Session 6a: Bicycles, Pedestrians, and Health Issues

QUANTIFYING NON-MOTORIZED DEMAND: A NEW WAY OF UNDERSTANDING WALKING AND BIKING ACTIVITY

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Presentation Topics

- Why is trip demand forecasting needed?
- What does the forecasting process do?
- How does the process work?
- Role of the NHTS data in the process
- Non-Motorized trip differences, 2001-2009

Need for Non-Motorized Trip Forecasting

Travel Demand Forecasting

The objective of travel demand forecasting is to predict changes in travel behavior and transportation conditions as a result of proposed transportation projects, policies, and future changes in socioeconomic and land use patterns.

Need for Non-Motorized Trip Forecasting

Travel Demand Forecasting

- Developed for vehicle travel

- Used primarily for highway mobility analysis

- Adaptable for freight, transit modes

Need for Non-Motorized Trip Forecasting

Factors Influencing Non-Motorized Travel

- **Perceptions & Attitudes** – Safety, Convenience, Time

- **Socioeconomic & Demographic Characteristics** – Age, Sex, Race, Income

- **Trip Characteristics** – Trip Distance, Presence and Quality of Facilities

- **Environment** – Land Use and Land Use Pattern, Topography

Need for Non-Motorized Trip Forecasting

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DISTANCE IS KEY!

Need for Non-Motorized Trip Forecasting

Applications of the Model

- Bicycle & Pedestrian Plans (Regional & Local)

- Project prioritization tool

- Safe Routes to Schools and school siting/planning

- Land use policy & sustainability testing

- Transit ridership estimating

- Public health metrics

What the Forecasting Procedure Does

Estimates the number of daily walk and bike trips generated by each parcel in the study area.
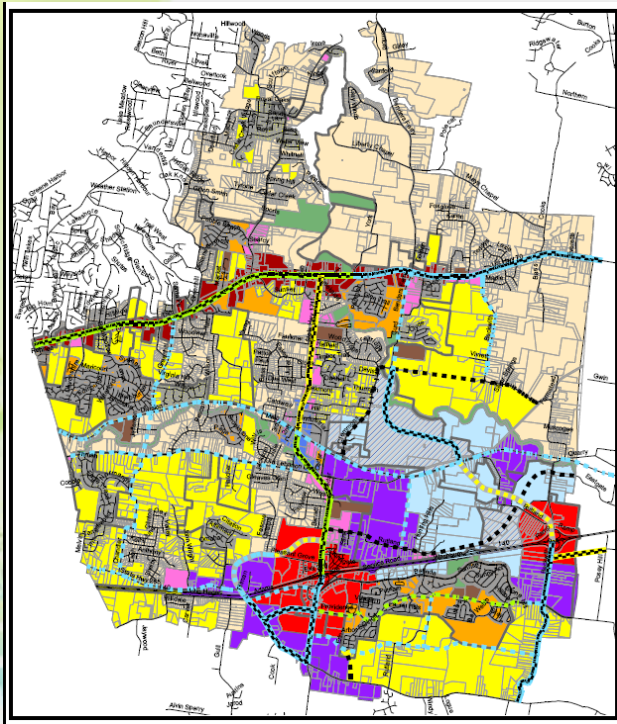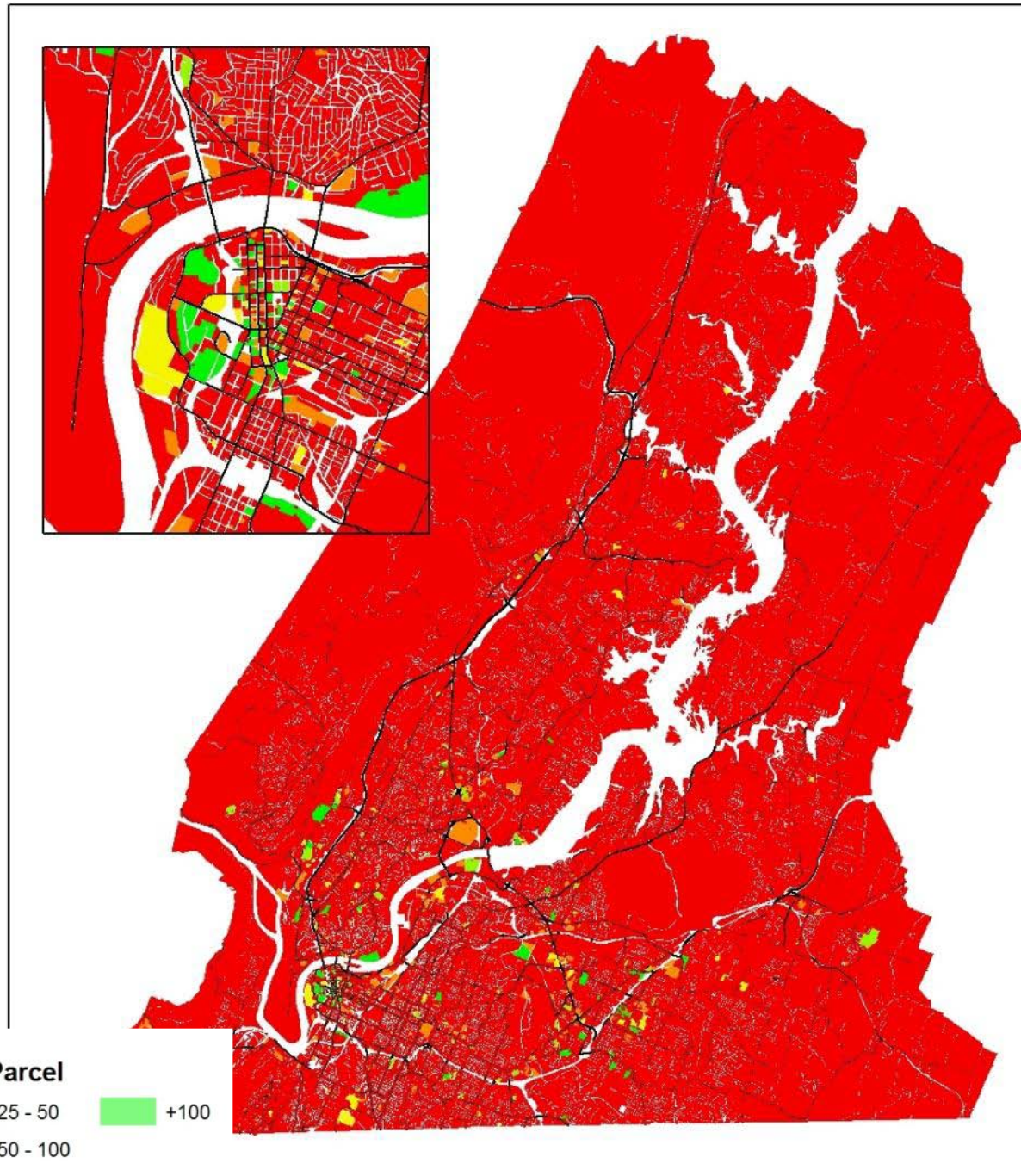

Existing Land Use

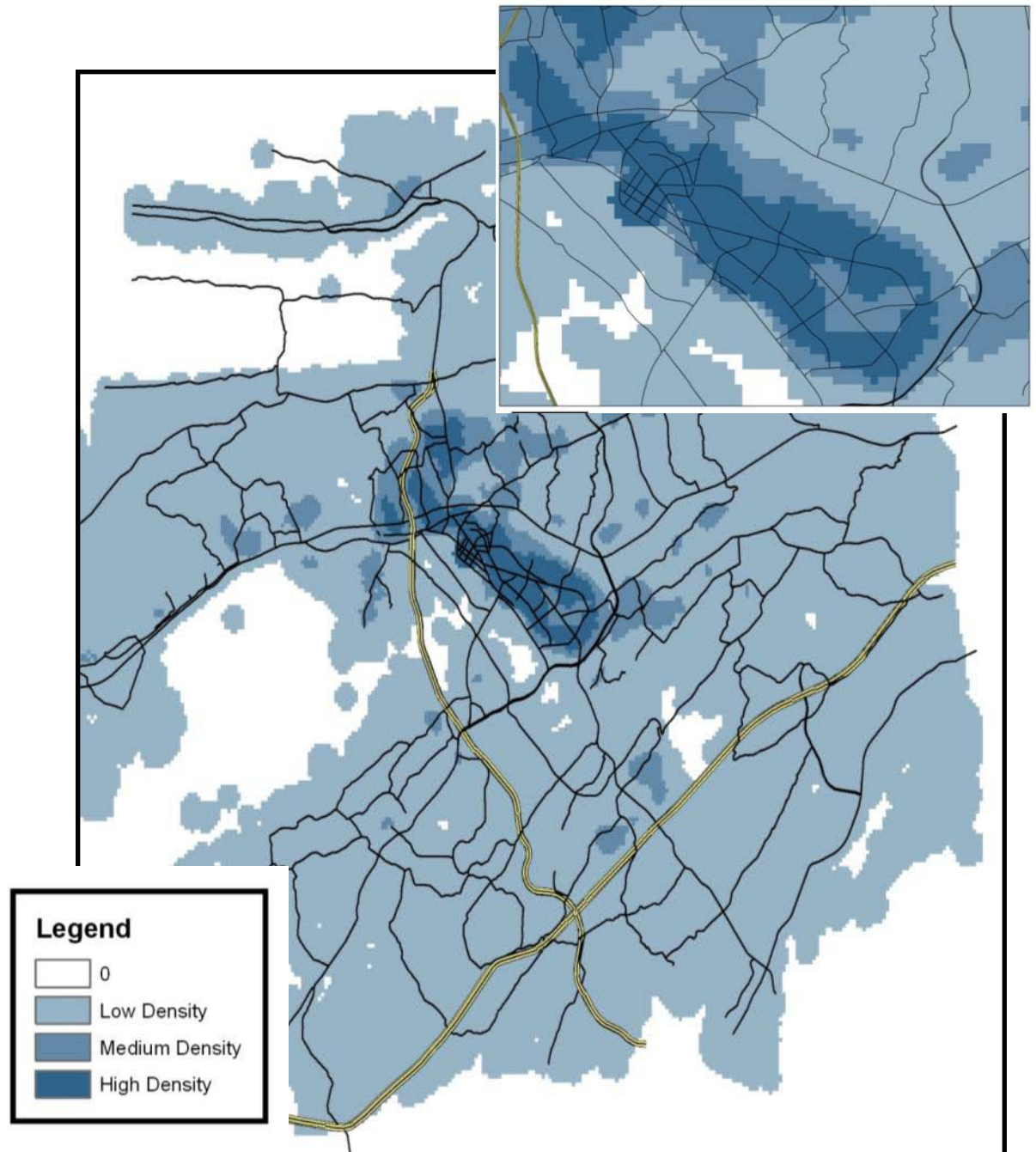**Future Land Use**

Non-Motorized Trips by Parcel

Useful for:

- Large generators
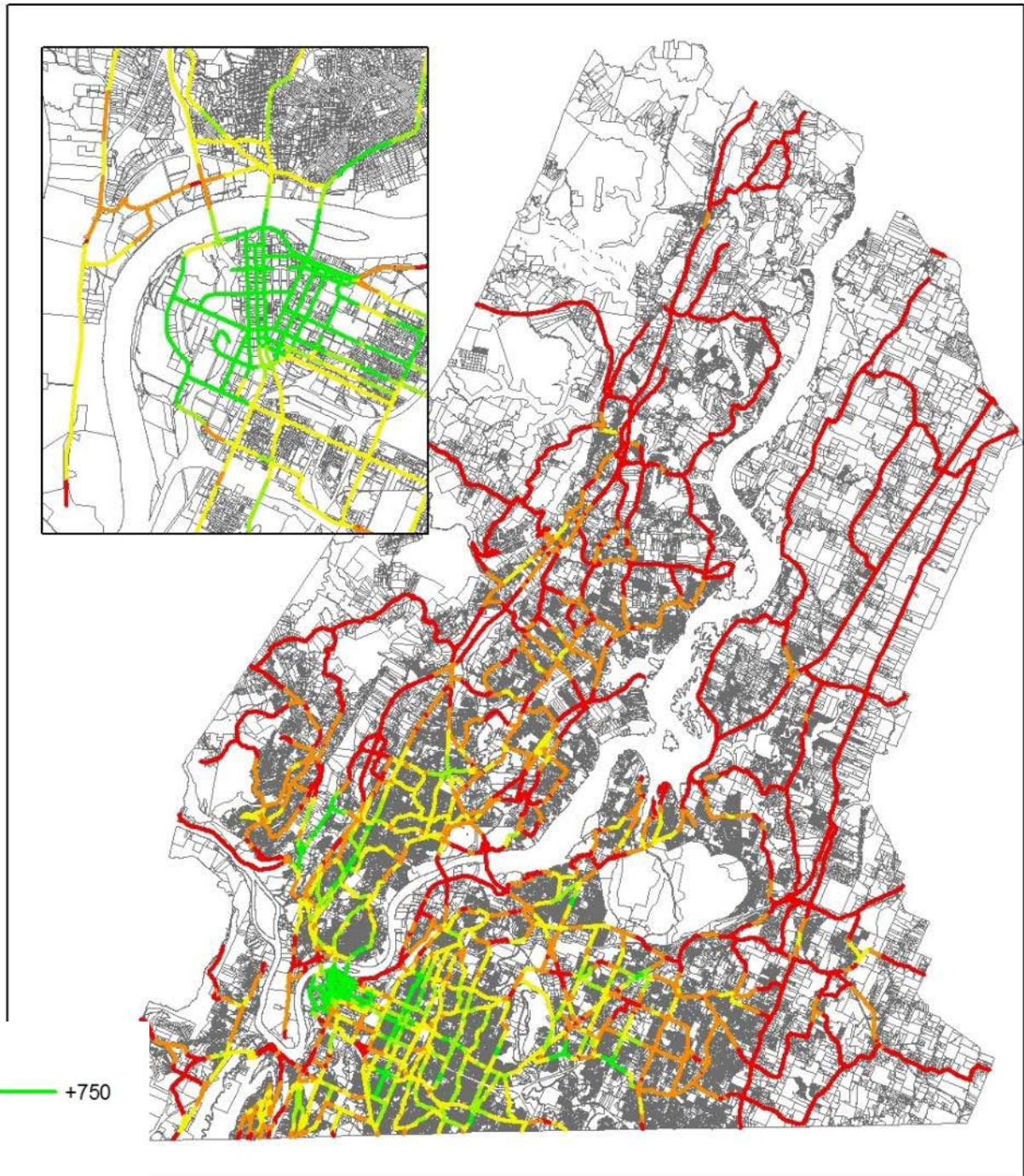- Grouping into areas (neighborhoods)

Bike/Ped Trips by Parcel

0 - 5	25 - 50
5 - 25	50 - 100
	+100

Non-Motorized Trips by Density

Useful for:

- Analyzing large areas

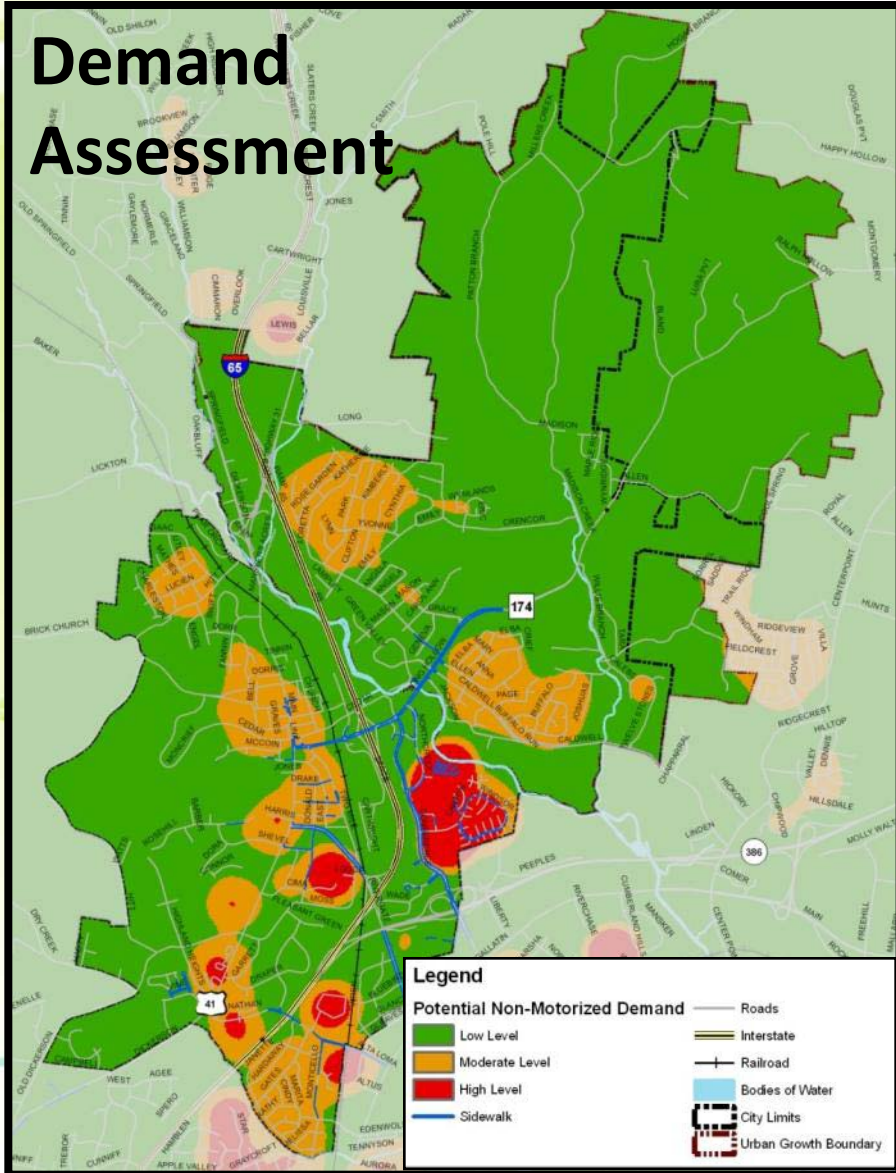- Walk/bike "hotspots"

- Identifying priority corridors

Legend

- ▢ 0
- ▢ Low Density
- ▢ Medium Density
- ▢ High Density

Non-Motorized Trips by Link

Useful for:

- Indentifying key segments

- "What could be" scenarios
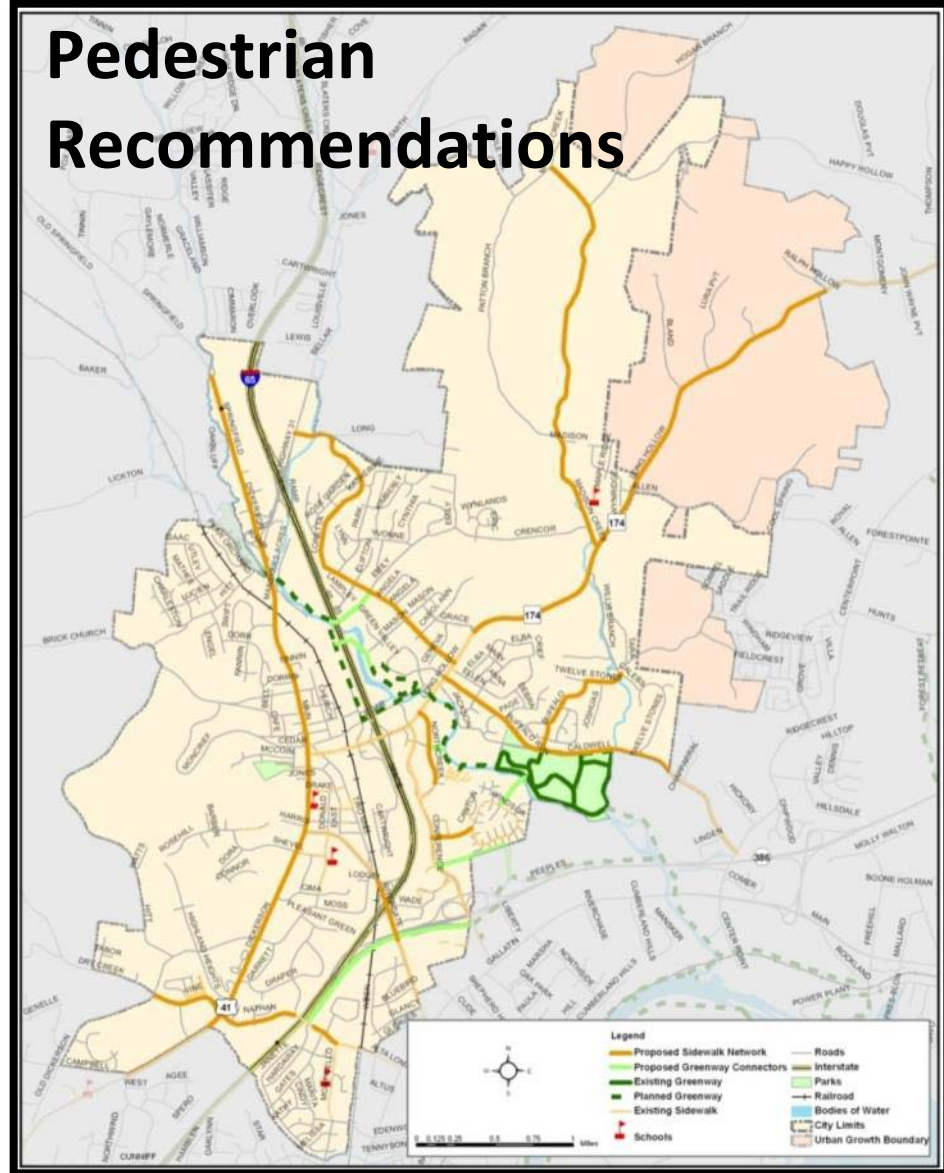
- Estimate future usage of bike/ped facilities

Bike/Ped Trips by Link

0 - 100	251 - 500	+750
101 - 250	501 - 750	

Citywide Level Planning

Demand Assessment

Pedestrian Recommendations

Legend
Potential Non-Motorized Demand — Roads
- Low Level — Interstate
- Moderate Level — Railroad
- High Level — Bodies of Water
- Sidewalk — City Limits
- Urban Growth Boundary

Legend
- Proposed Sidewalk Network — Roads
- Proposed Greenway Connectors — Interstate
- Existing Greenway — Parks
- Planned Greenway — Railroad
- Existing Sidewalk — Bodies of Water
- Schools — City Limits
- Urban Growth Boundary

Transit Planning

Probability to Walk to Transit
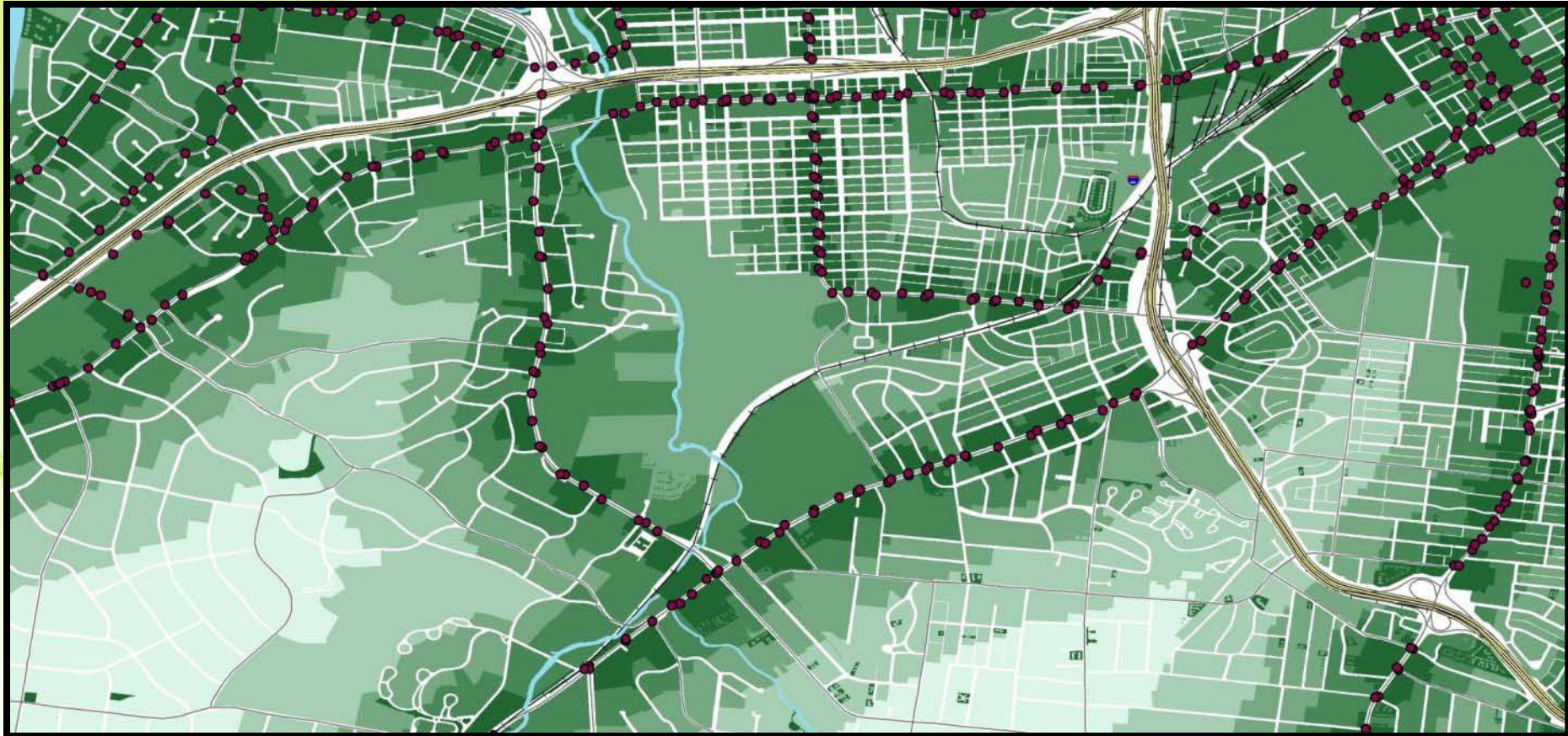
How the Forecasting Procedure Works

- Parcel basis
- Determines daily, one-way trips
- Assumes ideal facilities and connectivity
- Specifies multiple trip types
- Origin (generator) driven
- No real assignment after generation
- Adaptable to changing land uses
- Adaptable to emerging and/or local data
- Can be run on existing data
- Walk/bike trip reporting is variable (by parcel, street, neighborhood, etc)

How the Forecasting Procedure Works

General Non-Motorized Trip Generation Equation

Typical residential trip producing characteristics by trip type
(NHTS, ITE, place-specific data)

(Parcel characteristics) x (factor series)[1] x (probability statement)[2]

1) Usually 3-5 factors adjusting per-parcel walking/biking trip generation.
2) Resulting probability-from-proximity from impedance curves – based on NHTS data.

Role of the NHTS in the Process

(Parcel characteristics) x

(factor series) x

(probability statement)

How many trips generated?
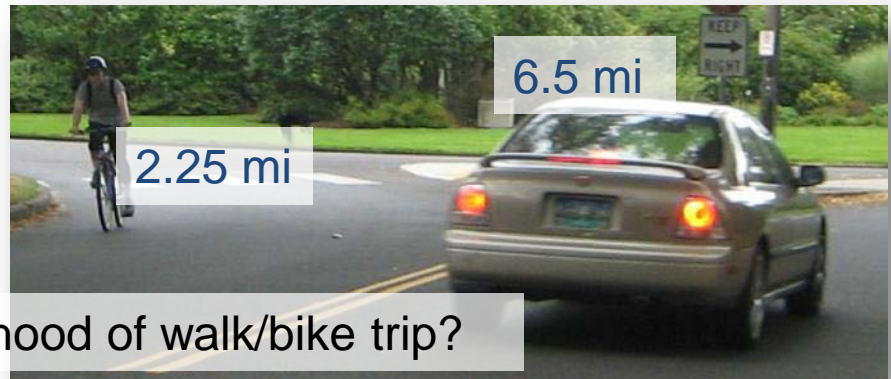
6.5 mi

2.25 mi

Likelihood of walk/bike trip?

Role of the NHTS in the Process

Trip Generation Factors

- Average trips per day (CNTTDTR in the Person file)

- Trip purpose split for all trips made (WHYTO in the Daytrip file)
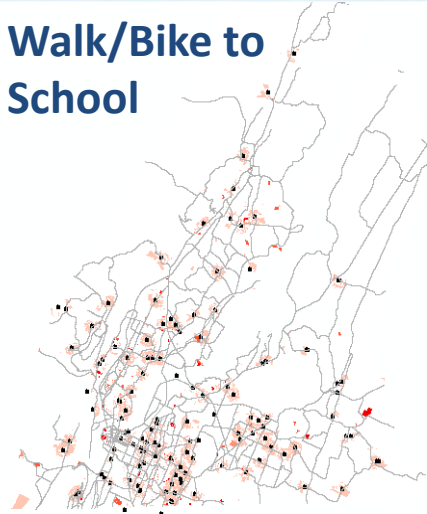
Role of the NHTS in the Process

Walk Trips

To School

To Work

To Recreation

To Shop

To Errand

To Transit

From Transit

From Parking

Bike Trips

To School

To Work

To Recreation

To Shop

To Errand

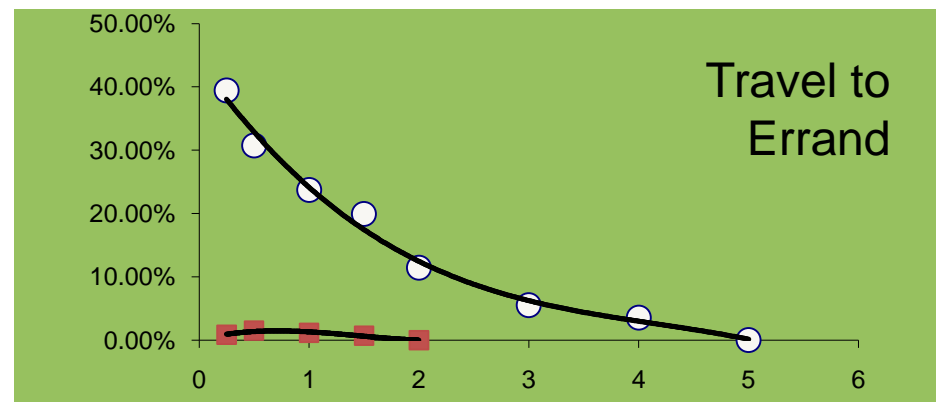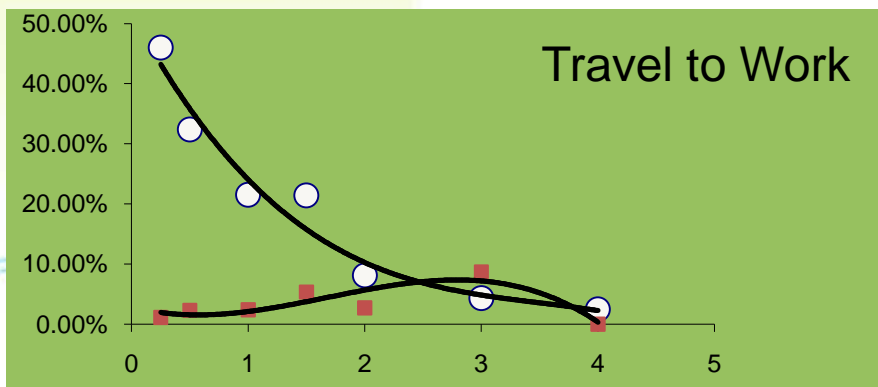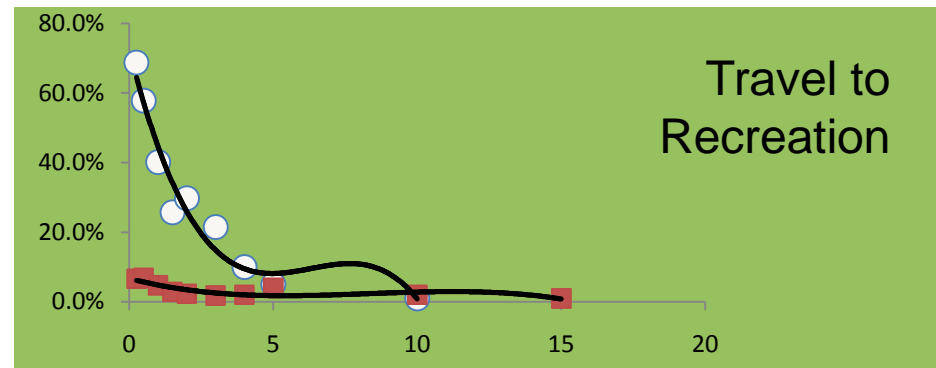**Walk/Bike to School**
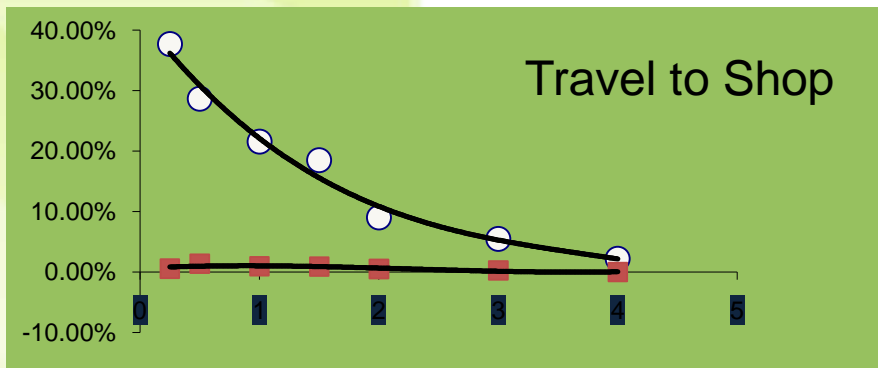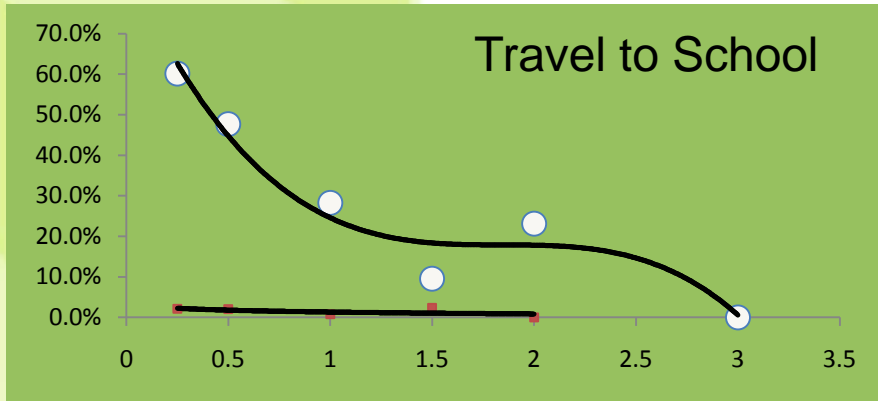
Walk/Bike to Shop
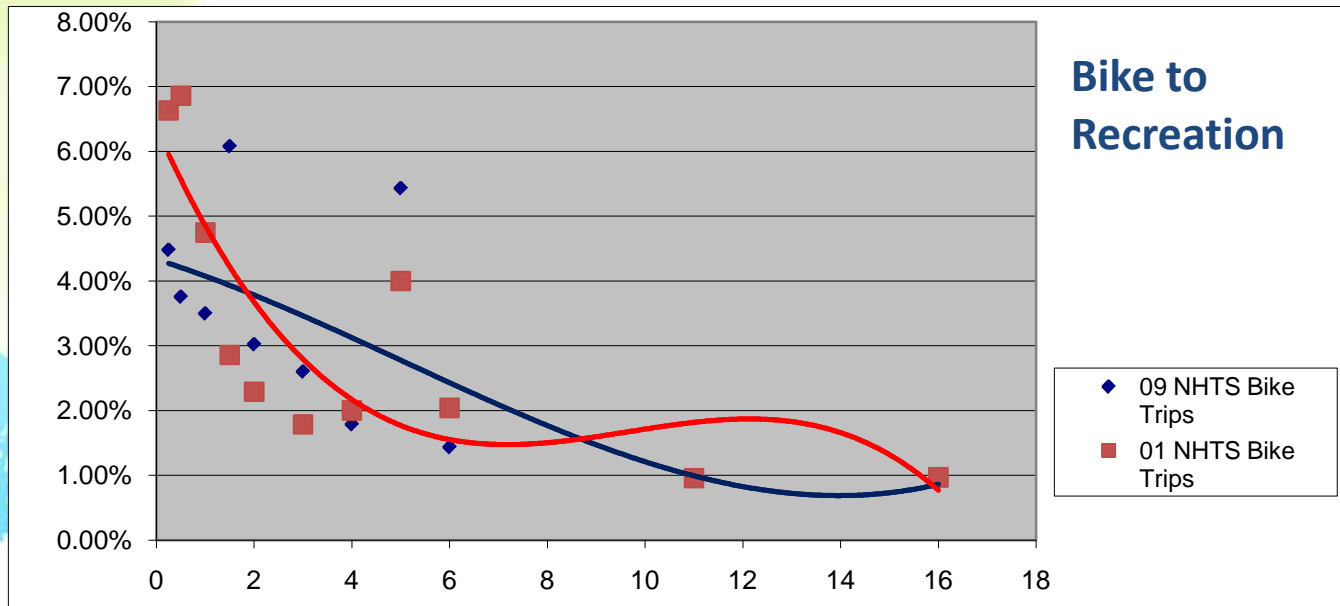
Walk/Bike to Recreation
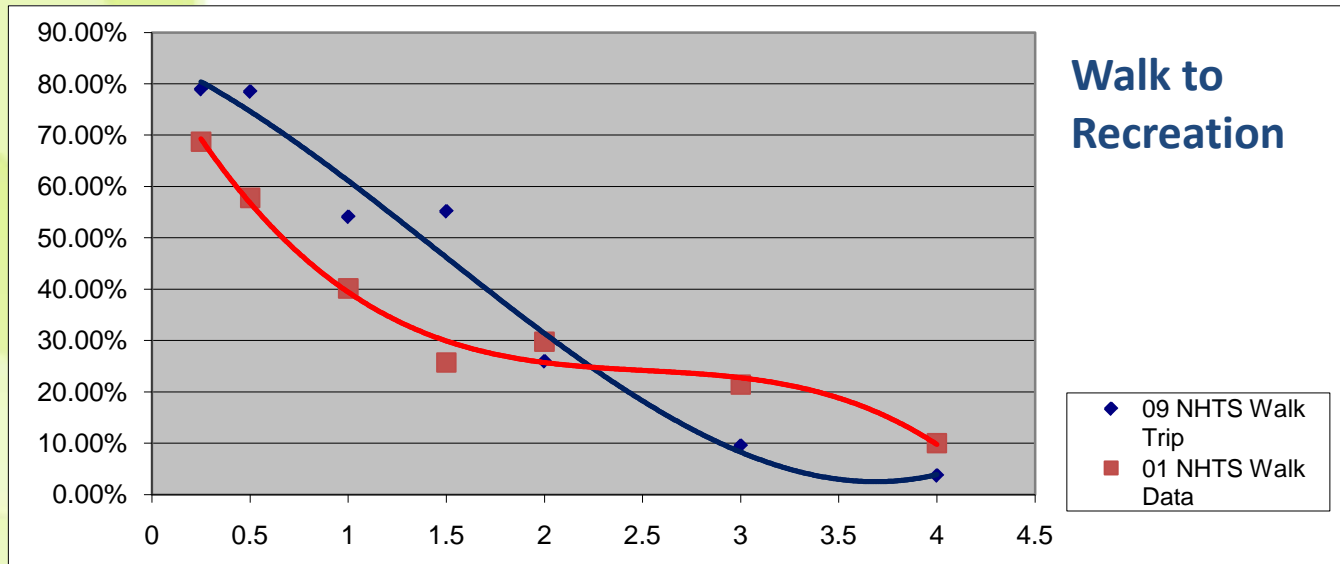
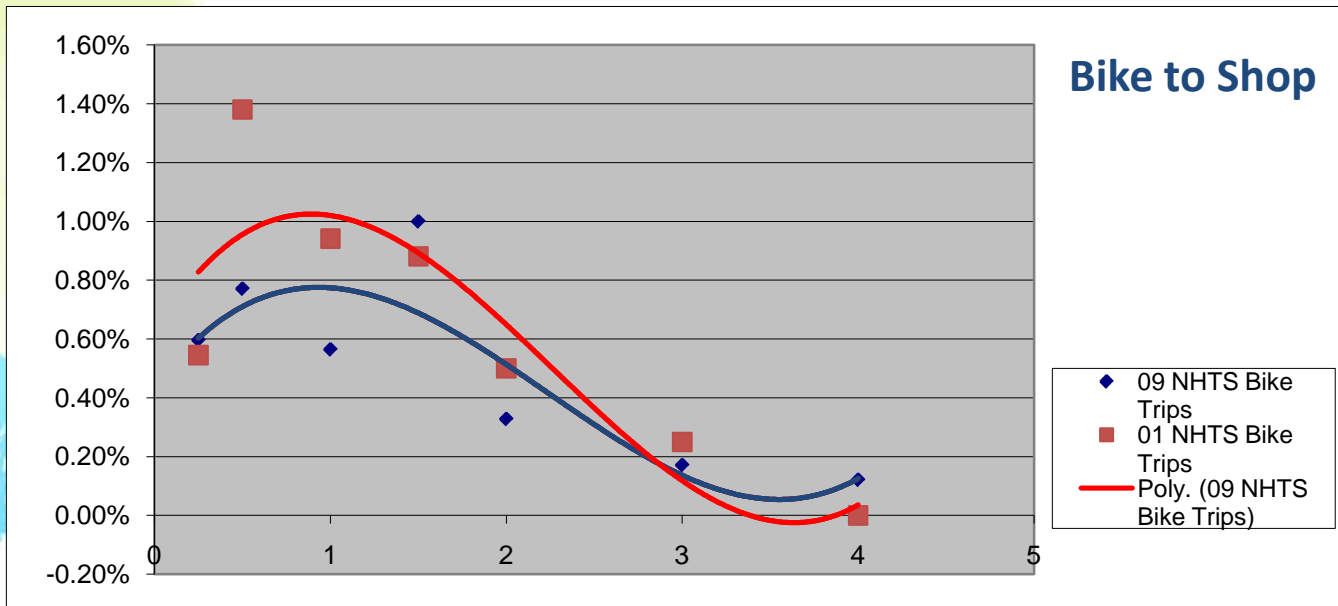**All Walk/Bike Trips**
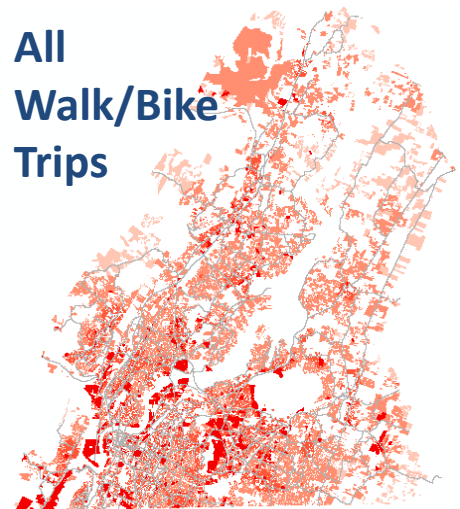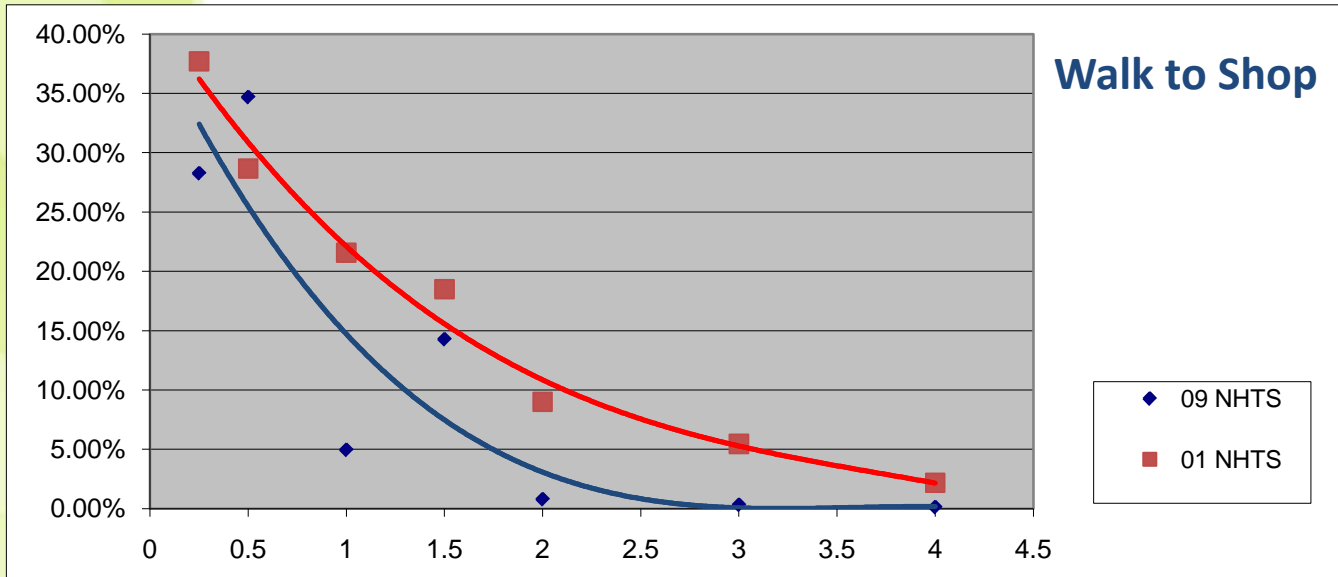
Travel Impedance Curves

Relationships predicting probability of trip-by-mode given proximity between land uses (based on 2001 NHTS data)
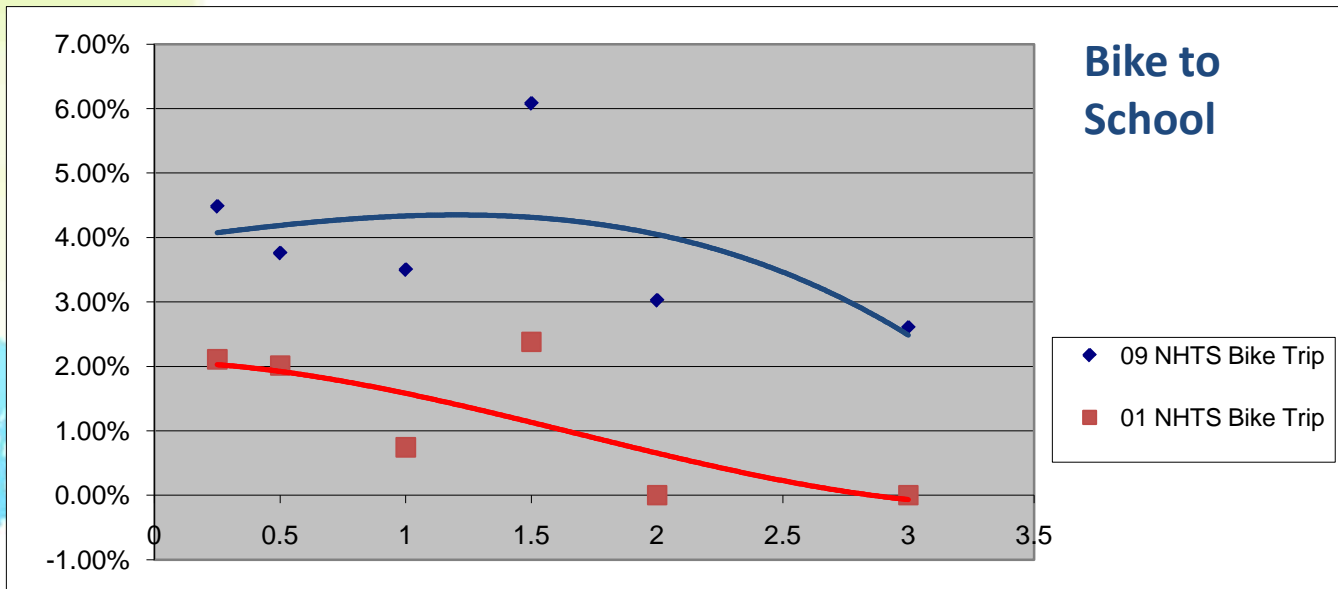
Variability in the NHTS Datasets 01-09

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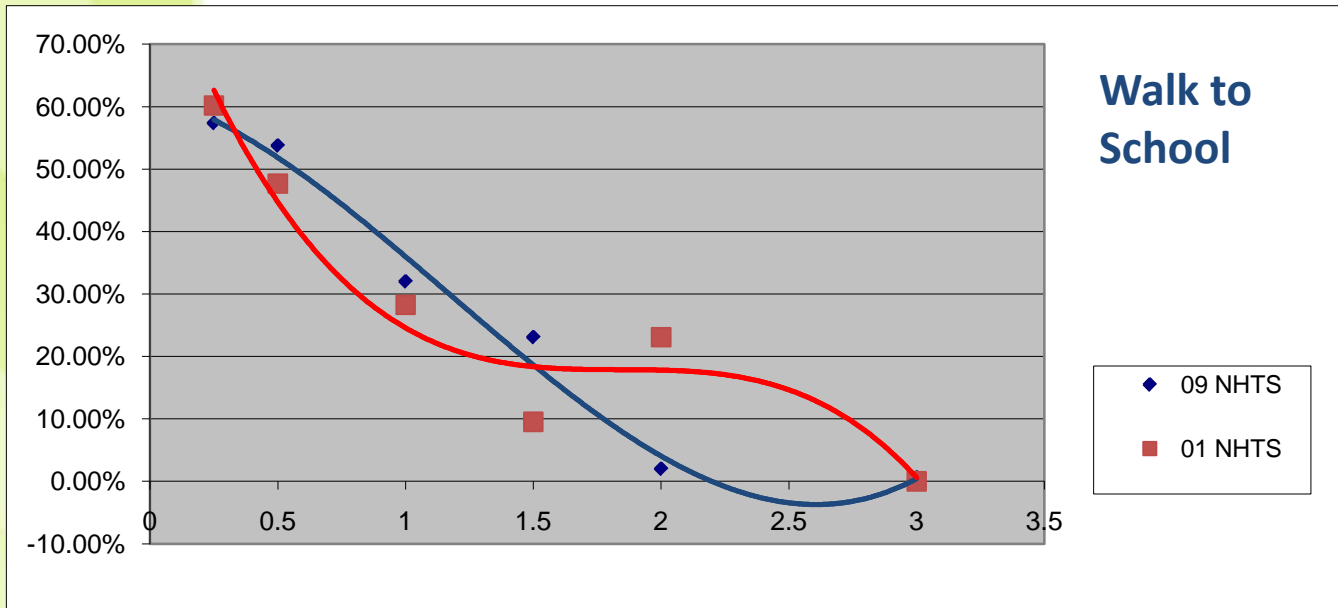
Variability in the NHTS Datasets 01-09

Other Findings (specific)

- Average number of daily trips per person decreased from 3.995 tpp to 3.779 tpp (CNTTDTR)

- Trip purpose split changes as follows (WHYTO):

  - Rec split from 15.6% to 17.3% (+1.7%)

  - Shop split from 35.7% to 37.9% (+2.2%)

  - Work split from 11.4% to 10.0% (-1.4%)

  - Errand split from 2.6% to 2.1% (-0.5%)

Variability in the NHTS Datasets 01-09

Other Findings (general)

All Trips

	2001 Dataset		2009 Dataset	
	Number	Percent	Number	Percent
All Trips	641,401	100%	1,165,197	100%
Walk Trips	51,526	8.0%	100,405	8.6%
Bike Trips	5,184	0.8%	9,443	0.8%

All Trips, 3 miles or less

	2001 Dataset		2009 Dataset	
	Number	Percent	Number	Percent
All Trips	285,197	100%	550,147	100%
Walk Trips	41,707	14.6%	97,427	17.7%
Bike Trips	3,756	1.3%	7,505	1.4%

Variability in the NHTS Datasets 01-09
Real Results – Kingsport, TN

	Walk 2001	Walk 2009	Bike 2001	Bike 2009	Total (2009)
School	4,356	4,480	191	274	4,754
Recreation	27,929	30,483	3,880	3,867	34,350
Shop	31,531	31,747	1,363	1,031	32,777
Work	3,844	3,432	630	1,809	5,241
Errand	1,612	1,181	47	30	1,211
To Transit	1,778	1,308			1,308
From Transit	1,778	1,308			1,308
From Parking	5,181	5,181			5,181
Total	102,222	101,739	6,111	7,010	108,749
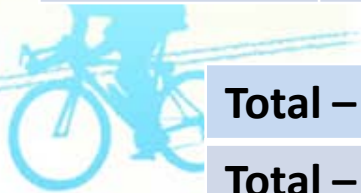
Total – All Walk/Bike Trips (2001 basis)	**108,333**
Total – All Walk/Bike Trips (2009 basis)	**108,749**

Variability in the NHTS Datasets 01-09

Kingsport Regional Walk and Bike Trips (2001 data basis)

Legend
☐ 0
Low Density
Medium Density
High Density
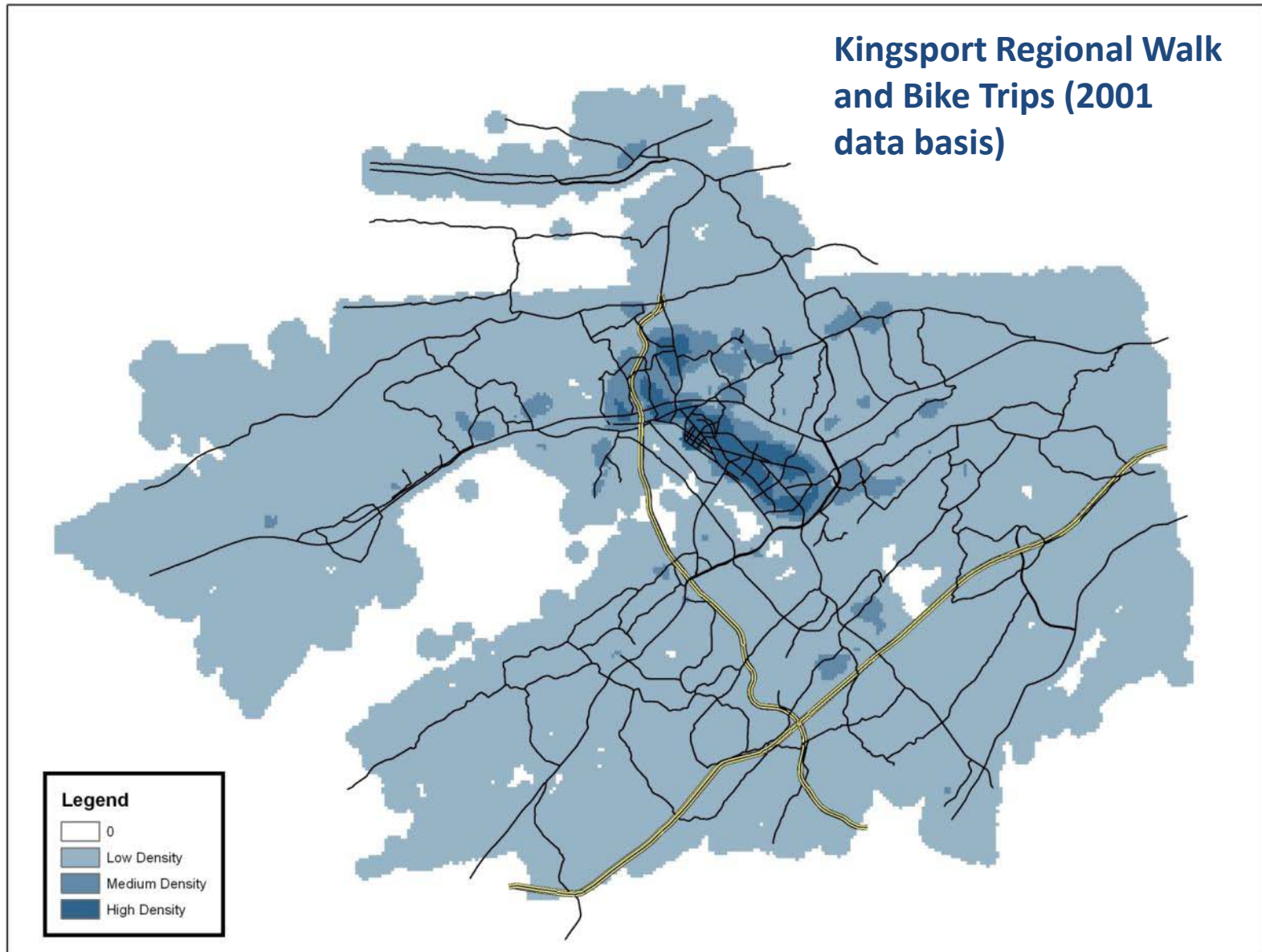
Variability in the NHTS Datasets 01-09

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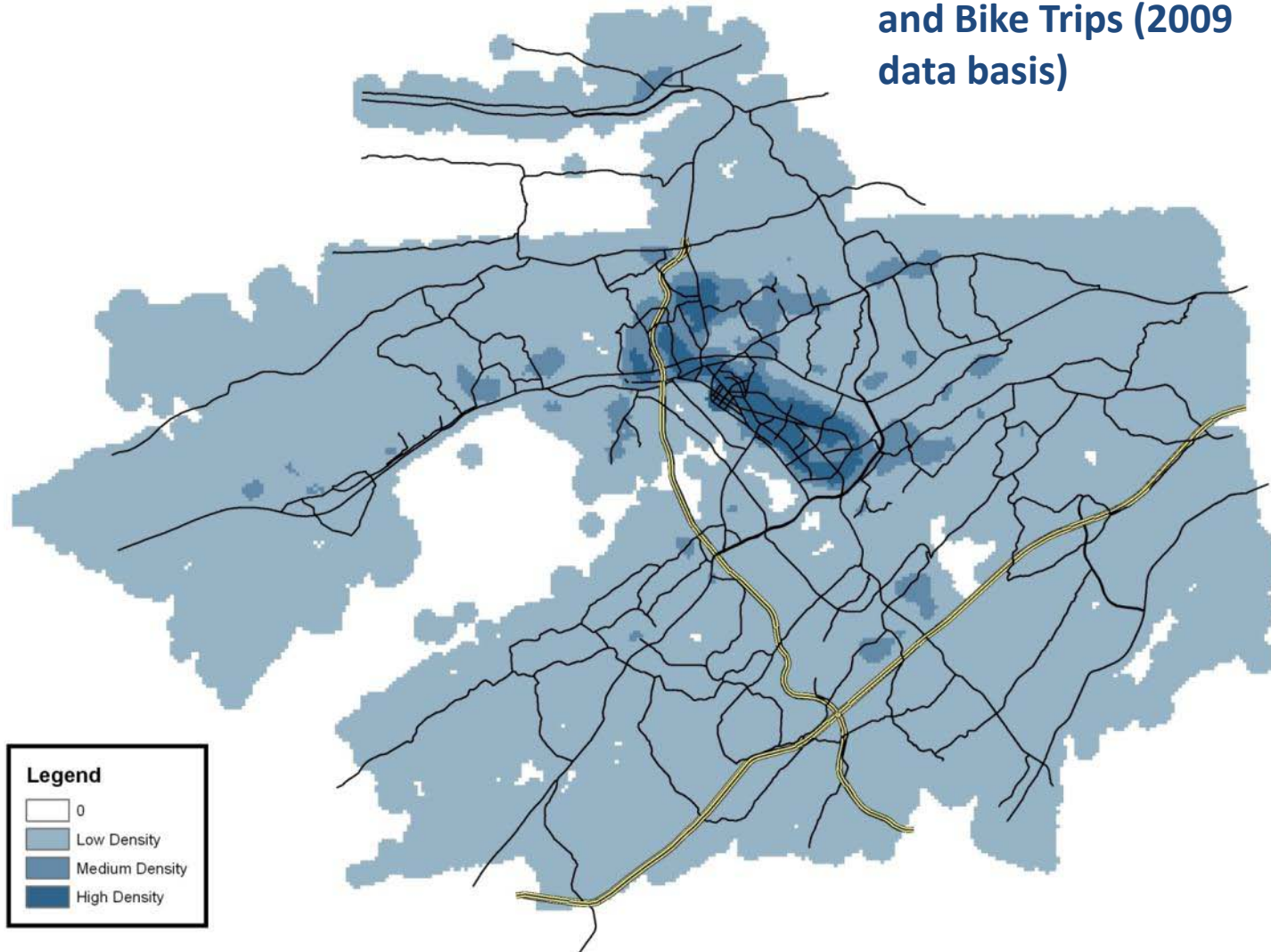
In Summary

- Using NHTS, a fine-grained, parcel-based analysis of non-motorized demand is possible and represents improvements to the traditional modeling practice.

- Opportunities to better predict non-motorized demand continues to exist & has expanded applications.

- Analysis of non-motorized NHTS data has shown trends that are both repeatable and dynamic.
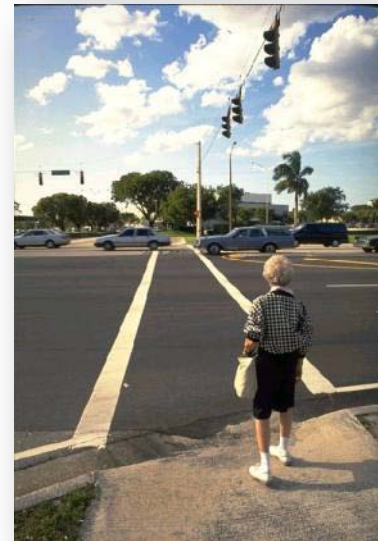
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