Trees & Urban Streets:
Public Perceptions
& Transportation Safety

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roadside trees = bad trees?
Presentation Outline

- City Trees & DOTs – perception/reality
- Trees, Livability & Value
- City Trees and Safety
- Design Opportunities

Clear Zone (U.S. policy):
Class 1- Least Risk

Solution to run-off-the-road crashes auto damage & driver injury
Class 3 Risk

Class 5 Risk

Class 7: Highest Risk
research on risk management
perceived versus actual risk

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- Design Solutions
trees make cities pretty . . .

Not just beauty . . .
environment, economics, social benefits

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

Community Economics

• 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
Goals for Roadside Trees?

- Transportation Perception: trees & landscape enhance beauty
- Evolving Understanding: green streets offer environmental, economic, and social benefits
- Do not compromise Safety!
- Engineering, landscape, and tree professionals working together

City Trees & Retail Behavior
Willing to pay 9-12% more
Wolf, J Forestry 2006, J Arb 2005
Image Categories (sorted by ratings)
(cities of 10-20 K population)

No Trees
mean 1.65
(lowest)

Full Canopy
mean 3.63

Scale: 1=not at all, 5=like very much, 26 images

1. Place Perceptions
• Amenity and Comfort
• Interaction with Merchants
• Quality of Products
• Maintenance and Upkeep

2. Patronage Behavior
• travel time, travel distance
• duration & frequency of visits
• willingness to pay for parking

most measures higher with trees

3. Product Pricing
• higher willingness to pay for all types of goods
• higher in districts with trees - 9-12%

multiple studies, funded by US Forest Service & NUCFAC
Physical Inactivity & Obesity

- Majority of Americans not active enough
- Goal: 30 minutes per day of moderate activity
to reduce risk factors for chronic diseases
  (heart, stroke, cancer, diabetes)
significant costs to national health services

Obesity Trends* Among U.S. Adults
1990, 1995, 2005
(*BMI ≥30, or about 30 lbs overweight for 5’4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Walkable Neighborhoods

Make Room for Pedestrians
Tree Values & Benefits

- Ecosystem / Environmental Services
- Community Economic Development
- Human Dimensions & Social Benefits

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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

Roadside Trees & Safety

- U.S. traffic accident rates in 2002

<table>
<thead>
<tr>
<th></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>*141,000 (2.2%)</td>
<td>4.1%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Fatality</td>
<td>1.2%</td>
<td>*43,005 (0.6%)</td>
<td>0.4%</td>
<td>&lt;0.001%</td>
</tr>
</tbody>
</table>

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

Bratton and Wolf, Trans Research Board, 2005
U.S. vs. Australia?

24/22 ROAD TRAFFIC FATALITIES, International comparisons - 2005

<table>
<thead>
<tr>
<th>Country</th>
<th>People killed</th>
<th>per 100,000 persons</th>
<th>per 10,000 registered vehicles</th>
<th>Total population</th>
<th>Total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>11</td>
<td>8.0</td>
<td>1.2</td>
<td>0.8</td>
<td>22.3</td>
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<tr>
<td>France</td>
<td>318</td>
<td>8.8</td>
<td>1.4</td>
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<td>Germany</td>
<td>361</td>
<td>6.5</td>
<td>1.0</td>
<td>0.8</td>
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<td>Japan</td>
<td>7</td>
<td>6.2</td>
<td>1.0</td>
<td>1.0</td>
<td>127.6</td>
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<tr>
<td>Korea, Republic</td>
<td>8</td>
<td>13.2</td>
<td>3.4</td>
<td>1.9</td>
<td>49.3</td>
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<tr>
<td>of South)</td>
<td>176</td>
<td>9.9</td>
<td>1.3</td>
<td>na</td>
<td>4.1</td>
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<tr>
<td>New Zealand</td>
<td>466</td>
<td>14.3</td>
<td>3.2</td>
<td>na</td>
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<td>Poland</td>
<td>5</td>
<td>11.8</td>
<td>2.3</td>
<td>na</td>
<td>10.6</td>
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<tr>
<td>Portugal</td>
<td>247</td>
<td>102</td>
<td>1.6</td>
<td>na</td>
<td>43.5</td>
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<tr>
<td>Spain</td>
<td>440</td>
<td>4.8</td>
<td>0.9</td>
<td>0.6</td>
<td>9.0</td>
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<tr>
<td>Sweden</td>
<td>409</td>
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<td>0.8</td>
<td>0.7</td>
<td>7.4</td>
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<tr>
<td>Switzerland</td>
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<td>5.5</td>
<td>1.0</td>
<td>0.6</td>
<td>58.5</td>
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<td>United States of</td>
<td>443</td>
<td>14.7</td>
<td>1.8</td>
<td>na</td>
<td>296.4</td>
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<tr>
<td>America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD median</td>
<td>na</td>
<td>9.5</td>
<td>1.4</td>
<td>0.9</td>
<td>na</td>
</tr>
</tbody>
</table>

Note: na = not available.

Source: Australian Transport Safety Bureau.

Roadside Trees & Safety

U.S. traffic accident rates in 2002

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Bratton and Wolf, Trans Research Board, 2005
Annual Fatality Risks:
M. Norris, Australia ISA, 2005

<table>
<thead>
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<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

fatal urban tree crash 1: 100,000
Injury Comparison

- All accidents
- Trees only

![Pie charts showing injury comparison]

Injury, Urban and Rural Differences

![Bar chart showing injury severity by location]

Frequency vs. Injury Severity: No injury, Possible injury, Non-incapacitating injury, Incapacitating injury, Fatality.
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

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Psychological Traffic Calming

“body language of the street”
“mental speedbumps” D. Engwicht

- complete streets
- home zones

www.completestreets.org/
Streets Focus on High-Speed

poor livability

Streets Focused on Vehicles

no room for people – utilities are more important
Complete the Streets!
cars/pedestrians/bikes

multi-modal systems

Context Sensitive Solutions
national & state policy – U.S.
Context Sensitive Solutions

case study: Barracks Row, WA DC
Home Zones (Dutch “woonerf”)  
Integrating the Street into Everyday Life
Street Alternatives & Safety

- 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

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
Human Dimensions of Urban Forestry and Urban Greening

- Nature and Consumer Environments: Studies about how the urban infrastructures influence business district vitality.
- Tessa and Transportation: Studies on the issue of creating quality landscapes in urban environments.
- Civic Engagements: Studies on human behaviors and benefits when people use public spaces.
- Policy and Planning: Integrating urban greening science with community change.
- Urban Forestry and Human Benefits: More research, studies and links.

Research Director
Kathleen L. Wulf, Ph.D.