Pedestrian and Bicycle Safety in the CNVR:

An Assessment of Existing Conditions

Council of Governments of the Central Naugatuck Valley

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ABSTRACT:	This study compiles data on automobile collisions involving pedestrians and bicycles in the Central Naugatuck Valley Region (CNVR) and analyzes the spatial distribution and characteristics involved in these accidents. The study includes recommendations to address bicycle and pedestrian safety issues in the region.

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CONTENTS

I. Introduction

This study compiles data on automobile collisions involving pedestrians and bicycles in the Central Naugatuck Valley Region (CNVR) and analyzes the spatial distribution and characteristics involved in these accidents. The purpose of the study is to identify common factors in reported bicycle and pedestrian accidents and locations that should be considered for future study. One objective of COGCNV's regional transportation plan is to "to increase the safety and security of the transportation system for motorized *and non-motorized users*" as part of our larger goal of developing and maintaining "an efficient transportation system that will provide the public with a high level of mobility, safety, and choice, while also addressing social, economic, and environmental needs and concerns." [1]

Methodology

The study uses accident data provided by the Connecticut Department of Transportation (ConnDOT) for all vehicle collisions involving pedestrians and bicycles from 2003 to 2007.[2] Incidents labeled as "Pedestrian" accidents in police reports do not adequately capture the whole universe of data, and "Bicycle" accidents are not classified. The data still underestimates the total number of cases, since it misses those accidents that go unreported. Time periods, injuries, and contributing factors in reported accidents are also analyzed in the study.

The initial statistical and spatial analysis of collision data allows us to identify preliminary relationships between accident frequency and socio-economic and land use characteristics. Statistical analysis was performed for the aggregate data of the whole region, the City of Waterbury, and the twelve towns that constitute the rest of the CNVR. Accidents involving pedestrians and bicycles were geo-coded and mapped to help identify any correlation with socio-economic characteristics and land use.

Geospatial Analysis

Accidents were geo-coded, mapped, and aggregated to the census block group level for spatial analysis. Point data representing each accident was overlaid on data layers representing socio-economic and land use characteristics to determine whether there is any correlation between the incidents and the presence of certain socioeconomic, land use, and roadway variables, using Geographic Information System (GIS) mapping.

A map of accident densities was created with *ArcGIS Spatial Analyst* software to identify hazardous locations with high frequencies of pedestrian and bicycle collisions. Further studies of these locations can identify the appropriate safety improvements. Since there is little data available for pedestrian and bicycle traffic in the region, these maps can also be

[1] COGCNV, *Long Range Transportation Plan 2007-2035*. July 2007. pp. 4-5

[2] This includes "property-damage only" collisions in 2007. These collision types were not recorded for ConnDOT's records prior to January 2007.

used to identify areas where counts should be performed. The following characteristics were analyzed in this report.

- ***Socio-economic Analysis***
  - *Poverty* ─ Areas where 25% of the population is below the poverty level, using block group data from the 2000 Census. For perspective, during the 2000 Census, only 12% of the national population was below the poverty level, 8% of the state population, and 11% of the Waterbury Urbanized Area.
  - *Access to a vehicle* ─ Areas where 25% of the population lacks access to a vehicle, using block group data from the 2000 Census.
  - *Age* ─ ConnDOT, CT Accident Summary Tables (CAST) (2007)

- ***Spatial Analysis***
  - *Density of Accidents* ─ *ArcGIS Spatial Analyst* was used to plot the density of "points" that represent accident locations
  - *Accidents at Intersections*
  - *Land Use* ─ COGCNV Geographic Information System (GIS) mapping data based on zoning and visual assessments
    - Regional Core ─ COGCNV Geographic Information System (GIS) mapping data based on zoning, population density, land use, and visual assessments
    - Community Centers ─ COGCNV Geographic Information System (GIS) mapping data based on zoning, population density, land use, and visual assessments

- ***Accident Characteristics***
  - *Hour*
  - *Day*
  - *Month*
  - *Contributing Factors*
  - *Injuries*

Scope of State and National Data

All trends at the state and national level are drawn from 2007 data. References to statewide trends are drawn from summary tables produced by ConnDOT's accident summary table database. In 2007, there were 1,277 motor vehicle accidents involving pedestrians and 820 involving bicyclists in the Connecticut.

National trends were identified using the National Highway Traffic Safety Administration's "Fatality Analysis Reporting System" (FARS). This comprehensive resource is available to the public and may be accessed at www.fars.nhtsa.dot.gov. In drawing comparisons, however, it must be noted that data from FARS reflects only fatal accidents.

II. Existing System

The existing pedestrian and bicycle transportation facilities in the state focus on recreational uses. With the exception of New Haven, which has a rather large percent of walking commuters,[3] few of the state's commuters use nonmotorized means of getting to work. According to the 2000 Census, 1.8% of the region's workforce either walked or biked to work. The 2006-2008 American Community Survey, which the Census Bureau uses to collect data annually, confirms that 2.3% of workers in Waterbury (~1,000 people) walk to work, while only a very small number ride their bicycles.

People, who walk and bike in the region, as in the rest of the state, are typically making short trips in high-density residential areas and central business districts or are using recreational paths. The first group experiences a greater safety concern as they must interact with motor vehicles regularly. While no data exists showing pedestrian or bicycle traffic volumes, the location of accidents found in the study pinpoints areas that should be targeted for future volume counts.

Facilities for Pedestrian & Bicycles

There are more than 60 off-road, multi-use trails in Connecticut, including the Middlebury Trolley Line trail, the Larkin State Park Trail, and the Farmington Canal Trail in the Central Naugatuck Valley Region (CNVR). Other trails are being planned in the state, primarily funded by the Federal Highway Administration (FHWA) under the Transportation Enhancement Program. Along with the network of sidewalks located in the region's urban and community centers, the region's multi-use trails are the main facilities serving recreational users.

Municipalities in the Naugatuck Valley are planning a greenway along the Naugatuck River with some already establishing sections that will be incorporated into the finished route. Within the region, COGCNV is developing a regional Naugatuck River greenway routing study, and Waterbury is completing a routing study for the City's portion. The CNVR portion was designated an official state greenway in 2003. A number of other recreational paths, called Blue-Blazed Hiking Trails, are located in the region. The CT Forest & Parks Association publishes the *CT Walk Book West* as a resource for locating the trails.

In its *Bike Plan: 1994*, COGCNV recommended several state routes to be used as potential bike lanes, shared routes, and inter-regional routes. See Figure 1 for a map of the proposed routes. In addition, the state is in the process of updating its Bicycle and Pedestrian Plan, which includes a map of bicycle routes that are rated based on their suitability. The map, which is still in draft form as of October 2009, can be found at www.ctbikepedplan.org. Most of the CNVR routes included on the state's bicycle map are the same as those recommended in COGCNV's 1994 plan.

[3] According to the 2000 Census, New Haven has the fourth highest rate of walking commuters among cities with over 100,000 people.

Figure 1. Proposed CNVR Regional Bikeway System, 1994

Bikeways

- Bike Lanes
- Shared Lanes
- Interregional Routes

Source: "Bikeways", Bike Plan: 1994, COGCNV.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP

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III. CNVR Pedestrian and Bicycle Accident Locations

Pedestrians

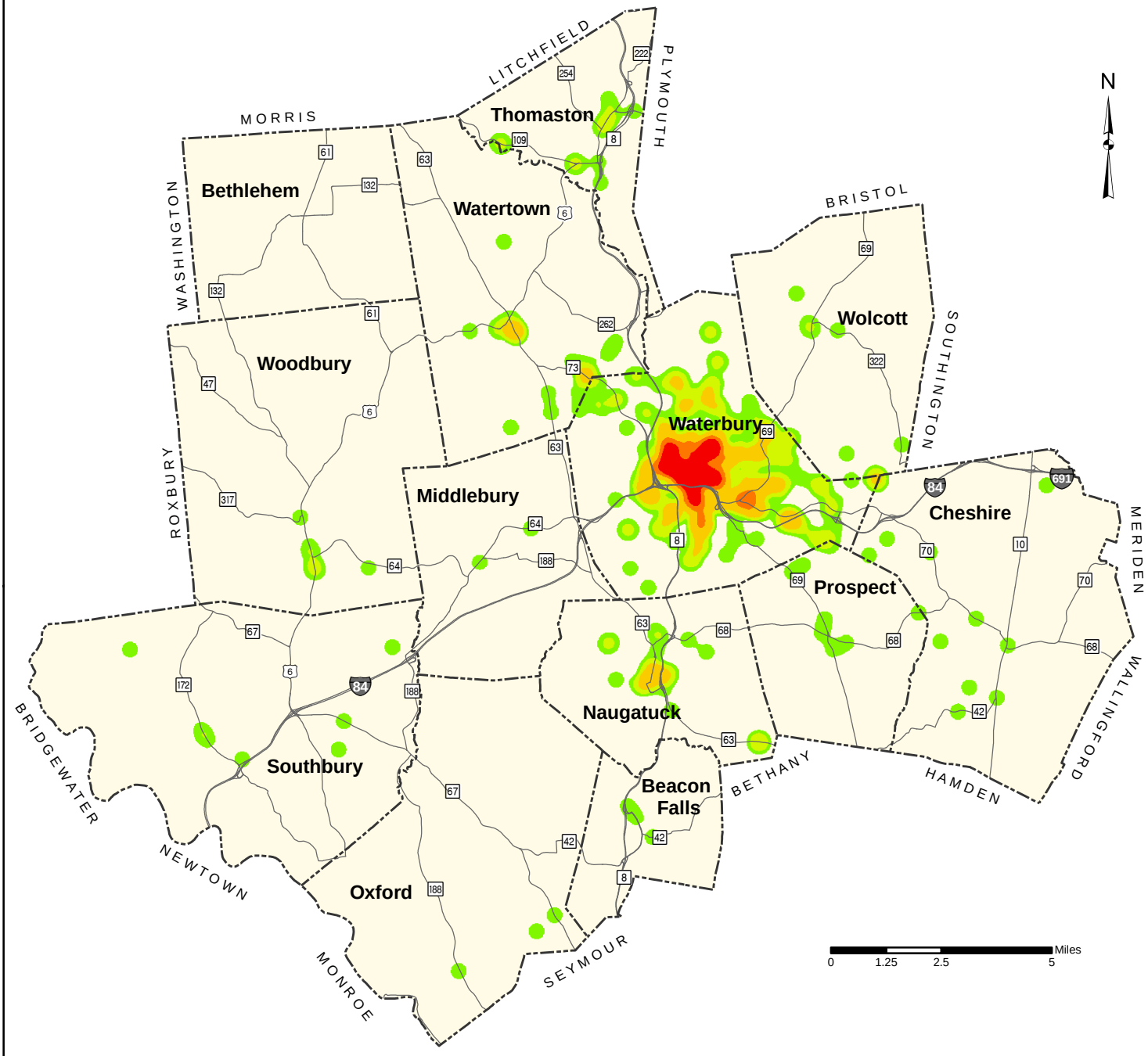
During the study period, 565 accidents involved pedestrians. 81% occurred in Waterbury.

Table 1. Pedestrian Accidents in the CNVR: 2003-2007 by Municipality

Municipality	Pedestrian Accidents	Percent of CNVR
Beacon Falls	3	< 1%
Bethlehem	0	—
Cheshire	10	2%
Middlebury	2	< 1%
Naugatuck	26	5%
Oxford	3	< 1%
Prospect	8	1%
Southbury	5	< 1%
Thomaston	12	2%
Waterbury	458	81%
Watertown	23	4%
Wolcott	8	1%
Woodbury	7	1%
CNVR	565	100%

High-hazard locations are represented on maps on the following pages. Figure 2 shows areas where the highest frequencies of accidents occur in the region. Figure 3 shows high frequency accident locations in Waterbury. Table 2 lists these locations with their respective vehicle traffic volumes. Corridors that have a high concentration of accidents tend to have volumes in excess of 5,000 vehicles per day.

Figure 2. Density of Pedestrian Accidents
Central Naugatuck Valley Region: 2003-2007



Density of Pedestrian Accidents - per square mile

4 246

LOW HIGH

Source: Accident Density was calculated by COGCNV using Spatial Analyst's Density Tool (Kernel Density)
"Accident Data", ConnDOT Accident Record Section, 2003-2007.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP

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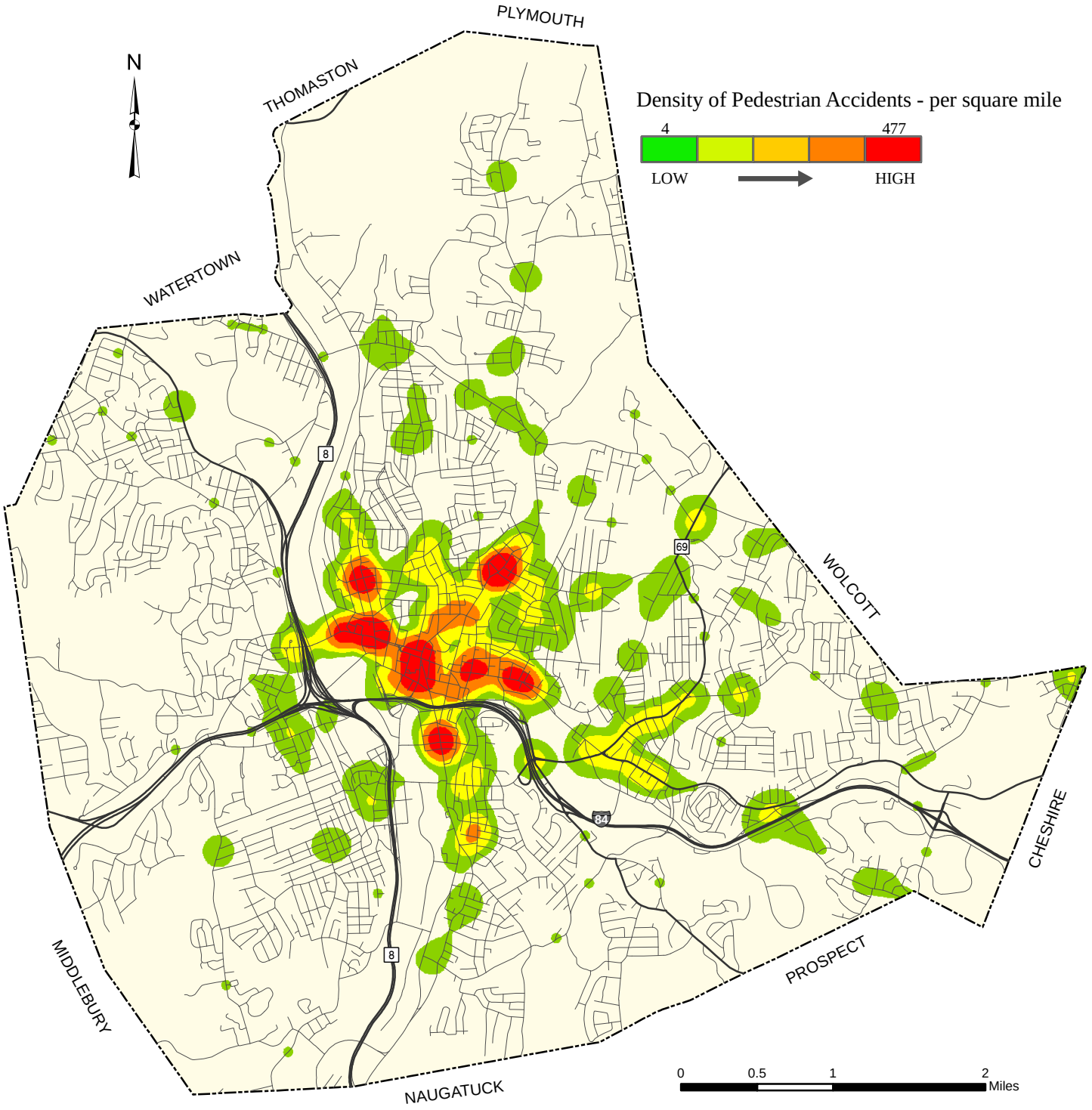
Figure 3. Density of Pedestrian Accidents
Waterbury: 2003-2007



Source: Accident Density was calculated by COGCNV using Spatial Analyst's Density Tool (Kernel Density)
"Accident Data", ConnDOT Accident Record Section, 2003-2007.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP

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Table 2. High Hazard Locations for Pedestrians in the CNVR

Geographic Area	Average Daily Traffic (vehicles/day)
Waterbury	
Downtown between Grand, Meadow, Grove, and N. Elm Street	4,000-8,000
E. Main Street from the Green to Wolcott Road	15,300
W. Main Street from the Green to Thomaston Avenue	22,800 (max.)
N. Main Street in the vicinity of East Farm Street	13,200
S. Main Street in the vicinity of East & West Liberty Street	6,400
Willow Street in the vicinity of Ridgewood Street	7,600
While not as severe, the following locations exhibit high accident frequencies in the rest of the region.	
Beacon Falls	
N. Main Street from Route 42 to Church Street	10,500
Cheshire	
South Main Street in the vicinity of Highland Avenue (Route 10)	27,900 (max.)
Naugatuck	
Meadow Street from Hillside to Rubber Avenue	8,100
Rubber Avenue from Meadow to Aetna Street	16,100
Maple Street from High to Church Street	12,600
Prospect	
Route 68 in the vicinity of Route 69	11,300 (max.)
Watertown	
Main Street (Route 63) from Route 6 to Woodruff Avenue	20,100 (max.)
Main Street, Oakville, (Route 73) from Davis to Buckingham Street	15,300 (max.)
Thomaston	
Route 6 in the vicinity of Route 109	10,700
Main Street from Route 254 to E. Main Street	12,300 (max.)
Woodbury	
Main Street (U.S. Route. 6) from Middle Quarter to Sherman Hill Road	16,800 (max.)

Bicycles

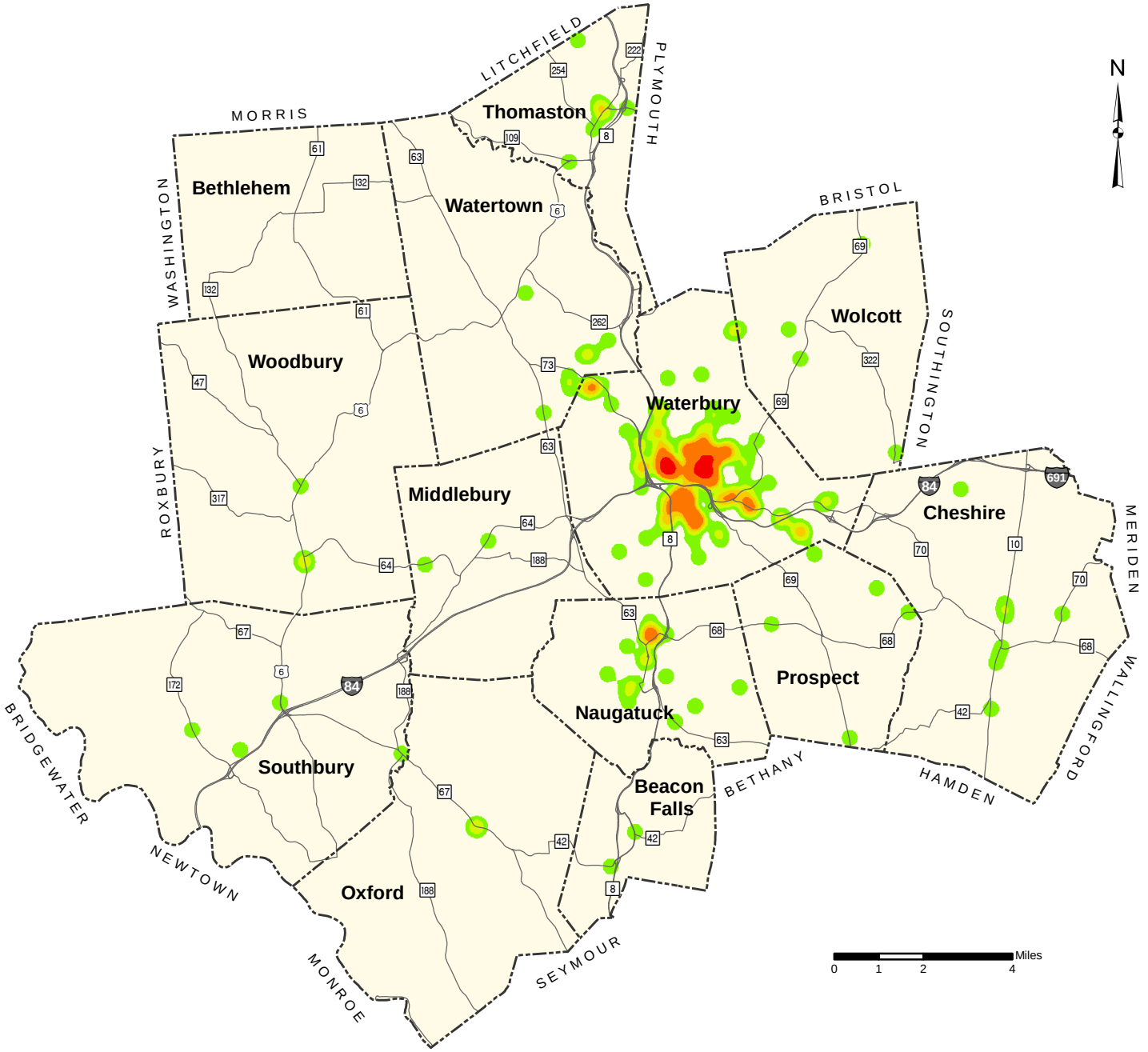
During the study period, 185 accidents involved bicycles. About two-thirds of these accidents occurred in Waterbury. Among suburban towns, Naugatuck had the most with 9% of the regional total.

Table 3. Bicycle Accidents in the CNVR: 2003-2007 by Municipality

Municipality	Bicycle Accidents	Percent of CNVR
Beacon Falls	2	1%
Bethlehem	0	0%
Cheshire	7	4%
Middlebury	2	1%
Naugatuck	17	9%
Oxford	2	1%
Prospect	5	3%
Southbury	4	2%
Thomaston	6	3%
Waterbury	125	68%
Watertown	7	4%
Wolcott	5	3%
Woodbury	3	2%
CNVR	185	100%

High-hazard locations are represented on maps on the following pages. Figure 4 shows areas with the highest frequencies of accidents in the region. Figure 5 shows high frequency accident locations in Waterbury. Table 4 lists these locations with their respective vehicle traffic volumes. Corridors that have a high concentration of accidents tend to have volumes in excess of 5,000 vehicles per day.

Figure 4. Density of Bicycle Accidents
Central Naugatuck Valley Region: 2003-2007



Density of Bicycle Accidents - per square mile

4 60

LOW HIGH

Source: Accident Density was calculated by COGCNV using Spatial Analyst's Density Tool (Kernel Density)
"Accident Data", ConnDOT Accident Record Section, 2003-2007.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP

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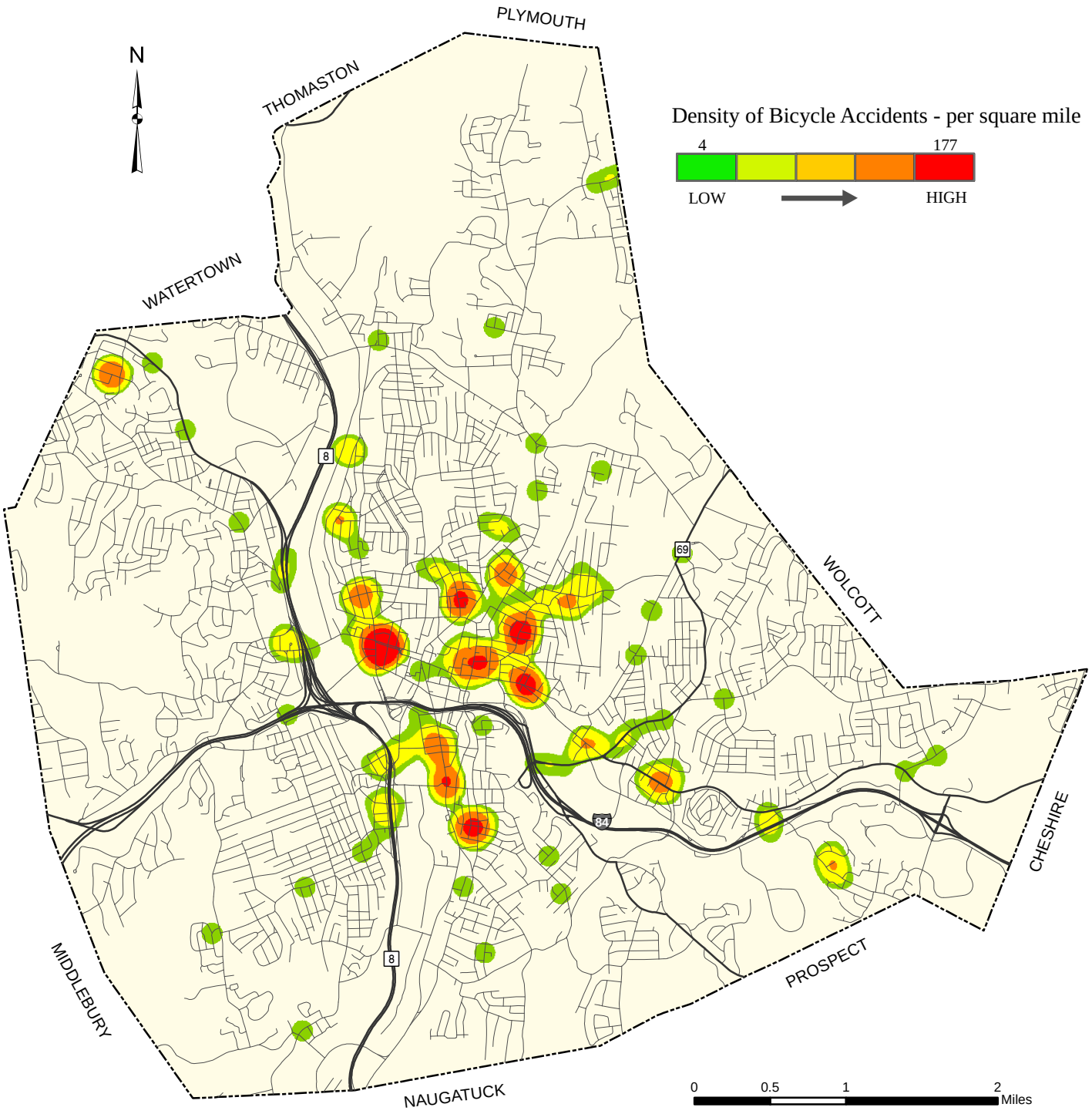
Figure 5. Density of Bicycle Accidents
Waterbury: 2003-2007



Source: Accident Density was calculated by COGCNV using Spatial Analyst's Density Tool (Kernel Density)
"Accident Data", ConnDOT Accident Record Section, 2003-2007.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP

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Table 4. High Hazard Locations for Bicyclists in the CNVR

Geographic Area	Average Daily Traffic (vehicles/day)
Waterbury	
E. Main Street in the vicinity of Wolcott Street	15,300
W. Main Street in the vicinity of Holmes Avenue	22,200
N. Main Street in the vicinity of Division Street	13,200
S. Main Street from East & West Dover to Washington Street	7,800
Lounsbury Avenue in the vicinity of South Street	550
Willow Street in the vicinity of Hillside Avenue	7,600
Cherry Street from High to E. Main Street	11,500
Walnut Street in the vicinity of Dikeman Street	6,900
Bishop Street from Hawkins to Elizabeth Street	unknown
Meadow Street at Freight Street	13,200
While not as severe, the following locations exhibit high accident frequencies in the rest of the region.	
Cheshire	
Highland Avenue from Weeks Road to Cheshire High School	27,900 (max.)
Naugatuck	
Spring Street between Anderson Street and Route 68	5,200

IV. Analysis of Surrounding Land Use and Socio-economic Characteristics

Pedestrians

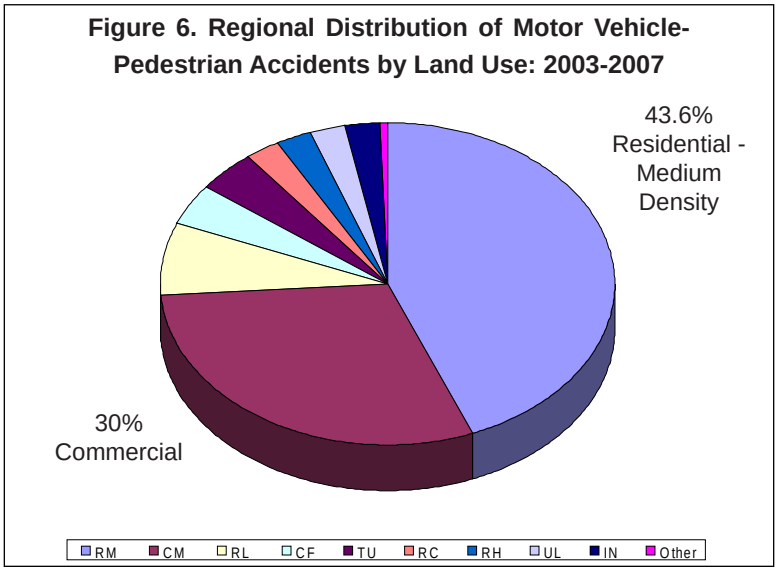
Socio-economic characteristics

Income ─ 49% of all accidents involving pedestrians were in areas where over one-quarter of the population earned below the poverty level (less than 1% of the region's land area). 22% are within areas where over half the population is under the poverty level.

Access to a Vehicle ─ 48% of all accidents involving pedestrians occurred in areas where over one-quarter of all households are without a vehicle (1.3% of the region's land area). 20% were in areas where half of all households are without a vehicle.

Land Use ─ 30% of all accidents involving pedestrians occurred in areas designated as Commercial, 44% as Residential – Medium density, and 7% occurred in areas designated as Residential – Low density. Approximately 85% of all accidents involving pedestrians occurred in the regional core and 5% occurred in community centers in the region. Figure 7 shows the distribution of bicycle and pedestrian accidents relative to the regional core and community centers.

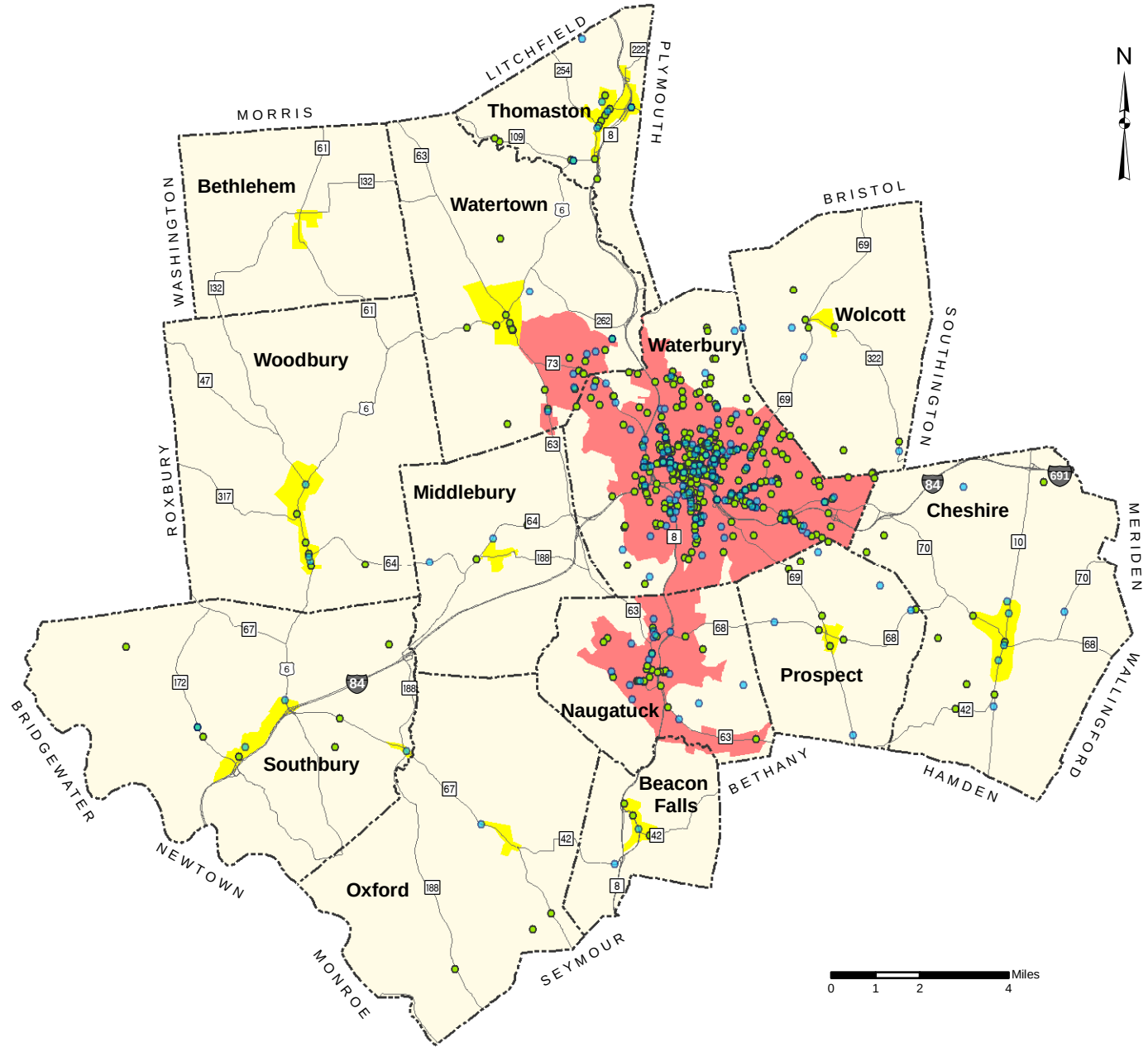
Figure 6. Regional Distribution of Motor Vehicle-Pedestrian Accidents by Land Use: 2003-2007



Time distribution

Month ─ In looking at the monthly accident trends, there tended to be a higher frequency in the fall and early winter months. The majority of incidents in Waterbury occurred in *November*, while the rest of the region saw a spike in *September* and *December*. Waterbury also exhibited a trend from *May through July*, which it did not share with the rest of the region. Statewide, peaks were from *September* through *December* as well as *May* and *June*. The national trends show more of a focus in the fall and winter months with the highest frequency of pedestrian fatalities occurring in *November*.

Figure 7. Bicycle and Pedestrian Accidents in the Regional Core and Community Centers: 2003-2007



Bicycle Accidents

Pedestrian Accidents

Regional Core

Community Centers

cnv_bnd

Source: "Accident Data", ConnDOT Accident Record Section, 2003-2007.
"Roads", c1984-2007 Tele Atlas, Rel. 01/08
"Town Boundary", DEP
"Regional Core" and "Community Centers", COGCNV

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Day ─ Accidents in the region commonly occur during the weekdays, primarily on *Tuesdays* and *Fridays*. In Waterbury, accidents are spread out on weekdays. The same is true at the state level, with most accidents occurring on *Tuesdays*. In the rest of the CNVR, however, the trend is focused on *Fridays*. This is more in line with national trends, which show that pedestrian fatalities are more common on weekend days (Friday - Sunday). Table 5 shows the most common days for pedestrian accidents.

Hour ─ Accidents most commonly occur in the evening between 3:00 and 8:00 p.m. at all geographic areas, with the highest frequencies from 4:00 - 5:00 PM.

Table 5. Most Common Time Periods for Pedestrian Accidents in CNVR and CT

Geographic Area	Peak Time Periods		
	Month	**Day**	**Hour**
CNVR	November	Friday	4:00 p.m.
Waterbury	November	Tuesday	4:00 p.m.
Rest of CNVR	September	Friday	5:00 p.m.
CT	October	Tuesday	5:00 p.m.

Most of these trends can be attributed to pedestrians travelling during dusk and other seasonal factors. Snow banks, earlier sunset hours, and wearing darker clothing are all common in the winter months and play a combined role in causing the increase in pedestrian accidents. Other factors that may be considered during the peak accident hours are increased traffic volumes during rush hour, school children walking home, and inadequate lighting on rural roadways during sunset hours.

Injury analysis

There were 472 injury-causing accidents involving pedestrians during the study period, of which *23%* included incapacitating injuries and 2% (11) were fatal injuries. Statewide, in 2007, there were 1,171 injury-causing accidents involving pedestrians, of which *20%* included incapacitating injuries and 3% (32) fatal injuries. Both sets of statistics seem to indicate that the majority of accidents cause only minor injury.

Intersections

62% of all accidents involving pedestrians during the study period occurred *between* intersections (mid-block crossings). Of those incidents, *44%* are attributed to unsafe use of highway by a pedestrian, which usually indicates that a crosswalk was not used. The locations are similar with the state trend, where *56%* of all pedestrian accidents occurred between intersections, while the national incidence reached a high of 77% of all fatal pedestrian accidents.

The frequency of pedestrian accidents at mid-block crossings is indicative of children darting into the middle of the road and pedestrians seeking out the most convenient route to their destination. When destinations are located in areas without a crosswalk, motorists will be caught by surprise and may be unable to react in time. Snow banks, street parking, inadequate lighting, and other obstacles may further limit pedestrian visibility and conspicuity.

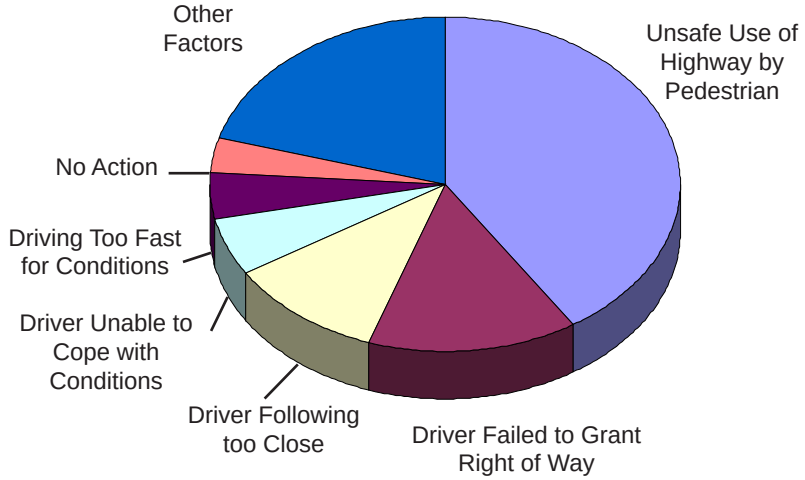
Factors involved in reported accidents

In the CNVR, accidents involving pedestrians are most often associated with "unsafe use of highway by pedestrians" and "failure to grant right-of-way." These are the most common factors statewide as well. Nationally, the most common factors were "improper crossing of roadway or intersection," and "walking/riding with or against traffic, playing, working, sitting, lying, standing, etc. in roadway." Both would qualify under the state's definition of "unsafe use of highway by pedestrian."

The two most common factors in the region can be associated with the party at-fault. When the vehicle is at-fault, it is often caused by the driver failing to grant right-of-way. The majority of these cases occur at unsignalized intersections, when a driver is turning and fails to stop for a pedestrian in the crosswalk. When the pedestrian is at-fault, on the other hand, it is typically classified as an unsafe use of the highway. This could mean that the pedestrian was either not using a crosswalk, hitching on a vehicle, or playing in the road.

It should be noted that the third most common contributing factor is "driver following too close" due to the number of rear-end collisions that were included in this study. Although no pedestrian was injured in these incidents, the accident records identify the role of a pedestrian in the collision, usually causing the first vehicle to stop or slow down abruptly.

Figure 8. Contributing Factors in Pedestrian Accidents in the CNVR: 2003-2007



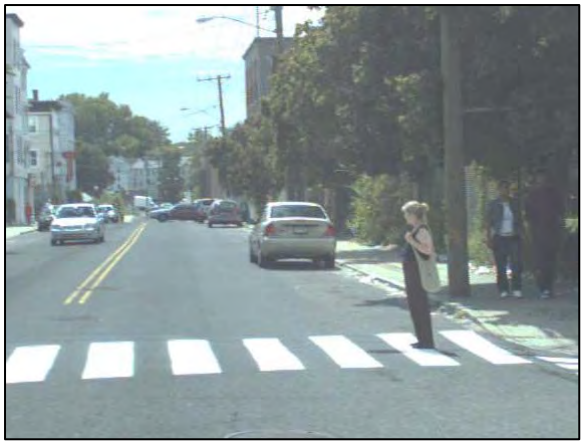
Distribution by Age

Data on pedestrian ages was only available for 2007, a year when there were 114 pedestrian accidents in the region. The data shows that the region's pedestrian accidents occurred most commonly among people from *10 to 24 years old*. In 2007, *39%* of pedestrians involved in accidents in Connecticut and *43%* of pedestrians injured nationwide were *under 25 years old*. While this trend is fairly uniform in the region, it is worth noting that 35% of pedestrians involved in accidents outside of Waterbury were *45 and older*.

Table 6. Percent of Pedestrian Accidents by Age: 2007

Age	CNVR	Waterbury	Rest of CNVR	CT
< 5	5%	6%	0%	3%
5-9	5%	6%	0%	5%
10-14	11%	11%	14%	8%
15-19	14%	13%	21%	12%
20-24	10%	9%	21%	8%
25-29	6%	6%	7%	6%
30-34	3%	3%	0%	4%
35-39	6%	7%	0%	6%
40-44	7%	8%	0%	7%
45-49	9%	9%	14%	7%
50-54	4%	4%	7%	6%
> 55	13%	13%	14%	18%
Unknown	8%	9%	0%	9%
Total	**100%**	**100%**	**100%**	**100%**

It is difficult to determine why some age groups are more susceptible to pedestrian accidents than others. Few studies have taken a comprehensive look at this topic, though some have noted that children are more likely to dart into the street, and young adults are more likely to cross at unmarked crossings, meaning that they are less careful about finding the safest place to cross. Children and older persons, on the other hand, are more likely to use marked crosswalks.[4] Pedestrian behavior varies based on a number of factors, including whether an area is urban or suburban, whether children are walking to school, and the presence of walkable destinations.



[4] FHWA, *Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines*. http://www.tfhrc.gov/safety/pubs/04100/03.htm. Retrieved on 9/1/09.

Bicycles

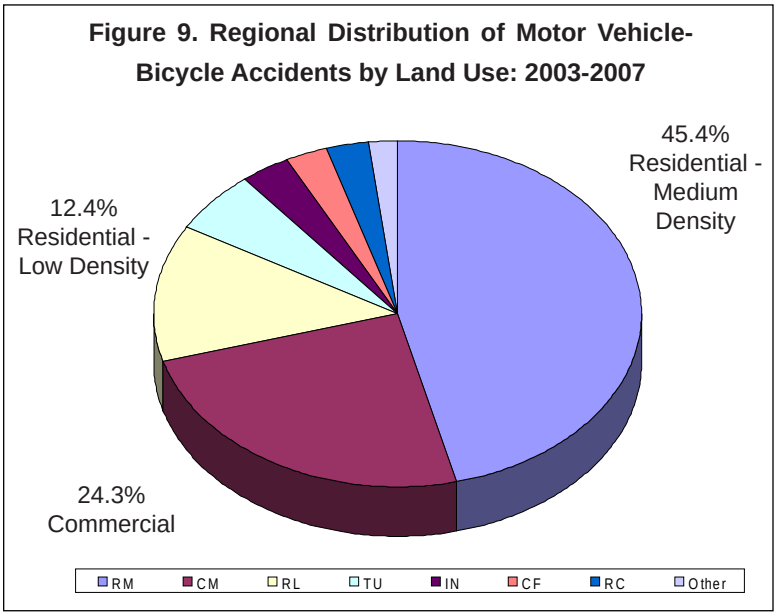
Socio-economic characteristics

Income ─ *35%* of all accidents involving bicycles were in areas where over one-quarter of the population earned below the poverty level (less than 1% of the region's land area). 13% are within areas where over half the population is under the poverty level.

Access to a Vehicle ─ *36%* of all accidents involving bicycles occurred in areas where over one-quarter of all households are without a vehicle (1.3% of the region's land area). 12% occur in areas where half of all households are without a vehicle.

Land Use ─ *25%* of all accidents involving bicycles occurred in areas designated as Commercial, *46%* as Residential – Medium density, and *13%* occurred in areas designated as Residential – Low density. Approximately *75%* of all accidents involving bicycles occurred in the regional core and *10%* occurred in community centers in the region. Figure 7 shows the distribution of bicycle and pedestrian accidents relative to the regional core and community centers.

Figure 9. Regional Distribution of Motor Vehicle-Bicycle Accidents by Land Use: 2003-2007



Time distribution

Month ─ The majority of bicycle accidents took place during the months of *August* and *September* in the region. This is likely because of the improved weather conditions and the associated increase in bicyclists on the roads. National and statewide trends were also higher in the summer months with peaks in the month of *June* and *July*, respectively.

Day ─ Accidents commonly occur on *Fridays* and *Tuesdays*, followed closely by *Saturdays*. The majority of accidents statewide occur on Thursdays with a high frequency of accidents spread throughout the weekdays. Table 7 shows the most common days for bicycle accidents.

Hour ─ Accidents most commonly occur in the evening between 5:00 – 6:00 p.m. in the region. The statewide trend is similar with the highest frequency of accidents occurring around 4:00 p.m.

Table 7. Most Common Time Periods for Bicycle Accidents in CNVR and CT

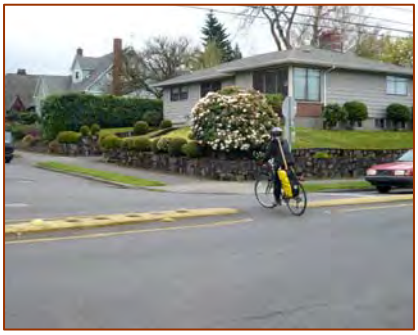
Geographic Area	Time Period		
	Month	Day	Hour
CNVR	September	Friday	5:00 p.m.
Waterbury	September	Saturday	5:00 p.m.
Rest of CNVR	September	Friday	5:00 p.m.
CT	July	Thursday	4:00 p.m.

The rise in accidents during the late summer months likely coincides with the suitable weather and the beginning of the school season. As with the pedestrian accident statistics, it appears that the peak period coincides with evening rush hour traffic. However, there also appears to be less of a problem of accidents occurring after sunset. While inadequate lighting can be hazardous for bicyclists, these figures show that most travel occurs during the daylight hours, which helps reduce the risks associated with seasonal factors: snow banks, early sunset hours, etc.

Injury analysis

There were 170 injury-causing accidents among bicyclists, of which *31%* included incapacitating injuries and 2% (3) fatal injuries. Statewide, in 2007, there were 657 injury-causing accidents among bicyclists, of which *33%* included incapacitating injuries and less than 1% (5) were fatal injuries. As with the pedestrian accident data, it appears that the majority of bicycle-automobile accidents result in only minor injuries.

Intersections



58% of all accidents involving bicycles occurred at intersections. Of those incidents, *44%* are attributed to failure to grant right-of-way, which indicates a recurring problem at conflict points between motorists and bicycles at intersections. Statewide, *61%* of pedestrian accidents occurred at intersections in 2007, but only *38%* of all fatal accidents nationally occurred at intersections.

While the regional data is in line with the state trend, there is a clear discrepancy with the national trend. The discrepancy can be the related to a variety of factors that are involved in accidents throughout the country. Other parts of the country may have a higher volume of cyclists

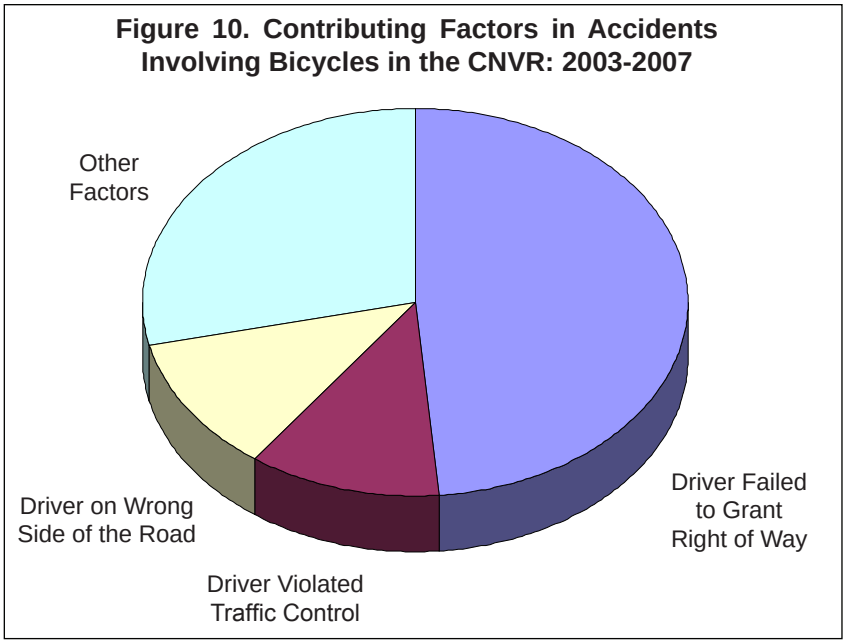
travelling longer distances, who are more susceptible to collisions between intersections. Since the national statistics represent only fatal accidents, it is also possible that the sample is a reflection of the most dangerous accidents and a tendency for these to occur between intersections.

Factors involved in reported accidents

In the CNVR, among those accidents involving bicycles, the most common factor was "failure to grant right-of-way." "Driving on the wrong side of the road" and "violating traffic controls" were tied for the second most common causes. The two most common factors cited in accidents involving bicycles statewide were "failure to grant right-of-way" and "violating traffic controls." Nationally, the most common factor was "failure to grant right-of-way." There is a clear trend in these collisions at all levels, where bicyclists and automobiles fail to grant the right-of-way or violate traffic controls, leading to collisions.

These two factors show a definite need to improve education among bicyclists and automobiles on how to properly "share the road." Under state statute, bicyclists are granted the same rights on roadways as a motor vehicle. Motor vehicle operators should be mindful of their presence on the roadway, treat them as another vehicle, and provide sufficient clearance when passing so that they may use the road safely. Bicyclists are also subject to the same restrictions as automobile drivers, meaning that they are required to obey all of the rules of the road that automobiles are subject to.

Figure 10. Contributing Factors in Accidents Involving Bicycles in the CNVR: 2003-2007



Distribution by Age

Data on the age of bicyclists was only available for 2007. There were a total of 39 accidents involving bicycles in the region that year. Because of the way that accident data is compiled, the ages of bicyclists are combined with other drivers in accident summaries, since they are considered vehicle operators, unlike pedestrians who are classified separately. This makes it difficult to determine the ages of bicyclists involved in these accidents. Of those individuals involved in bicycle collisions, we can isolate those vehicle operators, who were *under the age of 16* and therefore not allowed to operate automobiles. Within the state, that constitutes 15% of those involved in collisions, within the region 26%, within Waterbury 26%, and within the rest of the region 18%. Nationally, that number is 29% of all bicyclists injured in collisions, although the average age is 30.

The statistics show that the problem is distributed among age groups with collisions among young people being a greater problem in urban areas. The trend among children aged 10 and younger is much more significant in Waterbury (22%) than in the rest of the region, where the same age group are involved in less than 5% of all bicycle collisions.

Table 8. Percent of Bicyclist Accidents by Age: 2007

	Percent of Accidents, by age			
Age	**CT**	**CNVR**	**Waterbury**	**Rest of CNVR**
0-5	0%	1%	0%	0%
6-10	3%	17%	22%	4%
11-15	12%	8%	4%	14%
16 +	85%	74%	74%	82%
Total	100%	100%	100%	100%

V. Recommendations

The following recommendations are intended as guidelines for improving mobility and safety for nonmotorized users in the region. The recommendations are based on the spatial analysis and common characteristics in pedestrian and bicycle accidents identified in the report.

The Federal Highway Administration (FHWA) has compiled a list of effective countermeasures in their *PedSafe* and *BikeSafe* manual[6] that can be used as guidelines in improving hazardous locations. These manuals provide descriptions of useful treatments to common problems identified when looking at pedestrian and bicycle accidents. In the near-term, it would be useful to consider low-cost safety improvements as a means of reducing accidents in the most troubled locations, while planning to fix larger problems as long-term capital improvements. Near-term improvements should be directed towards areas with high accident frequencies that were identified on the accident density maps in Chapter III. Characteristics identified in Chapter IV as exhibiting a higher frequency of accidents among bicyclists and pedestrians should also be used to prioritize improvements and educational initiatives.

Safety Improvements in High-Hazard Corridors and "Hot Spots"

1. Focus on high-hazard corridors identified in the study, combined with public input and anecdotal evidence from public works staff and traffic engineers to target high priority areas for improvements.
   - Establish safety impact teams made up of engineering professionals and local stakeholders.
   - Cooperatively develop improvement concepts including design, education, and enforcement. Look at models like the NJDOT initiative, *Pedestrian Safety Corridor Program*, that targets corridors with a history of pedestrian safety problems.
   - Consult the *Pedsafe* and *BikeSafe* guides to determine appropriate countermeasures based on the accident data and characteristics of the troubled location.
     - For example, a high frequency of mid-block pedestrian accidents may indicate areas in need of a crosswalk, areas where pedestrians walk in the roadway, faded crosswalk markings, or children darting in the road. The *PedSafe* guide recommends a number of treatments to reduce these accident types, including:
       - Providing a sidewalk on both sides of the road.
       - Improving nighttime lighting.
       - Installing medians or pedestrian crossing islands.

[6] FHWA's "Pedestrian Safety Guide and Countermeasure Selection System," September 2004. Available online at www.walkinginfo.org
FHWA's "Bicycle Countermeasure Selection System," May 2006. Available online at www.bicyclinginfo.org

  - Implementing traffic calming measures.
  - Installing warning signs to alert drivers of upcoming crosswalks.

- For example, bicycle-automobile accidents that occur at intersections may indicate a concentration of conflict points. The *BikeSafe* guide recommends a number of treatments at these locations, including:
  - Improving lighting.
  - Enhancing pavement markings.
  - Signal optimization.
  - Making School Zone improvements.
  - Maintaining travel lanes and shoulders free of debris and surface irregularities.
- Prioritize corridors for funding.

Enforcement

2. Plan enforcement campaigns and develop strategies to curb traffic violations by both motorized and non-motorized users.

Education

3. Promote the use of reflective clothing and care when walking or riding along poorly-lit roadways to reduce pedestrian and bicycle accidents.

4. Educate motorists, bicyclists, and pedestrians on traffic regulations that apply to them. Develop learning programs to teach safe and responsible bike riding and crossing techniques to school children.

5. Continue support for ConnDOT's "Share the Road" campaign to alert drivers of the presence of cyclists and other non-motorized users.

Data Collection

6. Inventory crosswalks, pedestrian traffic generators (i.e. retail stores, schools), pedestrian sources (i.e. dense neighborhoods, apartment buildings, bus stops) and "demand lines" (well-worn paths along the roadside).
   - Use GIS software to develop and implement sidewalk projects. Create a detailed inventory of sidewalks in high-traffic and high-hazard corridors to aid in prioritizing improvement projects. Mapping sidewalks throughout the region will also aid in planning for connectivity and increased pedestrian access.

"Demand line" along Thomaston Avenue (SR 847) in Waterbury.
ConnDOT Highway Photolog: 2006.

7. Continue to accrue and monitor data to determine effectiveness of improvements. Identify areas where pedestrian and bicycle traffic counts would be useful.

Land Use and Transportation Design

8. Consider pedestrians and bicyclists in transportation design (i.e. complete streets, wide shoulders for cyclists). Assess the impact of highway improvement projects on pedestrians and bicyclists.

9. Consider pedestrians and bicyclists in land use design (i.e. sidewalks in new developments). Land use decisions and development patterns should not hinder the mobility of non-motorized transportation users.

VI. Public Comments

Joseph Perrelli

From: Lauren Rizzo [lrizzo@cogcnv.org]
Sent: Tuesday, January 12, 2010 10:53 AM
To: 'Joe Perrelli'
Subject: FW: Draft Pedestrian & Bicycle Safety Study
Attachments: Ped Bic Safety PDF.Final Draft.pdf

Lauren Rizzo
Administrative Assistant
COGCNV
60 North Main St., 3rd Floor
Waterbury, CT 06702
203.757.0535 - phone
203.756.7688 - fax

From: Lauren Rizzo [mailto:lrizzo@cogcnv.org] **On Behalf Of** Joe Perrelli
Sent: Thursday, December 31, 2009 10:48 AM
To: Linda Fercodini; Anthony Malone; Ellen Samoska; Geoffrey Green; Gil Graveline; Harmon Andrews; Harold Cosgrove; 'Herman Schuler'; James Sequin; Joseph McEvoy; Judy Wick ; Ken Long; Maria Hill; Martin Cobern; Martin Overton; Mary Barton; Mary Connolly ; Nancy Clark; Peter Betkoski ; Richard Minnick; Ruth Mulcahy; William Guerrera; 'Dan Norton'; 'David Kalinowski'; 'David Monckton'; 'Edward Bea'; 'James Stewart'; 'John Lawlor'; 'Paul Pronovost'; 'Roy Cavanaugh'; 'Thomas Crowe'; 'Wayne Watt'; Chuck Berger; Denis Cuevas; Jim Galligan; Joseph Michelangelo; Mark Pronovost ; Robert Oley; Scott Poryanda; Brian Miller ; Catherine Adsitt ; DeLoris Curtis; Jean Donegan; Michael Tanuis; Rebecca Augur; William Donovan; William Voelker
Cc: Stephen Livingston; David Balzer ; Peter Dorpalen; Virginia Mason
Subject: Draft Pedestrian & Bicycle Safety Study

To: Regional Planning Commission (RPC), Public Works Directors, Town Engineers, and Town Planners
From: Joe Perrelli, Regional Planner
Subject: **Draft Pedestrian & Bicycle Safety Study**
Date: December 31, 2009

The draft *Pedestrian and Bicycle Safety in the CNVR: An Assessment of Existing Conditions* is attached to this email. The study assesses existing conditions and identifies hazards for bicycles and pedestrians in the region. It was presented before the Regional Planning Commission (RPC) at the September meeting and will be presented for approval at the next RPC meeting on **January 12, 2010**. Please review the study and provide comments prior to the meeting.

Written comments may be mailed to COGCNV at 60 North Main Street, 3rd Floor, Waterbury, CT 06702, or e-mailed to jperrelli@cogcnv.org. If you have any questions, please contact Joe Perrelli at 203.757.0535.

Joseph Perrelli

From: 'Nancy Clark'
Sent: Thursday, December 31, 2009 1:32 PM
To: 'Joseph Perrelli'
Subject: Re: Draft Pedestrian & Bicycle Safety Study

COG Bicycle Draft
December 31, 2009

Joe:

Was there any data collected for "Frequency of Accidents in close proximity to Schools?"

Was there any data collected for "Purpose of Bicycle use?" Ex: pleasure / exercise vs transportation to work / school?"

Also, I think that the urban vs rural population affects the accident frequency due to number of cyclists, concentration of traffic, and purpose of use.

This could factor into the conclusions for improvement of safety measures.

Nancy Clark, Southbury