Benefits Current Models

The Health Value outlined by the Trust for Public Land identifies the economic burden of inactivity and the positive correlation to the increase to access to a public park and physical activity (Measuring the Economic Value of a City Park System 12). The Trust for Public Land identifies the local health benefit savings by estimating the number of individuals that use these parks for exercise and attributes the cost savings to medical costs to the individuals. The population that is attributed to these cost savings is cited to be defined by the Centers for Disease Control and Prevention (CDC) that defines this as at least 150 minutes of moderate activity per week, or 75 minutes of vigorous activity per week. The individuals receiving this benefit are identified by a local telephone survey (also used to collect the direct use figures), and only the respondents that identify themselves by using the park for the activity at least three times per week for a moderate to strenuous activity are counted (picnicking, sitting, strolling, and bird watching were eliminated). That sample proportion is then applied to the population to estimate the residents that receive the cost savings benefit (The Trust for Public Land, 2009).

The Trust for Public Land first identified common types of medical problems, such as heart disease and diabetes, and created a calculator based of studies done in 7 states, that show a $250 collective economic cost difference between those who do exercise regularly and those that don't Measuring the Economic Value of a City Park System, 12). For people over the age of 65, the value becomes $500 difference since seniors typically incur two or more times the cost. To estimate the value generated from this, a survey is conducted to determine the number of users that engage in physical activity in parks by age (adults under 65, and adults over 65) multiplied by the health value collective economic cost ($250 or $500). In the three studies conducted for Seattle, Denver, and Mecklenburg County, the collective economic cost difference is $351 for adults under 65 and $702 for adults over 65 (The Trust for Public Land, 2011). In addition, these studies done also take into account the difference in average healthcare cost and the national average which applies a regional multiplier to the total amount. The regional multiplier for Seattle is 0.95, Denver is 1.007 and Mecklenburg County is 0.785. This method for Health Value implies that these are the individual savings of physically active park users in a community which may or may not transfer to the local economy.

The Health Benefit identified in the National Recreation and Parks Association PRORAGIS EcoBenefit Calculator looks at conditions such as stress depression, obesity, and emotional disorder (EcoBenefits: Measuring the Economic Benefit of Local Parks.) and draws from the Trust for Public Land's report on Mecklenburg County, *The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina,* and uses the collective economic cost difference is $351 for adults under 65 and $702 for adults over 65 (12). The National Recreation and Parks Association PRORAGIS EcoBenefit

Calculator as notes that "no data is provided for the calculation of health benefits at this time" (EcoBenefits: Measuring the Economic Benefit of Local Parks). The citations for the Health Benefits indicate a percentage of population based upon the Mecklenburg County report, which could be dangerous for users of this calculator if they were to apply those percentages to their study area calculations since there may be a discrepancy and without a proper data set, users may use that as a default (PRORAGIS). A disadvantage of using this calculator may also be the lack of a regional multiplier used in the Trust for Public Land's calculations, which lessens the effect in generalization by combining geographic differences in health care costs.

Chapter 4.2: Health Benefits Population Proportion

The method under which TPL and NRPA uses for their benefit values do raise questions about validity, particularly the method employed to count people that gain these benefits and to what extent they receive these benefits. The studies for Denver (publication year 2010) and Seattle (publication year 2011) stated that the individuals who gain this benefit was 171,003 people and 179,061 people respectively. According to the U.S. Census Bureau, Denver's total population in 2010 was 600,158, counting for 28.5% of the total population. This population total increases to 3,090,874 people if the Denver-Aurora, CO combined statistical area was used, which would reduce the health benefit estimate to 5.5%. Similarly, Seattle's 2011 population was 620,778, accounting for 28.8% of the individual's that benefit from health benefit, and 5.1% if the Seattle–Tacoma–Bellevue, WA Metropolitan Statistical Area was used (Population 3,500,026). Additionally, if the percent of population that was under the age of 18 was removed from the population count, those percentages that receive the health benefits increases to 36.3% for Denver and 34.1% for Seattle. This range of values calls to question the validity of the initial population percentage and/or the percentage of telephone survey respondents that reported using parks at a minimum of 3 days per week for moderate activity.

In response to the first part of the question of validity, the studies themselves are for municipal park services and therefore only should be counted as serving the city's population itself. Otherwise the study must include a population outside the city as weekly users of parks within a city, or would have to include parks not part of the municipal park system to account for the population. For the strict purpose of this study, the assumption must be made that only the population that is served by the parks being valued, thus the city's population and not the metropolitan population.

The question of validity of the percentage of telephone survey respondents of activity is the next challenge of identifying a reasonable proportion of park users that use parks for moderate physical activities. In a 2003 study, *Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population* (Hutson, et al, 58), identified 25% of the telephone survey respondents had engaged in the recommended amount physical activity during the last month according to the CDC recommendations at the time "of engaging in moderate-intensity leisure-time physical activity for at least 30 minutes per session on 5 or more days of the week, or engaging in vigorous-intensity leisure-time physical activity for at least 20 minutes per session on 3 or more days of the week". However, these respondents also identified the environment being used for the activity which highlights that 8.6% of the respondents used a public park, 3.8% used other public recreational facility, 2.8% used school facility or grounds, 2.7% used a greenway or other walking/jogging/biking trail, and 1.4% used a golf course (Hutson, et al, 63). Other locations were identified in the study but these are identified as places deemed public open spaces which total 19% of the respondents that engage in the recommended amount physical activity or 4.8% of the total respondents. A study conducted in spring for Miami and summer for Chicago also counted physical activity using the System for Observing Play and Leisure Activity in Youth (SOPLAY) by counting the activities in 28 total parks for a week (Floyd, et al, 300). These results returned an 8% of park users engaging in vigorous activity in Miami and 22% in Chicago parks (Floyd, et al, 303). These percentages still only account for the population proportion that use parks for physical activity.

Identification of those that meet the requirement for physical activity for a week must also be addressed to identify the proper percentage of the population that adheres to those guidelines to gain the health benefit of physical activity. Troiano et al, concluded that the levels of self reported physical activity levels were far lower than actual level (186). This study was conducted with a sample of subjects during the National Health and Nutrition Examination Survey (NHANES), which participants first self reported their level of physical activity and then compared to data collected by an accelerometer that the subjects wore for at least one week. The study identified that the percentage of subjects that met the minimum physical activity requirement of at least 30 minutes of moderate-intensity activity on most days of the week for adults 20-59 years old was 3.5% and 2.4% of adults 60+ years old (Table 4.2.1). This conclusion showed that the self reported percentage of the sample that met the requirement of 51%, differed greatly from the 11.5% of ages 16+ from the study. This also raises questions on the validity of telephone surveys used to identify people who report that the minimum physical activity requirements are met.

Table 4.2.1: Prevalence[1] (% and SE) of the population attaining sufficient[2] physical activity to meet public health recommendations. (Troiano et al, 2008)

Approach	Age (yr)	Males	Females	Total
Counting every minute	6-11	48.9 (2.8)	34.7 (1.2)	42.0 (1.6)
	12-15	11.9 (1.7)	3.4 (0.6)	8.0 (1.1)
	16-19	10.0 (1.6)	5.4 (1.4)	7.6 (1.2)
Counting only bouts	16-19	7.1 (1.0)	4.1 (1.0)	5.6 (0.8)
	20-59	3.8 (0.4)	3.2 (0.3)	3.5 (0.3)
	60+	2.4 (0.4)	2.3 (0.5)	2.4 (0.4)

[1] Prevalence estimates were based on individuals with one or more valid days of accelerometer data. Adherence definitions were based on age-specific criteria for moderate intensity for ages 6–17 yr; moderate-intensity criterion = 2020 counts per minute for ages 18 and older.
[2] Adherence: for ages 6–19 yr, 60 or more minutes of moderate- or greater-intensity activity on 5 of 7 d, accumulating every minute above criterion; for ages 16 yr and older, 30 or more minutes of moderate- or greater-intensity activity on 5 of 7 d, accumulated in modified 10-min bouts (8 of 10 min). Ages 16–19 yr were estimated with both definitions.

Chapter 4.3: Modified Health Benefits from Parks Model

The modified health benefits model estimates the cost savings to individuals based on the heath care costs of individual cost savings, regional multiplier, and beneficiaries of those who use parks to meet the recommended level of physical activity. The equation used to determine the economic value benefit of individual health cost savings from a park is as follows:

Population of the city x the population ratio that use parks for physical activity x the population ratio that meets the minimum physical activity requirements x the age specified health cost savings x the regional multiplier

This method is similar to the method used by the Trust for Public Lands, but takes into account some discrepancies in tallying those who meet the recommended level of physical activities and those who don't. This ratio follows the studies above since the estimates need to reflect the percentage of the population that is actually gaining health benefits because of parks and not in other environments to assume the park benefit. The regional multiplier is also used to determine the health care savings per individual based on location and was derived by obtaining the Total All Payers Per Capita State Estimates by State of Residence - Personal Health Care by Centers for Medicare & Medicaid Services for 1991-2009 (11). Since 2013 analysis had not been added to the data, a linear regression was conducted between 1999 and 2009 to obtain the dollar figures for 2013 which were then compared to the United States per capita estimates to predict the ratio of cost by state (Table 4.3.1). The health benefits economic cost for all three methods used is calculated for both Denver, CO (Table 4.3.2) and Seattle, WA (Table 4.3.3) for comparison to the modified valuation method. The variables are derived from the Trust for Public Lands publications for the respective city's which is used to show the comparison of the difference

Table 4.3.1: Regional Multiplier (adapted from Total All Payers Per Capita State Estimates by State of Residence - Personal Health Care by Centers for Medicare & Medicaid Services)

State	2009	2013	Multiplier
United States	$6,815	$8,091	1.00
Idaho	$5,658	$6,806	0.84
Colorado	$5,994	$7,049	0.87
Washington	$6,782	$7,965	0.98

in calculation methods that distinguishes the user input method that NRPA uses and modified health benefits. Under this new model for comparison to both the Trust for Public

Land and NRPA models, the modified health benefits economic valuation returns a cost savings of the collective individuals who gain a health benefit for the minimum physical

Table 4.3.2: Denver Economic Health Benefits from Parks comparison of TPL, NRPA, and Modified Methods

Denver	TPL	NRPA	Modified
Health Benefits Adults Younger Than 65 Years of Age			
Average annual medical care cost difference	$351	$351	$364
Adults 20-64 yrs Total Population (2012 Census)	-	-	415,463
Adults 20-64 yrs Total Population (2010 Census)	-	394,500	-
Adults Younger Than 65 Years of Age Physically active in parks	158,954	158,954	-
Adults 20-59 yrs that likely meet recommendations for MVPA (3.5%)	-	-	14,541
Adults that get their MVPA exclusively from a park (11.3%)	-	-	1,643
Subtotal of health care benefits	$55,792,854	$55,792,854	$598,108.84
Adults 65 Years of Age and Older			
Average annual medical care cost difference	$702	$702	$727
Adults 65 Years of Age and Older (2012 Census)	-	-	66,717
Adults 65 Years of Age and Older (2010 Census)	-	62,132	-
Adults Younger Than 65 Years of Age Physically active in parks	12,409	12,409	-
Adults 60+ yrs that likely meet recommendations for MVPA (2.4%)	-	-	1,601
Adults that get their MVPA exclusively from a park	-	-	181
Subtotal of health care benefits	$8,711,118.00	$8,711,118	$131,540.84
Subtotals combined	$64,503,972.00	$64,503,972.00	$729,649.68
Regional multiplier for health costs	1.007	-	0.87
Total annual value of health benefits from parks	**$64,955,499.80**	**$64,503,972.00**	**$634,795.22**

Sources: The Trust for Public Lands, National Recreation and Parks Association PRORAGIS EcoBenefits Calculator

Table 4.3.3: Seattle Economic Health Benefits from Parks comparison of TPL, NRPA, and Modified Methods

Seattle	TPL	NRPA	Modified
Health Benefits			
Adults Younger Than 65 Years of Age			
Average annual medical care cost difference between active	$351	$351	$364
Adults 20-64 yrs Total Population (2012 Census)	-	-	449,001
Adults 20-64 yrs Total Population (2010 Census)	-	432,510	-
Adults Younger Than 65 Years of Age Physically active in parks	165,926	165,926	-
Adults 20-59 yrs that likely meet recommendations for MVPA (3.5%)	-	-	15,715
Adults that get their MVPA exclusively from a park (11.3%)	-	-	1,776
Subtotal of health care benefits	$58,240,026	$58,240,026	$646,390.82
Adults 65 Years of Age and Older			
Average annual medical care cost difference	$702	$702	$727
Adults 65 Years of Age and Older (2012 Census)	-	-	72,451
Adults 65 Years of Age and Older (2010 Census)	-	65,495	-
Adults 65 Years of Age and Older Physically active in parks	13,135	13,135	-
Adults 60+ yrs that likely meet recommendations for MVPA (2.4%)	-	-	1,739
Adults that get their MVPA exclusively from a park	-	-	196
Subtotal of health care benefits	$9,220,770.00	$9,220,770	$142,846.13
Subtotals combined	$67,460,796.00	$67,460,796.00	$789,236.95
Regional multiplier for health costs	0.95	-	0.98
Total annual value of health benefits from parks	**$64,087,756.20**	**$67,460,796.00**	**$773,452.21**

Sources: The Trust for Public Lands, National Recreation and Parks Association PRORAGIS EcoBenefits Calculator activity requirements in an urban park of $634,795.22 for Denver, CO and $773,452.21 for Seattle, WA. The modified health benefits economic valuation method is shown in the tables, which will be described in the next chapter.

Chapter 4.4: Coeur d'Alene Health Benefits from Parks

The Coeur d'Alene Health benefits we're calculated using the modified health benefits method described in Chapter 4.3, to model the health benefit economic value supplied by parks (Table 4.4.1). Age specific population totals were obtained from the U.S. Census Bureau from the most recent figures available, 2012 estimates. Next, the 150 minutes of moderate-to-vigorous physical activity criteria of 3.5% in adults, 20-59 years old, and 2.4% in 60+ years old. These national estimates are applied to the population of Coeur d'Alene, ID to supplement the lack of data pertaining to the population. Once the determination of the presentation of population meets the minimum physical activity requirement, the determination of individuals who use parks to gain the health benefit must be determined. This uses the *Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population* study of determining where this physical activity is taking place (Hutson, et al, 63). This is an important variable since many individuals do not solely use parks for physical activity, thus justifying the ratio of individuals that due gain a health benefit from the parks. For the purposes of accuracy, only the ratio of the sample in the study that used public parks and greenway or other walking/jogging/biking trail were used, which totaled of 11.3%.

The modified health benefits economic valuation method uses the Trust for Public Lands cost savings so the economic variable. The methods that were used to derive these figures is unknown at this time and assumed the estimates are correct. In addition, the variable was adjusted to the 2013 cost savings utilizing the Consumer Price Indexes (CPI) from the United states Bureau of Labor Statistics, which adjusts the TPL collective economic cost savings of $351 and $702, to cost savings of $364 and $727.

Table 4.4.1: Coeur d'Alene Economic Health Benefits from Parks

Coeur d'Alene	**Modified**
Health Benefits	
Adults Younger Than 65 Years of Age	
Average annual medical care cost difference	$364
Adults 20-64 yrs Total Population (2012 Census)	27,289
Adults 20-59 yrs that likely meet recommendations for MVPA (3.5%)	955
Adults that get their MVPA exclusively from a park	108
Subtotal of health care benefits	$39,285.79
Adults 65 Years of Age and Older	
Average annual medical care cost difference	$727
Adults 65 Years of Age and Older Total Population (2012 Census)	6,557
Adults 60+ yrs that likely meet recommendations for MVPA (2.4%)	157
Adults that get their MVPA exclusively from a park (11.3%)	18
Subtotal of health care benefits	$12,927.94
Subtotals combined	$52,213.73
Regional multiplier for health costs	0.84
Total annual value of health benefits from parks	**$43,859.53**

The modified health benefits economic valuation method shows the health benefits gained for the entire population of the city of Coeur d'Alene. This economic benefit is only applicable to those that physically take part in the minimum physical activity requirements to gain a the cost savings value as individuals. However, the total savings from not spending on health related expenditures could be a surplus by residents that may be absorbed in the local businesses.

References:

Bureau of Labor Statistics. "Inflation Calculator: Bureau of Labor Statistics." *U.S. Bureau of Labor Statistics*. U.S. Bureau of Labor Statistics, n.d. Web. 14 Apr. 2014. <http://www.bls.gov/data/inflation_calculator.htm>.

Centers for Disease Control and Prevention. Physical activity trends: 1990–1998. *Morb Mort Wkly Rep*. 2001;50:166–169.

Huston SL, Evenson KR, Bors P, Gizlice Z. Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *Am J Health Promot* 2003; 18: 58–69.

Floyd, M. F., Spengler, J. O., Maddock, J. E., Gobster, P. H., & Suau, L. J. (2007). Park-based physical activity in diverse communities of two U.S. cities: An observational study. *American Journal of Preventive Medicine, 34*, 299–305

Centers for Medicare & Medicaid Services. "State (Residence)." *Centers for Medicare & Medicaid Services*. Centers for Medicare & Medicaid Services, n.d. Web. 14 Apr. 2014. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsStateHealthAccountsResidence.html>.

National Recreation and Parks Association. "PRORAGIS." *PRORAGIS, Park and Recreation Operating Ratio and Geographic Information System*. National Reacreation and Parks Association, 2011-2013. Web. 11 Nov. 2013. <http://www.nrpa.org/PRORAGIS/>.

National Recreation and Parks Association. "EcoBenefits: Measuring the Economic Benefit of Local Parks." *PRORAGIS EcoBenefits, EcoBenefits Calculator, Measuring the Economic Benefit of Local Parks*. National Recreation and Parks Association, 2011-2013. Web. 09 Dec. 2013. <http://www.nrpa.org/PRORAGIS/Eco-Benefits/>.

Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40:181–188

The Trust for Public Land. "The Economic Benefits of Denver's Park and Recreation System." *Denver Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/denver-park-value-report-0>.

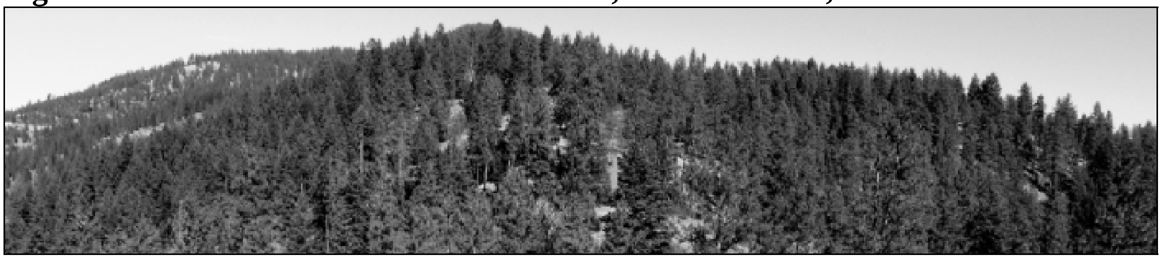
The Trust for Public Land. "The Economic Benefits of Seattle's Park and Recreation System." *Seattle Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." *Mecklenburg County Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

The Trust for Public Land. "Measuring the Economic Value of a City Park System." *Measuring The Economic Value Of A City Park System*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>.

Chapter 5: Air Quality Benefits

Figure 5.1: Canfield Mountain Natural Area, Coeur d'Alene, Idaho



Photograph Found Online: "Canfield Mountain Natural Area, Coeur d'Alene, Idaho". N.d. Parks Department, City of Coeur d'Alene. *cdaid.org/parks*. Web. 5 May 2014.

Air pollution damages human health and structures and incurs costs for care and maintenance. Nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone and particulates are removed by leaves of trees and other plants, absorbing gases and capturing particulates (Figure 5.1: Natural park in Coeur d'Alene Idaho). The Trust for Public Land calculation method used to determine the economic value of this ecosystem service is based upon the Urban-Forest Effects (UFORE) model developed by the U.S. Forest Service. The estimation of park land vegetation cover is derived through aerial photography interpretation. Then a pollutant flow through an area within a given time is applied to estimate the concentration and velocity of deposition. The method considers types of vegetation and seasonal leaf variation. The calculator uses hourly pollution concentration data from the U.S. Environmental Protection Agency to estimate the concentration rate in relationship to the vegetation cover and type (Trust for Public Land 12, 2009).

The final step outlined by the Trust for Public Land is: "The total pollutant flux is multiplied by tree-canopy coverage to estimate pollutant removal. The monetary value is estimated using the median U.S. externality value for each pollutant. (The “externality value” refers to the amount it would otherwise cost to prevent a unit of that pollutant from entering the atmosphere). For instance, the externality value of a short ton of carbon monoxide is $870 and $1,500 for the same amount of sulfur dioxide (Trust for Public Land 12, 2009). The advantage of this calculation method is that it takes into account the performance of the vegetation species, the regional air pollution concentrations, and compares it to the externality value.

The National Recreation and Parks Association PRORAGIS EcoBenefit Calculator establishes the value of Air Quality Benefits through the final findings of research conducted by three different studies: *Identified Benefits of Community Trees and Forests* (McPherson et al)*, Quantifying Urban Forest Structure, Function, and Value: the Chicago Urban Forest Climate Project* (Smith, Merritt, Nowak), and *Houston's Regional Forest* (NAAQS). Using the PRORAGIS EcoBenefit Calculator requires inputting the number of acres or number of trees multiplied by the (user chosen) potential benefit transfer set derived from the research aforementioned (PRORAGIS). The three potential benefit transfer sets are: $0.29 per tree per year (Smith, Merritt, Nowak), $0.51 per tree per year (NAAQS), or $94.91 per acres per year (McPherson et al). The $0.29 per tree per year comes from research based in Chicago and converted by the PRORAGIS EcoBenefit Calculator. In Chicago "50.8M trees provided $9.2M air pollution benefit in 1991 = $0.18 cents/tree, or $0.29 by 2011" (PRORAGIS). $0.51 per tree per year was the value determined by the research based in Houston. This determination takes the total value reported in the form of externality costs, and converts it to per tree and 2011 dollars (PRORAGIS). The $94.91 per acre per year potential benefit transfer data set is based upon the finding of one study at a 212 hectare urban park reporting "$136 per day value based upon pollution control technology" (McPherson et al).

Chapter 5.1: Modified Air Quality benefits

The values produced by both the Trust for Public Land Removal of Air Pollution by Vegetation and the National Recreation and Parks Association PRORAGIS EcoBenefit Calculator Air Quality Benefits assume externality costs that would be incurred to remove all air pollutants. In the effort of representing real returns from the parks, the value should represent the monetary value of the total vegetation benefit not exceeding existing air pollution standards set by the U.S. Environmental Protection Agency, and described by:

Estimated tree canopy coverage x the reduction in air pollution x the externality cost to remove.

The estimation of pollution reduction is derived from *Air Pollution Removal by Urban Trees and Shrubs in the United States,* which estimates a percentage of air quality improvement due to air pollution removal of nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone and particulates by urban trees (Dwyer). To apply to parks, the ratio of vegetation between parkland and the rest of the city is necessary. Once the air pollution removal percentage is calculated, that factor can be applied to the daily average air quality to represent the amount that is removed from the parks and added to the daily average to represent the air quality without those park trees. The simulated total air quality (values if those trees were not there), are compared to the U.S. Environmental Protection Agency National Ambient Air Quality Standards (NAAQS) to represent the value that would have to be removed to meet those standards, thus the benefit gained without having to enact additional air pollution control measures beyond those required by law.

Chapter 5.2: Coeur d'Alene Parks Air Quality Benefits

The benefit that the city of Coeur d'Alene parks provide for air pollution reduction is the increase in tree canopy coverage. This was calculated using GIS and the National Land Cover Database (NLCD) 2001 Percent Tree Canopy (Version 1.0). The canopy coverage was calculated to produce the percent of tree canopy coverage for the city minus the parkland tree canopy coverage to determine the percentage trend if no parks existed (Table 5.2.1). Second, the parkland tree canopy coverage was calculated with only the canopy coverage within the parks to determine the percentage covered. Third, the difference of canopy coverage was applied to the park land by applying the city trend to the park area to simulate the development if the park spaces were developed since tree canopy coverage may still exist at a smaller percentage. Finally, the percentage increase in the city was determined because parks exist with an increased tree canopy coverage, thus increasing the air pollution control due to urban trees.

Table 5.2.1: Canopy Coverage Benefit of Coeur d'Alene Parks

City Area	40,760,918.89 m^2
City Canopy Coverage	4,015,819.09 m^2
City Percentage	9.85%
Park Area	1,864,726.21 m^2
Park Canopy Coverage	893,680.91 m^2
Parks Percentage	47.93%
Park Canopy Coverage if Developed	183,715.27 m^2
Difference in Canopy Coverage	709,965.64 m^2
Percentage Increase in the City	5.66%

A study by Novak and Heisler calculated the air pollution reduction from the urban forest to be approximately $300/acre of externality cost to remove the pollutants (21). This value adjusted to 2012 dollars, for a value of $315.87 per acre per year. This value is then added to the 175.44 acres of the difference in canopy coverage if no parks existed for a total of

$55,416.23 of increased pollution removal from the 5.66% of the total increase in the city of Coeur d'Alene. The air quality around Northern Idaho is monitored by the Idaho Department of Environmental Quality and does not currently have any violations of NAAQS. This avoidance of a violation penalty cost can be calculated as cost savings to the city of Coeur d'Alene, with the understanding that the State of Idaho is liable for corrective action that may inadvertently pass on cost to the city for implementation of control measures. This means that this economic benefit will not be used for total calculations due to the small chance the city assumes the cost.

References:

Dwyer, J.F.; McPherson, E.G.; Schroeder, H. W.; Rowntree, R.A. 1992. Assessing the benefits and costs of the urban forest. *Journal of Arboriculture.* 18(5). Arboriculture & Urban Forestry. Web. 11 Dec. 2013. <http://joa.isa-arbor.com/>

Environmental Protection Agency. "National Ambient Air Quality Standards (NAAQS)." *EPA*. Environmental Protection Agency, 14 Dec. 2012. Web. 09 Dec. 2013. <http://www.epa.gov/air/criteria.html>.

"Geographic Information Systems." *GeospatialDENVER, the CIty's Program*. City and County of Denver, 2013. Web. 30 Nov. 2013.

McPherson, E. G, D. Nowak, G. Heisler, S. Grimmond, C. Souch, R. Grant, and R. Rowntree. "Quantifying Urban Forest Structure, Function, and Value: the Chicago Urban Forest Climate Project." *Urban Ecosystems*. 1.1 (1997): 49-61. Print.

National Reacreation and Parks Association. "PRORAGIS." *PRORAGIS, Park and Recreation Operating Ratio and Geographic Information System*. National Reacreation and Parks Association, 2011-2013. Web. 11 Nov. 2013. <http://www.nrpa.org/PRORAGIS/>.

Nowak, D.J.1994. Air pollution removal by Chicago's urban forest In: *McPherson, E.G, Nowak, D.J., and Rowntree, R.A.Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*. USDA Forest Service General Technical Report NE-186.pp.63 81.

Nowak David J., Heisler, Gordon M.. *Air Quality Effects of Urban Trees and Parks.*

National Recreation and Parks Association. 2010. Web. 15 Mar. 2014. <http://www.nrpa.org/uploadedFiles/nrpa.org/Publications_and_Research/Research/Papers/Nowak-Heisler-Research-Paper.pdf>

Smith, Peter D., Michael Merritt, and David Nowak. "Houston's Regional Forest." *Houston's Regional Forest - Houston's Regional Forest Report*. Houston's Regional Forest, Sept. 2005. Web. 11 Dec. 2013. <http://www.houstonregionalforest.org/Report/>.

The Trust for Public Land. "The Economic Benefits of Denver's Park and Recreation System." *Denver Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/denver-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of Seattle's Park and Recreation System." *Seattle Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." *Mecklenburg County Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

The Trust for Public Land. "Measuring the Economic Value of a City Park System." *Measuring The Economic Value Of A City Park System*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>.

U.S. Department of the Interior. "Multi-Resolution Land Characteristics Consortium (MRLC)." *Multi-Resolution Land Characteristics Consortium (MRLC)*. U.S. Department of the Interior, 03 Apr. 2014. Web. 11 Apr. 2014. <http://www.mrlc.gov/nlcd11_data.php>.

Chapter 6: Water Quality Benefits

Figure 6.1: Stormwater Management in Telopea Park, Canberra, Australia

Photograph Found Online: Halloleo. "Views of Telopea Park". 18 Dec. 2012. HDR Photo. *http://commons.wikimedia.org*. Web. 14 May 2014.

Water quality benefits from urban parks are valuable to a city in managing flooding from storms, reducing non-point source pollution, and improving the quality of local water bodies (Figure 6.1: Stormwater management channel in Telopea Park). Although some parks can have a negative impact on these factors, a healthy, well managed park and park system will positively address the stormwater issues. This benefit translates into economic values that can be used to reduce costs to city governments, residents, businesses, and developers for stormwater management infrastructure. The modified water quality benefit, presented here, addresses the economic value of stormwater as an extension and modification of the current models employed by the Trust for Public Land and National Recreation and Parks Association.

Chapter 6.1: Analysis of Current Models

The Trust for Public Land identifies the issues with stormwater as the transportation of pollutants and flooding during precipitation events (Measuring the Economic Value of a City Park System, 18). Stormwater management is an infrastructure component of all cities. It is intended to remove excess water from the urban and residential environment. Reduction of flood hazards is a primary goal and there are many stormwater management practices used to accomplish this. Curbs and gutters, storm sewer piping systems, and detention basins are common links between sites the receiving water, usually a lake or stream. The Trust for Public Land identifies park land as an area where stormwater is captured and infiltrated over the large areas or through vegetation. If the park land was to be developed instead remaining naturalistic, it would exacerbate the problem of managing stormwater.

This value is calculated using a model developed to estimate the value of retained stormwater due to green space by the Western Research Station of the U.S. Forest Service in Davis, California. The first step is to identify the total area of hard surfaces (roads, asphalt and concrete trails, structures) and other impervious spaces of all parks through aerial imagery. The next step is to identify the total area of vegetative and other pervious spaces from the same aerial imagery. This is repeated for the rest of the city to determine the ratio of pervious area to impervious area as if the parks were not there, simulating the benefit of stormwater management of parks. Once the areas are accounted for, then the amount and characteristics are added by combining two models. The hourly annual precipitation data is used to estimate annual runoff, which is then subtracted from the same area without the parks from the previous steps. Finally, the costs to manage each gallon of stormwater with traditional methods (concrete, pipes, and holding tanks/basins) is estimated and used to calculate the cost savings attributed to park land. The advantage of this method is that it does take into account the tax revenue that would be used for stormwater management technologies. The method focuses on the issues of flooding and indirectly the channelization and sedimentation of streams, but not on the more contemporary stormwater management concerns of reducing non-point source pollution.

National Recreation and Parks Association PRORAGIS EcoBenefit Calculator focuses on the water runoff, velocity, erosion, and pollution from precipitation events (EcoBenefits, 2013). This method calculates stormwater management benefits by multiplying the total number of acres of the park by the user selected potential benefit transfer data set supported by three research articles: Assessing the benefits and costs of the urban forest (Dwyer et al, 1992), The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina, and Identified Benefits of Community Trees and Forests (Coder, 1996).

The three potential benefit transfer sets are: $58.00 per acre per year [30], $142.13 per tree per year (Mecklenburg County, North Carolina) and $747.71 per acre per year (Coder, 1996). The $58.00 per acre per year, derived from Dwyer (1992), is based upon the research finding that: "Savings in stormwater management costs from trees in Tucson were calculated at $0.18 per tree per year or $600,000 over 500,000 trees and 40 years", which was then converted to 2011 dollars ($0.29), and converted again to $58.00 per acre at 200 trees per acre (EcoBenefits, 2013). This assumption would only be correct if there are around 200 trees per acre, and the climate and tree species are similar to the user identified site(s).

The $142.13 per tree per year uses the calculation method from The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina, that applies a 96% pervious parkland surfaces, 42 inches of rain per year, and a $0.0344 stormwater treatment cost per cubic foot, and then converts the final cost reported in the report to per acre value (PRORAGIS, 2013). For this calculation it is not known how the trees per acre was acquired since there is no count of tree totals in the Mecklenburg County Report. This potential benefit transfer data set would also only be correct if the user specified area has 42.22 inches of precipitation per year, about 96% pervious parkland surfaces, and stormwater treatment costs are the same as in North Carolina.

The $747.71 per acre per year potential benefit transfer data set uses the value of $336,000 saving per one square mile from Identified Benefits of Community Trees and Forests and converts to acres, then to 2011 dollars (640 acres or $525 per acre) (PRORAGIS 2013). According to Coder (1996), "37,500 tons of sediment per square mile per year comes off of developing and developed landscapes -- trees could reduce this value by 95% ($336,000 annual control cost savings with trees)". This value apparently only looks at sediment control savings only, which is appropriate if that is the desired cost savings input. Additionally it is not stated or referenced by Dr. Coder where this figure comes from (Coder 1996).

Chapter 6.2: Stormwater Management Benefit Method

Hydrological benefits of urban parks can be from runoff quantity reductions, quality improvements, or both. Flood control and reduced erosion are the benefits gained from stormwater runoff quantity reduction. Sedimentation, filtration, and purification lead to water quality benefits (pollution control). These benefits are addressed in the parkland hydrological cycle when it serves to improve the quality of stormwater being released or the reduction in quantity of stormwater contributing to urban flooding. The measurement of these benefits requires identifying two contributions that develop due to the presence of parks. First, the level of pollution abatement must be compared to the levels if no park exists. Second, the level of stormwater runoff reduction due to parks and the cost of traditional stormwater techniques compared to neighboring urban areas where no park exists. Identifying park features and functions is also critical in addressing the extent of benefits gained from parks.

Galen Cranz has identified five types of parks that have emerged from historical ideas about the purposes of parks. Her typology identifies the park types as: Pleasure Ground (1850 -1900), the Reform Park (1900 -1930), the Recreational Facility (1930 - 1965), the Open Space System (1965 - current), and the Sustainable Park (1990 - current) (Cranz, 2003). Only recently has the Sustainable Park type emerged, but Open Space Systems are still being developed. The elements of the Sustainable Park, particularly, addresses green infrastructure as an incorporated feature that serves the park and, in some situations, the area surrounding the park (Cranz 2003). This is important in placing the hydrological benefits of parks in context. Urban parks built before 1990 typically did not include green infrastructure features that serve the adjacent areas. Therefore the stormwater benefits gained from most parks, especially the Reform Park and Recreational Facility, do not extend beyond the borders of the park, except for reducing the total volume of runoff from the entire city or neighborhood compared to if they were developed for other land-uses with typical imperviousness. Generally, 20th Century municipal stormwater management plans did not seek to retain stormwater as a management method. Instead removal of stormwater as quickly as possible to outside the city through traditional networks of storm sewers was the universally adopted approach. Care should be taken when estimating the hydrological benefits of parks when establishing a benchmark to identify which parks contribute to the surrounding landscape and which do not.

One benefit parks contribute is the reduction in quantity and velocity of water managed to control flooding. Many urban parks are developed as public open areas that provide recreation, and preserve natural areas. Thus they are dominated by pervious surfaces that minimize precipitation runoff compared to the surrounding urban landscapes. This benefit reduces the total amount of stormwater runoff that the city is charged with managing. Only if stormwater from adjacent land-uses is directed into the park for detention, retention or treatment can the park be considered an extensive stormwater management benefit. The modified water quality benefits proposed equation used to determine the economic value benefit of water quantity from a park is as follows:

Total Area x difference in impervious surface percentage x Precipitation Volume x cost of construction of stormwater management infrastructure + drainage area served x cost of construction of stormwater management infrastructure

The second benefit parks will contribute to when dealing with stormwater is the water quality improvement resulting from the park. The equation used to determine the economic value benefit of water quality from a park is as follows:

Total Area x difference in impervious surface percentage x pollutants above EPA directed levels x Cost to build technologies to remove pollutants - cost savings from removing the pollutants

This benefit is only applied to parks that contribute to stormwater quality improvement. To determine the service scope of water quality improvement is to first determine the contribution that the parks elements contribute. This is done by defining a park as either a park that contains elements of stormwater Best Management Practices (BMPs) and those that do not. Many stormwater BMPs technologies exist and aid in pollutant removal (Figure 6.2.1). In cases where documentation of existing stormwater BMPs is lacking, the determination of the type of park may also be adequate, such as parks built after 1990, a Sustainable Park type, or a natural area or wetland.

Once the stormwater BMPs and/or the city stormwater management plan has been identified, the determination of the service area must be identified. This area will include the park and may also include neighboring areas that are part of the stormwater catchment and part of the city stormwater management plan. Applying this method will identify each park's contribution to a city's stormwater management infrastructure and define one of four park types: quantity reduction, extended quantity reduction, comprehensive improvement and extended comprehensive improvement.

Table 6.2.1: Average percentage of effectiveness of pollutant removal (adapted from National Management Measures to Control Nonpoint Source Pollution from Urban Areas)

Method	TSS	TP	OP	TN	Nox	Cu	Zn
Quality Control Pond	3	19	N/A	5	9	10	5
Dry Extended Detention Pond	61	20	N/A	31	-2	29	29
Dry Ponds	47	19	N/A	25	3.5	26	26
Wet Extended Detention Pond	80	55	69	35	63	44	69
Multiple-Pond System	91	76	N/A	N/A	87	N/A	N/A
Wet Pond	79	49	39	32	36	58	65
Wet Ponds	80	51	65	33	43	57	66
Shallow Marsh	83	43	66	26	73	33	42
Extended Detention Wetland	69	39	59	56	35	N/A	-74
Pond/Wetland System	71	56	37	19	40	58	56
Submerged Gravel Wetland	83	64	14	19	81	21	55
Wetlands	76	49	48	30	67	40	44
Organic Filter	88	61	30	41	-15	66	89
Perimeter Sand Filter	79	41	68	47	-53	25	69
Surface Sand Filter	87	59	N/A	31.5	-13	49	80
Vertical Sand Filter	58	45	21	15	-87	32	56
Bioretention	N/A	65	N/A	49	16	97	95
Filtering Practices	86	59	57	38	-14	49	88
Infiltration Trench	100	42	100	42	82	N/A	N/A
Porous Pavement	95	65	10	83	N/A	N/A	99
Ditches	31	-16	N/A	-9	24	14	0
Grass Channel	68	29	32	N/A	-25	42	45
Dry Swale	93	83	70	92	90	70	86
Wet Swale	74	28	-31	40	31	11	33
Open Channel Practices	81	34	1	84	31	51	71
Oil-Grit Separator	-8	-41	40	N/A	47	-11	17
Median	**70.20**	**42.08**	**41.84**	**37.59**	**25.98**	**39.59**	**50.46**

TSS - Total Suspended Solids TP - Total Phosphorus OP - Ortho-phosphorus
TN - Total Nitrogen NOx - Nitrate and Nitrite Nitrogen Cu - Copper Zn - Zinc

Chapter 6.3: Districts and Topography of Coeur d'Alene

This section and a few that follow present the assumptions, process and data associated with the economic benefit of parks in relationship to stormwater management and treatment in the city of Coeur d’Alene. Impervious surfaces of Coeur d'Alene parks is important in determining the effect on stormwater quantity and quality of the park benefits

Table 6.3.1: Average Percentage Impervious Surface by District

Districts[1]	**Average % Impervious**[2]
C-17 Commercial - This district is intended as a broad spectrum commercial district that permits limited service, wholesale / retail, and heavy commercial in addition to allowing residential development at a density of 17 units per gross acre	85
C-17 Commercial Limited - This district is intended as a low intensity commercial and residential mix district. This district permits residential development at a density of 17 units per gross acre as specified by the R-17 district	85
DC Downtown Core	85
CC Community Commercial - The Community Commercial District is intended to allow for the location of enterprises that mainly serve the surrounding residential areas and that provide a scale and character that are compatible with residential buildings.	85
LM Light Manufacturing	72
NC Neighborhood Commercial	85
M Manufacturing	72
MH-8 Mobile Home - This district is intended as a moderate density residential district for mobile homes at a density of 8 units per acre.	65
R-1 Residential - This district is intended as a residential area that permits single-family detached housing at a density of one dwelling unit per gross acre	20
R-3 Residential - This district is intended as a residential area that permits single family detached housing at a density of 3 dwelling units per gross acre.	30
R-5 Residential - This district is intended as a residential area that permits single family housing at a density of 5 dwelling units per gross acre.	38[3]
R-8 Residential - This district is intended as a residential area that permits a mix of housing types at a 8 dwelling units per gross acre.	65
R-12 Residential - This district is intended as a residential area that permits a mix of housing types at a density of not greater than 12 dwelling units per gross acre.	65
R-17 Residential - This district is intended as a medium/high residential area that permits a mix of housing types at a density of 17 dwelling units per gross acre.	65

[1] "City of Coeur D'Alene - Zoning District Information." *City of Coeur D'Alene - Zoning District Information*. City of Coeur D'Alene, 2011. Web. 02 Feb. 2014.
[2] "Chapter 9 – Hydrologic Soil-Cover Complexes." *NRCS EDirectives - Part 630 - Hydrology*. United States Department of Agriculture, May 2012. Web. 02 Feb. 2014. <http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17758.wba>.
[3] Uses the 1/4 acre parameter

provide compared to the impervious surface change if no parks exist. The difference in impervious surface is used in both calculating the change in stormwater runoff and pollution loads that result from precipitation. The impervious surface percentage is derived from the United States Department of Agriculture in order to integrate with national watershed modeling methods and matched to the zoning codes of the city of Coeur d'Alene (Table 6.3.1) (City of Coeur D'Alene, 2014).

Figure 6.3.2: Impervious Surfaces by Zoning District in Coeur d'Alene, Idaho

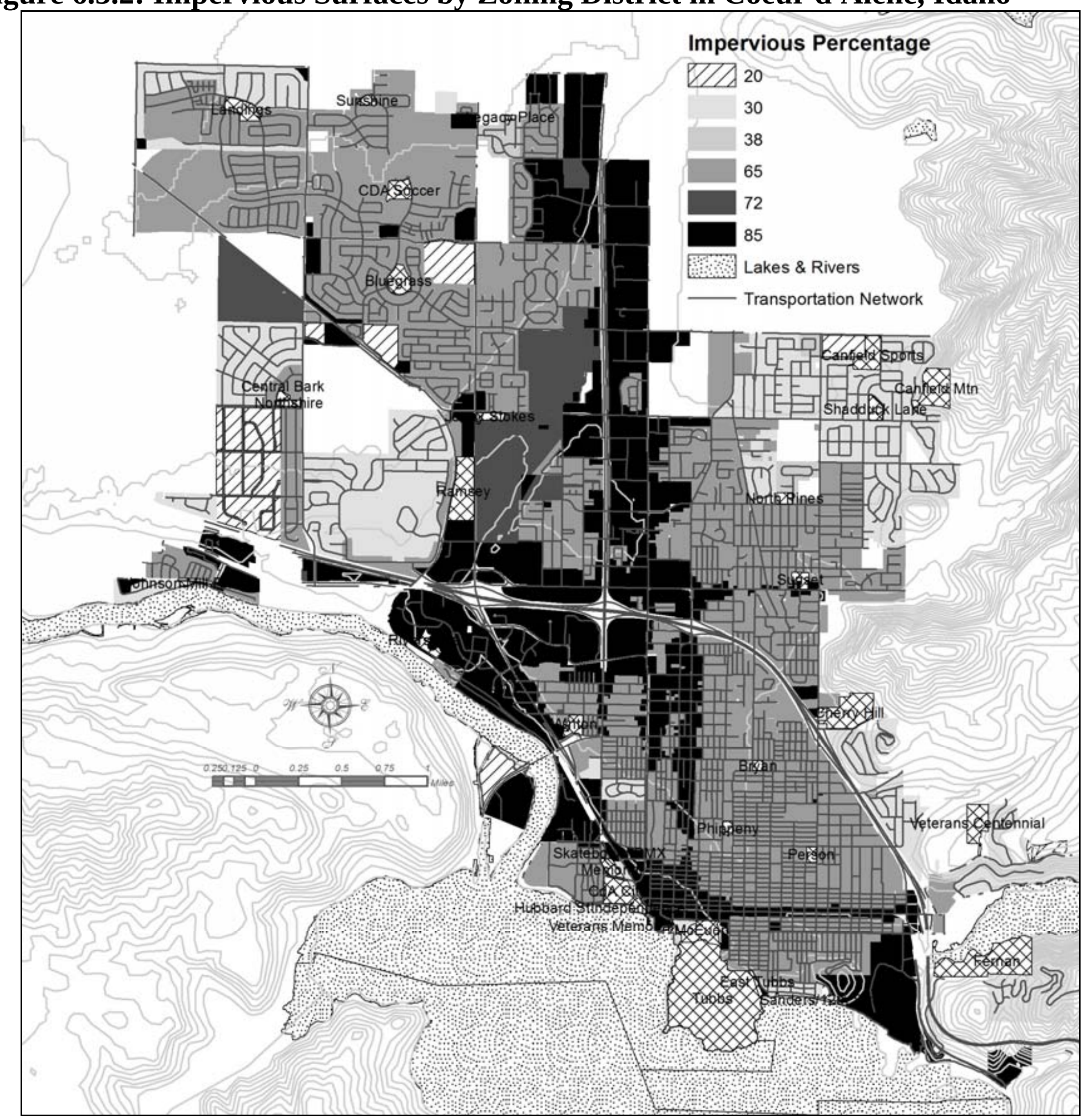


Table 6.3.3: Change in difference of Impervious Surface

Park Name	Park Impervious Surface[1]	Adjacent Impervious Surface District			Median	Difference
Bluegrass	15%	65%	-	-	65%	50%
Bryan	15%	65%	-	-	65%	50%
Canfield Mtn	15%	30%	-	-	30%	15%
Canfield Sports	15%	30%	20%	-	25%	10%
CdA City	15%	65%	30%	-	48%	33%
CDA Soccer	15%	65%	-	-	65%	50%
Central Bark	15%	65%	-	-	65%	50%
Cherry Hill	15%	65%	30%	-	48%	33%
East Tubbs	15%	85%	65%	30%	60%	45%
Fernan	15%	30%	-	-	30%	15%
Hubbard St	15%	65%	-	-	65%	50%
Independence	15%	85%	-	-	85%	70%
Jenny Stokes	15%	85%	72%	65%	74%	59%
Johnson Mill River	15%	85%	65%	30%	60%	45%
Landings	15%	65%	30%	-	48%	33%
Legacy Place	15%	38%	-	-	38%	23%
McEuen	15%	85%	30%	-	58%	43%
Memorial	15%	65%	30%	-	48%	33%
North Pines	15%	65%	38%	30%	44%	29%
Northshire	15%	65%	20%	-	43%	28%
Person	15%	65%	-	-	65%	50%
Phippeny	15%	65%	-	-	65%	50%
Ramsey	15%	85%	72%	65%	74%	59%
Riverstone	15%	85%	65%	-	75%	60%
Sanders/12th Street	15%	30%	20%	-	25%	10%
Shadduck Lane	15%	30%	-	-	30%	15%
Skateboard/BMX	15%	85%	65%	30%	60%	45%
Sunset	15%	85%	65%	-	75%	60%
Sunshine	15%	65%	-	-	65%	50%
Tubbs	15%	85%	65%	30%	60%	45%
Veterans Centennial	15%	30%	N/A	N/A	30%	15%
Veterans Memorial	15%	85%	30%	N/A	58%	43%
Winton	15%	85%	65%	N/A	75%	60%

[1] Impervious Surface Classification - University of Minnesota

The difference in impervious surface is calculated by determining the median percentage of all districts adjacent to each park (Figure 6.3.2 and Table 6.3.3). Using GIS, each park is assessed by applying the adjacent districts percentage as the value that would exist if the parks did not exist. Additionally, the existing impervious surfaces of the parks is accounted for by using the impervious surface of 15% as suggested in Impervious Surface Classification by the University of Minnesota (2011). The difference is the change in imperviousness that would exist if the parks did not exist and is used to calculate the quality and quantity benefit described in chapter 6.4.

Chapter 6.4: Coeur d'Alene Stormwater Management Economic Contribution

Stormwater management economic contributions rely on reductions of stormwater runoff quantity and stormwater pollution load. These two approaches are outlined to value the contribution by different park types and the stormwater best management practices engineering study of stormwater management.

The city of Coeur d'Alene stormwater management quantity economic contribution is calculated to predict the cost of stormwater management construction if no parks exist. Green Infrastructure for Landscape Planning, reports that engineers for the city of Lenexa, Kansas calculated $0.504 per square foot of impervious surface as the cost for construction of stormwater management facilities for new development (Austin, 2014). The total cost is summarized in Table 6.4.1 for all Coeur d'Alene parks and uses only the difference in impervious surface to value the change that the existing parks provide in reducing runoff. This cost saving can be applied to the city, developers, residents, or businesses, depending on who is determined to be responsible for the stormwater management costs had development taken place in lieu of the park land.

Table 6.4.1: Costs of Stormwater Management Construction

Park Name	**Impervious Surface (ft^2)**	**Cost ($.504/$ft^2$)[1]**
Bluegrass	250,976.85	$126,492.33
Bryan	46,245.14	$23,307.55
Canfield Mtn	156,410.89	$78,831.09
Canfield Sports	70,166.39	$35,363.86
CdA City	219,171.31	$110,462.34
CDA Soccer	210,510.77	$106,097.43
Central Bark	42,275.03	$21,306.62
Cherry Hill	417,952.04	$210,647.83
East Tubbs	38,250.38	$19,278.19
Fernan	353,501.51	$178,164.76
Hubbard St	9,844.45	$4,961.60
Independence	118,450.81	$59,699.21
Jenny Stokes	113,558.08	$57,233.27
Johnson Mill River	32,139.06	$16,198.09
Landings	154,788.45	$78,013.38
Legacy Place	9,516.49	$4,796.31
McEuen	288,497.82	$145,402.90
Memorial	58,234.59	$29,350.23
North Pines	48,226.08	$24,305.95
Northshire	40,927.51	$20,627.46
Person	71,446.47	$36,009.02
Phippeny	59,433.11	$29,954.29
Ramsey	733,027.32	$369,445.77
Riverstone	156,757.23	$79,005.65
Sanders/12th Street	5,377.14	$2,710.08
Shadduck Lane	41,239.21	$20,784.56
Skateboard/BMX	19,840.63	$9,999.68
Sunset	132,301.92	$66,680.17
Sunshine	64,443.77	$32,479.66
Tubbs	3,216,098.55	$1,620,913.67
Veterans Centennial	109,443.87	$55,159.71
Veterans Memorial	14,464.29	$7,290.00
Winton	171,206.16	$86,287.90
Total	**7,474,723.34**	**$3,767,260.56**

[1] *Green Infrastructure for Landscape Planning: Integrating Human and Natural Systems*

The city of Coeur d'Alene stormwater management quality cost savings calculates the increase of pollutants produced with the difference in impervious surface if the parks did not exist. This is compared for two events types; the monthly pollutant load that addresses constant levels of pollutant concentrations (Table 6.4.2), and storm events that addresses the influx of pollutant concentrations compared to the daily limits outlined by the

Table 6.4.2: Monthly Pollutant Load Comparison

Pollutant	Station 2: Bellerive[1]	Produced Monthly without parks[2]	Monthly Limit[3]
TSS (mg/l)	40	11.69	30
Total Lead (mg/l)	<0.0075	0.00	0.0025
Total Zinc (mg/l)	0.0549	0.00	0.135
TKN (mg/l)	2.98	5.85	Report
Total Phosphorus (mg/l)	0.39	0.12	N/A
Nitrate+Nitrite (mg/l)	2.98	1.17	Report

[1] July 2010 - City of Coeur d'Alene Storm Water Management Annual Report
[2] The National Stormwater Quality Database, Version 1.1
[3] NPDES Permit #ID 0022853

Table 6.4.3: Storm Event (2 year/24 hour storm) Pollutant Load Comparison

Pollutant	Station 2: Bellerive[1]	Produced in Storm Event[2]	Daily Limit[3]
TSS (mg/l)	40	39	N/A
Total Lead (mg/l)	<0.0075	0.00	0.0157
Total Zinc (mg/l)	0.0549	0.02	0.168
TKN (mg/l)	2.98	0.5	N/A
Total Phosphorus (mg/l)	0.39	0.22	0.051
Nitrate+Nitrite (mg/l)	2.98	0.58	N/A

TSS - total suspended solids, TKN - Total Kjeldahl Nitrogen (organic nitrogen plus ammonia)
[1] July 2010 - City of Coeur d'Alene Storm Water Management Annual Report
[2] The National Stormwater Quality Database, Version 1.1
[3] NPDES Permit #ID 0022853

National Pollution Discharge Elimination System (NPDES) Permit (Table 6.4.3). The produced monthly without parks and produced in storm event, are the pollution technologies to reduce those concentrations to meet the NPDES permit limits. In order to meet the permit requirements the cost of constructing the necessary treatment facility is calculate. Since parks avoid the need for these facilities, avoidance of these costs is a park benefit.

Implementation of stormwater pollution reduction technologies will incur construction costs, but will reduce the pollution concentrations to meet the standards. Table 6.4.4 is the cost to build the stormwater BMP's to the size needed. This guide, plus the use of Table 6.2.1, can be used to determine the cost expenditure for construction and the pollution reduction provided. For example, the current monthly total suspended solids (TSS) levels of 40 mg/l registered at Station 2 are over the monthly limit of 30 mg/l. The stormwater BMP to reduce that level by 25% could be an infiltration basin which costs $0.66 per ft3 of storage to construct (USEPA. 2005). If 29.07% of all runoff from parks was captured and 86% of TSS was removed, then a total of 25% removal of TSS would be achieved to meet the discharge standard. Accomplishing this would require a total of 381,163.24 ft^3 of runoff to be stored and treated in the infiltration basin. The cost to build the BMP would total $251,567.74. This actual cost of building a stormwater BMP feature to reduce pollution would have a secondary benefit. Since it would store some stormwater, it would reduce the requirement for stormwater storage to reduce flooding and other quantity issues. Therefore, the infiltration facility in the example above would provide an economic contribution in addition to the correction of pollution loads. Additionally, achieving the monthly and daily water quality limits avoids civil penalties, addressed in Chapter 6.5, from violation of the permit. This is another avoided cost benefit that that justifies spending on stormwater infrastructure.

Table 6.4.4: Average Construction Costs By BMP (adapted from National Management Measures to Control Nonpoint Source Pollution from Urban Areas)

Management Practice	Construction Costs	Useful Life (years)
Infiltration basin (ft^3 Storage)	$0.66	25
Infiltration trench (ft^3 Storage)	$5.23	10
Vegetated swales (linear ft)	$8.51	50
Porous pavement (ft^2)	$26.18	10
Filtration basins (ft^3 Storage)	$1.97	25
Water quality inlet with sand filter (per drainage acre)	$6.55	50
Ext. Detention Dry Pond (ft^3 Storage)	$0.55	50
Wet Pond and Extended Detention Wet Pond (ft^3 Storage)	$0.66	50
Bioretention practices (ft^3 Storage)	$0.66	50

Chapter 6.5: NPDES Permit Violation Civil Penalties

Penalties for violating the National Pollutant Discharge Elimination System (NPDES) is one cost that can be incurred by businesses, developers, or the city itself. Under the current permit for the city of Coeur d'Alene, violations can result in administrative civil penalties up to $11,000 per day for each violation. In 2009, the Hecla Mining Company, operating a mine near Mullan, Idaho, was fined $177,5000 for violations of it's NPDES wastewater permit for exceeding its limits for lead, zinc cadmium, and TSS (Occupational Health & Safety, 2009). The company was also issued an administrative order to upgrade the wastewater treatment system to full compliance. The Miami-Dade County, Florida was another entity cited for a violation of its NPDES permit at the local government scale. This resulted in a civil penalty of $978,000, and the repair of three waste water treatment plants and sewer system estimated to cost $1.6 billion. The agency was also required to implement a Supplemental Environmental Project to eliminate contaminating septic tanks. The cost of this measure was at least $2,047,200 (Morrissey, 2013). While these repair costs and civil penalties only arise when in violation, steps can be taken to reduce to risk of possible violation.

The water quality benefit for city parks could save or reduce these cost by minimizing the amount of pollution in stormwater runoff and reducing the risk of incurring penalties resulting from NPDES violations. Additionally, enacting an Supplemental Environmental Project within city parks can also be done cost effectively if stormwater management and treatment are part of the design programs for new and refurbished parks.

References:

Austin, Gary. Green Infrastructure for Landscape Planning: Integrating Human and Natural Systems. London: Routledge, 2014. 170. Print.

City of Coeur d'Alene. "City of Coeur D'Alene - Zoning District Information." City of Coeur D'Alene - Zoning District Information. City of Coeur D'Alene, 2014. Web. 16 Apr. 2014. <http://www.cdaid.org/152/departments/planning/zoning-district-information>

City of Coeur d'Alene. "City of Coeur d'Alene Storm Water Management Annual Report." City of Coeur D'Alene. City of Coeur d'Alene, 2011. Web. 1 Mar. 2014. <http://www.cdaid.org/files/Engineering/StormwaterManagementPlan.pdf>

Coder, Rim D. "Identified Benefits of Community Trees and Forests." Warnell School of Forestry and Natural Resources. The University of Georgia, Oct. 1996. Web. 11 Dec. 2013. <warnell.forestry.uga.edu/service/library/for96-039/for96-039.pdf>.

Cranz, Galen, and Michael Boland. "The Ecological Park as an Emerging Type." Places 15.3 (2003): 44-47. The Design Observer Group. Observer Omnimedia LLC, 1 July 2003. Web. 11 Feb. 2014. <http://places.designobserver.com/feature/the-ecological-park-as-an-emerging-type-----research-and-debate/373/>.

Dietz, M. E. (2007). "Low impact development practices: A review of current research and recommendations for future directions." Water Air and Soil Pollution 186(1-4): 351-363.

Dwyer, J.F.; McPherson, E.G.; Schroeder, H. W.; Rowntree, R.A. 1992. Assessing the benefits and costs of the urban forest. Journal of Arboriculture. 18(5). Arboriculture & Urban Forestry. Web. 11 Dec. 2013. <http://joa.isa-arbor.com/>

Occupational Health & Safety. "Idaho Mine Operator Pays for NPDES Permit Violations -- Occupational Health & Safety" Occupational Health & Safety, 4 June 2009. Accessed April 11, 2014. <http://ohsonline.com/articles/2009/06/04/idaho-mine-operator-pays.aspx>

Maestre, Alex, and Robert Pitt. "The National Stormwater Quality Database, Version 1.1." Civil, Construction, and Environmental Engineering. The University of Alabama, 2012. Web. 15 Mar. 2014. <http://rpitt.eng.ua.edu/Publications/Stormwater%20Characteristics/NSQD%20EPA.pdf>.

Morrissey, Alan. "EPA." Miami-Dade County Clean Water Act Settlement. U.S. Environmental Protection Agency, 6 June 2013. Web. 11 Apr. 2014. <http://www2.epa.gov/enforcement/miami-dade-county-clean-water-act-settlement>.

National Recreation and Parks Association. "EcoBenefits: Measuring the Economic Benefit of Local Parks." PRORAGIS EcoBenefits, EcoBenefits Calculator, Measuring the Economic Benefit of Local Parks. National Recreation and Parks Association, 2011-2013. Web. 09 Dec. 2013. <http://www.nrpa.org/PRORAGIS/Eco-Benefits>

National Reacreation and Parks Association. "PRORAGIS." PRORAGIS, Park and Recreation Operating Ratio and Geographic Information System. National Reacreation and Parks Association, 2011-2013. Web. 11 Nov. 2013. <http://www.nrpa.org/PRORAGIS/>

The Trust for Public Land. "Measuring the Economic Value of a City Park System." Measuring The Economic Value Of A City Park System. The Trust for Public Land, 2009. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>

The Trust for Public Land. "The Economic Benefits of Denver’s Park and Recreation System." Denver Park Value Report. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/denver-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of Seattle’s Park and Recreation System." Seattle Park Value Report. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." Mecklenburg County Park Value Report. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

United States Environmental Protection Agency. 2005d. National Management Measures to Control Nonpoint Source Pollution from Urban Areas. EPA 841-B-05-004. U.S. Environmental Protection Agency, Washington, DC. Web. 19 Mar. 2014. <http://water.epa.gov/polwaste/nps/urban/upload/urban_guidance.pdf.>

United States Environmental Protection Agency. "NPDES Permit #ID 0022853." United States Environmental Protection Agency. United States Environmental Protection Agency, 25 June 2013. Web. 19 Mar. 2014. <http://www.epa.gov/region10/pdf/permits/npdes/id/CDA_FS.pdf>

University of Minnesota. "Impervious Surface Classification." Impervious Surface Classification., 2011. Web. 16 Apr. 2014. <http://land.umn.edu/methods/imperv_class.html>

Chapter 7: Resident and Administration Benefit

Figure 7.1: Event at Sunshine Meadows Park, Coeur d'Alene, Idaho

Photograph Found Online: "Sunshine Meadows Park, Coeur d'Alene, Idaho". N.d. Parks Department, City of Coeur d'Alene. *cdaid.org/parks*. Web. 5 May 2014.

The Direct Use Value, as outlined by the Trust for Public Land, is the indirect benefit that is gained from engaging in a certain activity if the park user were to pay for it (Trust for Public Land, 2009 5). Economist refer to this as a "willingness to pay", and establishes the cost savings to the park user engaging in a certain activity in a park free of charge. The model used in the calculation is based upon the method developed by the U.S. Army Corps of Engineers that assigns a dollar value, "Unit Day Value" (Trust for Public Land, 2009 5). The Trust for Public Land uses this example to justify this input: "For example, playing in a playground is worth $3.50. Running, walking, or in-line skating on a park trail is worth $4, as is playing a game of tennis on a city court. For activities for which a fee is charged, like golf or ice skating, only the “extra value” (if any) is assigned; that is, if a round of golf costs $20 on a public course and $80 on a private course, the direct use value of the public course would be $60" (Trust for Public Land, 2009 5). This value is then modified to reflect frequent park by users since this value diminishes with increase of the frequency over time. For example, playground use value for one child is $3.50 the first week, but this is reduced to $1.93 for the seventh week for that child (Trust for Public Land, 2009 5). This value is then applied to seasonal trends of activity use in parks (Trust for Public Land, 2009 5). The total estimation is derived from city surveys that specifically inquire about park activity use. The National Recreation and Parks Association does not apply this factor in the park value calculation.

Chapter 7.1: Volunteer Benefits

Volunteering at the parks for events and park improvement activities allows residents to take part in community interaction and lend individual expertise. The Trust for Public Land has defined this as the community cohesion value, which is the "social capital", the social benefits (the value of interacting, communicating, competing, learning, and growing) that park environments provide (Trust for Public Land, 2009 9). The Trust for Public Land establishes the value of social capital as the amount of time and money that residents devote to the park, specifically volunteer hours and financial contributions (Trust for Public Land, 2009 9). This value is calculated by contributions to "friends of parks" groups and the volunteer hours multiplied by the hourly equivalent of volunteerism by the national organization Independent Sector (Trust for Public Land, 2009 9). Independent Sector calculates this value based upon hourly earnings of all production and nonsupervisory workers on a private non-farm payrolls average (derived from the yearly earnings provided by the Bureau of Labor Statistics) and then increases it by 12 percent to estimate for fringe benefits (BLS). Independent Sector also mentions that due to the difficulty of putting a dollar value on volunteer time "this is only a tool and only one way to show the immense value volunteers provide to an organization" and refers to the Bureau of Labor Statistics for hourly wages by occupation that can be used to determine the value of the specific value of wages (BLS). For example, the Independent Sector states that a volunteer hour is valued in Washington State at $22.69 per hour (BLS), as opposed to the Bureau of Labor Statistics Seattle-Tacoma-Bellevue, WA for Landscaping and Groundskeeping Workers with a median hourly wage of $14.40 per hour and a mean hourly wage of $15.29 per hour (BLS). The National Recreation and Parks Association does not apply the factor in the EcoBenefits park value calculator.

The wage savings of having volunteers doing work instead of personnel employed in a full time position is a real savings in employee wages. There are three ways to count those savings. The first is counting the hours of volunteers and basing that on the Independent Sector hourly wage, which is appropriate if the type of job performed is not known. The second is counting the hours of volunteers for each type of job performed and calculating the value based on the Bureau of Labor Statistics geographical figure, which would provide a more realistic hourly wage than with the first option. The third would be to estimate the full-time jobs needed to be performed that were performed by volunteers. This may skew the value depending on the what jobs and how long they were performed. For example, if 100 volunteers over the course of a year averaged 40 hours a week, this would be equal one full-time position. However, if 10 volunteers over the course of a year averaged 10 hours of work per week that would not be equivalent to a full time position, since there would still have to be a full-time (or at least part-time) position within the city to do the job. When volunteers replace the need for a full time worker there is hiring costs and job benefits savings. All three scenarios produce an economic contribution to the city but the value differs somewhat.

= Total Financial Contributions Value (Monetary + Materials Cost)

Option 1 = Total Volunteer Hours x Independent Sector hourly equivalent of volunteerism = Value of Volunteer Hours

Option 2 = Σ(Specific Job Total Volunteer Hours x Specific Job Bureau of Labor Statistics geographical hourly wage)

Option 3 = Σ(||(Specific Job Total Volunteer Hours/52 weeks per year)|| x (Specific Job Salary + additional costs/benefits)

According to Independent Sector, the value of volunteer time in Idaho is $19.92 per hour. The BLS reports that Landscaping and Groundskeeping Workers earn a median hourly wage of $12.13 and an annual mean wage of $26,860 in Coeur d'Alene (Table 7.1.1). The volunteering beconomic contribution is also considered a service of cost

Table 7.1.1: Volunteer Wage to Full Time Employee (FTE) Comparison

Parks Department Employees	Approximate Hourly Wage	2012 Actual Budget
12.00 FTE	$19.43	$485,047.43
12.04 FTE	$15.41	$385,975.41
Coeur d'Alene Volunteers	Hourly Wage	Volunteer Per FTE Equivalent[1]
Independent Sector	$19.92	$41,433.60
Landscaping and Groundskeeping Workers	$12.13	$25,230.40

[1] Per 2,080 hours (40 hour work week)

savings for a limited or no expense to the parks department. This expense only occurs because the parks exist which will not be applied to the final calculation, only that there is cost savings in rendering volunteers for the parks department as a savings in operating costs.

Chapter 7.2: City Parks Revenue/Expenditure

The revenue and expenditure for city parks departments is the summation of operations in a financial statement, typically reported in the city's budget. Although this changes annually, the accounting of these finances identifies trends of benefits or shortfalls within a model that are useful in policy making and financial decisions. The National Recreation and Parks Association accounts for these revenues in the Direct Revenue Benefits as an input into the PRORAGIS EcoBenefit Calculator. This is generated internally from a parks and recreation department that receives fees, rentals, entry fees and permits, and represents the prior fiscal years revenue recovered through the activities (EcoBenefits: Measuring the Economic). This input is just the revenue generated with no multipliers since it is actual revenue. The Direct Revenue Benefits is not applied in The Trust For Public Land park value calculation.

The City of Coeur d'Alene Parks and Recreation Department identified by the City of Coeur d'Alene finance department calculates the revenues and expenditures in the annual Financial Plan. The 2012 revenues and expenditures are used for this model to continue continuity with other economic value inputs. The total fiscal impact reported is $1,763,374.63 (Table 7.2.1).

Table 7.2.1: Coeur d'Alene Reported Financial Statement of Parks Department (2012)

General Fund Expenses	($1,694,818.63)
Capital Improvement Fund Revenues	$232,905.38
Capital Improvement Fund Expenses	($301,461.38)
Total	($1,763,374.63)

References:

City of Coeur D'Alene. "City of Coeur D'Alene - Financial Plan." *City of Coeur D'Alene - Financial Plan*. City of Coeur D'Alene, 2014. Web. 1 Apr. 2014. <http://www.cdaid.org/5/departments/finance/financial-plan>.

Independent Sector. "Independent Sector's Value of Volunteer Time." *Value of Volunteer Time | Independent Sector*. Independent Sector, 2012. Web. 12 Dec. 2013. <http://www.independentsector.org/volunteer_time>.

Kootenai County - Assessor's Department. *Kootenai County - Assessor's Department*. Kootenai County, 2011. Web. 16 Nov. 2013. <http://www.co.kootenai.id.us/departments/assessor/>.

National Recreation and Parks Association. "EcoBenefits: Measuring the Economic Benefit of Local Parks." *PRORAGIS EcoBenefits, EcoBenefits Calculator, Measuring the Economic Benefit of Local Parks*. National Recreation and Parks Association, 2011-2013. Web. 09 Dec. 2013. <http://www.nrpa.org/PRORAGIS/Eco-Benefits/>.

The Trust for Public Land. "The Economic Benefits of Denver's Park and Recreation System." *Denver Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/denver-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of Seattle's Park and Recreation System." *Seattle Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/seattle-park-value-report-0>.

The Trust for Public Land. "The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina." *Mecklenburg County Park Value Report*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/mecklenburg-county-park-value-report>.

The Trust for Public Land. "Measuring the Economic Value of a City Park System." *Measuring The Economic Value Of A City Park System*. The Trust for Public Land, 2013. Web. 04 Dec. 2013. <http://www.tpl.org/node/79299>.

United States Department of Labor. "May 2012 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates Seattle-Tacoma-Bellevue, WA." *Bureau of Labor Statistics*. United States Department of Labor, May 2012. Web. 12 Dec. 2013. <http://www.bls.gov/oes/current/oes_42660.htm>.

United States Department of Labor. "May 2012 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates Coeur d'Alene, ID." *Bureau of Labor Statistics*. United States Department of Labor, May 2012. Web. 12 Dec. 2013. < http://www.bls.gov/oes/current/oes_17660.htm>

Chapter 8: Inventory of Benefits

The inventory of benefits is the summation of all subsequent park economic values calculated by the modified method and organized in a manner easy to disseminate. It is organized to separate the recipients into the four groups that will benefit from the park values and the ones that use the park. These groups are: the City of Coeur d'Alene government, residents, local businesses, and developers. The City of Coeur d'Alene benefits from the reciprocating values that are given to the city for the maintenance or parks and tax collection to support these parks (Table 8.1). Residents benefit as users of the park spaces and maximize those benefits by using the amenity. Local Businesses have the most potential to benefit from these parks as they can draw outside visitors with the unique events that Coeur d'Alene can sponsor. Developers have the best potential to maximize successful park spaces and their own profits if approached correctly. This format of displaying city parks should be highly receptive to these groups identified and easier to all users of this model.

Table 8.1: Modified Park Economic Value Total

Type	City Actual Revenue	Residents	Businesses	Developers
Property Values	$543,436.12	($258.29)[1]	-	$44,440.80[2]
Tourism	-	-	$10,152,000	-
Health Value	-	$364-$727	$43,859.53	-
Air Quality Benefit	$55,416.23	-	-	-
Water Quality	$3,515,692.52	-	-	-
Volunteer Benefits	$385,975.41			
Annual Revenue	$232,905	-	-	-
Annual Expenditure	($1,996,280.01)	-	-	-
Total Real Value	($1,219,938.51)	($258.29)	$10,152,000	$44,440.80
Total Real and Theoretical Value/Savings	$1,517,207.14	$105.71-$468.71	$10,195,860	-

[1] Homeowners only
[2] Per residential unit sold
[3] Not annual, one time construction cost

Chapter 9: Conclusion

The modified parkland economic valuation method developed by this thesis addresses realistic costs that focus on producing comprehensible values for users. This method is ideal for use as a calculation of the value of individual park calculation due to the accuracy of the model and the simplified, yet descriptive methods. Individual parks, especially new development, would be well served under this model due to the simplified functions and applicable values. The output is also unique in that it classifies the values and costs into recipient group instead providing only a total sum.

However, this method is not without difficulties and would benefit from further research. The meta-analysis, which was rejected, needs further research before it can be applied accurately and confidently. Additional inputs may be needed to be included in the meta-analysis model for correction. Additionally, more studies and perhaps representation from all regions in the U.S. would correct the meta-analysis model. Using the National Parks and Recreation Association method of property valuation was a second choice and achieved a similar level of accuracy. An improved meta-analysis would reaffirm the accuracy of the NRPA variable and would achieve a higher level of confidence.

There are also intangible values that are not addressed which also skew the economic value the are concluded by the modified parkland economic valuation method and by both TPL and NRPA park benefit valuation methods, which establishes the real need and use for urban parks themselves. Many values such as cultural, spiritual, education, aesthetic, etc are not addressed and may only be inventoried through further research and analysis in economic valuation, substitution, or demand of these values. These values will contribute to the economic value of parks once discovered and further identify the truer economic benefit, impact, and contribution of urban parks.

The modified park value estimation method strengths are the applicability to model individual parks to an accuracy comparable to the method of assessing city park systems using the Trust for Public Lands method. Although the uses for this model would favor individual park modeling, this method also would be suitable for city park system valuation for smaller cities that do not contract with the Trust of Public Land for a valuation study.