THE EFFECT OF URBAN TREE CANOPY ON MICROCLIMATE AND HEAT ISLANDS

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Denver’s Urban Tree Canopy
• 2001 – 6% canopy cover \(\text{American Forests}\)
• 2006 – 10.41% canopy cover \(\text{NCDC}\)
• 2013 – 19.7% \(\text{US Forest Service & UC, Davis}\)
Data Sets

• 1993 Street tree inventory  – Colorado State Forest Service
• 2001 Canopy assessment  – American Forests
• 2006 Canopy assessment  – NCDC
• 2008 STRATUM analysis  – volunteers
• 2013 Canopy assessment  – USFS & UC, Davis
• 2.2 million trees  
  – 3.7 trees per capita  
• Asset value of $2.9B  
• $122 million in annual benefit from property value and ecosystem services  
  • $95M property value  
  • $18M storm water  
  • $6M summer cooling  
  • $530K CO2 storage
Maximizing Benefits
Hotspots and Plantable Spaces

Heat Islands & Planting Areas

Heat Islands
- Warm
- Hot

Neighborhood Potential Planting Spaces
- <1,000
- 1,000 - 2,500
- 2,500 - 5,000
- >5,000

Map showing distribution of heat islands and planting areas with color-coded neighborhoods.
### 4.1.4 Urban Natural Resources Sector

Table 4.4 identifies short-term adaptation activities associated with Urban Natural Resources Sector; the principal agencies are DPR and DPW.

**Table 4.4: Summary of Short-Term Adaptation Activities for Urban Natural Resources**

<table>
<thead>
<tr>
<th>Climate Impact</th>
<th>Vulnerability</th>
<th>EMS Activities</th>
<th>Responsible Agency</th>
<th>Agency Plan</th>
</tr>
</thead>
</table>
| Increase in temperature and urban heat island effect                           | Stress on trees and urban landscaping      | 1) Publish and begin the outreach of the Metro Denver Urban Forest Assessment  

2) Initiate a contract to inventory existing trees within the City in preparation for a Tree and Shade Master Plan  

3) Update the right-of-way tree list that focuses on trees that can thrive in future climates | Department of Parks and Recreation          | Metro Denver Urban Forest Assessment  

Tree and Shade Master Plan  

Right-of-Way Tree List Storm |
| Higher frequency of extreme weather events                                     | Stormwater management and flood control     | Include a discussion section on climate adaptation and mitigation in the Storm Drainage Master Plan documentation update currently underway by DPW planning staff | Department of Public Works               | Storm Drainage Master Plan                          |
| Contaminant loading from increased flooding and heavy rain spells              |                                                                             | Include climate adaptation and mitigation in discussion and documentation related to 6 year Water Quality Strategic Implementation Plan currently underway by DPW planning staff |                                            | Water Quality Strategic Implementation Plan          |
Attack of the Green Reaper

No EAB Were Harmed During Filming (photo by Russell Carr)
## Canopy Services and Potential Losses

<table>
<thead>
<tr>
<th>Service</th>
<th>Annual Benefit</th>
<th>15% reduction</th>
<th>Service Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Quality</strong></td>
<td>$1,554</td>
<td>$1,321</td>
<td>$233</td>
</tr>
<tr>
<td><strong>CO2 Storage and avoidance</strong></td>
<td>$535,772</td>
<td>$455,406</td>
<td>$80,366</td>
</tr>
<tr>
<td><strong>Rain fall interception</strong></td>
<td>$18,935,911</td>
<td>$16,095,524</td>
<td>$2,840,387</td>
</tr>
<tr>
<td><strong>Property value</strong></td>
<td>$95,731,364</td>
<td>$81,371,659</td>
<td>$14,359,705</td>
</tr>
<tr>
<td><strong>Energy saved</strong></td>
<td>$6,776,570</td>
<td>$5,760,085</td>
<td>$1,016,486</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$121,981,171</td>
<td>$103,683,995</td>
<td>$18,297,176</td>
</tr>
</tbody>
</table>
How much is all this going to cost?
Enhanced Arboricultural Budgets

Results

- 2014 Park tree inventory
- 2015 Forestry crew for street tree inventory
- 2015 Public awareness (5 years of funding)
- 2015 Debris reduction
- 2015 Park tree planting

$2.24 MILLION
Full park system inventory - 76K trees
Street trees in inventory - ~218K trees

2016 Budget expansion
• 10 new forestry staff members in 2 years
• Aggressive and proactive EAB program
  – $1M for treatments annually
  – $765k for proactive planting annually
  – $250K for outreach and education annually

$2.97 MILLION
Property Value & Neighborhood Tree Canopy

Average Median Property Value

- $ < $200,000
- $$$ $200,000 - $350,000
- $$$$ > $350,000

Average Tree Canopy Coverage

- <15%
- 15% - 25%
- >25%

0 1 2 Miles
Looking to the future

- Water research
- Trust for Public Land Climate Smart Cities
- Streetscape design
- Updating the Game Plan