



Ecobenefits of National Capital Region Park Trees

Introduction

Ten years of tree data collected within National Capital Region parks were used to determine the ecological benefits conferred by the trees in the region. The National Park Service's Inventory and Monitoring (I&M) Forest Vegetation Monitoring program provided data on trees throughout eleven of the National Capital Region (NCR) parks. Plot data for three parks, Rock Creek Park, Monocacy Battlefield, and Catoctin Mountain Park, was analyzed. Using iTree Eco, a program developed by the US Forest Service, the ecological benefits that National Park trees provide was quantified. The benefit data generated by iTree for the plots was then analyzed to show benefits conferred by trees throughout the entire park. Pollution removal and runoff interception benefits were found to be related to forested area in the parks and the surroundings of the park, with urban Rock Creek Park outperforming in many categories despite its size.

Process

Data from NCR I&M's Forest Vegetation Monitoring Program was used as the basis of this project. This data was collected at randomly placed plots chosen from a regular plot grid in forested regions of parks over the course of approximately ten years, resulting in a random sample. The data recorded many variables that iTree Eco could accept, but lacked others. The available data was sufficient to generate modeling reports from iTree for analysis.

Table 1. Available data from the Forest Vegetation Monitoring Program compared to data that iTree requested and considered "highly recommended."

NPS Data	iTree Data Requested
Date	
Tag/ID	
Species	
Diameter at Breast Height (DBH)	
DBH Height	
Latitude	
Longitude	
	Land Use
Status	Tree Height
Basal Area	Crown Size
Plot Name	Crown Health
Cycle	Crown Light Exposure

The reports produced by iTree and further analyzed included:

- Pollution removal- airborne gasses and particulates
- Carbon storage- carbon stored organically in trees
- Carbon sequestration- CO₂ removed from atmosphere
- Oxygen production- breathable O₂ produced by trees
- Bioemissions- other gasses produced by trees
- Avoided runoff- intercepted before reaching waterways
- Monetary benefits/value of above services
- Tree size data based on DBH and species

The datasets produced by iTree were compiled for each park. The total sums for each category were calculated as well as the sums and averages of each relevant tree species' contribution to the overall benefits. The park size and forest area was used to find what percentage of the park had been included in these sample plots to draw conclusions and find benefit values on a park-scale.

Table 2. Park and data descriptions for Rock Creek, Monocacy, and Catoctin.

	ROCK CREEK	MONOCACY	CATOCTIN
Area (km ²)	7.1	6.57	23.3
% Forested	83%	34%	96%
Area Forested (km ²)	5.89	2.2	22.4
Area Sampled (km ²)	0.0106	0.0106	0.0346
Trees in Sample	328	390	1061

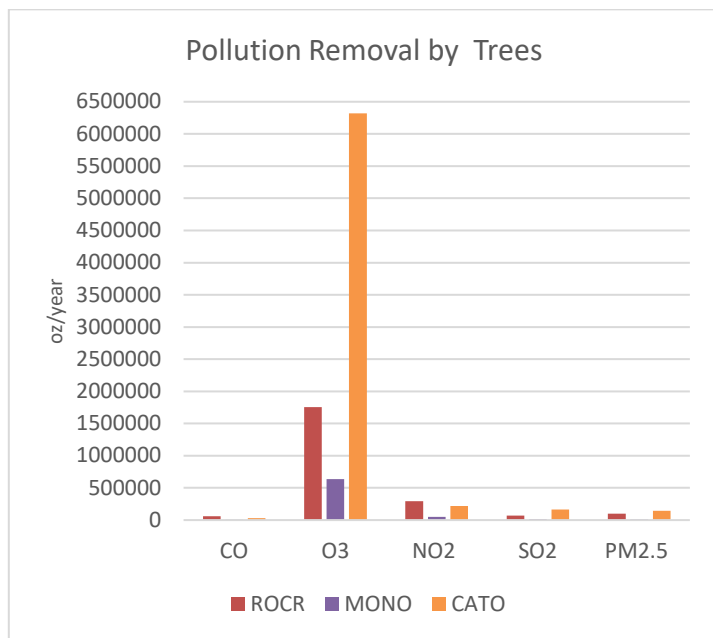
Results

All benefit categories were totaled for each park's plots and scaled appropriate to the total forested area of the park. Rock Creek Park, despite its smaller size, has a comparable pollution removal potential to Catoctin Mountain Park (see Figure 1). This is due to Rock Creek's urban location and the correspondingly greater amount of pollution. The value associated with pollution removal was far greater for Rock Creek as well (see Figure 2).

Avoided runoff was highest in Catoctin Mountain Park due to its size and highly forested nature (see Figure 3). However, the *value* associated with avoided runoff for Rock Creek Park was almost equal to that of Catoctin, despite its lower interception (see Figure 4). This is due to the surroundings of these parks, a highly urbanized area with many impervious surfaces and a more rural area for Rock Creek and Catoctin, respectively.

Catoctin Mountain Park far surpasses either Rock Creek Park or Monocacy Battlefield when it comes to oxygen production and carbon sequestration. This is again due to large, forested area. These benefits are closely tied to the area of each park that is forested and less impacted by a park's surroundings.

Figure 1. Pollution removal capability of trees in Rock Creek, Monocacy, and Catoctin.



Conclusions and Implications

The modeling results from iTree Eco has shed light on the relationship between trees in National Capital Region parks their surroundings. Quantification of the benefits and their value show data directly related to the size of the forested area of the parks, with Catoctin leading O₃ removal, transpiration, and potential evapotranspiration. Other values were related to the location of the park with Rock Creek Park leading in most monetary value categories. The urban location of Rock Creek Park, in the center of Washington, DC and surrounded by impervious surfaces, makes its ability to intercept runoff worth a great deal. The same can be said of its ability to remove pollutants like NO₂ and SO₂, both produced by the automobiles in the densely populated area.

Monocacy National Battlefield is the most lightly forested and smallest park included in this report, with only 2.2 km² of forest area. Its ecological benefits were correspondingly the lowest, though they should not be discounted as they are proportional to the park's forest size.

This investigation shows the high value of urban forests in pollution removal and runoff interception. Very forested parks in more rural areas, such as Catoctin, handle comparable amounts of pollution and runoff as less forested urban parks, such as Rock Creek.

Acknowledgements

Thanks to Ann Gallagher, John Paul Schmit, Elizabeth Matthews, Gregory Geise, David Nowak, Jason Henning, and William Southard for their help in completing this project.

Figure 2. Monetary value of pollution removal capability of trees in Rock Creek, Monocacy, and Catoctin.

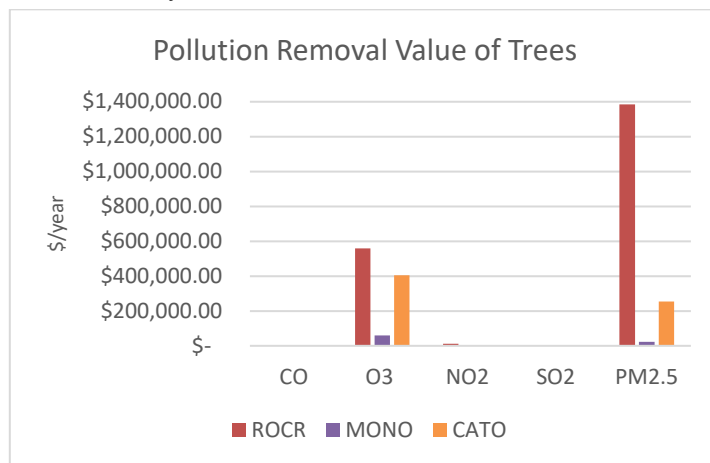


Figure 3. Avoided runoff capability (column groups show potential evapotranspiration, evaporation, transpiration, water intercepted, and avoided runoff) and value of trees in Rock Creek, Monocacy, and Catoctin. A bar showing the ft³ contained in 1000 Olympic-sized swimming pools on the far right is included as a reference for scale.

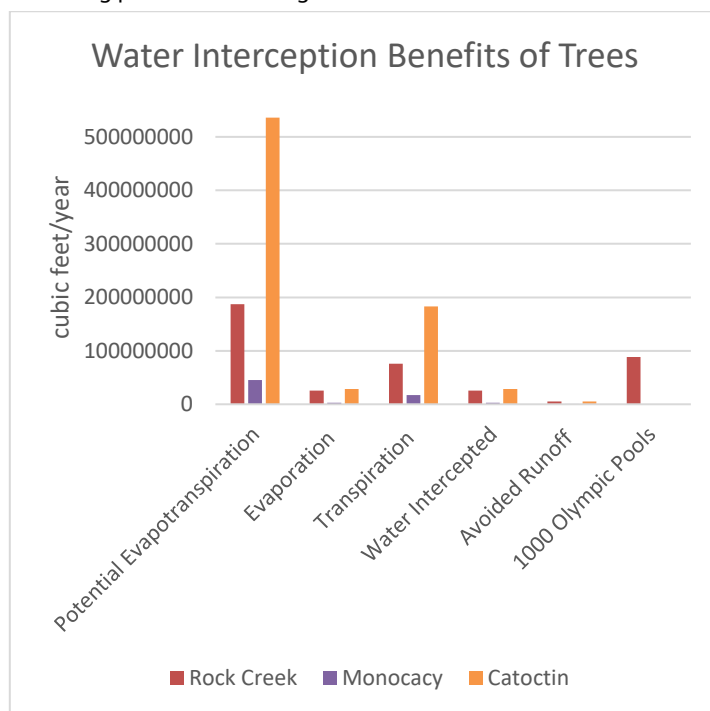


Figure 4. Avoided runoff value of trees in Rock Creek, Monocacy, and Catoctin.

