Designing for Bicyclist Safety

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Designing for Bicyclist Safety

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Learning Outcomes:

- Describe core bicyclist safety concepts
- Distinguish between various bicyclist facilities
- Identify innovative design features to enhance bicyclist safety
- Relate national objectives and priorities to improve bicycle travel
- Identify means of assessing quality of bicyclist facilities

Note of caution:

The knowledge and practice of designing for bicyclists is rapidly changing. Images in these materials and other guidelines may be outdated. Always check for the latest MUTCD interim approvals and experimental traffic control devices.

Agenda

The workshop will generally follow this agenda; however, the instructors will adjust as needed to conform to the specific needs of the participants.

	Registration and Participant Introductions
Module A	Introduction
Module B	Designing for On-Road Bikeways
Module C	Intersection Design Treatments
	Class Exercise
Module D	Design Policies and Safety Evaluation

Introduction

Module A

Learning Outcomes:

- Discuss the opportunities to improve bicycle travel.
- Identify key safety factors for bicyclists.

IMPERATIVE FOR IMPROVEMENT

What are the Opportunities?

- 50% of trips are ≤ 3 miles
- 1/3 of U.S. adults say they would commute by bike if safe facilities were available
- 1 out of every 11 U.S. households do not own an automobile

Sources:
https://www.bikewalkalliance.org/storage/documents/reports/2014BenchmarkingReport.pdf, p. 69
nhts.ornl.gov/2009/pub/stt.pdf

Experienced & Confident	Casual/Less Confident
Navigate on streets	Difficulty gauging traffic or unfamiliar with rules of road
Some prefer bike lane, shoulders, shared-use paths when available	Prefer shared use paths or bike lanes on low volume streets
Prefer direct route	Prefer separation from traffic
Speeds up to 25 mph on level and 45 mph on downgrade	May ride on sidewalk
Longer trips	Avoid traffic
	Speeds of 8 to 12 mph
	Trips of 1 to 5 miles

Source: AASHTO, *Guide for Development of Bicycle Facilities,* 2012.

Bicyclist Characteristics

Photo taken by Harvey Muller

Reasons for bicycling

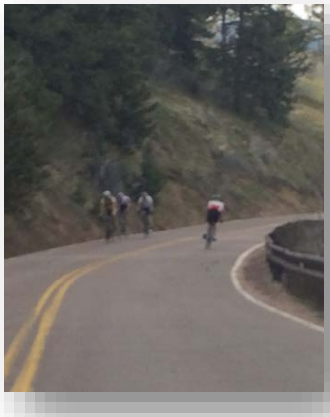
- Recreation 26.0%
- Exercise or health reasons 23.6%
- To go home 14.2%
- Personal errands 13.9%
- To visit a friend or relative 10.1%
- Commuting to school/work 5.0%
- Bicycle ride 2.3%
- Other 4.9%

Preferences

- Feel safe
- Feel secure
- Lower speed
- Lower volume
- Lower truck %
- Fewer lanes

Behaviors

- Violate traffic control
- Slow on uphill
- Fast on downhill



Deaths and Injuries

In 2014

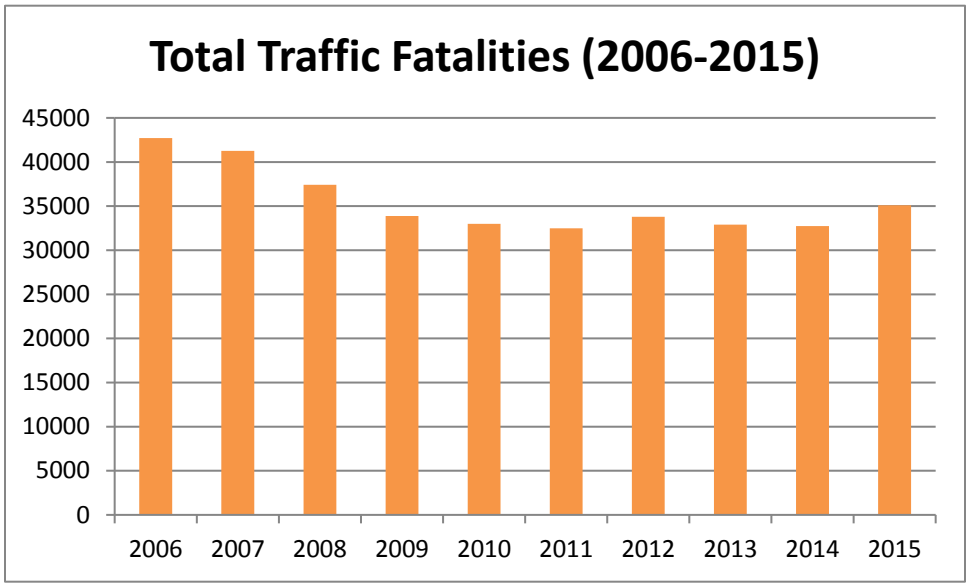
- ✖ 726 bicyclists killed
- ✖ 50,000 bicyclists injured
- ✖ Cyclists accounted for 2.2% of all traffic fatalities, **but make up fewer than 1% of all trips.**

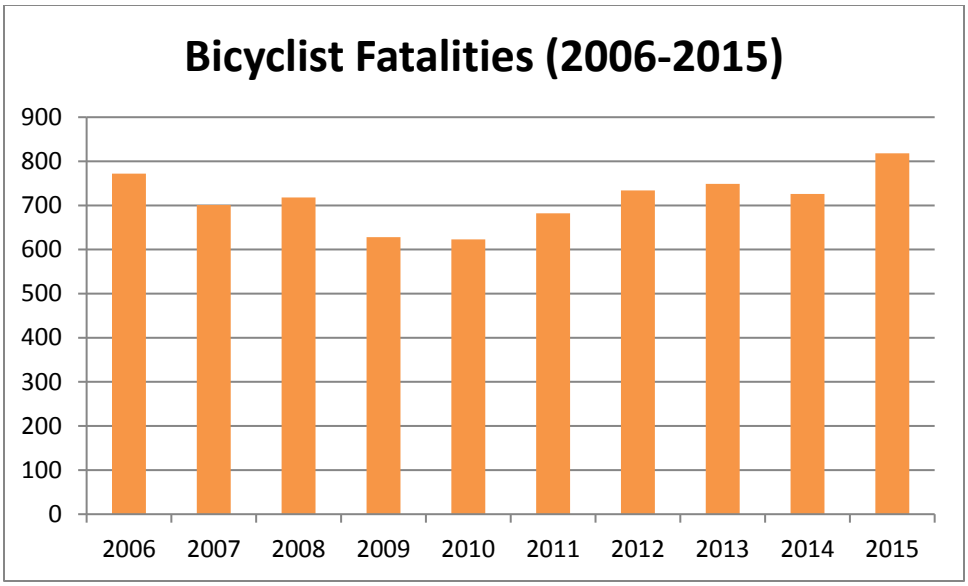
Source: NHTSA, "Traffic Safety Facts", May 2016, http://www-nrd.nhtsa.dot.gov/Pubs/812282.pdf.

Bicycle Fatalities by Year

From 2004 to 2013

- ✖ Total traffic fatalities decreased by almost 24%
- ✖ Bicyclist fatalities increased slightly (2%)

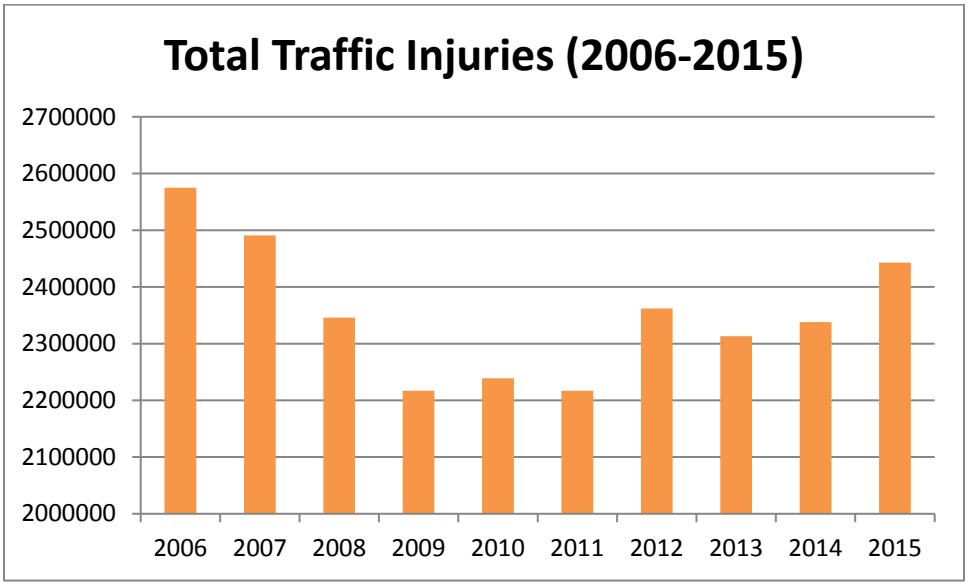


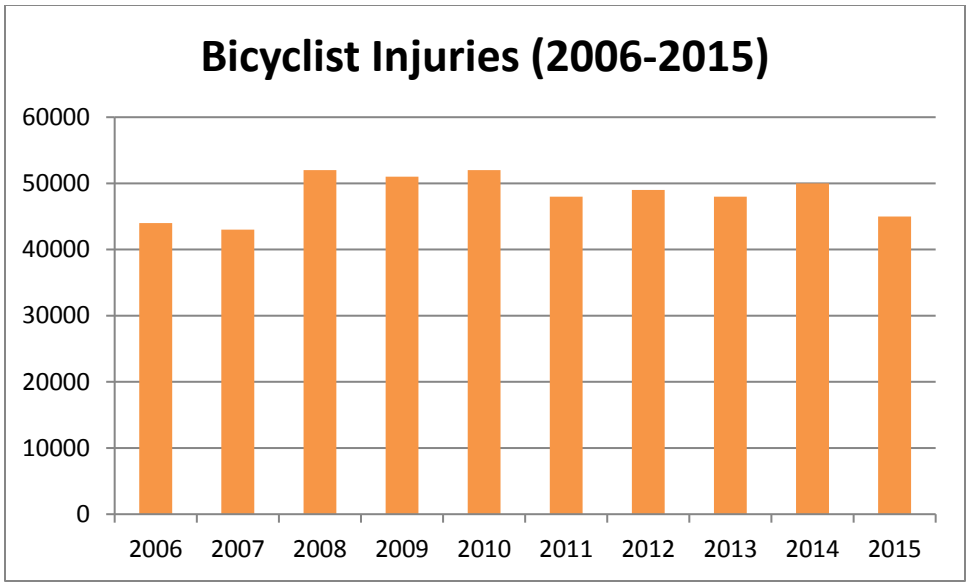


Bicycle Injuries by Year

From 2004 to 2013

- ✖ Total traffic injuries <u>decreased</u> by 17%
- ✖ Bicyclist injuries <u>increased</u> by 17%





Source: www.pedbikeinfo.org/data/factsheet_crash.cfm

Texas Crash Data

Year	Total Traffic Fatalities	Pedalcyclist Fatalities	Percentage of Total Traffic Fatalities	Resident Population (thousands)	Pedalcyclist Fatalities per Million Population
2011	3,016	43	1.4	25,675	1.67
2012	3,398	56	1.6	26,059	2.15
2013	3,382	48	1.4	26,448	1.81
2014	3,358	50	1.4	26,957	1.85
2015	3,516	50	1.4	27,469	1.8

Source: https://crashstats.nhtsa.dot.gov/

Bicycle Crash Characteristics

- ✖ 57% of fatalities at non-intersection locations
- ✖ 58% of injuries at intersections

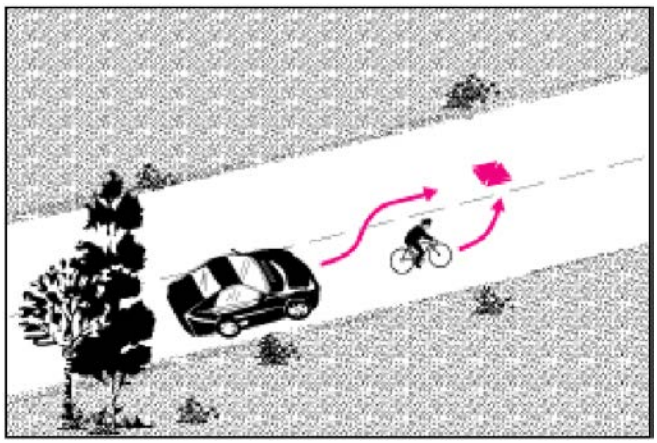
Most Common Crashes

For bicycle crashes, the most common crash types were different for rural and urban areas. "Bicyclist turn/merge into path of motorist" and "motorist overtaking" were some of the most common for rural bicycle crashes, and "motorist failed to yield", "bicyclist failed to yield at midblock", and "bicyclist failed to yield at intersection" were some of the most common for urban crashes. One prominent difference is that common rural crash types are ones that would occur at midblock segments while the urban crash types would occur at intersections.

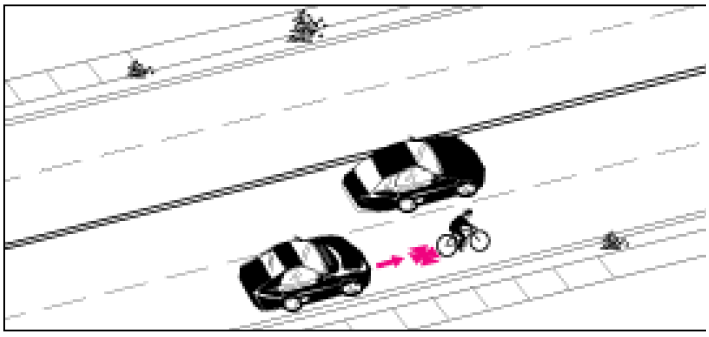
Source: http://www.hsisinfo.org/pdf/HSIS-Rural-PedBike-Final-Report.pdf

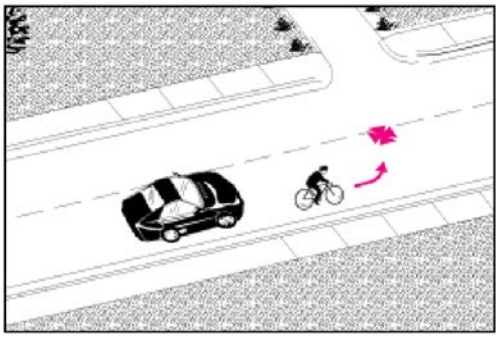
Rural

Turn/merge into path of motorist



Motorist overtaking

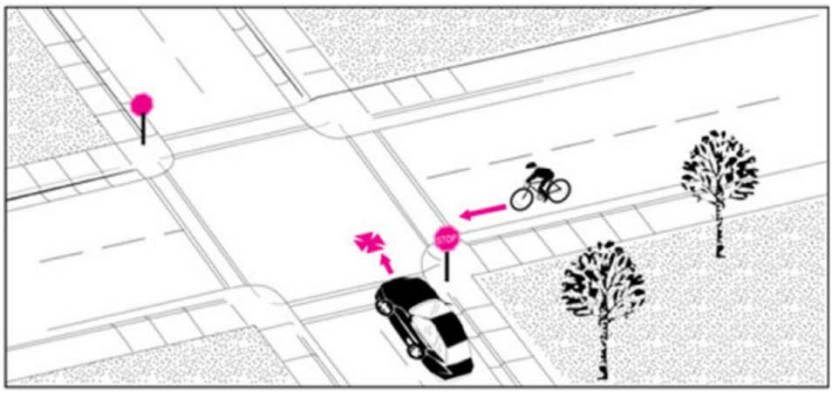


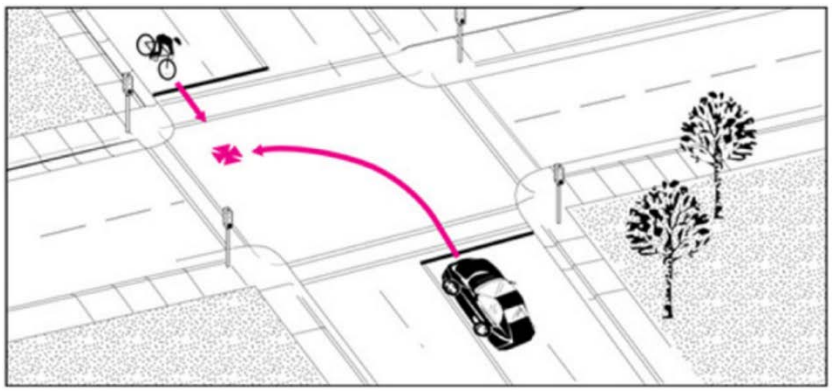


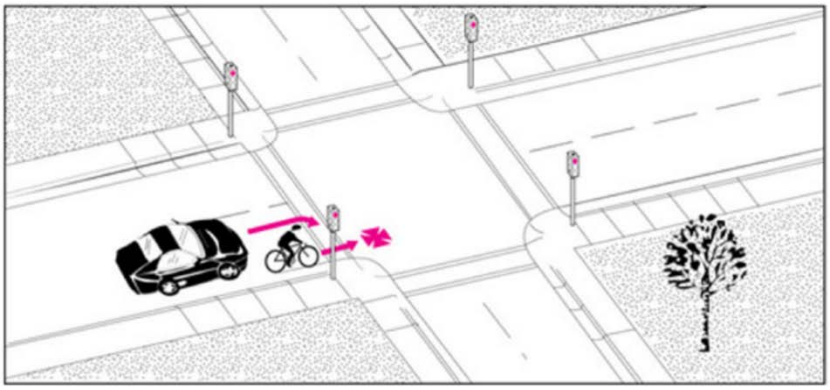
Source: http://www.bicyclinginfo.org/bikesafe/crash_analysis-types.cfm

Urban

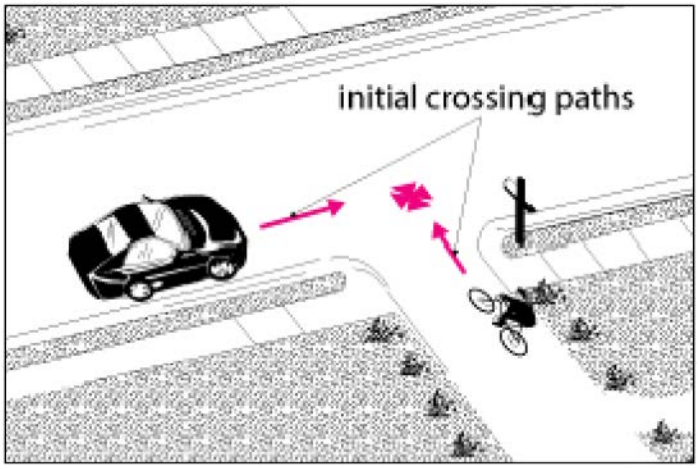
Motorist failed to yield



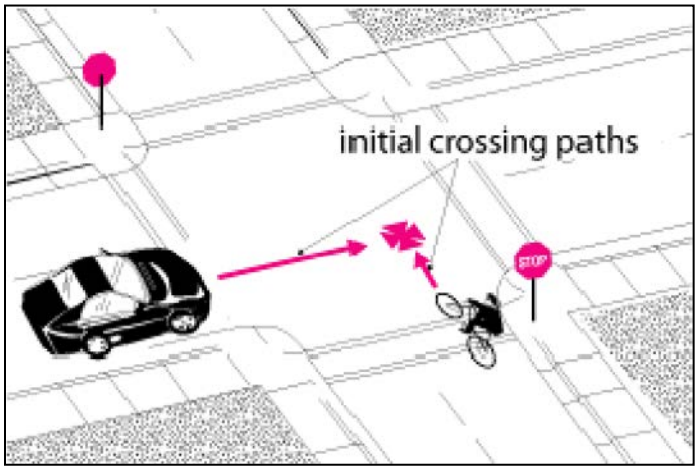


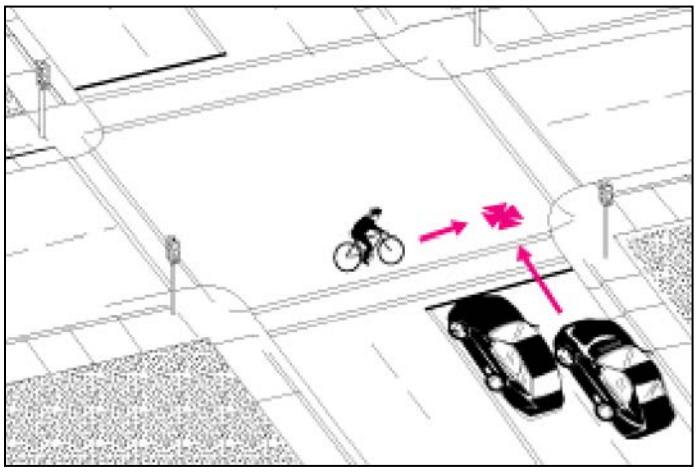


Bicyclist failed to yield at midblock

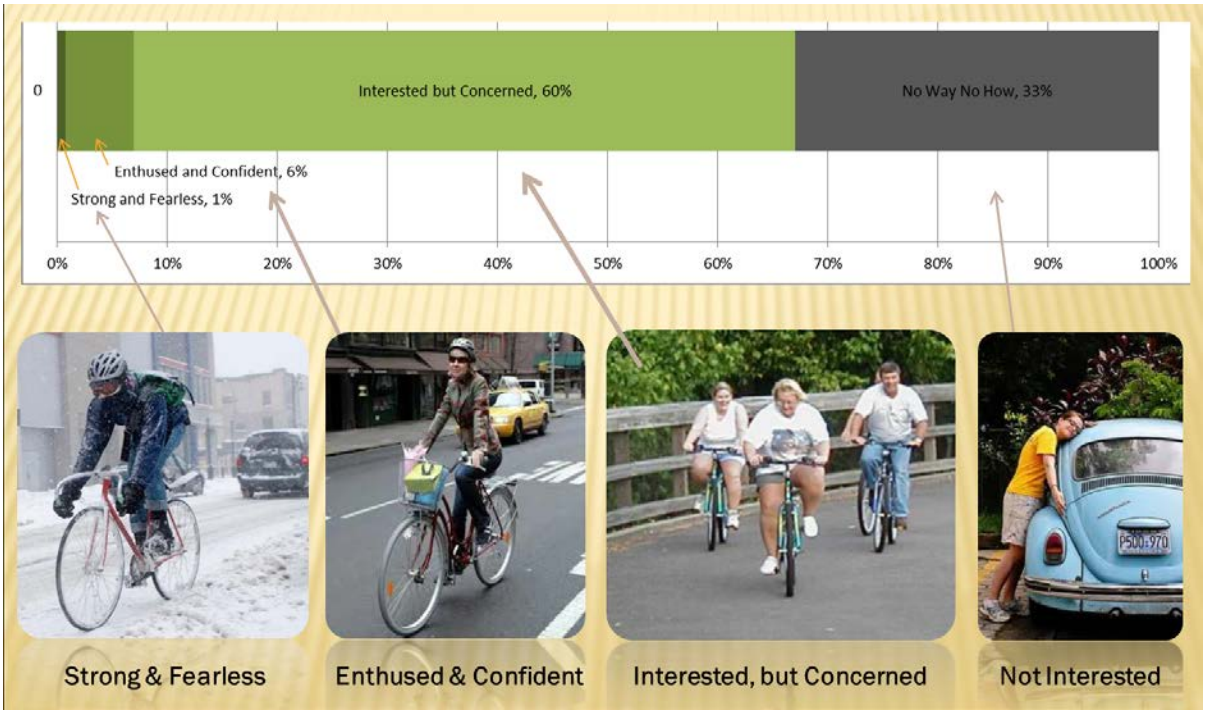


Bicyclist failed to yield at intersection





Types of Bicyclists – City of Portland



Levels of Traffic Stress (LTS)

- LTS 1: Suitable for almost all cyclists, including children trained to safely cross intersections (paths, low volume streets).
- LTS 2: Suitable to most adult cyclists but demanding more attention than expected from children (bike lanes, sharrows).
- LTS 3: More traffic stress than LTS 2, but less stress than integrating with multilane traffic (bike lanes/sharrows on arterials).
- LTS 4: Strong and fearless.

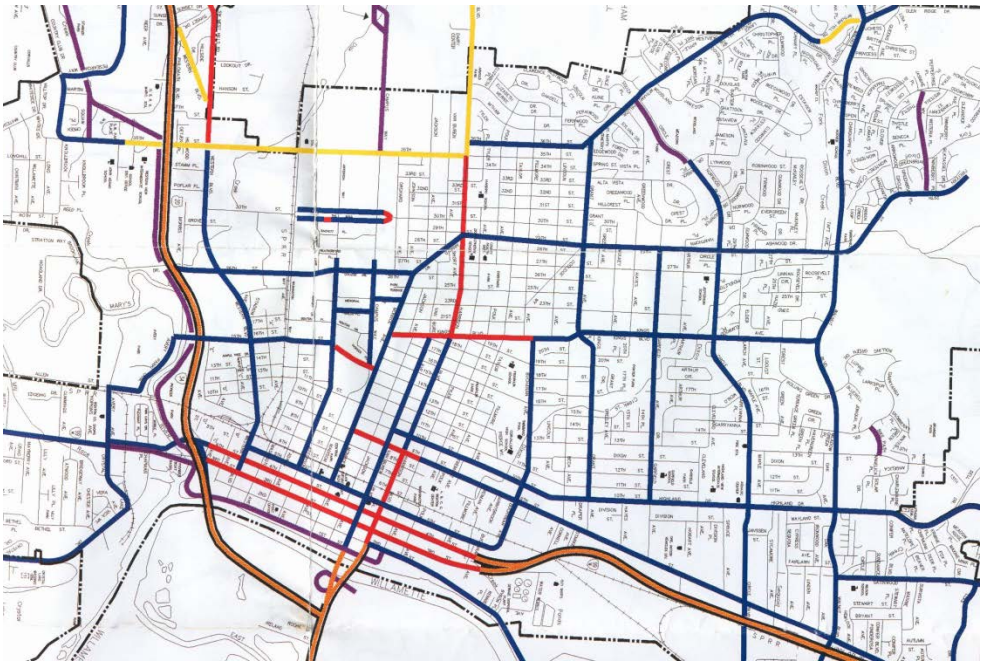
Levels of Traffic Stress			
LTS 1	LTS 2	LTS 3	LTS 4
• Physically separated from traffic or low-volume, mixed-flow traffic at 25 mph or less • Bike lanes 6 ft wide or more • Intersections easy to approach and cross • Comfortable for children	• Bike lanes 5.5 ft wide or less, next to 30 mph auto traffic • Unsignalized crossings of up to 5 lanes at 30 mph • Comfortable for most adults • Typical of bicycle facilities in Netherlands	• Bicycle lanes next to 35 mph auto traffic, or mixed-flow traffic at 30 mph or less • Comfortable for most current U.S. riders • Typical of bicycle facilities in U.S.	• No dedicated bicycle facilities • Traffic speeds 40 mph or more • Comfortable for "strong and fearless" riders (vehicular cyclists)

Source: Mekuria, Furth, and Nixon, "Low-Stress Bicycling and Network Connectivity", Mineta Transportation Institute, May 2012.

In order for [the casual/less confident] group to regularly choose bicycling as a mode of transportation, as physical network of visible, convenient, and well-designed bicycle facilities is needed.

Source: AASHTO, *Guide for Development of Bicycle Facilities,* 2012.

Well-Connected Network



CORE SAFETY CONCEPTS

Key Safety Factors

- ✖ Speed
- ✖ Number of lanes
- ✖ Visibility
- ✖ Traffic volume & composition
- ✖ Conflict points
- ✖ Proximity
- ✖ Bike control
- ✖ Connectivity

Low Risk

High Risk

Provide space on the street…

…or slow down traffic.

Don't ask, "Where can we put bicyclists?"

Instead ask, "How can we design roads to better include bicyclists?"