Benefit-Cost Analysis of Cullowhee Riverside Park

ECO 5660: Benefit Cost Analysis

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Introduction

Cullowhee Riverside Park is a proposed park in Jackson County, North Carolina that was designed by MountainTrue's Asheville Design Center volunteer landscape architect and coordinated by American Rivers. The goal of the developers is to revitalize the historic site of Cullowhee by constructing a river park that encourages safe exploration of the area and by providing improved access to the river. The park would be placed by the Tuckasegee River and aim to showcase it through utilizing natural topography and maximizing lines of sight.

Cullowhee Riverside Park has a high up front cost, so providing analysis that reinforces the idea that the park will provide at least equitable benefits is significant in moving forward with the project. The following paper aims to provide a benefit-cost analysis of the park that will aid in the decision to move forward with its development through the use of the Travel Cost Method (TCM), Linear Probability Models, Monte Carlo simulations, Net Present Value calculations, and sensitivity analysis.

Analysis

The cost for the Cullowhee Riverside Park was estimated to be $1.1 million, and this was the figure used in the present BCA. The $1.1 million is based on the construction costs of the project.

Visitation Estimate

The benefits of outdoor recreation projects are directly related to the number of visitors that the proposed park would get, so one of the first objectives of the present analysis was to create a projection for the number of visitors that would visit Cullowhee Riverside Park. To start this process, the population of Jackson County, 44,574, was retrieved from the US Census. Then, an outdoor recreation participation percentage estimate of 57.3% from the OIA 2024 report was used to figure out how many of individuals in Jackson County participate in outdoor recreation. Assuming that the individuals visiting Cullowhee are those who engage in casual recreation, the previous figure was multiplied by 40%, which, according to the OIA report, is the percentage of individuals that participate in outdoor recreation who are casual participants. The OIA report also states that individuals participate in outdoor activities between 4 and 24 times a year, which provides a range of visitations to outdoor recreation centers for the type of individuals who may visit Cullowhee. Using the range of visitation estimates, a worst case, base case, and best case can be created for the number of visitations to the Cullowhee Riverside Park. The resulting visitation estimates are a lower bound of 3144 visits, a midpoint of 11,002 visits, and an upper bound of 18,861 visits. Another way to consider the visitations to the park is in terms of resource capacity. If the park has 36 parking spots, then based on the total visitors who park in that spot in a year, each parking spot generates a certain number of visits per year. In this case, 11,002 visitors (base case) would be divided by the number of parking spots. The resulting calculation is that each parking spot generates 305 visits per year. Calculating these visitation estimates will allow for a calculation of benefits if a value can be placed on each individual visit, which is the next step in the present analysis.

Benefits Using the Travel Cost Method

The Travel Cost Method (TCM) was utilized to make a calculation of benefits for an individual who travels and recreates at the Cullowhee Riverside Park, and it allows for a value to be placed on each

individual visit. The travel cost method bases the value a visitor has for an experience at an outdoor recreation destination on the amount they spent to travel to the park, and TCM values for individuals that travel to each county in North Carolina were calculated in a previous paper by Ashe and Whitehead. Ashe and Whitehead utilized a survey to ask participants about their experiences/preferences with traveling, and they were able to create TCM estimations from that data. For Jackson County, the TCM per individual per day was estimated to be $29.20. Using the value of $29.20 and multiplying it by the different visitation estimates, a base case, worst case and best case were calculated. These different cases are based on the range of benefits that would be generated by the park. The best case is based on the top value of net benefits, the worst case is based on the lowest, and the base case on a midpoint of those values. The base case, worst case, and best case for Cullowhee Riverside Park resulted in $321,258, $91,805, and $550,741 in benefits respectively.

OLS Estimation

Utilizing Ashe and Whiteheads raw data set, an OLS estimation was created to estimate willingness to pay (WTP) for individuals traveling to Cullowhee Riverside Park. The variables used in the regression were the probability that an individual would attend the park, p(yes), and the amount of money an individual would spend to travel there (amount). Using the model, the probability whether an individual will visit the park can be estimated using the cost for that individual to travel to the park.

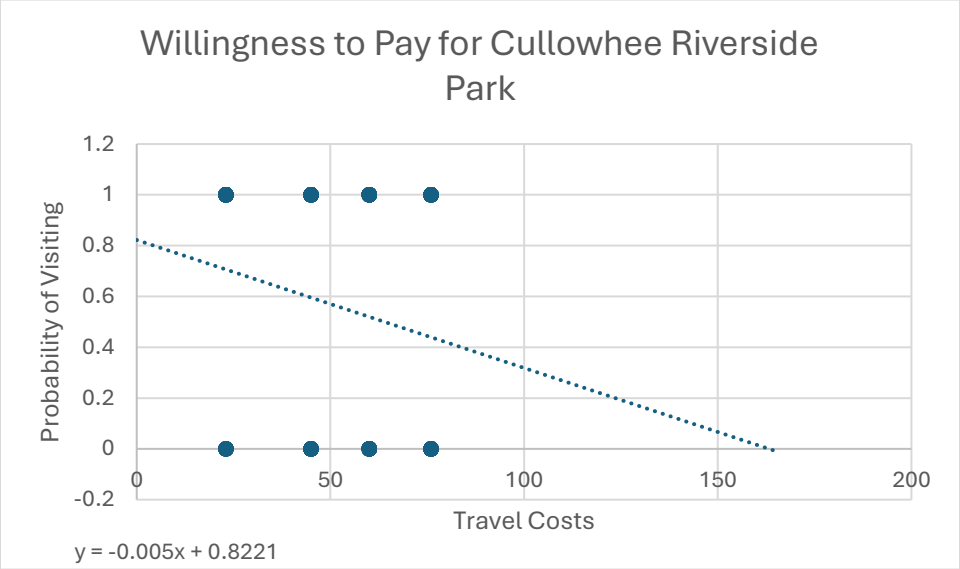

Figure 1

Given the equation that the p(yes)= -0.005amount + 0.82, 82% of people would go to the at an expense of $0. After graphing the equation, the willingness to pay for parties visiting Cullowhee Riverside Park can be calculated by the area under the line of best fit, which is 0.5(0.82)(164). Therefore, the willingness to pay is $67.41 for a party visiting the park. To convert this figure to an individual estimate, it needs to be divided by the average party size visiting Jackson County, which was estimated to be 3.15 by Ashe and Whitehead. The resulting WTP is $21.4 per person, and this only slightly differs from Ashe and Whitehead's estimate. Due to the difference being seemingly insignificant, the $29.20 TCM calculated by Ashe and Whitehead was used for the rest of the analysis.

Monte Carlo Simulation

Next, a Monte Carlo Simulation was conducted in order to account for the variability in the benefits and costs of the project. The lower bound of visitors, 3,144, and the upper bound of visitors, 18,861, were plugged into the simulation. Given that public funds could be used for the project, the Marginal Excess Tax Burden was inputted on a range of 0% to 20%. After inputting all of the information needed, 1000 trials were conducted to create estimates for the net benefit of the project. The results of the Monte Carlo simulation are displayed in figure 2.

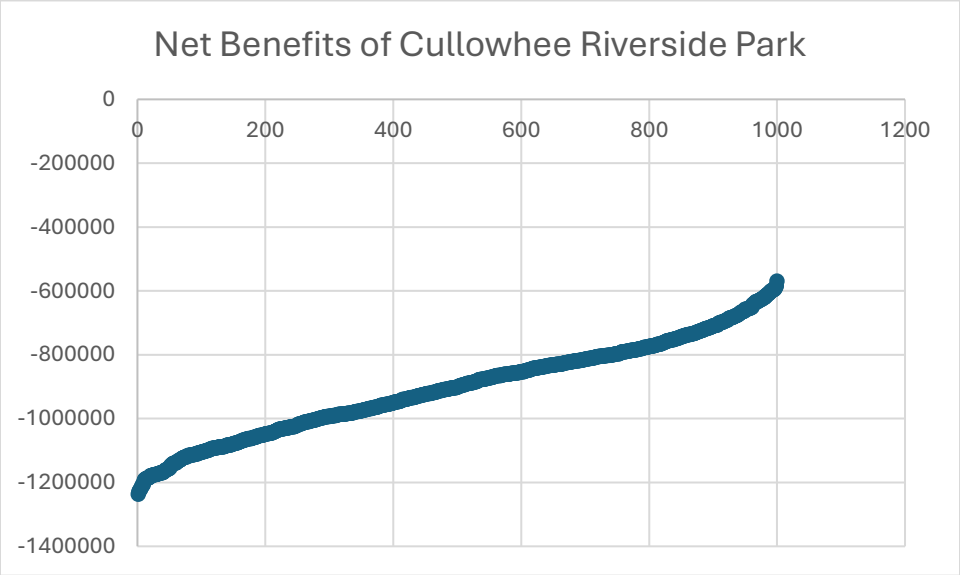

Figure 2

The results of the Monte Carlo simulation suggest that the mean benefits for the 1st year would be $322,123, which is equal to net benefits of -$905,014 in year one. However, given that the benefits will continue into the future, an NPV analysis of this number would provide a better picture of the true benefits of the project. Also, considering the annual benefits as an indication of the magnitude of overall benefits the project will generate is better than considering the net benefits. The range of annual benefits yielded by the Monte Carlo simulation are represented in figure 3.

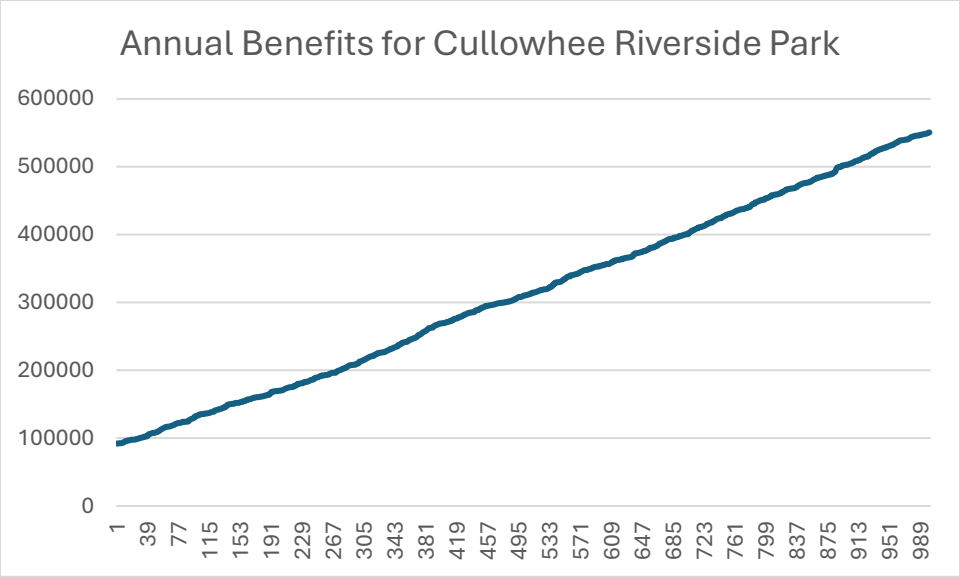

Figure 3

Net Present Value and Sensitivity Analysis

Following the Monte Carlo simulation, an NPV calculation was performed utilizing a 2% discount rate, which is the discount rate suggested by the federal government in their benefit cost analysis document titled OMB Circular A-4. The base case benefits estimate, $321,258, was used to create the NPV analysis, which is within $1000 of the average benefits in the Monte Carlo simulation. Given that the average is so close to the base case, it is practical to use the base case in this analysis. The resulting NPV value was $3,950,315, implying that the project's long-term benefits would far exceed its high upfront costs. Following the initial NPV calculation, sensitivity analysis was performed to account for variability in the discount rate. The discount rates of 3% and 4% used in the sensitivity analysis resulted in NPV's of $3,452,234 and $3,021,437, respectively. Even with higher discount rates, the long-term benefits of the project seem to outweigh the upfront cost.

Discussion

After conducting a benefit-cost analysis on the Cullowhee Riverside Park project, the benefits of the project greatly outweigh the costs. The benefits provided in the base case of the project result in a NPV of over $3 million. Furthermore, the Monte Carlo simulation resulted in an average annual benefit that is equitable to the base case. Even with variability accounted for, there is a significantly positive difference in benefits and costs. When sensitivity analysis was run, higher discount rates did not hinder the project heavily, further reinforcing the robustness of the findings despite varying discount rates.

Even though the paper suggests that the Cullowhee Riverside Park project is highly beneficial, there are a variety of limitations. One limitation to this analysis is that it relies on many assumptions, such as reliance of Ashe and Whitehead's study for TCM values, rather than utilizing a variety of estimates. Future estimates could compile more data or utilize a variety of methods to create the most accurate measurements. Furthermore, the Monte Carlo simulation may not account for other external factors, such as economic downturns or environmental challenges. Likewise, the damage of Hurricane Helene was not accounted for in this paper, and it could have an effect on travel within Jackson County and other areas of Western North Carolina. These limitations should be accounted for when reviewing the results of this paper.

Aside from assessing the travel costs, the park could provide Jackson County with a safe and enjoyable outdoor recreation experience as well as bring benefits to those within and outside the county. The quality of life of the individuals in the county could be increased by such a project and the community could be revitalized. The county would also likely see increased tourism, and that could provide benefits to local businesses that the tourists visit.

Conclusion

Given the analysis performed in this paper, the Cullowhee Riverside Park appears to be a highly beneficial project. The benefit-cost analysis demonstrated that the park's estimated benefits far outweigh its upfront costs. Moreover, the positive benefits are sustained despite variability, indicating the robustness of the findings and greenlighting the development of the project. Continuing to pursue this project would be advantageous to the county as it could play a role in its economic development and highlight the historic area. In conclusion, Cullowhee River Park represents an opportunity to mix economic growth with cultural preservation that can create a lasting impact on current and future generations.