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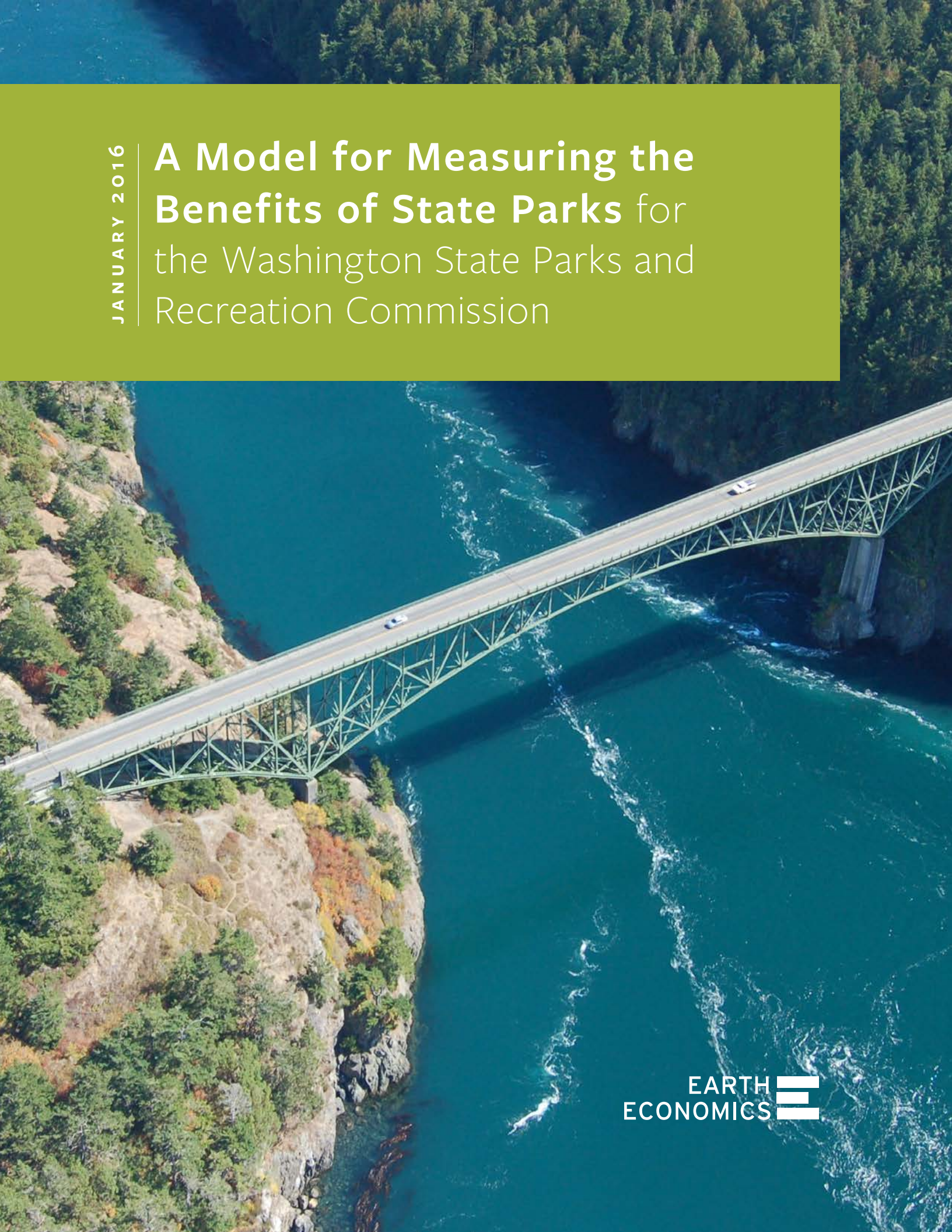
A Model for Measuring the Benefits of State Parks for the Washington State Parks and Recreation Commission



EARTH ECONOMICS

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The authors are responsible for the content of this report.

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Executive Summary

Washington's state parks provide a myriad of benefits to both urban and rural environments and nearby residents. Green spaces within state parks provide direct benefits to the populations living in close proximity. For example, the forests within state parks provide outdoor recreational opportunities, and they also help to store water and control flooding during heavy rainfalls, improve air quality, and regulate the local climate. In cities, green spaces tend to be smaller, but with a larger number of beneficiaries. In rural settings, green spaces can be larger and better able to perform natural processes while also providing more unique recreational opportunities that help fuel local economies. Even residents who do not live nearby benefit from state park lands. For example, carbon sequestration or water storage provide benefits well beyond the immediate vicinity of these lands.

The benefits provided by state parks can be economic, social, environmental, or health-related and it is important to take this whole suite of potential benefits into account to better inform decision-making. This report provides a framework to help decision-making regarding state park acquisition and development and a tool prototype to operationalize the framework. The framework outlines ways to value benefits given potential beneficiaries and land cover types and configurations. The benefits are expressed as economic values that are applicable to policy decision-making at every jurisdictional level.

This report also identifies drivers for visitation. A regression analysis was exercised to reveal variables that may influence park visitation, such as wildlife viewing and recreational opportunities. The regression returned promising results, but demonstrated that by nature, predicting behavioral patterns is complicated. Often, variables cannot be quantified.

Parks provide immense market and non-market benefits to the surrounding communities, often at minute costs when compared with the benefits. With the proposed framework and tool, decision makers will have the proper means to demonstrate the full benefits that parks provide.

Chapter I. Introduction

The Washington State Parks and Recreation Commission engaged Earth Economics to develop a framework and accompanying tool for making more informed decisions in acquisition and development. Currently, the Commission does not have a defined set of measures or a systematic method for evaluating the benefits of state parks.

More specifically, the Commission aims to be more directed and less opportunistic with land acquisition and development and to maximize the value of parks in terms of economic, social, and environmental benefits. A parks performance evaluation system and a systematic method for determining strategic new park development are needed. Moreover, there is increasing pressure to recognize and integrate the non-market benefits provided by a healthy environment. By including these benefits, the Commission seeks to broaden its understanding of performance measures by integrating effects on Washington's ecosystems into the decision-making process.

This report and accompanying tool will aid the Commission in identifying successful parks and those in need of business plan adjustments. Additionally, this report lays out a framework to guide park acquisition and development. Key drivers such as park visitation were identified and modeled, and the predictive power of this tool can be improved as more data becomes available.

The first step in the development of the tool was to identify the main criteria for consideration in a decision-making tool. Secondly, the measurement or quantification of these criteria was established in order to operationalize the tool.[a] The framework outlined in the next two chapters will serve as a foundation that can be modified and adjusted as more information becomes available. Some unmeasurable criteria will remain important, but will have to be evaluated at the discretion of the decision-maker. In general, the purpose of this tool is to aid land acquisition managers in making sound investment decisions now and in the future.

The Mission and Vision of the Washington State Parks and Recreation Commission served as guiding principles for this work.

Mission: The Washington State Parks and Recreation Commission cares for Washington's most treasured lands, waters, and historic places. State parks connect all Washingtonians to their diverse natural and cultural heritage and provide memorable recreational and educational experiences that enhance their lives.

[a] Measures and parameters used to operationalize criteria can change over time.

Vision: Washington's state parks will be cherished destinations with natural, cultural, recreational, artistic, and interpretive experiences that all Washingtonians enjoy, appreciate, and proudly support.

Issues Surrounding Land Acquisition

Historically, the Commission's investment decisions have been made in an opportunistic but non-systematic way, based on whether a property has interesting natural, cultural, or recreational potential. In recent years, there has been increasing pressure to focus on financial returns. However, non-market returns such as social benefits or environmental improvements can be equally, if not more, important outcomes when measured and integrated into decision-making. The proposed framework and tool provide structure for the decision-making process.

The tool is analogous to a Return on Investment (ROI) analysis tool that can be used not only to justify current park investments, but also to make improved investment choices when acquiring and developing land for state park use in reference to different economic, environmental, and social criteria. In addition to providing a more complete account of all the potential returns that can be expected from different land stewardship investments, this tool could also be used to understand the beneficiaries of different actions, alignment with specific policy goals, and potential mechanisms to make state parks more sustainable. For example, beneficiaries from environmental improvements may be different from those of improved park amenities. Policy goals can include health campaigns or climate mitigation efforts, which can be measured with this tool. Understanding park revenue and visitor trends also speak to the sustainability of parks.

Smart investments are the key to securing real prosperity and long-term value both in the private and public sectors. An important advancement for private investment was the improved valuation and reporting required for private firms. Just as private investors were largely blind to a company's value 100 years ago, firms, citizens, and decision-makers today may be unable to make the best investment decisions without policies that build environmental and social values into reporting standards and investment opportunities.

In recent years, more agencies have adopted environmental and social goals in addition to their financial goals under the concept of a triple bottom line business strategy. This strategy of integrating all benefits, rather than purely financial benefits, has proven to be more beneficial in the long run for sustaining economic prosperity.[1] Moreover, there is now increasing pressure on public institutions to explicitly account for ecosystem service impacts.[2]

Integrating the costs and benefits of conservation investments into the land acquisition and development decision-making process can begin with the framework provided in this report. Well-informed land use decisions and natural resource management, integrated across the

landscape and its services (e.g., water resources, parks, flood-risk reduction, biodiversity), build a more efficient economy and a foundation for successful land management.

Developing a reliable strategy for land acquisition is a complex task, however. Many factors complicate the development of a systematic approach, such as population trends over time, changing recreational preferences, land development, and shifting policy goals. The proposed framework adopts a set of assumptions and methods which can be adjusted as key parameters change.

Related Work

The tool is based on the foundation laid out in Earth Economics' original 2015 report to the Recreation and Conservation office, *Economic Contribution of Outdoor Recreation in Washington State*. This report accounted for recreation occurring on Washington State lands, both public and private.

Follow up work for the Washington State Parks and Recreation Commission narrowed the focus to the contribution of state parks in Washington; *The Economic Contribution of Washington State Parks*. This work helped to identify key drivers of visitation to parks and showcase the non-market value of state parks' lands.

Study Limitations

The scope of work was to develop a model for measuring the quantitative (and, to the extent possible, the qualitative) benefits of acquiring and developing land for use as state parks. The Commission asked the following questions:

- Where should the Commission acquire lands for new parks?
- Which of the undeveloped properties currently owned by the Agency should be targeted first for park development?

The questions were addressed by converting all quantifiable elements into a common indicator, monetary units. This process requires the valuation of many non-market benefits. Valuation exercises have limitations, yet they should not detract from the core findings of this study. First of all, not all elements can be quantified. Those that can be quantified are limited to the value that can be derived for economic frameworks. Most importantly, qualitative elements are left to the judgment and discretion of the decision-maker. For this reason, it is important to be transparent regarding the proposed framework and tool's scope and capabilities.

In addition, most of the valuation methodologies use secondary data for the economic value attributed per spatial or demographic unit. For example, the economic value of a given ecosystem (e.g., wetlands) is estimated from prior studies of that ecosystem type, translated

into a ‘per acre’ unit. This methodology provides a general value estimate without collecting primary data on the particular health of the existing ecosystems in a given state park.

The predictive tool has further limitations. Humans make unpredictable decisions; therefore, forecasting human behavior based on a set of parameters and historical trends is challenging. This, paired with data limitations, limits the predictive power of the tool prototype.

Who Should Use This Report

This report is intended to be used by the Washington State Parks and Recreation Commission, but it can also be used by the State of Washington, and city and county officials to better inform decision-making and investment in recreational lands. Innovative economic measures, policies, funding mechanisms, and smart investment can come together in Washington State to provide multi-benefit, sustainable solutions to secure healthy lands and healthy economies.

The results of this report should catalyze public dialogue regarding the development of a local and state-level funding source to both maintain existing economically and ecologically critical programs/projects, and to help position the Commission to be highly competitive for state, federal and private grants for park lands as an invaluable asset to Washingtonians.

Chapter II. Identifying Criteria for Assessment

This section outlines the first step in the creation of a framework for tool development. First, we identified key criteria for assessment and outlined the market and non-market benefits associated with state parks. Earth Economics met with stakeholders and subject matter experts from the Commission to create a framework for tool development. The Commission has years of experience acquiring land for state park development, therefore they are best positioned to identify why people visit state parks. Meetings with Commission staff helped to address the question "What value do state parks provide to Washingtonians?"

The criteria for assessment encompass three major themes of the triple bottom line, representing different types of benefits: environment, economy, and society. Figure 1 illustrates the themes and subcomponents that define the general criteria. It should be noted that many of the benefits emerging from state park recreation overlap more than one benefit category. The following sections describe each of these themes in further detail.

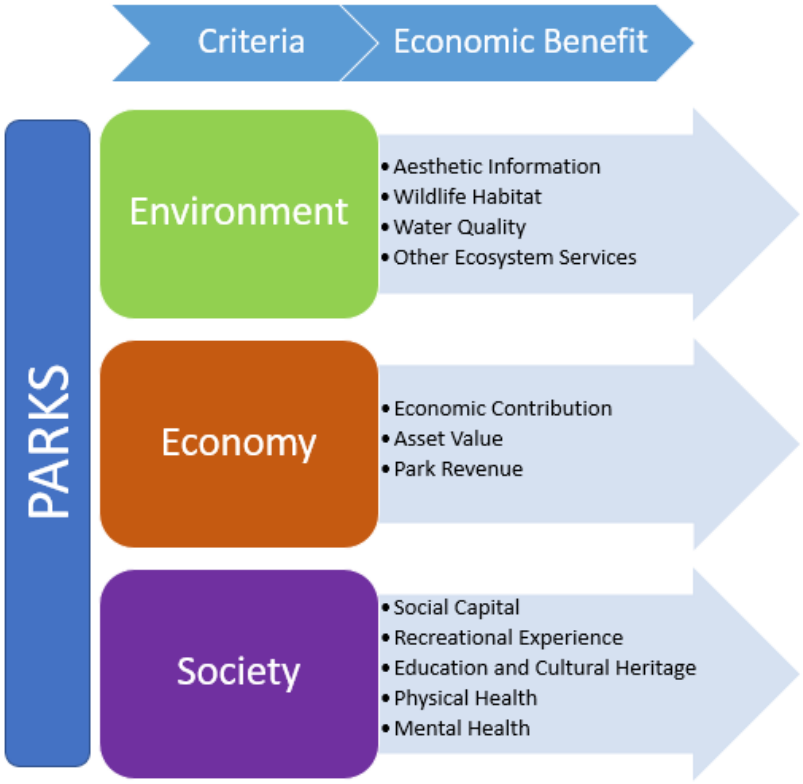


Figure 1. Criteria for assessment of park benefits

Environment

Natural capital is defined as the greenspace, forests, coastline, and bodies of water that exist within the state parks system. Ecosystem services are the benefits these natural systems provide free of charge. If recreated with manmade solutions, these services would be enormously expensive, yet their value often remains unrecognized in spite of the many market and non-market benefits they provide to Washingtonians every day. Forests, natural floodplains, wetlands, estuaries, barrier islands, rock reefs and kelp forests, for example, all help absorb and store large amounts of rainwater and runoff, or act as a buffer against storm surges and coastal wave action. These natural assets reduce storm and flood damage and lessen the need for costly infrastructure. The benefits provided by natural systems translate into real savings and valuable goods and services. The Commission's investments have supported important ecosystem service benefits through their acquired land. Figure 2 shows the relationship between natural capital and the production of ecosystem services.

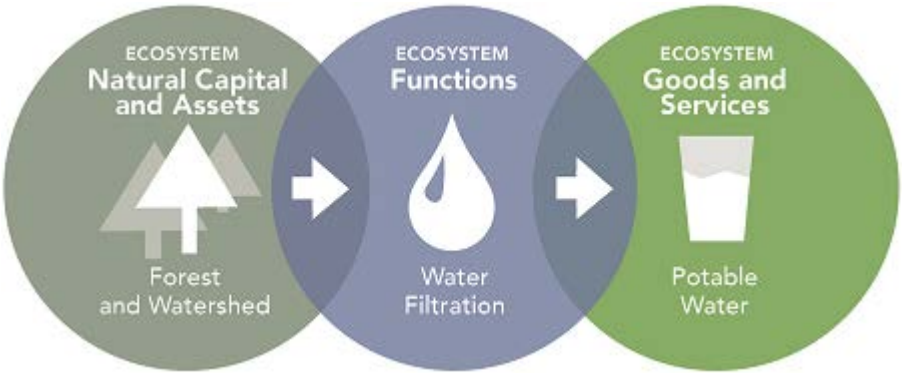


Figure 2. Provision of ecosystem services

Science's capacity to measure and integrate natural capital benefits into traditional economic metrics is growing. Typically, conservation projects have been measured by acres acquired, easements purchased, or trees planted. Today, the benefits of these conservation investments can also be estimated in dollar values for the direct benefits they produce or costs avoided. Ecosystem service valuation assigns a dollar value to goods and services provided by a given ecosystem contained within a land cover. The following descriptions outline the ecosystem services addressed in this framework.

Aesthetic Information

Aesthetic Information is defined as enjoying the sights, sounds, smells, and presence of nature. This ecosystem service is often valued through the environmental attributes of property sales

and hence reflects the added housing value to those who live close to outdoor recreational areas. Properties located on the edge of a lake are often more expensive than non-lakeside properties in the same area. For example, one half of the respondents to a National Association of Realtors survey reported they would pay 10% more for a house located near a park or open space, while the actual premium paid for homes directly adjacent to parks is 16% higher. [3]

Wildlife Habitat

Recreational activities like wildlife viewing or hunting would not exist without the ecosystem service of habitat and nursery. Wildlife viewing was in fact the most lucrative outdoor recreation activity in Washington State in 2014.[4] Beyond recreation, however, ecosystems within state parks also provide safe havens for endangered species and other species critical to food webs and other ecological functions. In some cases, people value the existence of wildlife as an end in itself (intrinsic value of wildlife), yet there are many other methods for valuing habitat. It can be valued as a factor of production (e.g. inputs to crops or maintenance of fish populations) or through willingness-to-pay surveys for specific species.

Water Quality

Many state parks feature rivers, lakes, and watersheds. The vegetated landscape around these water bodies plays an important function in improving or maintaining water quality, which eventually affects downstream users as well. Forest and grassland vegetation along river banks stabilizes soils and prevents erosion, reducing sediment run-off. Vegetation, microbes, and soils remove pollutants and sediment from the water by adhering to contaminants, reducing water speed to enhance infiltration, biochemically transforming nutrients and contaminants, absorbing water and nutrients from the root zone of trees, stabilizing eroding banks, and diluting contaminated water.[5] Other types of species, like shellfish, are able to provide clean water by removing pollutants and sediment from the water. Natural lands filter and control the flow of water in lieu of built infrastructure like water purification facilities, levies, and storm water systems. One way to value water quality is by determining the replacement value, or the cost of replacing these natural filtration and flow control functions with built infrastructure.

Other Ecosystem Services

State park lands provide many other ecosystem services in addition to those outlined above. Stormwater, flood, or fire protection, climate regulation, carbon sequestration, and educational opportunities are just some of the other important ecosystem services communities can access (see Appendix B for a more complete list). The proposed tool prototype only measures the three services outlined above (water quality, habitat, and aesthetics).

Economy

State parks are assets to neighboring communities through park visitor spending and to the Commission in terms of revenue streams and asset holding value. Parks provide a vessel for

economic activity, sustaining local businesses, creating jobs, and fueling local economies. Moreover, park lands themselves appreciate in value over time and park entrance fees and other services help to fund operations.

Economic Contribution

Visitor expenditures, which are defined as any expenditure related to state park visitation, promote economic activity. This economic activity ripples in the economy across a wide array of industries and generates income, jobs, and taxes. The income, jobs, and taxes that are generated by state park visitation are called economic contributions.

Not all economic contributions are the same; some industries are better at recirculating spending within the regional economy. For example, when a person spends $20 on a trip to a movie theater, much of that $20 immediately leaves the regional economy and goes to production studios, movie theater chains, and chain restaurants, while only a small portion stays within the region, mostly in the form of employee compensation. Spending associated with recreation at state parks, however, tends to recirculate within the economy at a higher rate. As *Economic Contribution of Washington State Parks* found, 51.5% of spending associated with state park visitation stays within the state.[4] A British Columbia study[6] found that 45% of spending at local independent retailers stays within the region while only 17% of spending at national chains stays within the regional economy. When money is re-spent within the region, more taxes, jobs, and income are created.

Trip expenditures associated with park visitation depend on a myriad of factors. Within the State Parks system, some parks serve predominantly as local day parks and therefore do not yield much spending per visit. Other parks are destinations for multi-day, non-local overnight campers that result in considerable spending within rural communities. Finally, many parks provide a mix of these two ends of the spectrum. Parks can be grouped according to their proximity to urban centers (urban, rural, or suburban). These park designations, along with the major activities that happen within them, are used to determine park spending profiles.

As previously stated, visitation to state parks brings spending to nearby communities, whether urban or rural. Outdoor recreation opportunities play an important role in rural development and economic livelihood. Often, rural communities have limited economic opportunities and a few large industries contribute to most of the jobs and income within a county. Therefore, expenditures injected into the rural markets can have significant influence on the region's economy. Economic contribution will be measured with three metrics: economic output, tax generation, and non-park jobs.

Economic Output

When participants visit Washington's state parks, they spend money on groceries, hotels, restaurants, and recreation equipment. There is a ripple effect each time money changes hands; a portion of it leaves the region, some is re-spent within the region, and the rest is saved. The money that is re-spent within the region continues to generate economic activity. The sum of all of these ripple expenditures is defined as economic output. This report uses two regions for assessment: the county and the state as a whole.

Tax Generation

Expenditures on production and imports made by state park visitors will generate tax revenue, or tax on production and imports (TOPI), a large portion of which contributes directly to the State General Fund.

Non-Park Jobs

Consumer expenditures also provide vital jobs to the surrounding community. In some areas, outdoor recreation tourism is one of the main drivers of employment. Non-park jobs include food service workers, gas station attendants, recreational service providers, and hotel workers, to name a few.

Asset Value

Just as home and land values have risen over the past 100 years, so too have the tracts of land in state parks gained great value since they were first purchased or donated. The Commission has surplused some parcels that have not turned out to be satisfactory for park purposes, and reinvested proceeds in more suitable park lands.

Park Revenue

Although park revenue is only one of the benefits provided by state parks, it has been a growing concern in recent years. This increased focus on park revenue is due to the fact that it is the most easily identifiable benefit and is often considered the only quantifiable benefit. This analysis finds that park revenue is one of the smallest benefits to state parks when compared to the full suite of economic benefits (which includes social and environmental ones).

The Commission currently receives income from use permits, Discover Pass sales, leases, donations, and grants, as well as general financial support from the Washington State General Fund. Boosting or discovering additional revenue streams is essential to reducing the state parks maintenance backlog and avoiding future shutdown.

Society

State parks provide considerable social value to Washingtonians through education and cultural heritage, community cohesion (i.e. social capital), recreational experiences, and physical and

mental health. These benefits are all considered non-market benefits and are therefore not valued in a traditional economic analysis.

Social Capital

State parks help to build stronger communities through the volunteer hours and other social bonding that occur on state park lands. Not only is volunteerism crucial for maintaining the health and vitality of state parks, but it also forms strong community bonds. The Commission reports that volunteers clock over 275,000 hours every year, providing an estimated value between 2 and 25 million dollars.[7]

Recreational Experience

One of the main goals of the Commission is to provide memorable and valuable recreational experiences. Economists typically measure the full value of recreational experiences by studying visitor behavior or conducting elaborate surveys. Overall, the actual value of outdoor recreation in state parks is much greater than the recorded economic transactions or expenditures incurred. The additional value that a recreational experience provides is referred to as consumer surplus.

Consumer surplus is the difference between the maximum price consumers would be willing to pay for a good or service and what they actually pay for it. This difference is a gain for the consumer since they pay less than the value they place on that benefit. For example, a Washingtonian may be willing to pay $50 to go hiking for one day on the Olympic Peninsula. If the actual cost of the hiking trip is only $20, then the hiker gains a net economic benefit (consumer surplus) of $30 per day. Even though this consumer surplus is obtained free of charge, the existence of extra benefits is strategic in the decision to visit an attraction or engage in an activity.

Education and Cultural Heritage

One of the greatest benefits provided by state parks is the conservation of historical and cultural sites. Many of these sites might have been lost or degraded had the Commission not acted years ago. State parks preserve 33 sites and properties listed on the Washington Heritage Register and/or National Historic Register and help to connect generations to their cultural heritage and ensure that future generations have that same opportunity. Additionally, these historical connections provide educational opportunities.

Health

Physical and physiological health are often among the most undervalued benefits that open green spaces provide. Parks are crucial to maintaining fitness and mental health, and a strong and healthy parks system can encourage residents to get outside and utilize these assets.

Physical Health

Obesity and medical conditions that result from physical inactivity have increasingly been a major concern in the U.S. Rather large economic costs are associated with these health risks. In 2009, the U.S. Centers for Disease Control estimated that $147 billion in yearly medical costs could be attributed to obesity.[8]

In its 2011 annual report, the American Lung Association noted a significant increase in cases of asthma.[9] This proliferation of respiratory disease results from industrial air pollution and vehicle emissions. In order to comply with regulations under the Clean Air Act, billions of dollars have been spent in the U.S. to meet air quality requirements. Green spaces have the ability to filter air and improve air quality at low costs.

Mental Health

Physical activity positively influences early stages of human cognitive development, social interaction, language development and general body strengthening. Research on the effects of the natural environment on stress and physiological health has been increasingly validated and recognized. Research conducted by Roger Ulrich under his "Stress Reduction Theory," claims that natural environments promote recovery from any form of stress, whether short or long term.[10]

This analysis does not calculate the mental health or community health derived from state parks, but recognizes that natural environments reduce many forms of stress and provide benefits through the positive social interactions, exercise, and relaxation that occur in parks.[11]

Chapter III. Measuring Target Criteria

In the previous section, we defined the criteria to be considered for assessing the value of public lands. In this section, measurements are proposed for each criterion, including key parameters that would drive each measurement. Many of the economic values associated with park benefits are calculated with a per-visit estimate; therefore, park visitation drives most of the criteria included in this analysis. Some exceptions include green spaces conserved as state parks that continually provide ecosystem services (Environment criterion). Also, the economic value of land tends to appreciate over time, irrespective of visitation.[12]

As more information becomes available and criteria are refined, new methods can be adopted and adjustments can be made. In order to allow for comparison between criteria, as well as between costs and benefits, all measurements are translated into economic values.

Not all of the criteria that have been identified can be quantified. Although one can refer to supporting literature to qualify the effect, appraisal methods may not have been developed yet or data may not be available for their measurement. For these reasons, a measurement method is proposed only for the bolded, non-Italicized criteria in Figure 3 below.

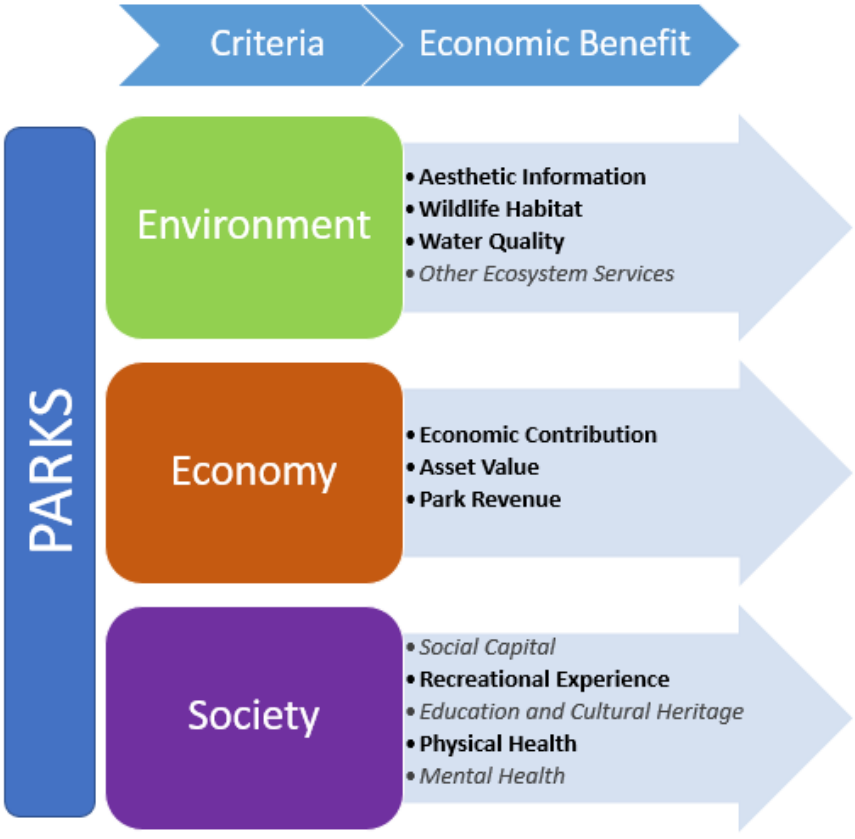


Figure 3. Quantifiable criteria for assessment of park benefits

Measuring Environmental Benefits

Ecosystem service valuation measures the economic benefits that people derive from natural ecosystems. These benefits are often free of charge, and expressed as non-market values or market value equivalents. This framework includes the three most prominent ecosystem services found in state parks; water quality, aesthetics, and habitat.

A number of methodologies have been developed to estimate the values of these ecosystem services (see Appendix B for some of the most common methodologies). In benefit transfer methodology (BTM), values from published studies can be used as general approximations in the absence of primary data for site-specific valuations. This method is commonly applied in policy analysis, as decision makers require timely and cost-effective methods for valuing green spaces.

Under BTM, the main determinant of ecosystem service values is the land cover type. The first step in the valuation is to derive an inventory of land covers within a defined area, counted by acre. These land covers, ranging from wetlands to forests to agricultural lands, provide a suite of ecosystem services. For example, lakes are associated with high aesthetic values, habitat for aquatic species, and water reservoirs. Forests are important for carbon sequestration, habitat for terrestrial species, climate regulation, and nutrient cycling. Accounting for the ecosystem services present within a park requires an inventory of the land cover types present within the park boundaries. As an example within the Washington State Parks system, Table 1 outlines the land cover types and their corresponding acreages within Tolmie State Park. The total land in Tolmie State Park is estimated at 154 acres, most of which is forests, some of which is beaches, and a small portion of which is developed land.

Table 1. Tolmie State Park Land Cover Types

Land Cover – Tolmie State Park	Acres
Developed, Open Space	9.95
Deciduous Forest	30.49
Evergreen Forest	15.95
Mixed Forest	44.75
Grassland/Herbaceous	-
Pasture/Hay	-
Cultivated Crops	-
Woody Wetlands	-
Emergent Herbaceous Wetlands	9.72
Shrub/Scrub	0.21
Rivers and Lakes	20.77
Beaches	22.15
Total	154

Each land cover type provides different amounts and types of ecosystem services, amounting to a unique value for each. Earth Economics maintains a database of peer-reviewed valuation studies organized by land cover class. Table 2 shows the values determined for each land cover type present in Washington State Parks, using Earth Economics' database of applicable primary studies. Values are calculated on a per acre basis. The range of values represents the different primary studies available for each land cover type in Washington State.

Table 2. Ecosystem Service Values for Land Cover Types in Washington State Parks

Land Cover Type	Annual Low ($/acre/year) 2015	Annual Average ($/acre/year) 2015	Annual High ($/acre/year) 2015
Developed, Open Space	$484	$1,752	$3,020
Deciduous Forest	$6,036	$9,076	$12,116
Evergreen Forest	$6,365	$9,408	$12,451
Mixed Forest	$5,551	$8,591	$11,630
Grassland/Herbaceous	$8,031	$10,398	$12,764
Pasture/Hay	$5	$10	$15
Cultivated Crops	$9,776	$14,921	$20,066
Woody Wetlands	$534	$16,916	$33,297
Emergent Herbaceous Wetlands	$946	$10,936	$20,926
Shrub/Scrub	$129	$340	$550
Rivers and Lakes	$258	$419	$579
Beaches	$253	$460	$667

Total ecosystem service values for each park will be based on the land cover type and its corresponding value per acre multiplied by the acreage. Decision makers can choose to use a low, average, or high value per acre. Using the average value per acre, the total ecosystem service value for Tolmie State Park would be $953,915 per year.

Measuring Economic Benefits

Economic Contribution

In this section, economic benefits refer to economic activity fueled by visits to state parks which in turn result in economic development in the region. Economic development can be measured by economic contributions, that is, the effect economic activity has on an economy. All the indicators used for this criterion reflect total economic activity as it trickles down through the economy from an initial expenditure made during a park visit. The underlying driver is thus the number of visits that a state park receives as well as the amounts and types of expenditures made in each visit.

Total expenditures made per year in association with each park are entered into an input-output model in order to derive the total trickle down effects (all the industries that benefit

through the supply chain with each expenditure). Multipliers, which refer to the ratio between initial expenditures and the total economic contribution (also called Keynesian multiplier), show how initial expenditures generate additional economic activity as the initial money is re-spent by other businesses and workers. IMPLAN software was used to calculate these effects.

The economic activity multipliers for the three indicators used (output, tax generation, and jobs) are derived from *The Economic Contribution of Washington's State Parks.* In the case where there was no contribution analysis done for the county, i.e., counties without state parks, multipliers from *Economic Contribution of Outdoor Recreation in Washington State* were used.[b]

Economic Output

Output represents the gross value of all financial transactions that occur in a region as reported by industry accounting. It includes transactions made between intermediary industries as well as the sale of final goods and services. In this case it includes employee compensation, proprietor income, taxes on production, and profits.

Tax Generation

Washington State charges a base 6.5% sales tax, and additional local taxes range from 0% to 3%. This effectively puts the sales tax rate between 6.5% and 9.5%. IMPLAN estimates tax on production and imports (TOPI) as a combination of state and local taxes and therefore the state tax must be extracted from the total TOPI paid, based on the local tax rate. This report focuses on tax generation estimates for the State General Fund. These are calculated by first deriving the tax multiplier: dividing TOPI by consumer expenditures. This multiplier can then be used to estimate TOPI based on estimated consumer expenditures. Again, TOPI is a combination of state and local taxes, therefore, the tax rates for each county are applied and the resulting portion extracted in order to calculate only taxes that contribute to the State General Fund.

Non-Park Jobs

Food service, hotels, and recreational services jobs are all supported by state park visitor spending. These calculations do not include direct employment or other spending by the Commission.

Park Revenue

Park revenue can be calculated by multiplying the annual estimated visitor days by historical park revenue per visitor. In this study, park revenue estimates are based on FY2012 reported revenue and visitor data.

[b] Counties without state parks include Benton, Garfield, Lincoln, Stevens, Wahkiakum, and Walla Walla.

Asset Value

As a state agency, the Commission does not pay property taxes on its lands, and therefore there is often no assessed value of the land. Additionally, park lands are often acquired piece by piece over many years, which can make calculating an acquisition price difficult. The difference between acquisition costs and current assessed value could theoretically be used to calculate investment gains through asset value. Therefore, this category of the tool is not currently operationalized, but is included should the Commission wish to use it.

Measuring the Benefit to Society

Recreational Experiences

Consumer surplus estimates for recreational activities were derived from a recreation value database developed by Dr. Randall Rosenberger, Professor of Environmental Economics at Oregon State University.[13] Primary valuation methods included stated preference and revealed preference methods, such as travel cost and contingent valuation methods (see Appendix B).

In this database, values are derived specifically for recreation within state parks. The average state park visit is estimated to provide an average of $38 in consumer surplus. In other words, the average state park participant would be willing to pay an additional $38 for their experience beyond the expenditures they are already incurring. The total consumer surplus for the park will be calculated by multiplying visits by the consumer surplus value.

Physical Health

In this report, health benefits were measured through avoided costs, or the costs that would have incurred had people not exercised in the park. Many studies link park visitation with avoided medical costs.

Health benefits were calculated using data from the Trust for the Public Lands 2011 report *The Economic Benefits of Seattle's Park and Recreation System*. The report focuses on those who use parks for exercise, and calculates the healthcare savings from people reducing their risk of diseases associated with obesity. In our calculation, we assumed that the benefits would be similar to visiting state parks. The report states that Seattle area parks had 140 million visits, with healthcare savings of $64 million. This equates to a per-visit value of $0.46.

Chapter IV. Decision Analysis Tool

With the park assessment criteria identified and methodologies for measurement in place, the framework can be put into action through the tool proposed in this section. This tool enables a comparative analysis of existing parks or future potential parks based on the different benefit criteria. In addition, it enables the inclusion of a cost component to frame the decision-making process as a benefit cost analysis (BCA) or a return on investment (ROI) analysis. For example, although some parks may be costly, the relative benefits they provide may justify the cost. On the other hand, other less costly parks may provide relatively few benefits. Translating all measures into a common unit allows for these types of comparison. In this case, all the benefits quantified are framed as monetary dollar equivalents. It is important to note, however, that other benefits may not be quantifiable in a systematic fashion and hence their integration into the tool is not possible.

The benefits received from state parks can be considered returns from an investment (acquisition or development). Understanding the rate of return of a particular acquisition or investment is essential to allocating capital efficiently and generating significant and real returns. Both the Commission and Washingtonians are beneficiaries of these "significant and real returns". The Commission can demonstrate the value that they bring to Washingtonians through market and non-market benefits of park open spaces and recreational opportunities identified in Chapter II.

Once total economic benefits and costs have been identified, quantified, and monetized, decisions can be made in a more systematic and defensible way. As discussed in Chapter I, understanding the decision-making process as analogous to an ROI analysis can be a useful way to measure the relative efficiency of different investments by comparing the expected benefits of each investment to its cost over time. The measurement of ROI has been successful and often preferable to other decision-making tools for ensuring cost-efficiency and the maximization of benefits. It is not restricted to financial benefits and its application to conservation goals has increased in recent years. [14, 15]

This chapter details how an ROI analysis can aid the Commission through the evaluation of current properties and parks and outlines a framework for land acquisition. With the evaluation of currently owned parks and properties, an ROI analysis showcases the quantifiable benefits and costs and illustrates, with case studies, how parks can be compared. Additionally, a framework for utilizing this tool for future land acquisition purposes will be proposed and drafted around the findings of a regression analysis of key park characteristics in Chapter V.

Return on Investment

An ROI calculation considers the costs and benefits of a specific investment. As the mission and vision of the Commission is to benefit all Washingtonians, only public benefits and public costs are considered in this analysis. Costs include fixed costs (such as the purchase of land), and variable costs (such as maintenance costs). Benefits include market benefits (e.g. rents, yields, jobs), agency revenue (park entrance fees), and non-market benefits like health and social benefits (such as avoided medical expenses) and environmental benefits (ecosystem services).

In its simplest form, ROI is expressed as follows:

$$ROI = \frac{(Benefits - Costs)}{Costs}$$

Results from an ROI are generally shown as a percentage change in dollar value from a given investment over a specific period of time. By taking costs into account, an ROI can show the relative advantages and actual output per dollar spent on different actions and projects. Consideration of this information often changes perceived priorities. [16]Sometimes, land use decisions that yield high monetary benefits seem like attractive options, but their cost-benefit ratio may reveal a lower benefit per dollar spent. For these reasons, an ROI calculation is one of the most complete and useful tools for decisions regarding land-use options.

An ROI is used to determine whether the benefits will outweigh the costs over the duration of an investment. The breakeven point is the point at which the initial costs are recovered and the benefits begin to outweigh the total costs. If there are no fixed costs to recover, then the general rule is that if the benefits of park acquisition and/or development outweigh the costs, then it is a wise decision. A higher ROI, of course, indicates a better decision. In fact, ROI results are most useful when applied on a comparative analysis. Comparing ROIs reveals the investment with more benefits. The type of benefits provided can also be filtered individually, if there is interest in focusing on one type of benefit over another. If no cost data is available, the comparison can be made on the benefit results alone.

Some benefits, such as the particular uniqueness of a park (e.g. waterfall or historic site) or park scarcity relative to population density, are not captured by the attributes included within the proposed criteria and hence are not measured, but they can be presented as qualitative considerations to the decision maker.

Cost Components

The inclusion of a cost component can be at the discretion of the decision-maker and is also subject to data availability. In general, costs include agency-specific costs, such as operations & maintenance costs, park purchase costs, or fixed costs. Including costs allows the Commission to justify the costs of purchasing and operating state parks.

In the proposed tool, costs for each existing park were provided by the Commission, with some limitations on data availability. Additionally, opportunity costs such as the cost of holding land and foregone tax revenues to the state from the next best alternative, e.g., housing developments, were not accounted for, but should be given due consideration (for example, Washington receives about 30% of its tax revenue from property taxes).[17]

One-Time Costs

One-time costs (or fixed costs) are non-annual costs such as acquisition or building costs. These costs, which can be provided by the parks department, were generally incurred years ago when the State Parks system was young and undeveloped land was relatively abundant and cheap. The earliest acreage tends to be the most valuable land. In other cases, state parks lands were donated or acquired at low prices in the interest of the public good. For these reasons, it may seem that many parks can provide large benefits with small one-time costs.

Operations and Maintenance Costs

Operations and maintenance (O&M) costs occur once a park is acquired and include park upkeep, staff, and security expenses. Where the Commission provided O&M cost data, it has been included in the tool. For properties and parks with missing or incomplete data, these metrics were not included.

Comparative Analysis Tool

The proposed tool can be used in two ways. First, it gives the Commission the ability to assess the benefits and costs of *existing* parks. This function relies on the data provided by the Commission for the existing park system, such as park revenue, O&M costs, and visitation. Of the 181 existing parks and other lands, 111 have complete data, and 70 are missing some form of data, such as land cover, revenue, or O&M costs.

The other use of the tool is for projecting benefits of *future acquisitions*. This functionality requires projections for data (visitation, activities, and other hypothetical characteristics) that are currently unknown. In order to estimate some of these key variables, a series of regression analyses were carried out using historical data provided by the Commission in order to predict future trends in hypothetical scenarios. This functionality is explored further in Chapter V.

Illustrating the Comparative Analysis Tool with Existing Parks

The proposed tool has been submitted as a separate document. It consists of a series of spreadsheets that connect to historical data, data projections, and calculated values for selected variables particular to Washington State in order to measure the criteria proposed in the framework document. The tool has been automated to calculate all the proposed criteria measurements using simple entries that can be filled out by the decision maker.

This section of the report describes the benefits of four existing parks and presents an ROI comparison based on the data provided by the Commission and external data used for criteria measurement. This section should be used in combination with the tool document in order to understand how to operate the tool. The headings of this section directly relate to the headings on the tool.

Park Characteristics

This section of the tool includes key park characteristics such as the number of visitors, their type of visit (day or overnight), park location relative to population centers, and other park attributes. These park characteristics are used to measure the proposed criteria, and therefore determine park benefits. Land cover of a park is a characteristic used to determine ecosystem service valuation.

Components Included in Calculation

This section of the tool allows for the selection and adjustment of criteria based on the user's goals. Criteria that can be adjusted include options such as selecting benefits for inclusion, inserting manual visitation, and specifying the percentage of visitors that are boaters. This section also allows the user to input the purchase cost of the property.

Yearly Benefits and Costs

This is a summary of the results for each criteria provided as yearly benefits and cost for a given year. It also includes the major drivers: visitation and expenditures. Currently, the yearly value is based on expected population growth. Visitation and economic values grow with projected population growth and projected inflation, respectively.

Summary of State Parks ROI Analysis

This section illustrates cumulative benefits across various years. Benefits and costs begin accruing at year 1, and are projected through year 25. The first three rows show the costs associated with park operations, and the bottom rows estimate the benefits. At the bottom of the table, an ROI result is expressed as a percentage of the benefits produced per unit of investment. Positive percentages indicate positive returns, and the opposite is true for negative numbers. For example, a 50% ROI means that the project provides $1.50 in benefits for every $1 in costs.

Summary of State Parks Contribution Analysis

The contribution analysis section provides a detailed summary of economic benefits. These benefits are a direct result of park visitation and consumer spending related to visitation. The results are given in both cumulative and per year benefits.

Case Study: Federation Forest, Lake Sammamish, Cape Disappointment, and Tolmie State Parks

Annual park visitation, expenditures, benefits, and costs are compiled in the Annual Benefits and Costs table. These values are estimated for the year 2015, but can be adjusted within the tool to view future benefits and costs.

Table 3. Annual benefits and costs from case study parks

Federation Forest Annual Visitation	Year: 2015
2015 Visitation	94,995
Consumer Expenditures	$2,091,650
Economic Contribution	$1,991,060
Tax Contributions	$117,257
Recreational Experience/Consumer Surplus	$3,638,309
Ecosystem Services	$5,257,818
Health	$43,303
Park Revenue	$5,507
O&M Costs	$126,670

Lake Sammamish Annual Visitation	Year: 2015
2015 Visitation	1,486,021
Consumer Expenditures	$29,063,848
Economic Contribution	$27,666,129
Tax Contributions	$1,629,304
Recreational Experience/Consumer Surplus	$56,914,604
Ecosystem Services	$4,437,410
Health	$677,388
Park Revenue	$821,427
O&M Costs	$968,686

Cape Disappointment Annual Visitation	Year: 2015
2015 Visitation	862,495
Consumer Expenditures	$21,072,886
Economic Contribution	$11,943,525
Tax Contributions	$527,742
Recreational Experience/Consumer Surplus	$33,033,559
Ecosystem Services	$18,072,340
Health	$393,160
Park Revenue	$1,435,263
O&M Costs	$2,100,323

Tolmie Annual Visitation	Year: 2015
2015 Visitation	1156,190
Consumer Expenditures	$2,352,885
Economic Contribution	$1,627,118
Tax Contributions	$88,595
Recreational Experience/Consumer Surplus	$4,411,777
Ecosystem Services	$953,915
Health	$52,508
Park Revenue	$46,669
O&M Costs	$172,711

Comparative Analysis Results

Translating all benefits into dollar values allows them to be compared in a common unit. Figure 4 summarizes the benefits provided by each park and allows for a comparison of the parks in terms of aggregate benefits. Criteria-specific benefits can also be used for more targeted comparisons, for example, a comparison of the ecosystem services provided by different parks. In the case studies provided above, Lake Sammamish State Park provides $950,000 in ecosystem services each year, a relatively small value when compared to Federation Forest State Park. However, Lake Sammamish provides nearly $100 million in consumer surplus to

visitors while Federation Forest provides only $3.3 million. Depending on what criteria is most important, a decision can be made based on a specific criterion or on the combination of all criteria.

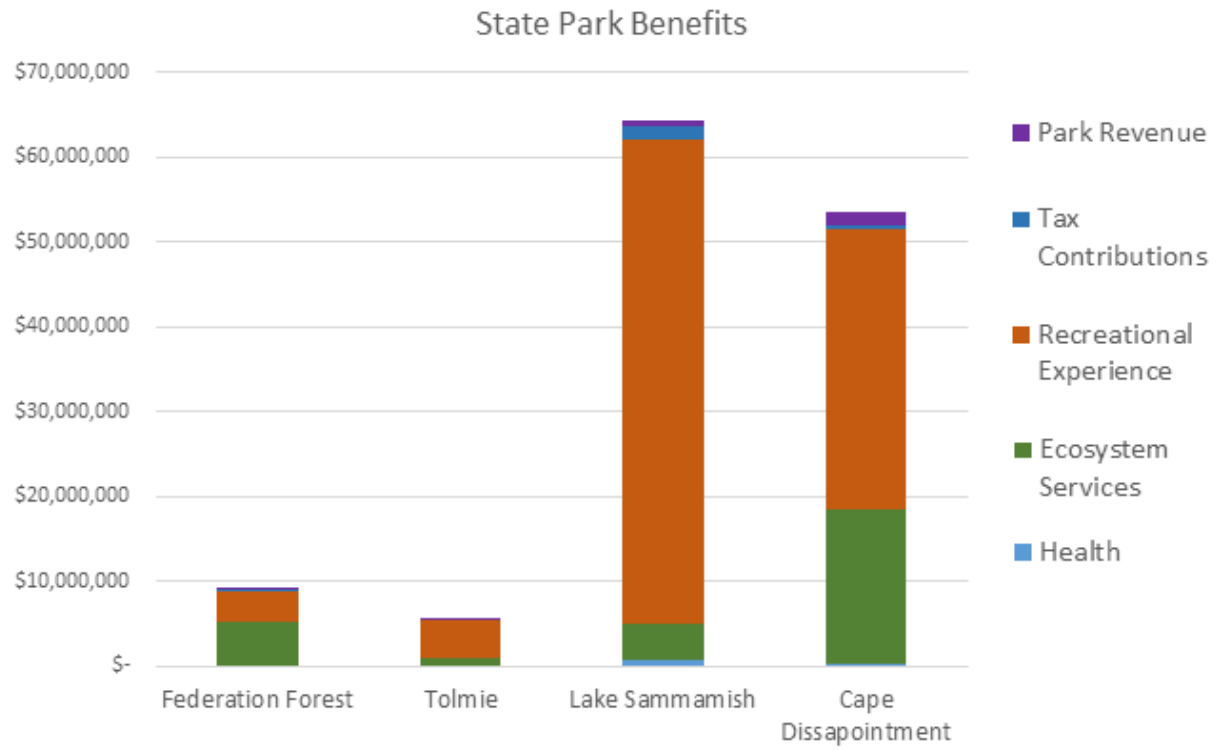


Figure 4. Benefits provided by case study parks

Another comparison that could be made is total benefit per acre, by park. This removes the advantage or disadvantage a park might have due to sheer size. In this case, the benefits per acre are $173,200 for Lake Sammamish, $46,600 for Tolmie, $33,000 for Cape Disappointment and $19,300 for Federation Forest.

In order to make the decision-making process even more complete, the cost element can also be integrated into the calculation. An ROI analysis can be used when cost information is available. In this case, the comparison between parks is expressed in the form of a ratio in terms of how much gain is derived relative to the cost that is incurred. In these cases, the ROI can help to show which parks yield the greatest dividend. The ratio calculated would take into account all identified costs and benefits to show which one has the highest rate of return. The following tables illustrate the ROI for each of the state parks listed in the previous analysis.

Table 4. ROI results from case study parks

Summary of State Parks ROI Results for Federation Forest	
Cumulative Costs	**Year 1**
O&M Costs	$126,670
One-time Costs	$0
Total Costs	$126,670
Cumulative Benefits	**Year 1**
Park Revenue	$5,507
Tax Contributions to WA GF	$80,228
Recreational Experience	$3,638,309
Ecosystem Services	$5,257,818
Health and Social	$43,303
Total Benefits	$9,019,657
ROI	**7021%**

Summary of State Parks ROI Results for Lake Sammamish	
Cumulative Costs	**Year 1**
O&M Costs	$968,686
One-time Costs	$0
Total Costs	$968,686
Cumulative Benefits	**Year 1**
Park Revenue	$821,427
Tax Contributions to WA GF	$1,114,787
Recreational Experience	$56,914,604
Ecosystem Services	$4,437,410
Health and Social	$677,388
Total Benefits	$63,144,189
ROI	**6419%**

Summary of State Parks ROI Results for Cape Disappointment	
Cumulative Costs	**Year 1**
O&M Costs	$2,100,323
One-time Costs	$0
Total Costs	$2,100,323
Cumulative Benefits	**Year 1**
Park Revenue	$1,435,263
Tax Contributions to WA GF	$434,218
Recreational Experience	$33,033,559
Ecosystem Services	$18,072,340
Health and Social	$393,160
Total Benefits	$51,933,277
ROI	**2373%**

Summary of State Parks ROI Results for Tolmie	
Cumulative Costs	**Year 1**
O&M Costs	$172,711
One-time Costs	$0
Total Costs	$172,711
Cumulative Benefits	**Year 1**
Park Revenue	$46,669
Tax Contributions to WA GF	$72,895
Recreational Experience	$4,411,777
Ecosystem Services	$953,915
Health and Social	$52,508
Total Benefits	$5,491,095
ROI	**3079%**

ROI Analysis Results

The integrated benefit estimate and ROI analysis show that although Federation Forest State Park may not receive the same level of visitation as some of the more popular parks, it still provides immense value to the state. Traditional economic analysis would show that Federation Forest has O&M costs of $127,000 and only $5,500 in financial revenue each year, running a major deficit and with a negative ROI. However, by integrating the full suite of benefits provided by the park each year, it becomes clear that the park actually provides over $28 million in benefits each year, most of which come in the form of ecosystem service benefits. The ROI in this case is immense.

Chapter V. Development of Tool for Predictive Purposes

Many of the benefits provided by parks are measured on a per visit basis, thus park visitation drives most of the criteria included in this analysis. Visitation estimates were available for existing parks, but, of course, not for non-existing ones. In order to decide whether an acquisition is worthwhile, the potential park visitation must be estimated. However, numerous factors influence visitation to public outdoor recreation areas and complicate forecasting of visitation numbers. Previous studies highlight variables including park age, spatial relationship to populated areas and other preserved spaces, available facilities, and visitor demographics as significant predictors of park visitation.[18,19]

As a piece of this study, a regression analysis was carried out with the data available for Washington State Parks to allow the tool to assess different hypothetical sites. The objectives of this regression analysis were:

(1) To identify key drivers to park visitation and

(2) To develop a framework for estimating visitation as it relates to new park acquisition and development.

The a priori expectations for park draw were that consumers visit parks based on the available amenities, the land cover, and the park's location in relation to urban cores. The modeled park amenities include shoreline access, historic and interpretive opportunities, hiking trails, and wildlife viewing opportunities. What is difficult to quantify are the breathtaking views or astonishing geologic features that are available at many of Washington's state parks as well as the nature of assigning value to individuals' decision-making. Many of these more intangible elements were not included.

An ordinary least squares (OLS) regression was used to estimate state park visitation (v) as a function of park amenities, land cover, and relation to urban core. Below is the base model:

$$V = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \mu$$

Table 5. Hypothesized Variables Included in Base Model

Type		Variable
Dependent Variable	v	Visitation
Constant	α	Constant
Park Characteristics	β_1	NumberRecActivities
	B_2	Birdcount
	B_3	RadiusPop
	B_4	DrivingDistToUrbanCore
	B_5	StateHistReg
	B_6	Hiking
Natural Characteristics	B_7	Park Area
	B_8	OpenWater
	B_9	BarrenLand
	β_{10}	EvergreenForest
	β_{11}	DevelopedLowIntensity
Error Term	μ	Error term

The Commission provided Earth Economics with park visitation data from FY2012, a list of park amenities, and a GIS dataset for state park boundaries (polygons). Land cover data was then derived from the USGS' National Land Cover Database (NLCD) and applied to the park boundaries. Parks with no visitation, costs, full-time employment, or park boundaries were omitted from the dataset and therefore not used in the regression analysis. Wildlife opportunities were derived from eBird statistics, further explained below. Parks on the State Historic Register were captured using a GIS dataset from the State Register website.

Results

With the use of Stata[c], a regression analysis was performed on all quantified variables. The modeled coefficients and associated p-values are given for a regression including all variables (see Table 6).

[c] A data analysis and statistical software

Table 6. Variables quantified for estimating park visitation

Type	Variable		Explanation	Coefficient	p-value
Dependent Variable	Visitation	V	Number of visits a park receives in a year		
	Constant	α	Constant	0 (Suppressed Constant)	
Park Characteristics	NumberRecActivities	β_1	Number of recreational amenities within the park, e.g., camping, hiking, swimming	14743.37	0.044
	Birdcount	β_2	Number of bird observations within the park in 2012	97.65985	0.001
	RadiusPop	β_3	2015 population within a 25 mile radius	0.025574	0.43
	DrivingDistToUrbanCore	β_4	Driving miles to nearest city of more than 100,000 inhabitants	-397.4061	0.352
	StateHistReg	β_5	Does the park contain a feature listed on the Washington State Historic Register, yes/no (dummy)	-66588.28	0.128
	Hiking	β_6	Miles of hiking trails	-841.8036	0.633
Natural Characteristics	Park Area	β_7	Park area in ft^2	-0.0004422	0.345
	OpenWater	β_8	Open Water area within park in ft^2	0.0134657	0.002
	BarrenLand	β_9	Barren Land (mostly beaches) area within park in ft^2	0.0287003	0.035
	EvergreenForest	β_{10}	Evergreen Forest area within park in ft^2	0.0013527	0.019
	DevelopedLowIntensity	β_{11}	Developed Low Intensity area within park in ft^2	0.1918412	0.000

Variables that were not statistically significant (p-value > .05) were dropped from the model. Barren land (mostly beaches) did yield a p-value of .056, and was included in the regression at the researcher's discretion. The regression included six variables that partially predict park visitation (see Table 7). The final regression analysis yielded an adjusted R-squared value of .7569, meaning that about 75% of the observed variance can be accounted for with the model. A model that explains all of the variability in the data would have an R-squared of 100%, in contrast, a model that explains none of the variability in the data would have an R-squared of 0%.

These variables provide a good fit to the trends observed in park visitation. The variables suggest drivers of visitation to parks given their significant relationship with the number of

visits a park receives. The Commission can then consider some of the variables with the most significant p-values when seeking to increase visitation numbers.

The predictive power of the model and the errors observed across individual parts suggest that the data contains some unexplained variability. Of course, there are many other factors that come in to play with a park's visitation trends. Often, studies dealing with human behavior have R-squared values of less than 50% because people are fairly unpredictable. [20] The table below shows the significant variables retained in the model.

Table 7. Significant variables in the visitation regression model

Type	Variable		Explanation	Coefficient	p-value
Dependent Variable	Visitation	*V*	Number of visits a park receives in a year		
	Constant	A	Constant	Suppressed Constant (0)	
Park Characteristics	NumberRecActivities	β_1	Number of recreational amenities within the park, e.g., camping, hiking, swimming	10646.75	0.007
	Birdcount	β_2	Number of bird observations within the park in 2012. Used as a proxy for wildlife viewing opportunities	93.04064	0.001
	OtherParkCharacteristics	β_3	Park characteristics which are unquantifiable or unknown	?	?
Natural Characteristics	OpenWater	β_4	Open Water area within park in ft^2	0.0141919	0.001
	BarrenLand	β_5	Barren Land (mostly beaches) area within park in ft^2	0.0259913	0.056
	EvergreenForest	β_6	Evergreen Forest area within park in ft^2	0.0007444	0.020
	DevelopedLowIntensity	β_7	Developed Low Intensity area within park in ft^2	0.1757745	0.000
	OtherNaturalCharacteristics	$\beta 8$	Natural characteristics which are unquantifiable or unknown	?	?
	Error Term	μ	Error term		

Explanation of Key Drivers

This section of the report will use the regression analysis to identify key drivers in park visitation. Not all drivers to park visitation have been identified or quantified, and therefore the limitations of this model's predictive power should be acknowledged. As more data becomes available on key amenities and visitor draw factors, projections for visitation can be improved. Starting from the most important, the key drivers in visitation are number of recreational activities available, wildlife viewing opportunities, and natural park characteristics.

Number of General Activities Available

This variable was constructed from the Washington State Parks brochure and includes activities allowed within different parks such as beach exploration, fishing, swimming, hiking, equestrian, and cross-country skiing. The count of activities was used as a variable.

The series of regression models carried out consistently showed this count variable as significant to the 1% level, suggesting it is highly correlated to the number of visits a park receives. The more activities a park is able to offer, the more opportunities that exist for individuals with differing recreational preferences. This speaks to the park's diversity.

Wildlife Viewing Opportunities

Wildlife viewing and photography was identified as the third most popular outdoor recreation activity in Washington State, with over 150 million participant days every year.[21] Because data was not directly available on the activities occurring at state parks, proxy data was used to estimate the number of wildlife viewers visiting state parks. Data was requested and processed from eBird, a popular bird reporting website that provides the spatial distribution of bird observations based on user submissions.[22] This dataset contained over 779,590 individual accounts of bird sightings in Washington, 40,153 of which occur at state parks. This variable was found to be significant to the 1% level, having a positive influence on visitation.

There is indeed a correlation between park visitation and eBird reporting, suggesting that the most visited parks report more observations.

Natural Park Characteristics

Many of the parks' natural characteristics were found to be significant at the 1% and 5% level, meaning they are statistically significant. In general, visitation to parks is associated with the presence of evergreen forests, beaches and water bodies. It was also found that low intensity development of land cover was significant, which includes roads and light infrastructure.

Other Factors:

Parks with buildings and/or lands on the State Historic Register seemed to influence park visitation, but were only significant at the 10% level, i.e., in many cases these may not have an influence on visitation. Due to only 27 listed properties on the Register aligning with the 110 studied state parks, there may not be sufficient data to draw conclusions about the influencing factor of historical sites.

This analysis did not reveal that hiking trails and driving distance to urban core were statistically significant in estimating visitation. Yet hiking is one of the highest-ranking activities in Washington in terms of participation as of 2015.[4] Also, although driving distance to urban core was not statistically significant, it is theoretically significant as it is known that urban parks receive more visitation than rural parks and easy access is also an important factor. This

variable may become significant with a larger sample size or a different proxy to measure consumer's willingness to travel to parks.

Conclusions about Estimating Visitation

This analysis highlights a few key drivers of visitation specific to Washington State Parks, but the regression should be used as a framework and not as an exact formula for predicting visitation. When trying to predict visitation to future Washington State Park sites, this analysis suggests that focus should be placed on determining what and how many activities the park can support, the number of wildlife viewing opportunities, and the land cover types present within the parks. Park location (driving distance to urban core), preservation of historic sites, and hiking availability may further influence visitation.

There are other park characteristics and natural features that influence visitation that could not be captured in this analysis. Many characteristics are not systematically quantifiable, and others may be unknown or unpredictable. For example, unique look-out points, the rocky landscapes created by particular mountains, or the presence of a magnificent waterfall are all elements that are hard to quantify.

Population Growth and Future Visitation

In addition to the drivers identified in the regression analysis, future visitation is also modeled using expected population growth. Visitation increases are based on projected population increases for the county and the state.[23]

Total visitation is made up of local and non-local visitors. Local visitors use the county's projected population increase and non-local visitors are estimated from the state's population increase. The proportion of local and non-local visitors is estimated based on a park's designation as "urban", "sub-urban", or "rural" (see Appendix C).

Chapter VI. Conclusion and Future Work

This report identified criteria that should be included when conducting an economic assessment of state parks. These criteria provide benefits to both the Commission and to Washingtonians. Furthermore, drivers of state park visitation were identified, and in some cases, quantified.

In Chapter II, the objective was to identify the value state parks provide to Washingtonians. Three major criteria classes were defined: environment, economy and society. These criteria classes are important to both the Commission in terms of economic sustainability, and to Washingtonians in terms of health, economic, environmental and social value.

Following the identification of key parameters, benefits of the selected criteria were measured. In order to allow for comparison between criteria, as well as between costs and benefits, all measurements were translated into economic values. Although our capacity for measuring benefits that are not traditionally measured is growing, not all criteria were measurable nor quantifiable at this point. Benefits that are not measured can be presented as qualitative considerations to the decision maker.

Using the information identified in the previous chapters, a decision-making tool was developed to assist the Commission in illustrating park-by-park costs and benefits with the ability to focus on different benefit criterion. This tool proved to be useful when evaluating parks with low visitation, as many yielded high ecosystem service values.

Finally, a framework was constructed for predicting park visitation for the purpose of acquisition and development. A regression analysis was exercised to identify variables that may influence park visitation, such as wildlife viewing and recreational opportunities. The regression returned promising results, but proved that by nature, predicting behavioral patterns is limited by the model. Many variables cannot be quantified.

Up until now, the substantial economic, social, and ecological value of state parks has not been well understood. This has been partially due to insufficient science and tools at the disposal of decision makers to properly quantify benefits. This report and accompanying tool should be used to show the true benefit that the Washington State Parks System provides Washingtonians through recreational experiences and as a driver for economic development. Benefits realized have been found to be multiple orders of magnitude greater than the Commission's operating costs.

Research should continue to identify new ways to measure the many non-market benefits that natural spaces provide. Continuing to identify, quantify, and monetize benefits provided by parks will further build the case that parks truly are invaluable assets. As Theodore Roosevelt

famously said*, "Cherish these natural wonders, cherish the natural resources, cherish the history and romance as a sacred heritage, for your children and your children's children. Do not let selfish men or greedy interests skin your country of its beauty, its riches or its romance."*

Appendix A. Parks Used and Available Data

Park Name	Regression	O&M	Revenue	Trails Data	GIS Data
Alta Lake	x	x	X	x	x
Anderson Lake	x	x	X	x	x
Banks Lake					
Battle Ground Lake	x	x	X	x	x
Bay View	x	x	X		x
Beacon Rock	x	x	X	x	x
Belfair	x	x	X	x	x
Big Eddy					
Birch Bay	x	x	X	x	x
Blake Island	x	x	X	x	x
Blind Island		x	X		x
Bogachiel	x	x	X	x	x
Bottle Beach	x	x		x	x
Bridgeport	x	x	X	x	x
Bridle Trails	x	x	X	x	x
Brooks Memorial	x			x	x
Brooks Memorial (ELC)					
Burrows Island					x
Cama Beach	x	x	X	x	x
Camano Island	x	x	X	x	x
Camp Calvinwood					x
Camp Delany (ELC)					
Camp William T. Wooten (ELC)		x	X		x
Cape Disappointment	x	x	X	x	x
Cape Disappointment (VH)					
Clark Island					x
Columbia Hills	x	x	X	x	x
Columbia Plateau Trail	x	x	X	x	x
Columbia Plateau Trail S					
Conconully	x	x	X	x	x
Cornet Bay (ELC)					
Crawford	x	x	X	x	x
Crown Point					x
Curlew Lake	x	x	X	x	x
Daroga	x	x	X	x	x
Dash Point	x	x	X	x	x
Deception Pass	x	x	X	x	x

Park Name	Regression	O&M	Revenue	Trails Data	GIS Data
Deception Pass CCC (IC)					
Doe Island		x	X		x
Dosewallips	x	x	X	x	x
Doug's Beach	x	x	X		x
Dry Falls (IC)					
Ebey's Landing		x		x	x
Federation Forest	x	x	X	x	x
Fields Spring	x	x	X	x	x
Flaming Geyser	x	x	X	x	x
Fort Casey	x	x	X	x	x
Fort Columbia	x	x	X	x	x
Fort Columbia (VH)					
Fort Ebey	x	x	X	x	x
Fort Flagler	x	x	X	x	x
Fort Flagler (ELC)					
Fort Flagler museum					
Fort Simcoe	x	x	X	x	x
Fort Townsend	x	x	X	x	x
Fort Worden	x	x	X	x	x
Fort Worden (Conf Ctr)					
Ginkgo Petrified Forest	x	x	X	x	x
Ginkgo Petrified Forest (IC)					
Goldendale Observatory	x	x	X		x
Grayland Beach	x	x	X		x
Griffith-Priday	x	x	X		x
Harstine Island				x	x
Hope Island		x	X		x
Hope island		x	X		x
Ike Kinswa	x	x	X	x	x
Illahee	x	x	X	x	x
Iron Horse Palouse	x			x	x
Iron Horse Palouse	x			x	x
Jackson House					x
James Island					x
Jarrell Cove	x	x	X	x	x
Joemma Beach	x	x	X	x	x
Jones Island		x	X	x	x
Joseph Whidbey	x	x	X	x	x

Park Name	Regression	O&M	Revenue	Trails Data	GIS Data
Kanaskat-Palmer	x	x	X	x	x
Kitsap Memorial	x	x	X	x	x
Kopachuck	x	x	X	x	x
Lake Chelan	x	x	X	x	x
Lake Easton	x	x	X	x	x
Lake Sammamish	x	x	X	x	x
Lake Sylvia	x	x	X	x	x
Lake Wenatchee	x	x	X	x	x
Larrabee	x	x	X	x	x
Leadbetter Point	x			x	x
Lewis & Clark	x	x	X	x	x
Lewis & Clark Trail	x	x	X	x	x
Lewis and Clark (ELC)					
Lewis and Clark (IC)					
Lime Kiln Point	x			x	x
Lincoln Rock	x	x	X	x	x
Long Beach OBA					
Loomis Lake	x				x
Manchester	x	x	X	x	x
Marine Science center					
Maryhill	x	x	X		x
Matia Island		x	X		x
Matilda N. Jackson				x	x
McMicken Island		x	X		x
Millersylvania	x	x	X	x	x
Millersylvania (ELC)					
Millersylvania (Lakeside Cottage)					
Moran	x	x	X	x	x
Moran (ELC)					
Mount Spokane	x	x	X	x	x
Mystery Bay	x	x	X		x
Nolte	x	x	X	x	x
North Jetty					
Obstruction Pass				x	
Ocean City	x	x	X	x	x
Ocean Shores					
Olallie	x	x	X	x	x
Olmstead Place	x	x	X	x	x

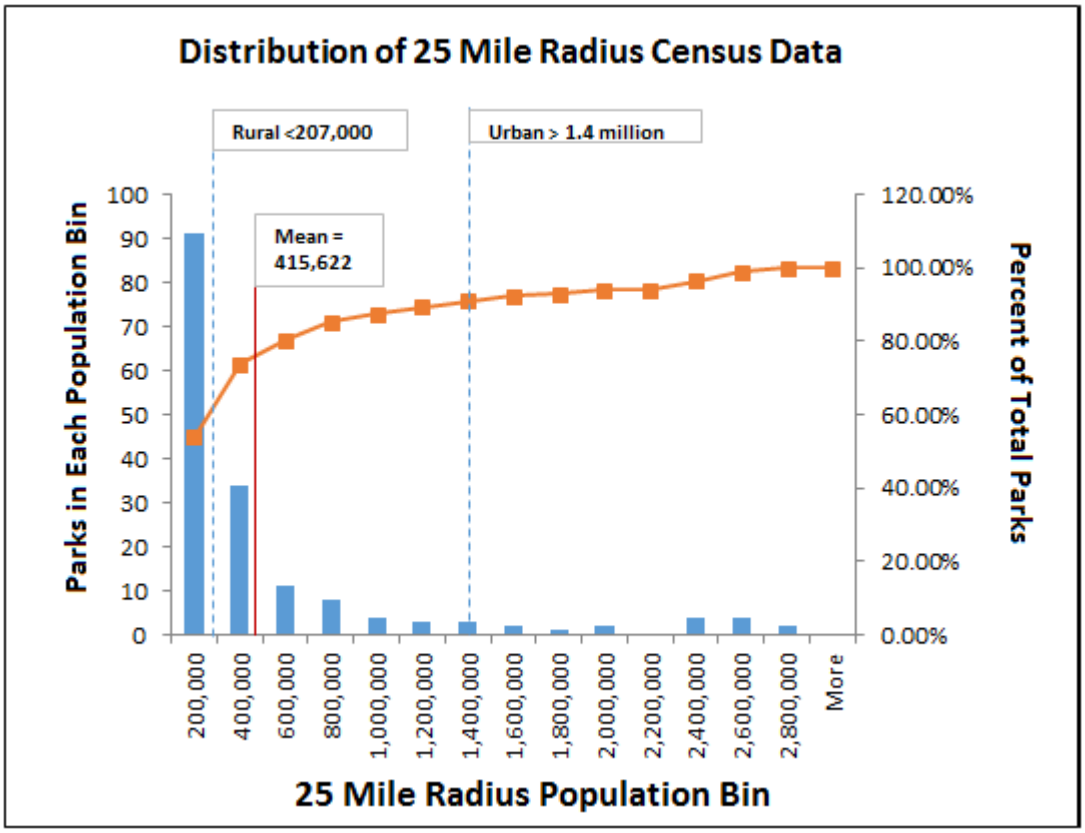
Park Name	Regression	O&M	Revenue	Trails Data	GIS Data
Pacific Beach	x	x	X	x	x
Pacific Pines	x				x
Palouse Falls	x	x	X	x	x
Paradise Point	x	x	X	x	x
Patos Island		x	X	x	x
Peace Arch	x	x	X		x
Pearrygin Lake	x	x	X	x	x
Penrose Point	x	x	X	x	x
Peshastin Pinnacles	x	x	X	x	x
Pleasant Harbor					x
Point Doughty					
Posey Island		x	X		x
Potholes	x	x	X	x	x
Potlatch	x	x	X	x	x
Puffer Butte (ELC)					
Rainbow Falls	x	x	X	x	x
Ramblewood					
Rasar	x	x	X	x	x
Reed Island					x
Riverside	x	x	X	x	x
Rockport	x	x	X	x	x
Rothschild House		x			
Sacajawea	x	x	X	x	x
Sacajawea (IC)					
Saddlebag Island		x	X		x
Saint Edward	x	x	X	x	x
Saltwater	x	x	X	x	x
Scenic Beach	x	x	X	x	x
Schafer	x	x	X	x	x
Seaquest	x	x	X	x	x
Sequim Bay	x	x	X	x	x
Shine Tidelands	x	x	X		x
South Whidbey	x	x	X	x	x
Spencer Spit	x	x	X	x	x
Spokane House					
Spokane River Centennial Trail					x
Spring Creek Hatchery		x	X		x
Squak Mountain	x	x	X	x	x

Park Name	Regression	O&M	Revenue	Trails Data	GIS Data
Square Lake					x
Squilchuck	x	x	X	x	x
St. Helens Visitor Center (IC)					
Steamboat Rock (Banks Lake)	x	x	X		x
Steptoe Butte	x	x	X		x
Steptoe Memorial					
Stretch Point					x
Stuart Island		x	X	x	x
Sucia Island		x	X	x	x
Sun Lakes Resort					
Sun Lakes-Dry Falls	x	x	X	x	x
Tokeland					
Tolmie	x	x	X	x	x
Triton Cove	x	x	X		x
Turn Island		x	X	x	x
Twanoh	x	x	X	x	x
Twenty-Five Mile Creek	x	x	X	x	x
Twin Harbors Beach	x	x	X	x	x
Upright channel					
Wallace Falls	x	x	X	x	x
Wanapum Dam – Kittitas					
Wanapum Dam - Grant					
Wenatchee Confluence	x	x	X	x	x
Westhaven	x	x	X	x	x
Westport Light	x	x	X	x	x
Willapa Hills Trail - Lewis				x	x
Willapa Hills Trail - Pacific				x	x
Wo-He-Lo					
Wolfe Property					x
Yakima Sportsman	x			x	x

Appendix B. Non-Market Benefits Valuation Methodologies

Valuation Method	Description	Example	Value
Market Approaches			
Market Price	Valuations are directly obtained from the amounts people pay for the service or good on a private market.	Timber is often sold on a private market.	Total revenue
Replacement Cost	Cost of replacing ecosystem services with man-made systems.	The cost of replacing a watershed's natural filtration services with a man-made water filtration plant.	Value larger than the current cost of supply
Avoided Cost	Value of costs avoided or mitigated by ecosystem services that would have been incurred in the absence of those services.	Wetlands buffer the storm surge of a hurricane, reducing damage along the coast.	Value larger than the current cost of supply
Production Approaches	Service values are assigned from the impacts of those services on economic outputs.	Improvement in watershed health leads to an increase in commercial and recreational salmon catch.	Consumer surplus, producer surplus
Revealed Preference Approaches			
Travel Cost	Uses variations in travel cost to trace out the recreation demand curve, from which the consumer surplus is calculated.	Recreation areas attract tourists whose value placed on that area must be at least what they were willing to pay to travel to it.	Consumer surplus
Hedonic Pricing	The value of a service is implied by what people will be willing to pay for the service through purchases in related markets.	Housing prices along the coastline tend to exceed the prices of inland homes.	Consumer surplus
Stated Preference Approaches			
Contingent Valuation	Value for service demand elicited by posing hypothetical scenarios that involve some valuation of land use alternatives.	People are willing to pay for preservation of wilderness for aesthetic and other reasons.	Consumer surplus

Appendix C. Assumptions for Urban, Suburban and Rural Parks



For this study, GIS was employed by "clipping" US Census 2010 Block data for population with a 25 mile radius circle around the centroid of each state park. The mean was then derived of these 25 mile radius population counts: 415,622. Because the dataset was highly skewed to rural, the standard deviation of 634,995 was not suitable for bell curve distribution analytics. As a result we analyzed the distribution curve of state park 25 mile population and created two thresholds between rural and suburban and suburban and urban. The resulting division of parks and total participants into these categories can be seen in Table 8. For example, the chart shows that that 92 parks have a 25 mile radius population of 200,000 or less (this is 56.7% of all parks), about 30 parks have a 25 mile radius population of 400,000 (or about 16% of all parks), and so on.

Table 8. Summary of Urban-Rural Designation

	25 Mile Radius Population Range	Local %	Non Local %	Number of Parks	Total Participants Data
Urban	>1.4 million	79%	21%	15 (8.3%)	3,685,815 (10.3%)
Suburban	1.4 million to 207,000	72%	28%	63 (35%)	14,290,146 (39.9%)
Rural	<207,000	62%	38%	103 (56.7%)	17,871,809 (49.8%)
Total	N/A	68%	32%	181	35,847,770
Dean Runyan (2002)	All Parks	64%	36%		

A spectrum of local and non-local participant ratios along an urban to rural gradient is confirmed by primary data collected on participant origin for a New York State Park study.[24] On the extreme urban side of the spectrum New York State recorded "non-local visitors" at 2.9% of total State Park participants in New York City and 37.8% for the Niagara Frontier. Relative urban density varies from era to era, nation to nation, and region to region, therefore we did not transfer these values directly. The range of ratios we chose was a more conservative range of non-local participants with 21% for urban parks, 28% for suburban, and 38% for rural parks. Regardless of the designation, these parks still have a majority of local participants. For guidance we benchmarked this assumption against Dean Runyan's assertion that 64% of 2002 State Park Visitors were local day visitors.[25]

TABLE 7. SHARE OF NON-LOCAL VISITORS AND ESTIMATED TOTAL NON-LOCAL VISITOR EXPENDITURES BY REGION

	non-local visitors	non-local visitor expenditures ($ millions)	
	(percent)	low	high
Allegany	18.20%	$12.20	$25.20
Capital/Saratoga	36.20%	$40.60	$83.60
Central	32.40%	$25.90	$53.30
Finger Lakes	31.70%	$31.80	$65.60
Genesee	20.80%	$8.70	$18.00
Long Island	9.50%	$64.20	$132.20
New York City	2.90%	$4.50	$9.20
Niagara Frontier	37.80%	$132.40	$272.70
Palisades	6.80%	$10.20	$20.90
Taconic	12.20%	$12.90	$26.50
Thousand Islands	21.40%	$12.50	$25.70
state	**18.50%**	**$356**	**$733**

source: non-local visitors, OPRHP; expenditures, see text

Figure 5: Non-Local Participants ("Visitors") by Survey in NY State

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