Dr. John Kevern is a nationally recognized expert on pervious concrete. He received his M.S. and Ph.D. degrees from Iowa State University in Civil Engineering Materials with both thesis and dissertation on the durability and application of pervious concrete. He is a member of the pervious concrete committees at ACI, ASCE, and NRMCA. He is also a member of the national transportation research board and sits on various concrete committees. He joined the faculty at the University of Missouri - Kansas City in 2008. Some of his current pervious concrete research topics include pervious concrete roadways for noise reduction and improved skid resistance, using pervious concrete to reduce slip/fall, and using pervious concrete to mitigate the urban heat island.

Green Streets
ACI Fall 2010 Pittsburgh
John T. Kevern and Liv Haselbach

A Street considering equity of access for the users while balancing the environmental considerations of the selected materials and impacts of the design throughout the entire project lifecycle.

Green Street Components

- Pedestrian access
- Alternative Modes of Transportation
- Integrating Design
- Better Material Selection Choices
- Integrated Stormwater Management
- Urban Heat Island Effect
- Light Pollution
- Construction Emissions
- Public Education
- Use Regional Materials

Concrete Uses

See if you can spot all of the ways concrete can be utilized in a green street.
Improving Access

- Clearly Marked Crossings
- ADA Compliant Sidewalks and Ramps

David Leopold, Project Manager, Chicago Streetscape and Sustainable Design Program

Safer Walking Surfaces

- Pervious concrete has less icing, better traction, higher contact pressures

Biomechanical testing on frozen pervious concrete

Increasing Alternative Transportation

- Relocating bus stops
- Reconstructing ADA compliant bus stop areas

Increasing Alternative Transportation

- Curitiba, Brazil

Integrating Design

David Leopold, Project Manager, Chicago Streetscape and Sustainable Design Program
Concrete Material Improvements

- Recycled industrial by-products
- Recycled wash water
- Recycled aggregates
- Photocatalytic cement

Better Material Choices

- 2 lift pavements, equal cost, better performance, lower environmental impact

An optimized 2 lift with lower cementitious, SCMs, recycled concrete aggregate, etc. can easily reduce the CO₂ by 50%.

Managing Stormwater

Mimicking Former Site Hydrology

- Storage
- Infiltration and the recharge of ground water
- Evaporation and evapotranspiration
- Detention

Stormwater planter in Kansas City

Green Street Stormwater Technologies

Curb extensions: Curb extensions are created by carving out portions of the street’s parking zones and converting them into landscaped curb areas similar to the parkway.

Permeable Pavements: Permeable pavement allows water to infiltrate the ground.

Planters: Planters transform a street’s pedestrian zone into attractive and sustainable stormwater management systems.

Biotreatment History in the Pacific Northwest

Portland Planter Box details first published in 1998

Bioretention BMPs favored as a means of flow control and pollution control since 2008 (Portland)

Approximately 2,000 flow through planter boxes installed in the City of Portland.
NE Siskiyou Curb Extensions

- Helps with stormwater volume, rate, and quality
- Helps with traffic calming
- Helps with pedestrian safety

Bioretention Gone Right

- Biotreatment media must be protected from construction runoff
- Compaction should be avoided
  - Material staging
  - Heavy equipment traffic
- Install media as final component
- Block inlets, cover media until construction completed

Biotreatment Construction and Commissioning

Biotreatment Inspection and Maintenance

- Inspection and Maintenance Fundamentals
  - Remove trash and debris
  - Inspect energy dissipation elements
  - Restore design percolation rate
  - Restore design storage capacity and grade/elevation
  - Note areas of deposition and channelization
  - Restore even mulch and media distribution
  - Note flow patterns around inlet and overflow and correct as necessary
Pervious Concrete

Urban Heat Islands

- 6 – 12 °F Hotter in daytime
- Up to 22 °F Hotter at night
- More Smog Occurrences
- High Level of Ground-Level Ozone
- More Frequent Air Quality Alerts
- Increased Health Problems
- Higher Energy Demand

Urban Heat Island Strategies

- Highly reflective surfaces
- Infrared blocking coatings
- Permeable pavements
- Shading
- Vegetation

Source: Low Impact Development Design Manual for highway Runoff Control


Figure 3. Thermal Behavior of Pavements (EPA 2010)
Energy Efficient Lighting

- Examples in Chicago achieved 49% reduction in energy use over a streetscape baseline
- Utilize a white light source
- Eliminate light trespass into the night sky

Construction Emissions

- Use more durable materials
- Use more efficient construction equipment

Public Education about Target Pollutants

<table>
<thead>
<tr>
<th>AUTOMOBILES</th>
<th>HOME</th>
<th>PUBLIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gasoline</td>
<td>• Toxic chemicals</td>
<td>• Littering</td>
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<tr>
<td>• Oil</td>
<td>• Paints</td>
<td>• Pet waste</td>
</tr>
<tr>
<td>• Antifreeze</td>
<td>• Fertilizers and pesticides</td>
<td></td>
</tr>
<tr>
<td>• Car washing</td>
<td>• Soil erosion</td>
<td></td>
</tr>
</tbody>
</table>

Case Studies – Austin, TX

Scoop the Poop

- PRE PROGRAM (2000)
  - 250 TONS PET WASTE PER YEAR INTO WATERSHED

- CURRENT (2005)
  - 540,000 MUTT MITTS
  - REDUCED BY 135,000 LB

Grow Green

- BROCHURES PROVIDED TO PARTICIPATING NURSERIES
- 14 OF 16 SHOWED INCREASED SALES FOR GROW GREEN PLANTS
- • 4 SHOWED DECREASED FERTILIZER SALES
- • 11 SHOWED INCREASED ORGANIC AND NATURAL FERTILIZER SALES

Regional Materials

- Less transportation = lower emissions
- LEED, Chicago, Greenroads use 500 miles

<table>
<thead>
<tr>
<th>WEIGHT/DISTANCE</th>
<th>ZONE</th>
<th>MATERIAL OR SERVICE</th>
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<tbody>
<tr>
<td>7</td>
<td>LEED</td>
<td>Renewable Energy Technologies</td>
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<tr>
<td>6</td>
<td></td>
<td>Water Reuse Technology</td>
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<tr>
<td>5</td>
<td></td>
<td>Construction Waste Reuse Technology</td>
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<td>4</td>
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<td>5,800 Tons Pet Waste Removed</td>
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<td>2</td>
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<td>500 Tons Pet Waste Removed</td>
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Living Building Challenge Regional Materials

What’s a Green Street?

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- Alternative Modes of Transportation
- Integrating Design
- Better Material Selection Choices
- Integrated Stormwater Management
- Urban Heat Island Effect
- Light Pollution
- Construction Emissions
- Public Education
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For More Information

- Green streets manuals
  - Portland Stormwater Management Manual
  - Seattle Right-of-Way Manual