Traffic Safety & City Trees: Finding a Livable Balance

Savannah Tree Foundation
Community Workshop

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Is this so bad?
Why Roadside Trees?

- Transportation Perception: Primary Benefit of Landscaping is to Enhance Beauty

- Evolving Understanding: Street Trees offer Environmental, Economic, and Social Benefits

Recommendation: Do not compromise Safety, but Engineering & Landscape professionals need to work together to Identify Strategies to Safely Incorporate Street Trees

Presentation Format

- Trees, Livability & Value
- City Trees and Safety
- Design Solutions
Ecosystem / Environmental Services

- Stormwater Absorption & Quality
- Air pollutants reduction
- Nitrogen, phosphorus and sediment interception
- Carbon emission reduction, storage and sequestration
- Urban heat-island cooling
- Reduced “bad” ozone
- Wildlife habitat creation

Human Well-Being Benefits

- Stress reduction in urban lifestyles
- Higher job satisfaction and reduced absenteeism
- Reduced violence and more constructive conflict resolution in domestic conflict
- Improved surgery and illness recovery
- Greater creativity and modeling behavior in children’s play
- Reduced ADHD symptoms
Economic Incentives

- Improved consumer environments in business districts: + 9-12% product spending
- Residential real estate values:
  - + 3-7% with trees in yard
  - + 5-20% proximity to natural open space
  - + 9% when adjacent to street tree plantings
- Commercial property rental rates: + 7%
- Air pollution mitigation
- Heating and cooling cost reductions

Tree Values & Benefits

- Ecosystem / Environmental Services
- Public Goods & Valuation
- Human Dimensions & Benefits
City Trees & Retail Behavior
Willing to pay 9-12% more
Wolf, J Forestry 2006, J Arb 2005

Physical Activity & Obesity

- Majority of Americans Not Active Enough
- Goal: 30 minutes per day of Moderate Activity
- Risk Factor for Chronic Diseases (Heart, Stroke, Cancer, Diabetes)
- Significant Costs to National Health Services

310-580,000 deaths per year
$100 annual billion medical costs (1995)
9.4% of all U.S. medical costs
Obesity Trends* Among U.S. Adults
2004

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)

Doubling of adult obesity rate since 1980.
parks, open spaces & trails
Provide Continuous Pedestrian Facilities
Walking and Bicycling: International Comparisons

Pucher, AJPH 93:1509, 2003
Make Room for Pedestrians

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Problem!

- Drivers run off the road and crash into trees

Distribution of Crashes

Total 2002 motor vehicle crashes: 6,316,000 collisions with trees - 1.9% (120,000 per year)
Injury Comparison

- All accidents
- Trees only

<table>
<thead>
<tr>
<th>Injury Type</th>
<th>All Accidents</th>
<th>Trees only</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Injury</td>
<td>55%</td>
<td>61%</td>
</tr>
<tr>
<td>Possible Injury</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>Non-incapacitating Injury</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Incapacitating Injury</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Fatality</td>
<td>29%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Roadside Trees & Safety

U.S. traffic accident rates in 2002

<table>
<thead>
<tr>
<th>Injury Type</th>
<th>U.S. Total</th>
<th>Tree Accidents</th>
<th>Urban Accidents</th>
<th>Urban Tree Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Accidents</td>
<td>*6,316,000 (100%)</td>
<td>1.9%</td>
<td>37%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Incapacitating Injury and Fatality</td>
<td>13%</td>
<td>*14,100 (2.2%)</td>
<td>0.9%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Fatality</td>
<td>*43,005 (0.6%)</td>
<td>0.1%</td>
<td>*3,258 (&lt;0.001%)</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

* NHTSA (2004) - %s may differ due to sampling and analysis procedures

Bratton and Wolf, Trans Research Board, 2005
Annual Fatality Risks:

M. Norris, Australia ISA, 2005

Table 1 Every Day Risks
Source ANSTO (Higson 1989)

<table>
<thead>
<tr>
<th>Risk</th>
<th>Individual risk per person per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking (20 cigarettes a day)</td>
<td>1:200</td>
</tr>
<tr>
<td>Cancers from all causes</td>
<td>1:500</td>
</tr>
<tr>
<td>Drinking alcohol</td>
<td>1:2,500</td>
</tr>
<tr>
<td>Travelling by Motor vehicle</td>
<td>1:7,000</td>
</tr>
<tr>
<td>Travelling by Train</td>
<td>1:33,000</td>
</tr>
<tr>
<td>Travelling by Aeroplane</td>
<td>1:100,000</td>
</tr>
<tr>
<td>Fires and accidental burns</td>
<td>1:100,000</td>
</tr>
<tr>
<td>Cataclysmic storms and storm flood</td>
<td>1:5,000,000</td>
</tr>
<tr>
<td>Lightning strike</td>
<td>1:10,000,000</td>
</tr>
<tr>
<td>Meteorite</td>
<td>1:1,000,000,000</td>
</tr>
</tbody>
</table>

Urban/Rural Crash Rates

2001 Traffic Data

- Mileage Traveled
- Crashes

Fatal urban tree crash 1: 100,000
Injury, Urban and Rural Differences

Frequency

Injury Severity

- No injury
- Possible injury
- Non-incapacitating injury
- Incapacitating injury
- Fatality

Rural
Urban
Behavior & Safe Driving!

- Crashes occur on weekends, late evening hours
- Winding rural roads, vehicle leaves road on outside of curves
- Male traffic fatalities outnumber female 2 to 1
- Drunk driving - about 50% of all traffic fatalities
- Seat belt use reduces risk of death by 42%
- Travel speed exceeds posted speed - about 30% of fatalities

Recent Urban Research

- Safety effects of three urban roadside design strategies:
  - widening paved shoulders
  - widening fixed-object offsets
  - livable (pedestrian oriented) street treatments

- Only livable streets variable was consistently, negatively associated with reduced roadside and midblock crashes

E. Dumbaugh, 2006, Trans Research Record
Recent Urban Research

- Consider vehicle speed & compatibility with other transportation modes
- Operating speed modeling, GPS recorded:
  - higher speed - 2 lane per direction vs. one lane (most significant factor)
  - reduced speed - on-street parking and sidewalks
  - reduced speed - increase in density of trees or utility poles, or decrease in their offsets
  - reduced speed - increase in density of driveways, T intersections

Wang, Dixon, Li, Hunter; 2006, Trans Research Record

Presentation Format

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- Design Solutions
Streets Focus on High-Speed

Poor Livability Factor
Streets Focused on Vehicles

No room for people – Utility Encroachments

Complete the Streets!
cars/pedestrians/bikes
Home Zones (Dutch “woonerf”)  
Integrating the Street into Everyday Life

Home Zones  
Traffic Calming  
Green Streets  
Festival Planning  
Play Spaces  
Multi-modal  
Transport
Psychological Traffic Calming
“body language of the street”
“mental speedbumps” D. Engwicht
- complete streets
- home zones

Closing Thoughts
- Community benefits of vegetation are extensive and evidence-based
- Safety on urban streets is very important
- Pursue collaboration of transportation and urban forest professionals
- AASHTO Green Book offers flexible guidelines
Closing Thoughts

- Street features and geometry as driver feedback system
  - design speed versus operating speed
  - perception and behavior
  - role of roadside in speed modulation
  - attain mobility & livability

www.cfr.washington.edu/research.envmind