PEDS

Pedestrian Environment Data Scan

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Background

“The lack of detailed and accurate data on both behavioral and objective measures of environments likely represents the single most important issue to address in future attempts to isolate individual or groups of environmental predictors of walking and bicycling.”

Moudon & Lee 2003

Overall Aims

- Develop, test and administer an environmental audit of pedestrian conditions
- Score the audit measures in order to aggregate the data
- Use empirical data collected from audit as explanatory factors in models of physical activity and walking behavior.

Objectives

- Develop a comprehensive audit methodology:
  - Instrument
  - Administration protocol
  - Training and other supporting materials
- Test reliability and validity

Guiding Principles

- Consider a variety of environmental elements and contexts
- Design for efficient and reliable administration
- Integrate with hand-held technology (GIS, Geologgers, PDAs)
- Test the reliability of audit measures in different administrative formats and different environments

Previous Efforts

Pikora, et al. 2002. “Developing a Reliable Audit Instrument to Measure the Physical Environment for Physical Activity”. *American Journal of Preventive Medicine*, Volume 23, Issue 3, October, pp. 187-194.

Emery, et al. 2003. “Reliability and Validity of Two Instruments Designed to Assess the Walking and Bicycling Suitability of Sidewalks and Roads.” *American Journal of Health Promotion*, September/October, Volume 18, Number 1, pp.38-46.

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

Segment type

Land use

Slope

Connectivity

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

- Lighting
- Amenities
- Wayfinding Aids
- Tree Shade
- Enclosure
- Power lines
- Cleanliness
- Articulation
- Building Setback
- Building Height
- Transit Facilities

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

- Type of facility
- Path material
- Obstructions
- Buffers
- Distance from curb
- Path width
- Completeness
- Connectivity
- Condition
- Crossing aids
- Curb cuts

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

- Condition
- No. of lanes
- Posted speed limit
- On-street parking
- Off-street parking
- Building access
- Driveways
- Traffic control devices
- Bike facilities

Audit Measures

Macro level environment

Micro level environment

Pedestrian facilities

Road attributes

Subjective assessment

Attractiveness for Walking

Attractiveness for Cycling

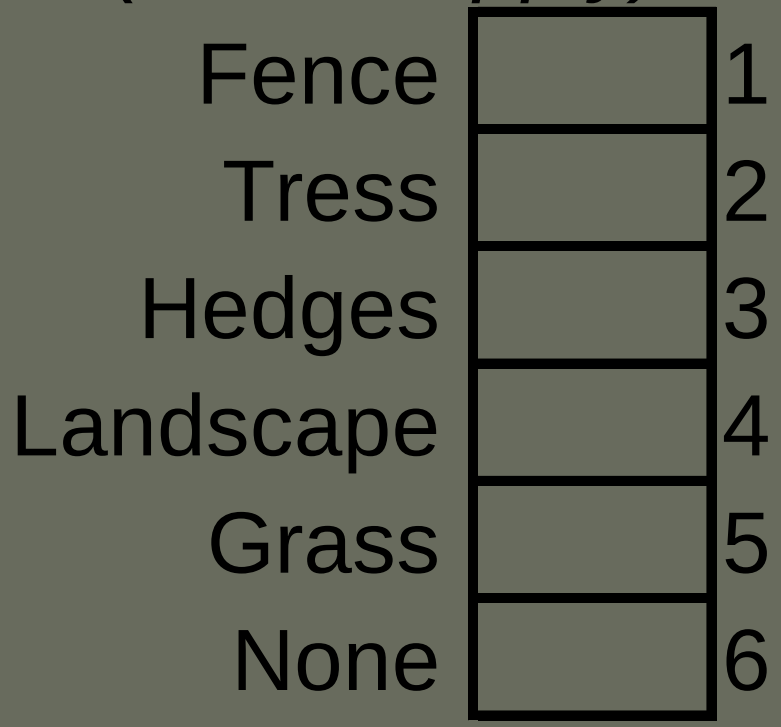
Safe for Walking

Safe for Cycling

Measure Characteristics

- 40 questions; 83 measures
- Nominal measures

8. Buffers between road and path *(all that apply)*



Measure Characteristics

- 40 questions; 83 measures
- Ordinal data

6. Path condition/maintenance

Poor (many bumps/cracks/holes)		1
Fair (some bumps/cracks/holes)		2
Good (very few bumps/cracks/holes)		3
Under Repair		4

Measure Characteristics

- 40 questions; 83 measures
- Ordinal data - Likert

Subjective Assessment: Segment…

Enter 1,2,3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree

.....is attractive for walking. ____1

.....is attractive for cycling. ____1

.....feels safe for walking. ____1

.....feels safe for cycling. ____1

Measure Characteristics

- 40 questions; 83 measures
- Continuous

15. Number of lanes

Minimum # of lanes to cross ____ 1

Maximum # of lanes to cross ____ 1

Supporting Materials

- Training presentation with detailed descriptions (including photographic examples) of every question
- Practice videotaped street segments
- Detailed protocol included to provide reference available for use in the field

Training

Question 10

Sidewalk Condition/Mairtenance

- Poor

(many bumps, cracks, holes and weeds)

- Fair

(some bumps, cracks, holes and weeds)

- Good

(very few bumps, cracks, holes and weeds)

- Under Repair

Q10 - Sidewalk Condition: Poor

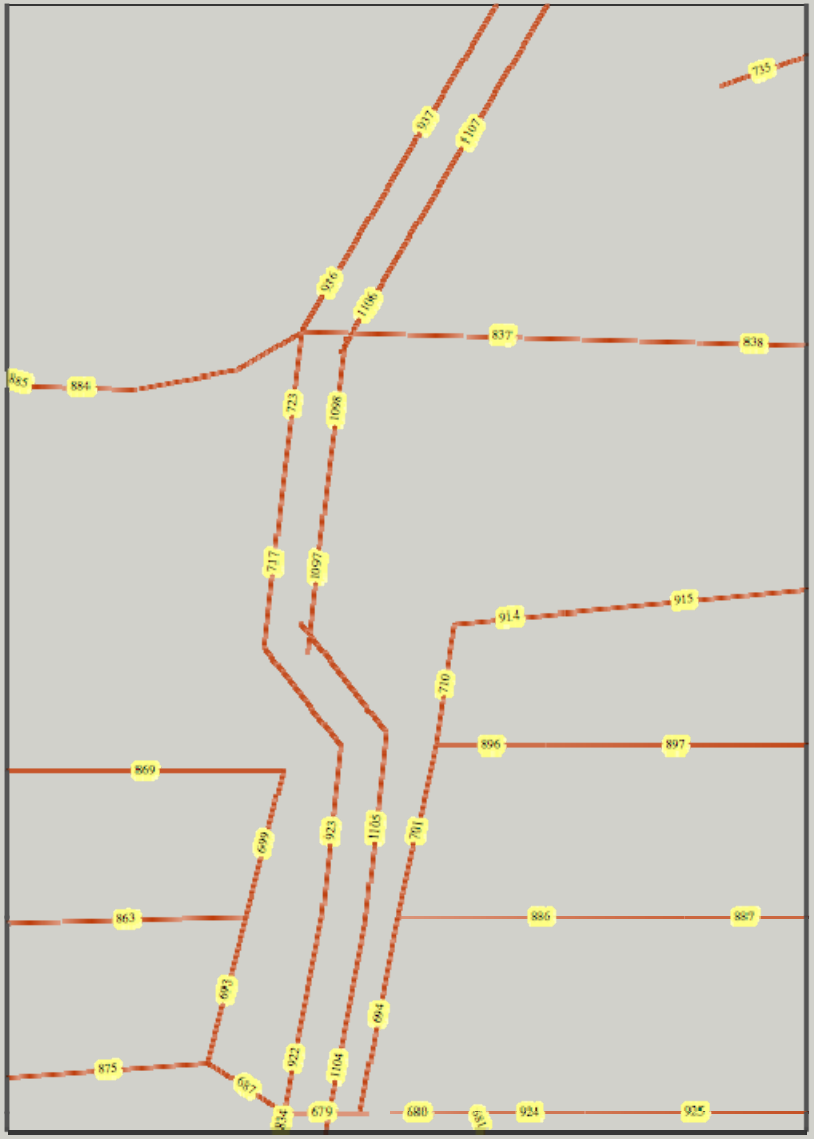
Q10 - Sidewalk Condition: Fair

Q10 - Sidewalk Condition: Good

Administration

- Designed to be administered in pairs
- Unit of analysis is path segment
- Audit on-foot
- Audit both sides of street at once, except for arterials
- Tested several administration scenarios

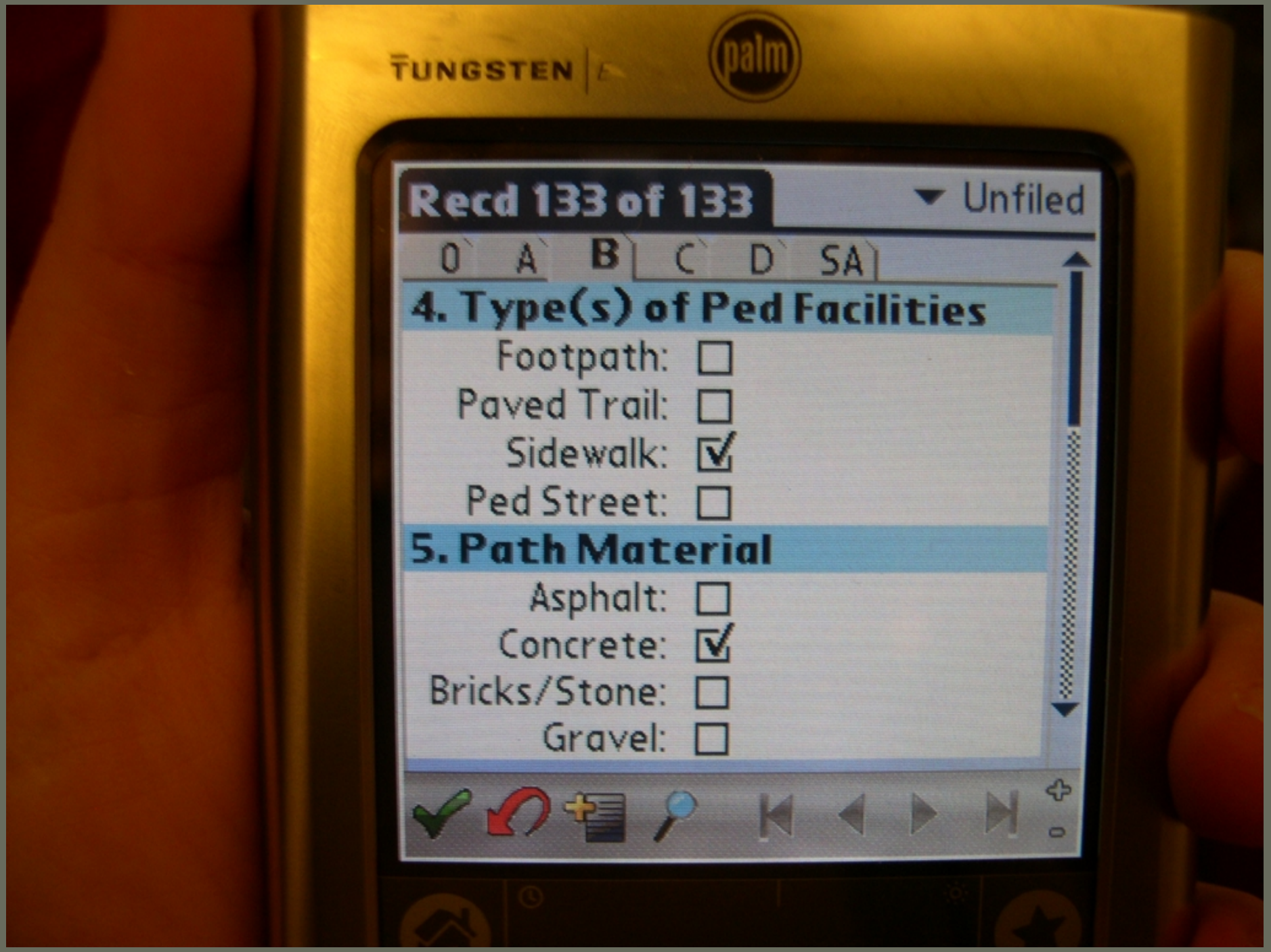
Pedestrian Segments



- Adapted from TIGER street network files
- Average segment length: 400 feet
- Supplemented with GPS data for off-road pedestrian networks
- Georeferenced

Handheld Technology

- Pencil and paper instrument adapted and tested with use in PDA
  - PDA supports protocol and maps
  - Reduces data entry error and time
  - PDAs with ArcPad allow for real-time editing of segments and network
  - GPS and cameras can be integrated


TUNGSTEN
palm
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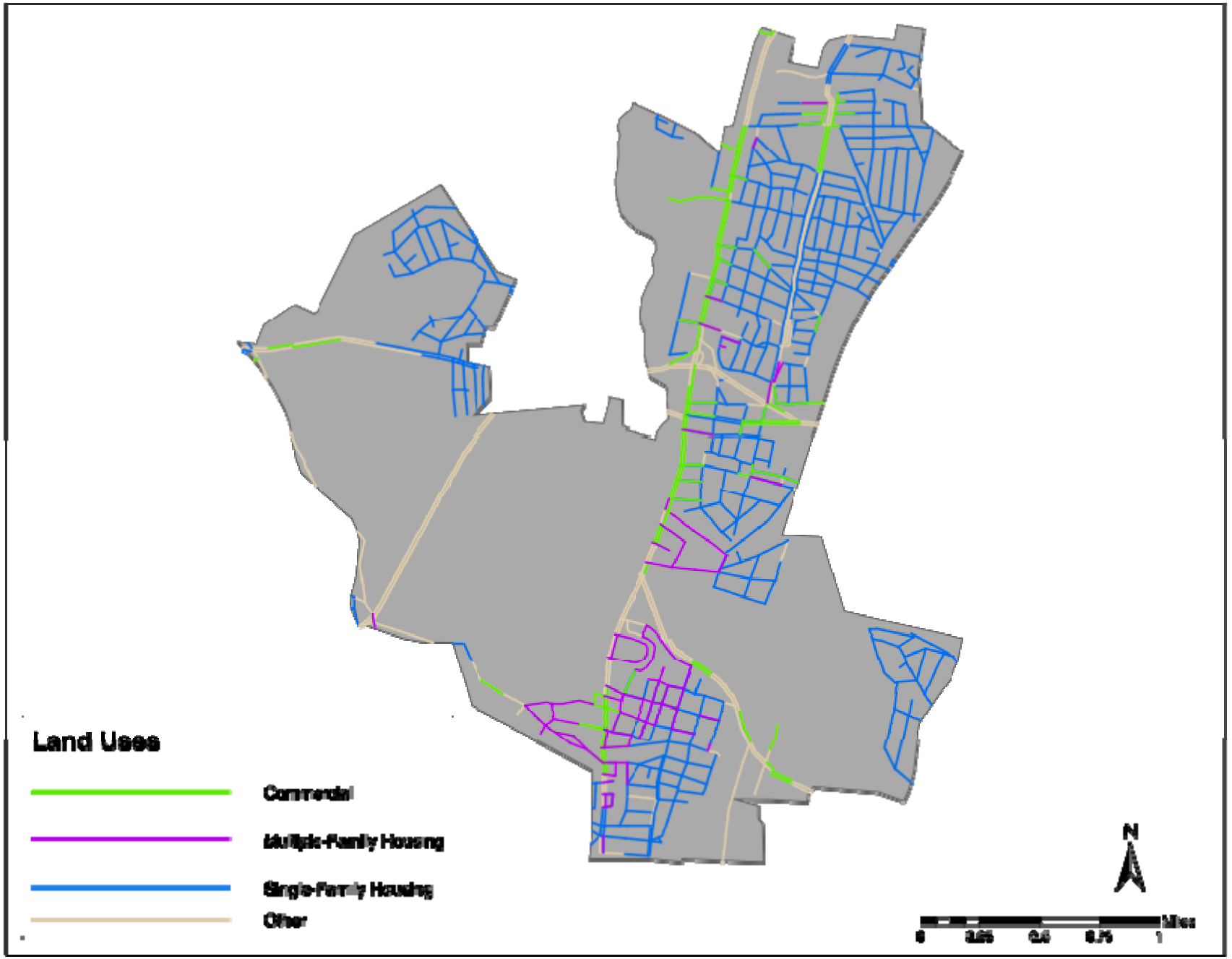
4. Type(s) of Ped Facilities
Footpath:
Paved Trail:
Sidewalk:
Ped Street:
5. Path Material
Asphalt:
Concrete:
Bricks/Stone:
Gravel:

Reliability Testing

- Administered and tested in 2004 in College Park, MD
- 995 segments audited at 3-5 minutes per segment
- Scenarios tested:
  - reliability of measures
  - Instrument question ordering
  - administrative methods

LAND USES IN COLLEGE PARK, MD




USED CARS
USED CARS
USED CARS

Results: Measures

Most reliable (Kappa>0.75)	Least reliable (Kappa < 0.40)
Segment type	Path obstructions
Uses	Road condition
Continuity	Lighting
Path material	Enclosure
Buffers	Cleanliness
Completeness	Articulation
Traffic control	Setbacks
Transit facilities	

Results: Question Order

- Subjective questions give overall impression of the walkability of a segment
- Audit reliability was tested with subjective section at beginning and end of the audit
- Kappa scores overall were higher for segments where the subjective section was completed last

Results: Administration

- Administrative methods tested:
  - Auditing in pairs
  - Auditing alone
  - Auditing in “waves” where each administrator is a specialist for one section of the audit
- Auditing in pairs had overall higher reliability than auditing alone or in waves

Conclusions

- High reliability measures were mostly objective
- Less reliable measures are complex and intrinsically subjective but address important micro-level features
- Instrument, training and administration procedures modified to reflect these findings

Conclusions

- The audit methodology is flexible as it can make use of GPS, GIS and PDAs or be administered with pencil & paper
- The audit could also be used to evaluate resident perceptions of the environment
- Results of behavioral models will inform audit design

Future Research

- Conduct tests of internal and external validity
- Develop and test sampling strategies
- Score the audit measures
- Test associations between pedestrian activity and the built environment

Active Living Research

Montgomery Co., MD

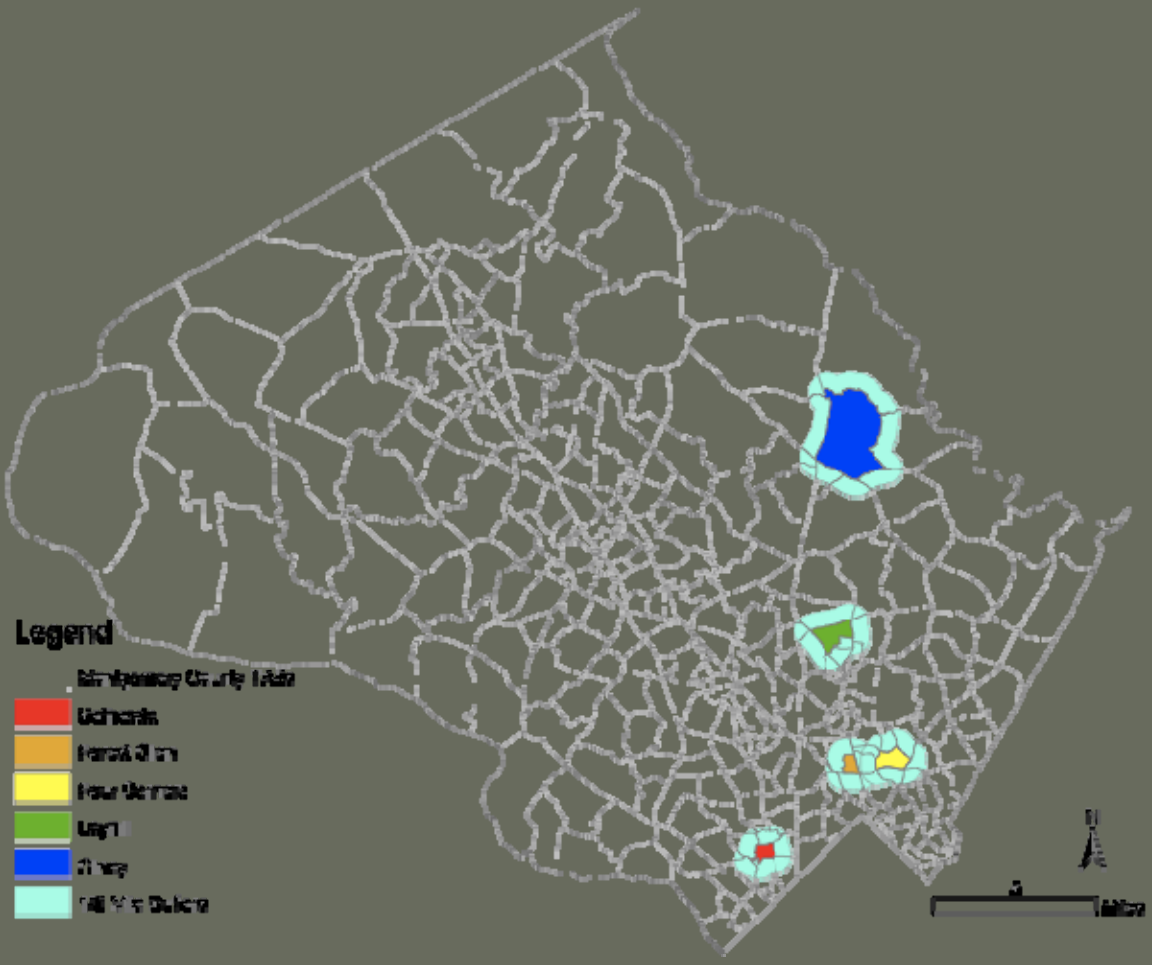
300 participants

Built environment measures

- Audit
- Macro-level

Physical activity

Walking



Score Audit for Each Participant

Audit materials available:

National Center for Smart Growth Research and Education, University of Maryland

http://www.smartgrowth.umd.edu

Active Living Research

http://www.activelivingresearch.org