This Methods Document accompanies a *Landscape Performance Series* Case Study Brief. It was produced through the Landscape Architecture Foundation’s *Case Study Investigation* (CSI) program, a unique research collaboration that matches LAF-funded faculty-student research teams with leading practitioners to document the benefits of exemplary high-performing landscape projects.

The full case study can be found at:
https://landscapeperformance.org/case-study-briefs/railroad-park
Landscape Performance Benefits

Environmental Benefits

1. Sequesters approximately 20,000 lbs of atmospheric carbon annually in 531 newly-planted trees, equivalent to driving a single passenger vehicle 21,000 miles. The tree canopies also intercept 92,000 gallons of stormwater runoff annually.

Calculations
The National Tree Benefit Calculator was used to calculate the amount of carbon sequestered by an individual tree in a single year. The species and caliper were chosen in the drop-down menu of the calculator based off of the plant schedule of the planting plan. If a caliper range was given, the lower end of the range was used. For river birch, the only multi-trunk tree specified, it was assumed that 3 leaders were typical. For evergreen trees specified at a particular height instead of caliper, an estimate was made based off of similar observed species. As part of the National Tree Benefit Calculator, the amount of stormwater captured by a plant’s physical structure is also estimated.

20,822 total lbs of atmospheric carbon sequestered as estimated by the National Tree Benefit Calculator (see Appendix A).

Per the United States Environmental Protection Agency Greenhouse Gas Equivalencies Calculator, that amount of carbon is comparable to 21,742 miles driven by an average passenger vehicle.

The estimate from individual trees was multiplied by the number of a given species, then all were added to produce total stormwater capture (see Appendix A).

Limitations
This number does not take into account any of the shrubs or perennials within the park. Wax myrtle was included in the planting plan as a tree; however, it is often considered a large shrub and was not available in the National Tree Benefit Calculator so it is not reflected in this number. These calculations are estimations based off of the trees at installation and are expected to increase as time passes.

Sources
National Tree Benefit Calculator - Davey Tree Experts and Casey Trees

Planting schedule provided by Emily Leader of Tom Leader Studios


2. Increased the number of bird species observed on the site by 250%, from an estimated 10 to 35, including the bobolink, wood duck, peregrine falcon, loggerhead shrike, and northern mockingbird.

Information provided by the Birmingham Audubon Society indicates 35 bird species observed within park boundaries since the establishment of Railroad Park. The Society estimates 10 species observed before the park’s establishment, which indicates a 250% increase in species present.
Calculations

Formula for Percent Change \(((y-x)/x) \times 100\)
\(x\) represents pre-development, \(y\) represents post-development

\[
(35-10) = 25 \\
25/10 = 2.5 \\
2.5 \times 100 = 250\% 
\]

Limitations
36 birds were spotted, however one (American white pelican) was discounted because it was flying over the park and not actually within it.

Sources
Greg Harber, Birmingham Audubon Society, Board Member (see Appendix B).

Social Benefits

1. Attracts over 600,000 visitors annually.

Calculations

“The park attracted 600,000 visitors in 2014 and already had exceeded that number by August of 2015.”

Limitations
Information attributed to source cited; researchers did not independently verify data.

Source

2. Improves the perception of Downtown Birmingham for 98% of 95 survey respondents and improves the unification of the northern and southern parts of the city for 92% of respondents.

Calculations
93 of the 95 respondents said that the park has helped improve city perceptions. 70 respondents claimed the park improved North/South unification “very much” while an additional 17 claimed “somewhat.”

City Perceptions
\[
93 \div 95 = .979 \times 100 = 97.9\% \approx 98\% 
\]

Unification
\[
70+17=87 \\
87 \div 95 = .916 \times 100 = 91.6\% \approx 92\% 
\]
Limitations
None

Sources
Survey Questions 9 and 11 (see Appendix C).

3. Influenced the housing choice of 43% of 63 survey respondents who live near the park.

Calculations
Of the 95 survey respondents, 60 claimed to live or live and work near the park. In a separate question, 26 respondents said the park did influence their decision in their housing choice.

\[
\frac{26}{60} = 0.4333 = 43\%
\]

Limitations
There is a slight discrepancy between Question 4 and Question 8. Question 4 established that 60 people live near the park. However, Question 8 implies that possibly 68 people live near the park. The housing choice summary statistic does not take into account the fact that a portion of the 60 respondents already lived in the area prior to the park’s construction.

Sources
Survey Question 4 (see Appendix C).

4. Serves as a place to exercise for 77% of 95 survey respondents.

Calculations
Of 95 survey respondents, 73 claimed to use the park for exercise.

\[
\frac{73}{95} = 0.768 \times 100 = 76.8\% = 77\%
\]
Limitations
“Exercise” was not defined, leaving it open to interpretation for the survey respondents.

Sources
Survey Question 7 (see Appendix C).

Economic Benefits

1. Catalyzed $324.5 million in public and private investment in the area since the park’s opening, with over $200 million more in private investment in the works.

“The area has seen $324.5 million in public and private investment in the past few years, and more than $200 million more in private investment is in the works.”

Limitations
Information attributed to source cited; researchers did not independently verify data.

Source
## National Tree Benefits Calculator Results

<table>
<thead>
<tr>
<th>Tree Species</th>
<th># of Trees</th>
<th>Height (inches)</th>
<th>Caliper (inch es)</th>
<th>Stormwater per tree (gal)</th>
<th>Total Stormwater (gal)</th>
<th>Carbon per Tree (lbs)</th>
<th>Total Carbon (lbs)</th>
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<tbody>
<tr>
<td>Acer saccharum</td>
<td>22</td>
<td>3</td>
<td></td>
<td>157</td>
<td>3454</td>
<td>53</td>
<td>1166</td>
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<td>Betula nigra ‘Dura Heat”</td>
<td>18</td>
<td>16’</td>
<td>2.5</td>
<td>206</td>
<td>3708</td>
<td>41</td>
<td>738</td>
</tr>
<tr>
<td>*3 trunks, 1.5 in caliper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Betula nigra “dura heat”</td>
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<td>10’</td>
<td>1.7</td>
<td>102</td>
<td>5406</td>
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<td>795</td>
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<td>*3 trunks, 1 in caliper</td>
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<td>Cercis canadensis</td>
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<td>154</td>
<td>3388</td>
<td>30</td>
<td>660</td>
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<td>2926</td>
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<td>570</td>
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<td>Fagus grandiflora</td>
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<td>Fraxinus pennsylvanica ‘Urbanite’</td>
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<td></td>
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<td>Ilex opaca ‘Greenleaf’</td>
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<td>1612</td>
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<td>Liriodendron tulipifera</td>
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<td></td>
<td>148</td>
<td>2664</td>
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<td>720</td>
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<tr>
<td>Magnolia grandiflora</td>
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<td>10’</td>
<td>2</td>
<td>114</td>
<td>1710</td>
<td>9</td>
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<tr>
<td></td>
<td>a ‘Alta’ Magnolia virginiana ‘Australis’ Magnolia</td>
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<td>10’</td>
<td>2</td>
<td>141</td>
<td>1692</td>
<td>25</td>
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<td>Myrica cerifera Wax Myrtle</td>
<td>0</td>
<td>8’</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>*Not available within iTree-often considered shrub.</td>
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<td>272</td>
<td>11968</td>
<td>57</td>
<td>2508</td>
<td></td>
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<td>Pinus virginiana Virginia Pine</td>
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<td>10’</td>
<td>2</td>
<td>60</td>
<td>1560</td>
<td>7</td>
<td>182</td>
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<tr>
<td>Pistacia chinensis Chinese Pistache</td>
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<td>4</td>
<td>402</td>
<td>8040</td>
<td>89</td>
<td>1780</td>
<td></td>
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<tr>
<td>Quercus lyrata Overcup Oak</td>
<td>60</td>
<td>3</td>
<td>272</td>
<td>16320</td>
<td>57</td>
<td>3420</td>
<td></td>
</tr>
<tr>
<td>Quercus nutallii Nutall Oak</td>
<td>13</td>
<td>3</td>
<td>148</td>
<td>1924</td>
<td>40</td>
<td>520</td>
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<tr>
<td>Taxodium distichum Bald Cypress</td>
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<td>3</td>
<td>148</td>
<td>7400</td>
<td>40</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Ulmus americana ‘Princeton’</td>
<td>50</td>
<td>3</td>
<td>148</td>
<td>7400</td>
<td>40</td>
<td>2000</td>
<td></td>
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<tr>
<td>Totals</td>
<td>531</td>
<td></td>
<td>92000</td>
<td>20822</td>
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</tr>
</tbody>
</table>
Appendix C
Survey by Auburn University: Railroad Park, Birmingham, AL
Sponsored by: Landscape Architecture Foundation Case Study Initiative

1. I wish to participate in this survey:
   a. Yes
   b. No

2. My age range is:
   a. 18 - 35
   b. 36 - 64
   c. 65 and older
   d. I do not wish to disclose this information

3. I identify as:
   a. Male
   b. Female
   c. Other (Please explain) __________________________________________________________
   d. I do not wish to disclose this information.

4. What is your geographic relationship to this park?
   a. I live near this park.
   b. I work near this park.
   c. I live and work near this park
   d. Other (Please Explain) _______________________________________________________

5. How often do you visit this park?
   a. Daily (everyday)
   b. Weekly (2 or more times a week)
   c. Monthly (2 or more times a month)
   d. Other (Please explain) _______________________________________________________

6. How long do you stay at the park?
   a. Less than 1 hour.
   b. 1-3 hours.
   c. More than 3 hours.
   d. Other (Please explain) _______________________________________________________

7. What are the reasons you use/visit this park? (Indicate all options that apply)
   a. To exercise
   b. To attend cultural events, such as film screenings or festivals
   c. To eat in the park's café
   d. Other (Please explain) _______________________________________________________

8. Did the park influence your decision to live in the area?
   a. Yes- it influenced my decision.
   b. No- it did not exist when I moved to the area
   c. No- I did not care about living near the park
   d. I do not live in the area so this question does not apply to me

9. Do you feel the park has helped unify the northern and southern sides of the city?
   a. Yes, very much so
b. Yes, somewhat  
c. No, not at all  
d. I am not sure

10. How do you most closely identify? (Select all that apply)  
a. College student/ young professional  
b. Parent with young/school-aged children  
c. Mid-career/established professional  
d. Retired individual

11. Has the park contributed to a more positive perception of downtown Birmingham?  
a. Yes  
b. No  
c. Unsure

Comments:________________________________________________________________________
Appendix D

Biofiltration Capacity of Circulating Pond-Stream System
(appears in Sustainable Features section)

The circulating pond-stream system provides biofiltration for over 1.5 million gallons of water.

Calculations
A site map provided by the contractor was scaled up in AutoCAD and the bathymetric lines were outlined. The “area” function was used for each elevation and was then used in the Contour Area Method to calculate the estimated volume.

<table>
<thead>
<tr>
<th></th>
<th>Cubic Feet</th>
<th>Cubic Yards</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopond</td>
<td>3579.80</td>
<td>132.59</td>
<td>26776.90</td>
</tr>
<tr>
<td>Northlake</td>
<td>25605.75</td>
<td>948.36</td>
<td>191531.01</td>
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<tr>
<td>South Lake</td>
<td>150190.65</td>
<td>5562.62</td>
<td>1123426.06</td>
</tr>
<tr>
<td>Pond 1</td>
<td>8903.05</td>
<td>329.74</td>
<td>66594.81</td>
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<tr>
<td>Pond 2</td>
<td>10870.50</td>
<td>402.61</td>
<td>81311.34</td>
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<tr>
<td>Wetland</td>
<td>7430.90</td>
<td>275.22</td>
<td>55583.13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>206,580.65</strong></td>
<td><strong>7,651.14</strong></td>
<td><strong>1,545,223.26</strong></td>
</tr>
</tbody>
</table>

Limitations
This calculation does not take into account the water displaced by flora/fauna or held within the soils and streams (due to their shallow, fast moving nature). It also assumes that the park is not in flood condition, but rather all bodies of water are at their normal levels.

Sources
Site Map - Provided by the general contractor, not for public release.

Calculations were derived from Equation 8.3 in *Site Engineering for Landscape Architects* (Strom, Nathan, Woland 2013).