INTRODUCTION

Stormwater management is an important component in city planning, especially as urbanization increases.

The more impervious surfaces reduce the water infiltration leading to an increase in stormwater runoff, which occurs when rainwater or melted snow flows over the streets, lawns and other sites creating negative economic and environmental impacts within the cities.

We identified the flooding zones in Bloomington and of those areas, we examined one specific block in Bloomington - Indiana between 7th and Kirkwood.

The purpose of the study was to (1) re-inventory the current tree cover (2) assess and evaluate the tree cover and potential areas for implementing stormwater management tools.

METHODS

Conducted a re-inventory of the street trees on both sides of Indiana Avenue between 7th and Kirkwood.

Cataloged the existing trees’ diameter at breast height (DBH), species, condition, maintenance requirements, and age.

Cross examined with the existing 2007 and 2012 tree inventory to identify the tree change over time.

Utilized data with direct observations to construct stormwater management recommendations.

QUESTION

Can trees be an effective tool in urban stormwater management?

RESULTS

![Graphs showing tree maturity distribution]

ANALYSIS

As a tree lifetime increases, the amount of rainfall intercepted increases, where more surface area = more evapotranspiration.

Trees are able to intercept this rainwater through two main mechanisms:
(1) Tree roots grow near the surface since that is where the majority of the nutrients lie. The roots are able to soak up and store more of the rainwater and prevent it from flushing chemicals into unwanted places and preventing soil erosion.
(2) The leaves, branches, and bark will also catch the rainfall reducing the overall amount of runoff.

The difference between semi-mature and mature: Once a tree is considered mature, it is providing the maximum amount of benefits available to the community.

Table 1 shows how each tree seen in the most recent inventory (2007) can provide between 3,000-5,000 more rainfall interception once full maturity is reached.

<table>
<thead>
<tr>
<th>Tree</th>
<th>Semi-Mature (gallons/year)</th>
<th>Mature (gallons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar Maple</td>
<td>5,619 (41)</td>
<td>7,358 (40)</td>
</tr>
<tr>
<td>Red Maple</td>
<td>5,720 (41)</td>
<td>7,607 (40)</td>
</tr>
<tr>
<td>Pin Oak</td>
<td>2,569 (11)</td>
<td>7,353 (25)</td>
</tr>
</tbody>
</table>

Table 1. Values taken from the National Tree Benefit Calculator of gallons intercepted per year based on maturity level.

RECOMMENDATIONS & CONCLUSION

Increase tree cover: The wider the canopy cover the more rainwater the tree will be able to absorb thus reducing a lot of costs in building sewerage treatment plants. The city of Seattle did a cost benefit analysis of increasing the canopy cover from 18% to 38% and the results suggested that it would double the stormwater retention capacity by more than $41 million.

Convert impermeable surfaces: There was a computer modeling done which shows that for every 1% of impermeable land which is transformed into woodland, the runoff would be reduced by 0.5%. Trees which are planted as part of “sustainable urban drainage System schemes” have been proved to be effective in controlling flooding in urban areas.

Creating tree wells and curb extensions: Tree wells do not take up space, in addition to providing ecological service they also provide shade to the vehicles parked under them and reduce the quantity of hydrocarbons and suspended particulate matter in the air.

Creating artificial rain gardens and tree islands: Many of the tree lawn and areas that have a lot of utility lines can be converted into rain-gardens patches with native trees and plants. These rain gardens reduce stormwater runoffs. In addition to reducing the quantity of storm water runoffs they add aesthetic value to the property they are easy to maintain and they also keep the water clean.

ACKNOWLEDGMENTS

Dr Burney Fisher for the access to the 2007 and 2012 Bloomington Street Tree Inventory and use of the National Tree Benefit Calculator for tree maturity information.