



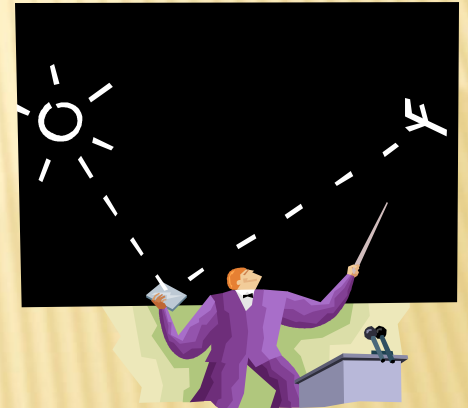
Jacksonville, FL

April 2022

DESIGNING FOR BICYCLIST SAFETY

MEET YOUR INSTRUCTORS

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WORKSHOP LOGISTICS



MEET YOUR COLLEAGUES

HELLO

my name is

- ✘ Name
- ✘ Job title (function)
- ✘ Employer/location
- ✘ Topics of personal interest

WORKSHOP 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 Images in these materials and other guidelines may be outdated.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 and experimental TCD's.





Designing for Bicyclist Safety

IMPERATIVE FOR IMPROVEMENT

LEARNING OUTCOMES

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

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



BICYCLIST SKILL & COMFORT

Experienced & Confident

- ✘ Navigate on streets
- ✘ Some prefer bike lane, shoulders, shared-use paths when available
- ✘ Prefer direct route
- ✘ Speeds up to 25 mph on level and 45 mph on downgrade
- ✘ Longer trips

Casual/Less Confident

- ✘ Difficulty gauging traffic or unfamiliar with rules of road
- ✘ Prefer shared use paths or bike lanes on low volume streets
- ✘ Prefer separation from traffic
- ✘ May ride on sidewalk
- ✘ Avoid traffic
- ✘ Speeds of 8 to 12 mph
- ✘ Trips of 1 to 5 miles

BICYCLIST CHARACTERISTICS

✘ 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%



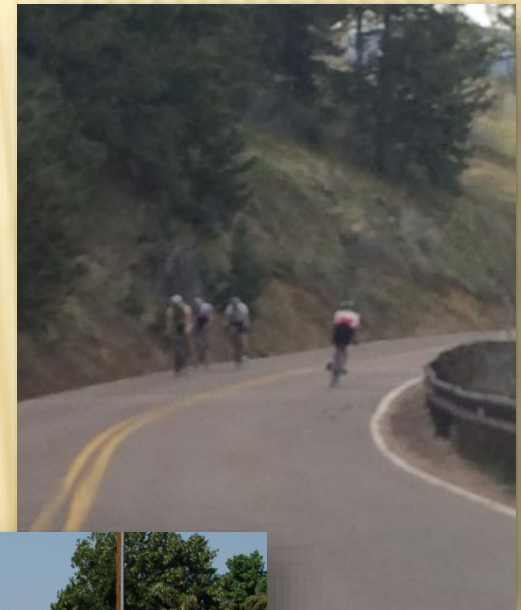
BICYCLIST CHARACTERISTICS

✘ 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 2019

- ✘ 846 killed
- ✘ 49,000 injured
- ✘ Cyclists accounted for 2.3% of all traffic fatalities



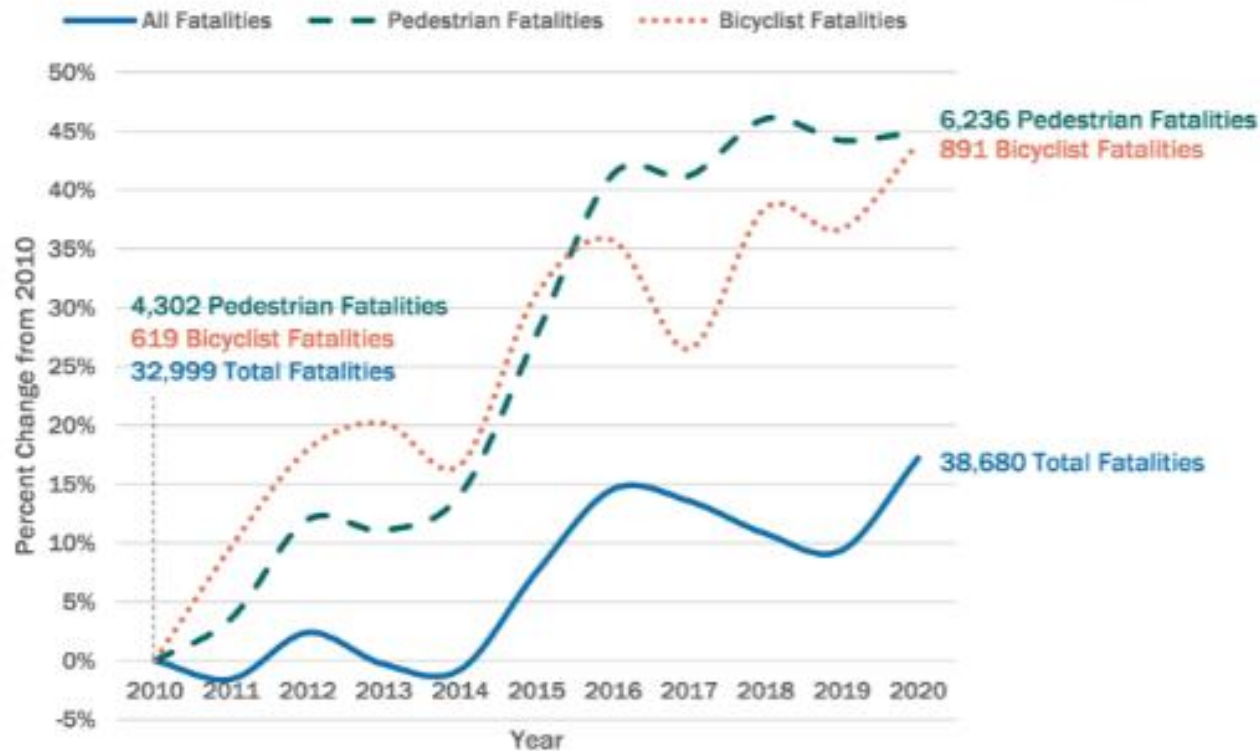
...but make up 1% of all trips.

BICYCLE FATALITIES BY YEAR



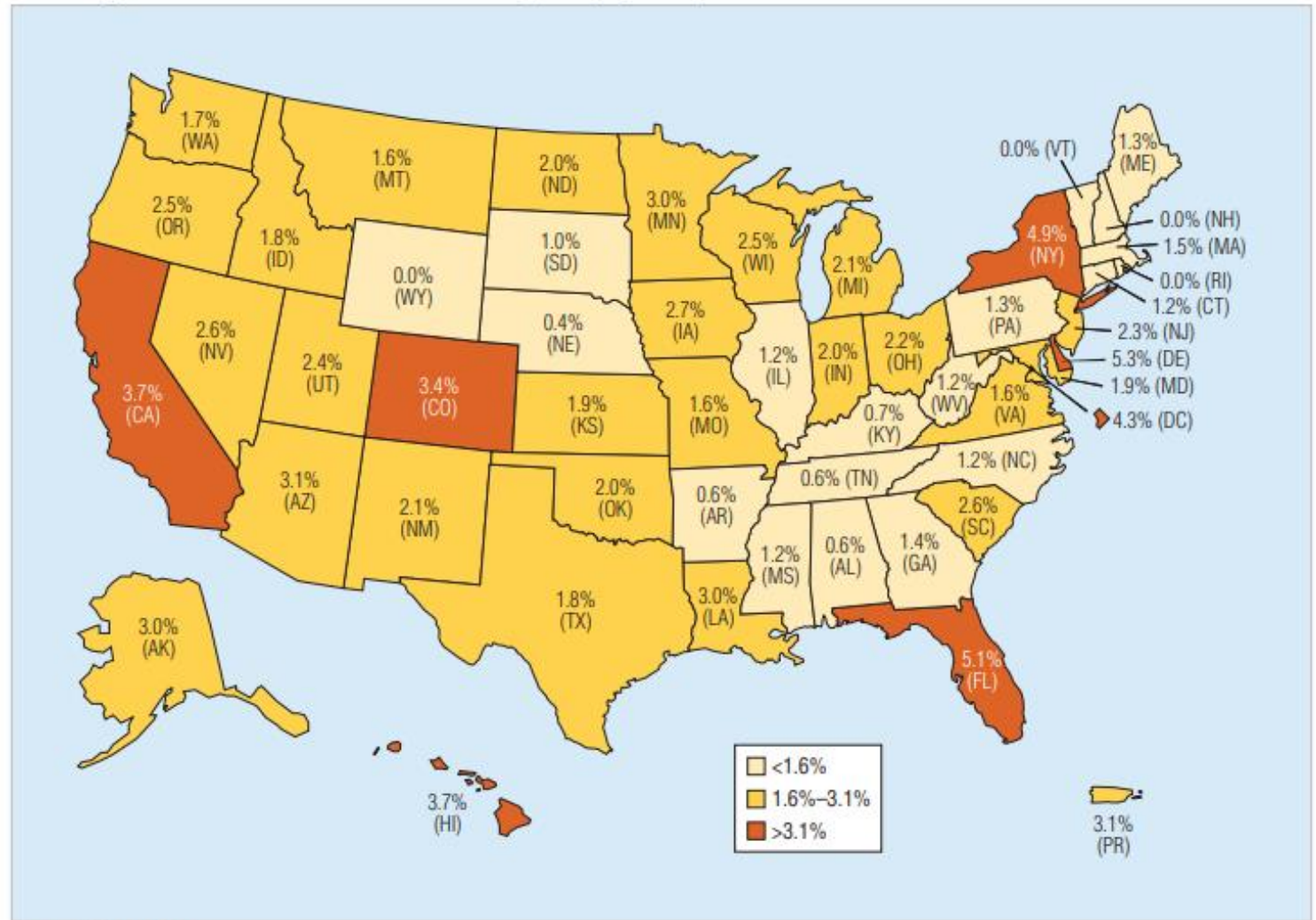
Fatalities among all users have been increasing.

Fatalities among pedestrians and bicyclists have been increasing even faster.



STATE CRASH DATA

Percentage of Total Fatalities Who Were Pedalcyclists, by State, 2019



Source: FARS 2019 ARF

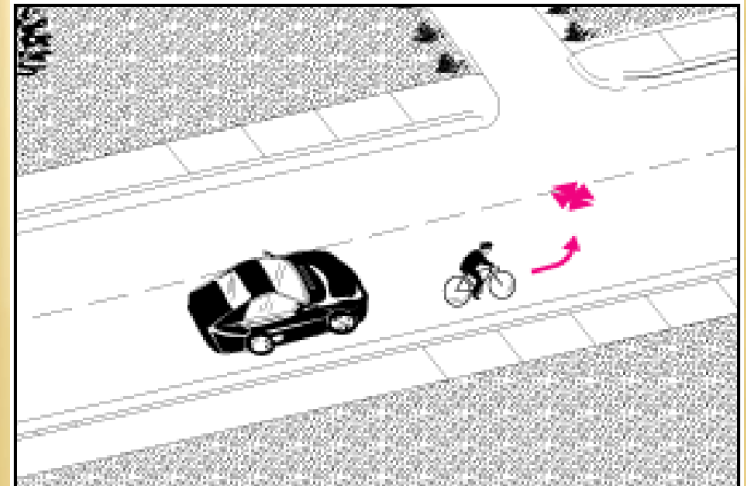
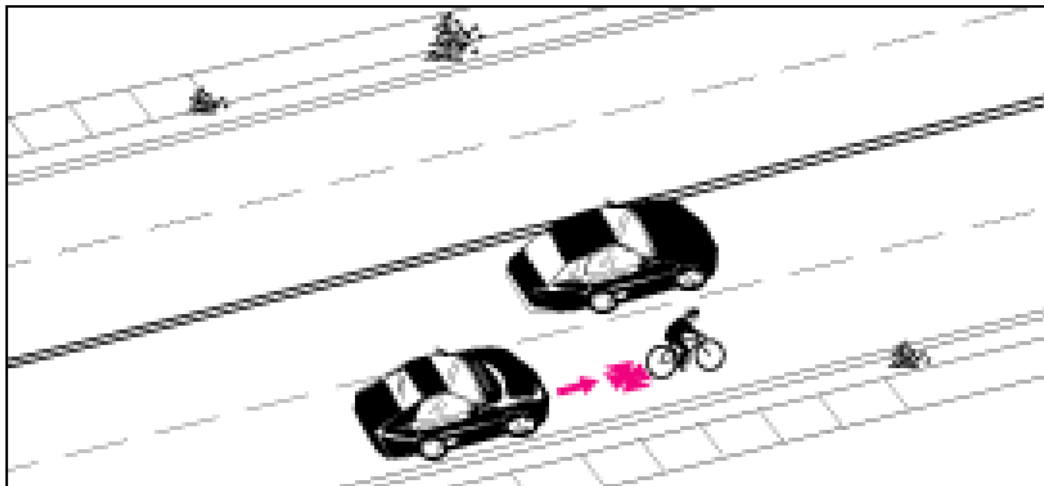
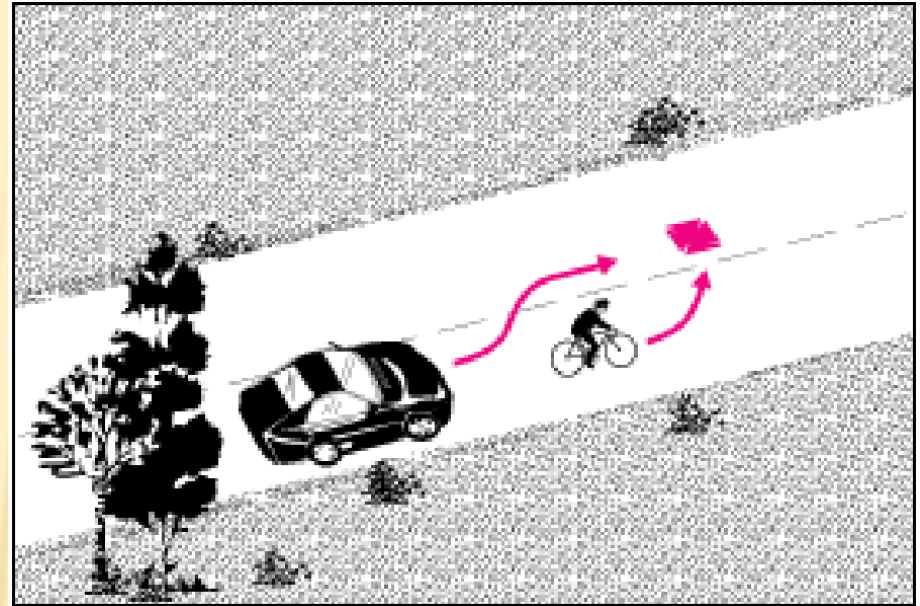
BICYCLE CRASH CHARACTERISTICS

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



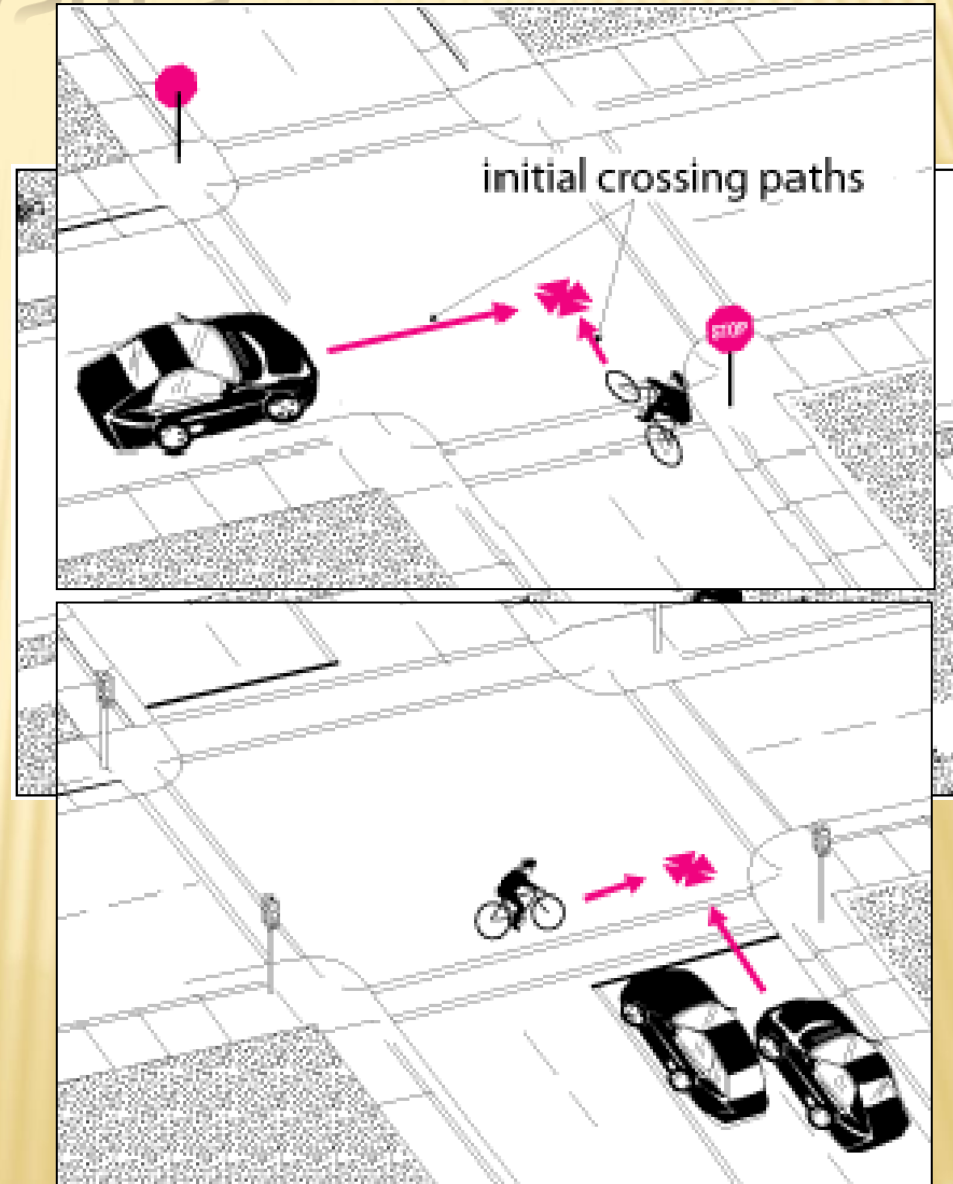
MOST COMMON CRASHES

- ✗ Rural
 - + Turn/merge into path of motorist
 - + Motorist overtaking

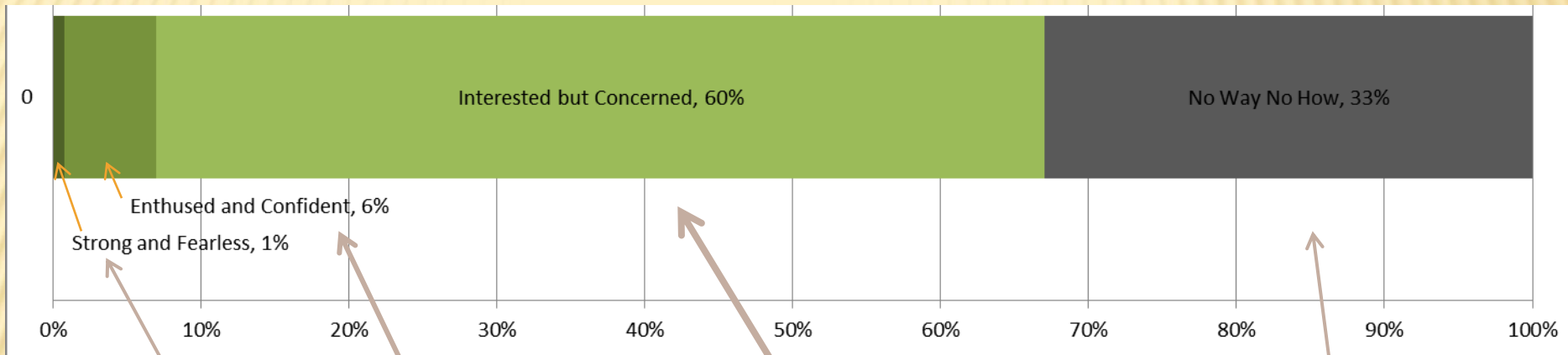


MOST COMMON CRASHES

- ✗ Urban
 - + Motorist failed to yield
 - + Bicyclist failed to yield at midblock
 - + Bicyclist failed to yield at intersection



TYPES OF BICYCLISTS – CITY OF PORTLAND



Strong & Fearless



Enthused & Confident



Interested, but Concerned



Not Interested

BICYCLIST DESIGN USER PROFILES

Interested but Concerned

Somewhat Confident

Highly Confident

Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided; prefer off-street or separated bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.

Generally prefer more separated facilities, but are comfortable riding in bicycle lanes or on paved shoulders if need be.

Comfortable riding with traffic; will use roads without bike lanes.



LOW STRESS TOLERANCE

HIGH STRESS TOLERANCE

Source: Dill, J., McNeil, N. (2012). Four Types of Cyclists? Examining a Typology to Better Understand Bicycling Behavior and Potential.



BICYCLIST DESIGN USER PROFILES

Interested but Concerned

51%-56% of the total population

Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided; prefer off-street or separated bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.

Somewhat Confident

5-9% of the total population

Generally prefer more separated facilities, but are comfortable riding in bicycle lanes or on paved shoulders if need be.

Highly Confident

4-7% of the total population

Comfortable riding with traffic; will use roads without bike lanes.



**LOW STRESS
TOLERANCE**

**HIGH STRESS
TOLERANCE**

Source: Dill, J., McNeil, N. (2012). Four Types of Cyclists? Examining a Typology to Better Understand Bicycling Behavior and Potential.



LEVELS OF TRAFFIC STRESS (LTS)

- ✘ LTS 1: Suitable for almost all
- ✘ LTS 2: Suitable to most adult cyclists
- ✘ LTS 3: More traffic stress
- ✘ LTS 4: Strong and fearless

LEVELS OF TRAFFIC STRESS (LTS)

Levels of Traffic Stress

LTS 1	LTS 2	LTS 3	LTS 4
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• No dedicated bicycle facilities• Traffic speeds 40 mph or more• Comfortable for “strong and fearless” riders (vehicular cyclists)

CASUAL/LESS CONFIDENT

In order for this group to regularly choose bicycling as a mode of transportation, a physical network of visible, convenient, and well-designed bicycle facilities is needed.

AASHTO Guide for the Development of Bicycle Facilities 2012

The Bicycle Network

Seven Principles of Bicycle Network Design



Safety

The frequency and severity of crashes are minimized and conflicts with motor vehicles are limited



Comfort

Conditions do not deter bicycling due to stress, anxiety, or concerns over safety



Connectivity

All destinations can be accessed using the bicycling network and there are no gaps or missing links



Directness

Bicycling distances and trip times are minimized



Cohesion

Distances between parallel and intersecting bike routes are minimized



Attractiveness

Routes direct bicyclists through lively areas and personal safety is prioritized

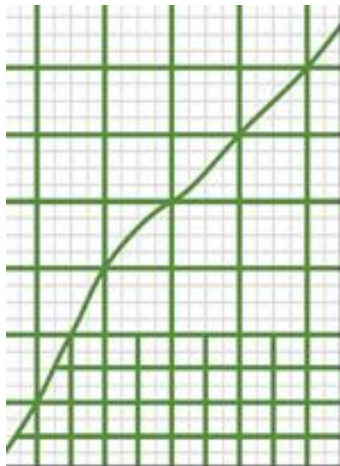


Unbroken Flow

Stops, such as long waits at traffic lights, are limited and street lighting is consistent



Network Context



The level to which the preferred bikeway type should be compromised, if compromise is necessary, should be informed by the relative importance of the segment within the larger network and the availability of alternative routes. For example, if the form of the bike network is a grid, a compromise on one segment may be acceptable given that a high-quality parallel route may be available.

In contrast, if there is only one roadway that provides access for bicyclists, for example to a downtown center, compromising on the bikeway type is less desirable.





Designing for Bicyclist Safety

CORE SAFETY CONCEPTS

KEY SAFETY FACTORS

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

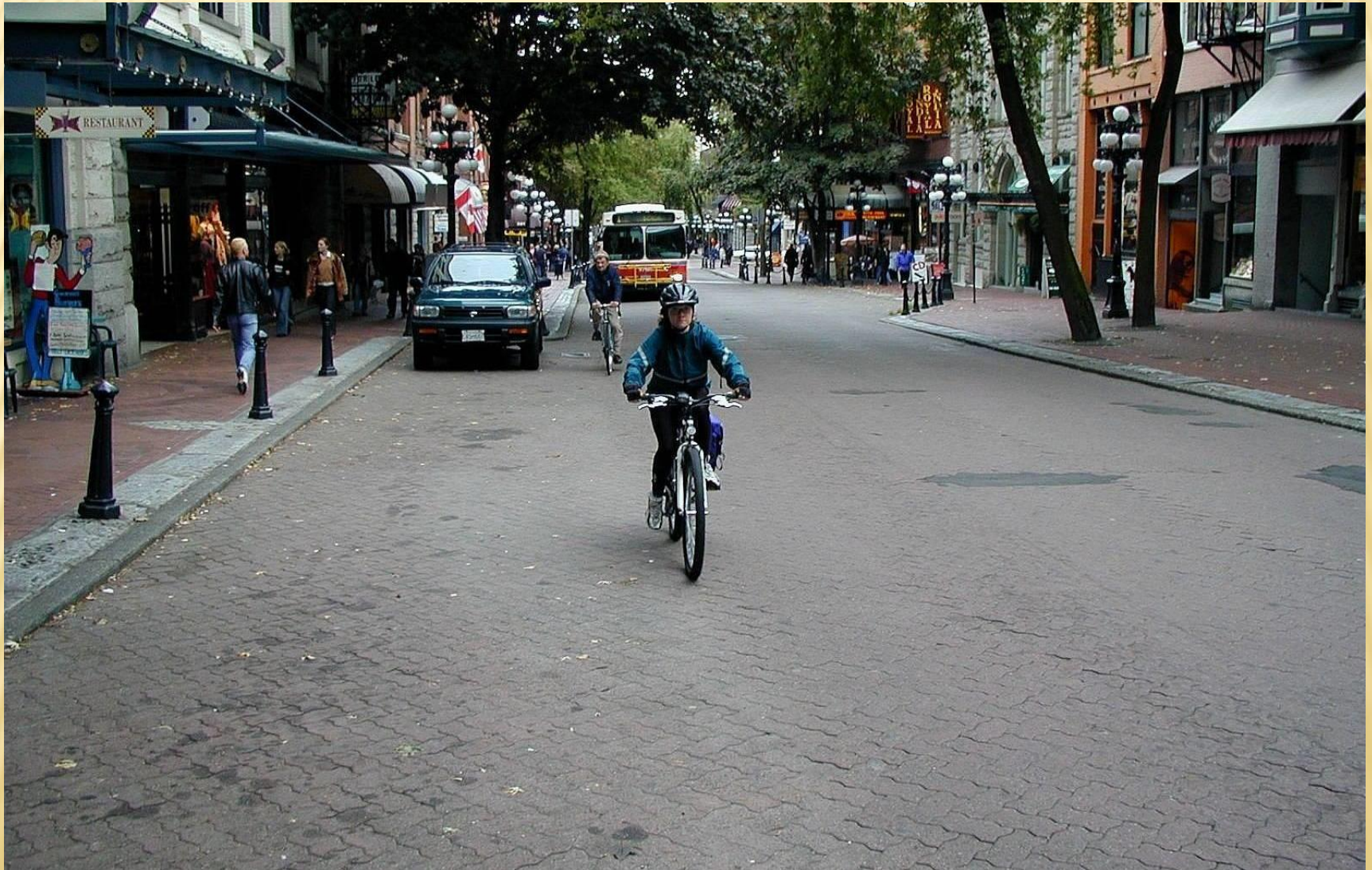


COMPLETE STREET



Portland, Oregon

BICYCLIST ORIENTED: LOW RISK



Vancouver, British Columbia

AUTO ORIENTED: HIGH RISK



Las Vegas, Nevada

PROVIDE SPACE ON STREET...



Corvallis, Oregon

...OR SLOW DOWN TRAFFIC





Corvallis, Oregon

Where can we put bicyclists?



Corvallis, Oregon

How can we design to better include bicyclists?



Designing for Bicyclist Safety

SUMMARY THOUGHTS

LEARNING CHECK

✘ How long are typical trips for the casual, less confident rider?

a) 1 to 5 miles

b) 5 to 8 miles

c) 10 to 12 miles

LEARNING CHECK

✘ What percentage of trips in the U.S. are less than 3 miles?

a) 37 %

b) 50 %

c) 60 %

LEARNING CHECK

- ✘ Most bicycle facilities in the U.S. are what level of traffic stress?
 - a) LTS 1
 - b) LTS 2
 - c) LTS 3
 - d) LTS 4

LEARNING CHECK

- ✘ What level of traffic stress is comfortable for most adult bicyclists?
 - a) LTS 1
 - b) LTS 2
 - c) LTS 3
 - d) LTS 4

LEARNING OUTCOMES

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



Designing for Bicyclist Safety

QUESTIONS
