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Highlights from the Green Lane: A Comprehensive Evaluation of Protected Cycling Facilities

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Highlights from the Green Lane: A Comprehensive Evaluation of Protected Cycling Facilities

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Portland State University

PSU Friday Transportation
Seminar
May 2, 2014



Photo credit: Nathan McNeil, PSU

Research Objectives

- A field-based evaluation of protected bikeways in five U.S. cities to study:
 - Safety of users (both perceived and actual)
 - Effectiveness of the design
 - Perceptions of residents and other road users
 - Attractiveness to more casual cyclists
 - Change in economic activity



Dearborn Street - Chicago, IL

Two-way protected lane on one-way street



Milwaukee Avenue - Chicago, IL

One-way protected lane on both sides on a two-way street



L Street - Washington, DC

One-way protected lane on a one-way street



Multnomah Street - Portland, OR

One-way protected lane on both sides on a two-way street



Rio Grande Street -
Austin, TX

Two-way protected lane on one-way street



Oak/Fell Streets –
San Francisco, CA

Couplet of one-way protected lanes on one-way streets



Barton Springs
Road – Austin, TX

One-way protected lane on the south side of the
road (other direction is shared use path)



Bluebonnet Lane –
Austin, TX

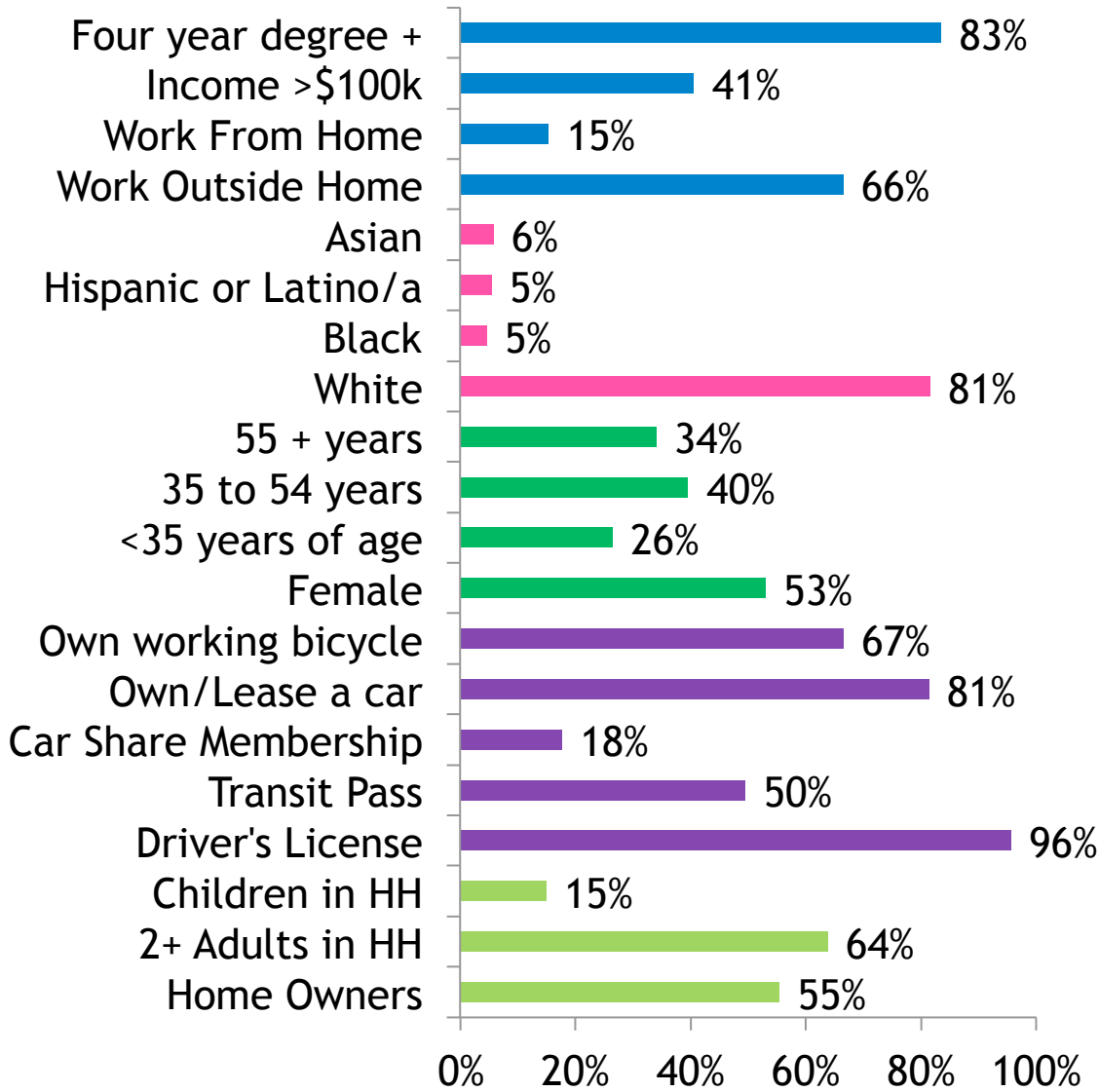
Two-way protected lane on a two-way street



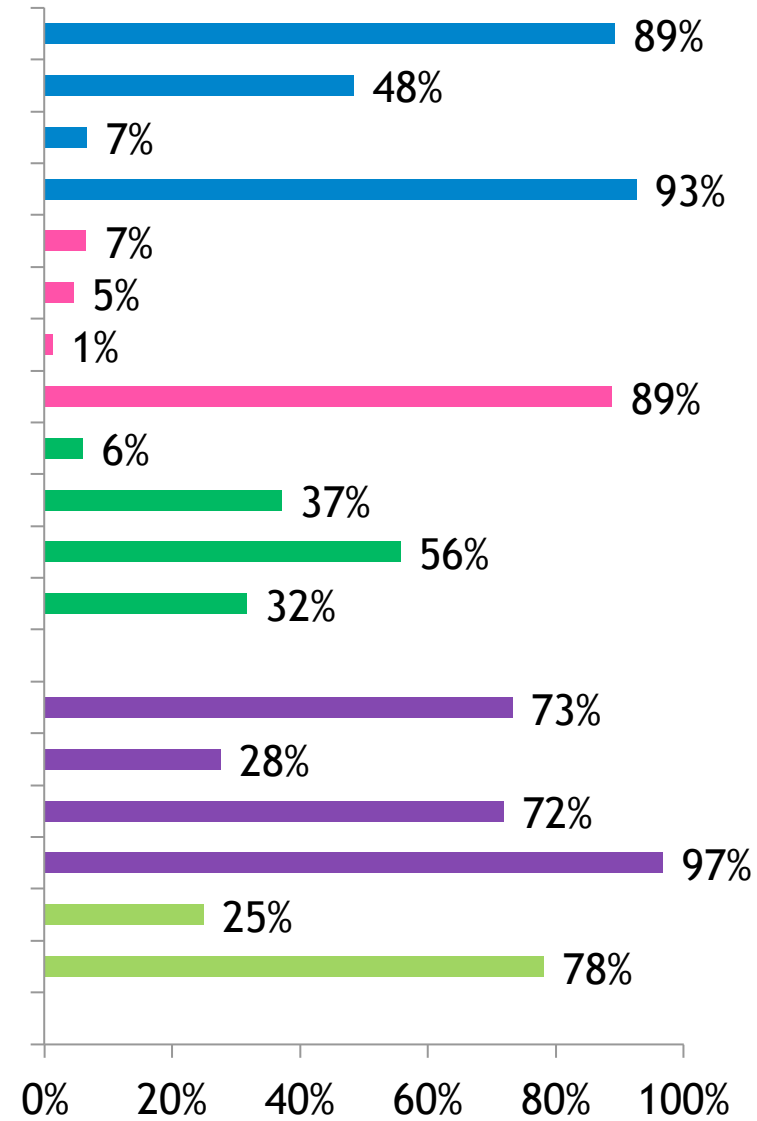
Data Collected

- Resident Surveys
 - 9,617 surveys mailed
 - 2,283 returned (34% used online option)
 - 24% response rate
- Bicyclist Surveys
 - 3,409 bicyclists intercepted
 - 1,111 surveys completed
 - 33% response rate
- Video Recorded at Intersections
 - 16 locations in 4 cities
 - 204 hours analyzed
 - 21,728 bicyclists and 23,347 turning vehicles observed

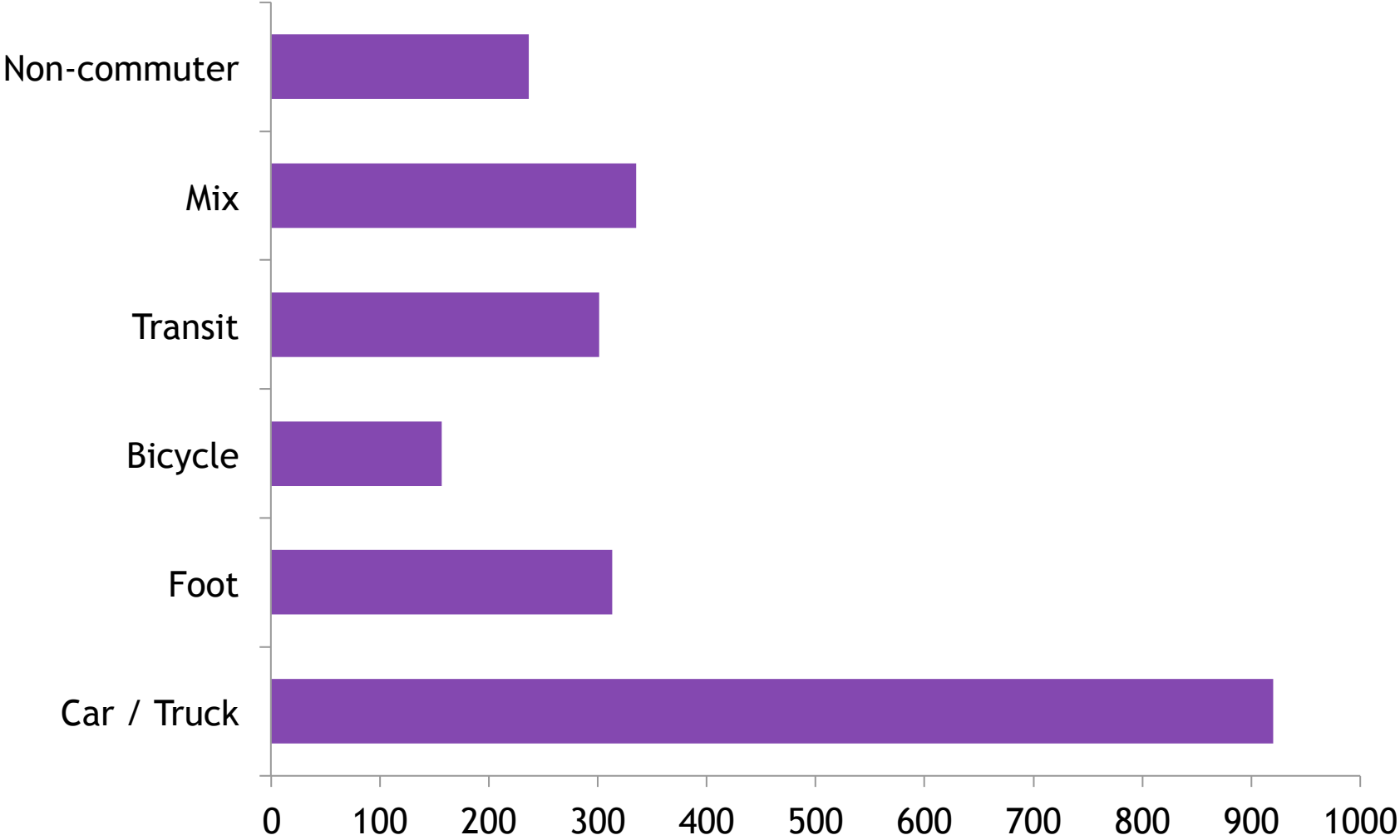
Resident



Bicyclist



Residents by Primary Commute Mode

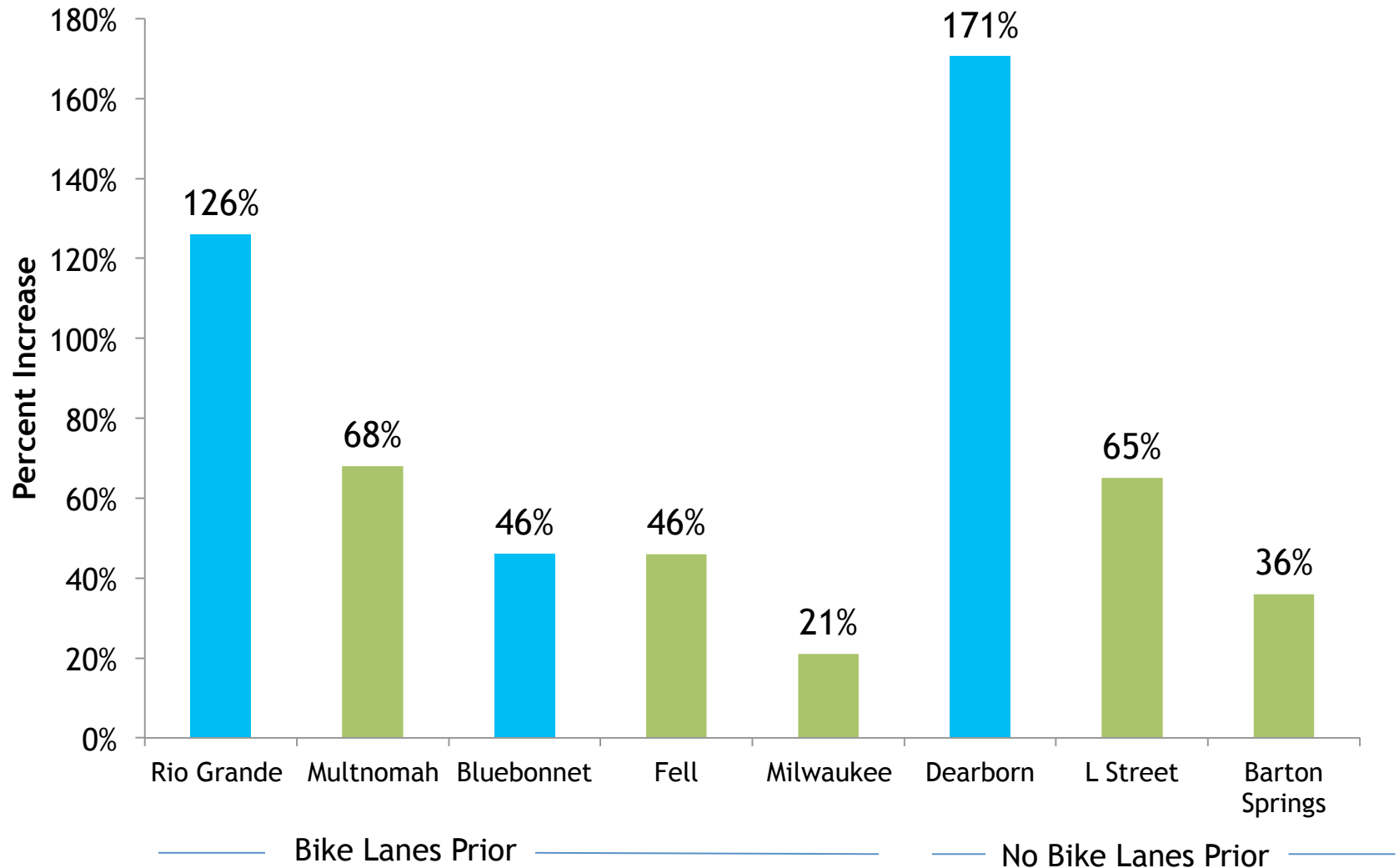


Today...

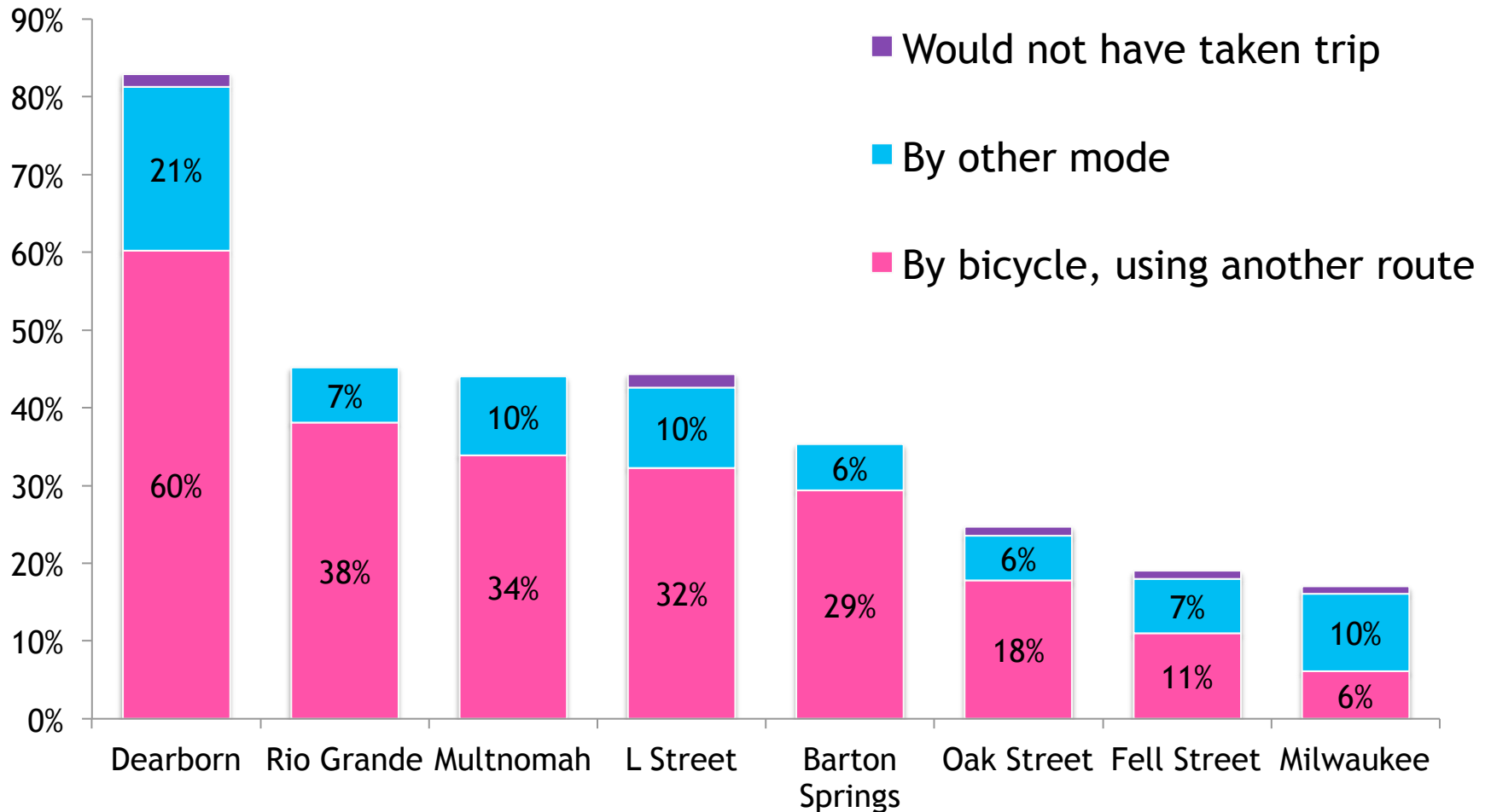
1. Did the number of people bicycling change?
2. How well do the designs work?
3. Do the lane improve people's perceptions of safety?
4. What do residents think about the lanes?
5. How attractive are the lanes for less comfortable cyclists?

1. Did the number of people bicycling change?

Change in Observed Bicycle Volumes



Before the new facility was built, how would you have made this trip?

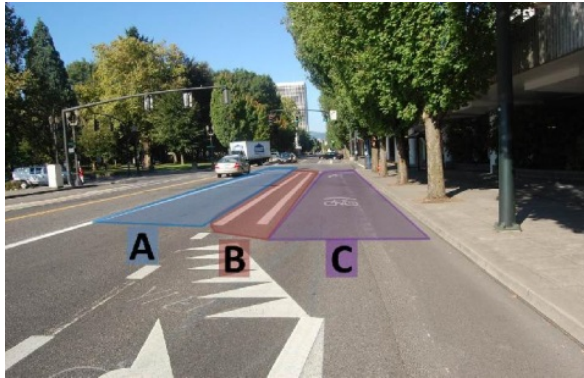


2. How well do the designs work?

Design Elements Evaluated

- Intersections
 - Mixing zones
 - Fully signalized
- Providing curb access
 - Loading zone
 - Transit stops
- Other design elements
 - Width
 - Green pavement marking
 - Minor driveways

Mixing Zone Designs



NACTO-Style Yield Shark Tooth Mixing Zone

Photo from survey (shown): Multnomah and NE 9th, Video Location(s): Multnomah and NE 9th



Flexpost Delimited Mixing Zone with Advisory Bike Lane (ABL)

Photo from survey (shown): L Street
Video Location(s): L Street/ 15th Street, L Street/ Connecticut



Mixing Zone with Advisory Bike Lane (ABL)

Photo from survey (shown): Oak St. and Divisadero St.
Video Location(s): Oak St. and Divisadero St.



Mixing zone w/ green-back sharrow mixing zone

Photo from survey (shown): Oak St. and Broderick St. Video Location(s): Oak St. and Broderick St



Mixing Zone with Full Green Skip Marking

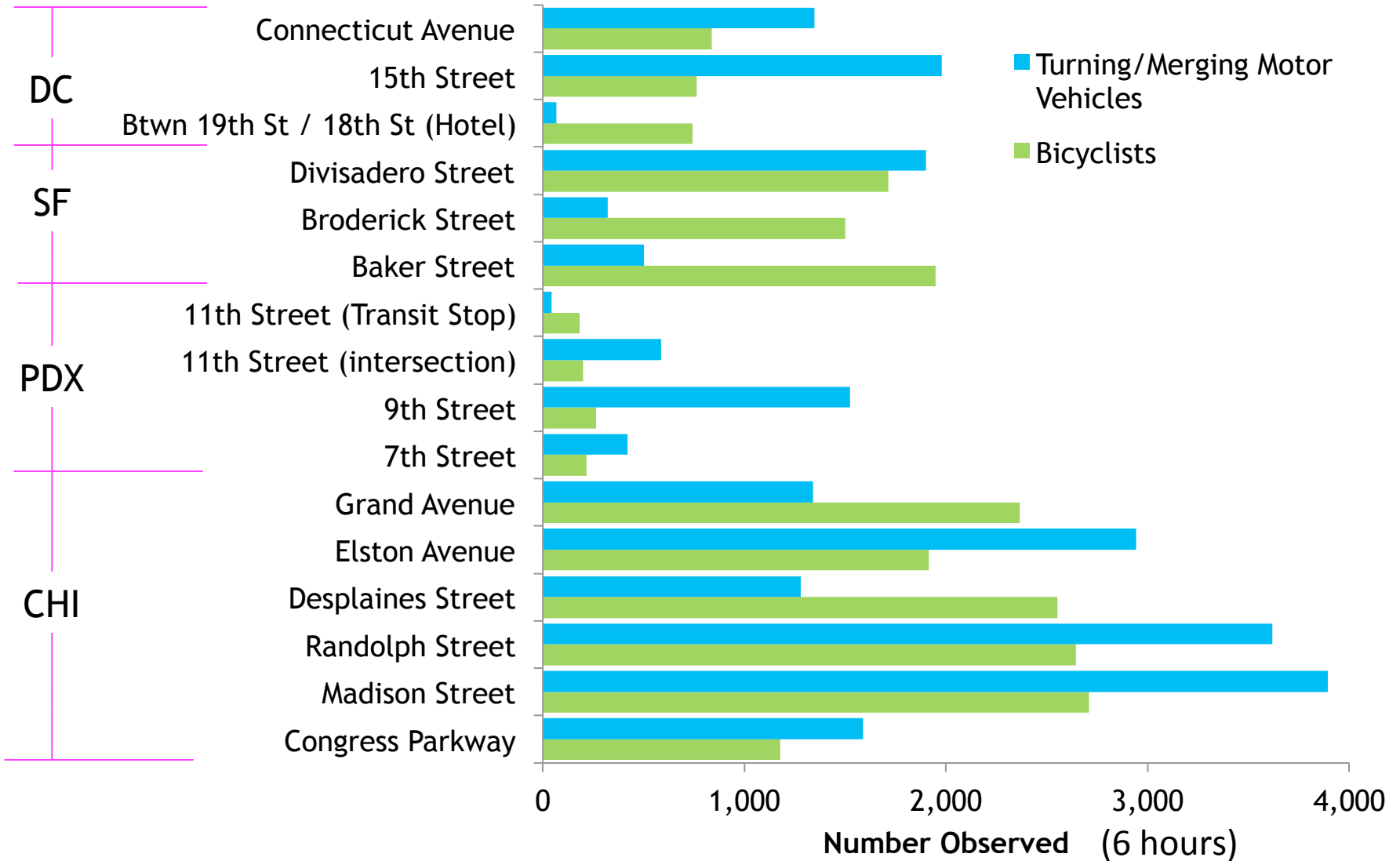
Photo from survey (shown): Fell St. and Broderick St.
Video Location(s): Fell St. and Baker


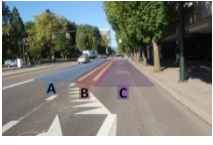






Mixing Zone with Advisory Bike Lane (ABL)

Photo from survey (shown): Fell St. and Divisadero St.
Video Location(s): No video

Total Video Observations



Mixing Zone Design	Survey				Video		Survey		Video	Calculated Conflict Rates
	Percent Strongly Agreeing Bicyclists "Understand"	Correctly Identified Location			Correct Lane Use		Percent			
		Thorough Bicycles	Bicycle Turning Right	Turning Motorist	Turning Motorist	Through Bicyclist	Strongly Agreeing Vehicles Yield	Agreeing They Feel Safe		
 Flexpost Delimited Mixing Zone with Advisory Bike Lane (ABL): L Street	85%	-	-	-	87%	91%	17%	64%	0.16	
 NACTO-Style Yield Shark Tooth Mixing Zone: Multnomah/ 9th	63%	51%	98%	79%	93%	63%	14%	73%	0.37	
 Mixing Zone with Advisory Bike Lane (ABL): Oak/ Divisadero	75%	94%	73%	92%	66%	81%	19%	74%	0.12	
 Mixing Zone with Advisory Bike Lane (ABL): Fell/ Divisadero	81%	93%	74%	97%	-	-	15%	72%	-	
 Mixing zone w/ green-back sharrow mixing zone: Oak/Broderick	71%	79%	97%	95%	48%	30%	15%	79%	0.44	
 Mixing Zone with Full Green Skip Marking: Fell/ Broderick or Fell/Baker	74%	73%	96%	95%	49%	-	22%	84%	0.13	



chicagosfoodbank.org

ONE WAY

USE BIKE SIGNAL

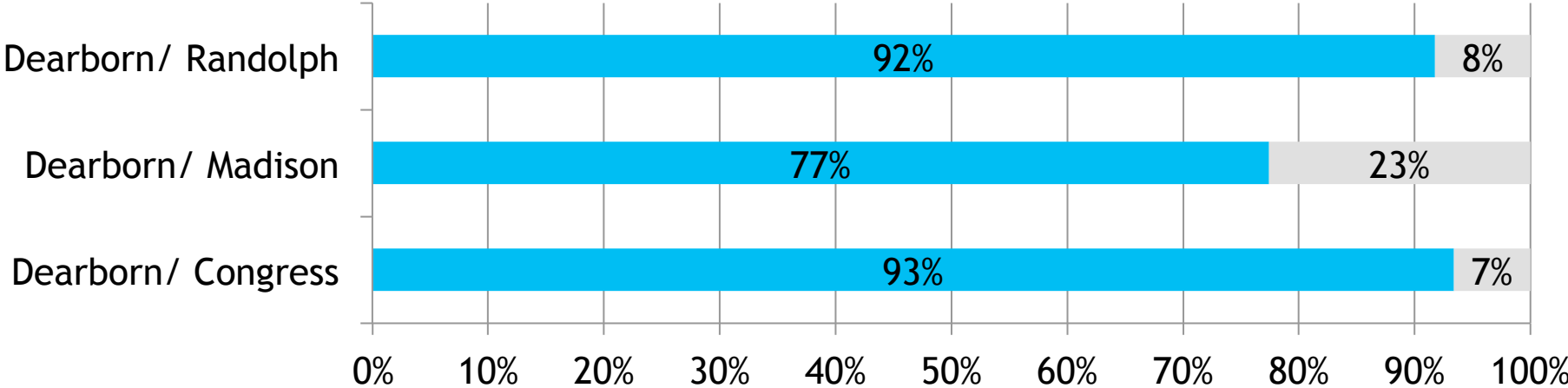
Dearborn and Madison, Chicago, IL
Photo: C. Monsere

Bicycle Signals on Dearborn

- Using the small bicycle in the bicycle signal lens is a good way to communicate the signal is only for bicycles
 - 87% agree
- I like that bicyclists and turning cars each have their own signal
 - 74% agree
- At these intersections, it is always clear to me which signal I should use as a motorist
 - 66% agree

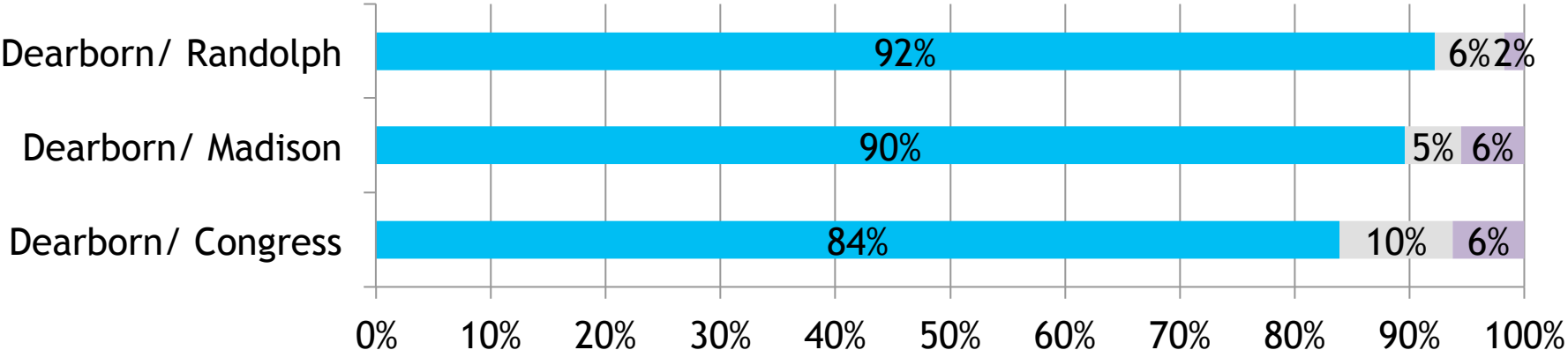
People on Bicycles

■ Waited for green/legal right-turn on red ■ Proceeded illegally on red



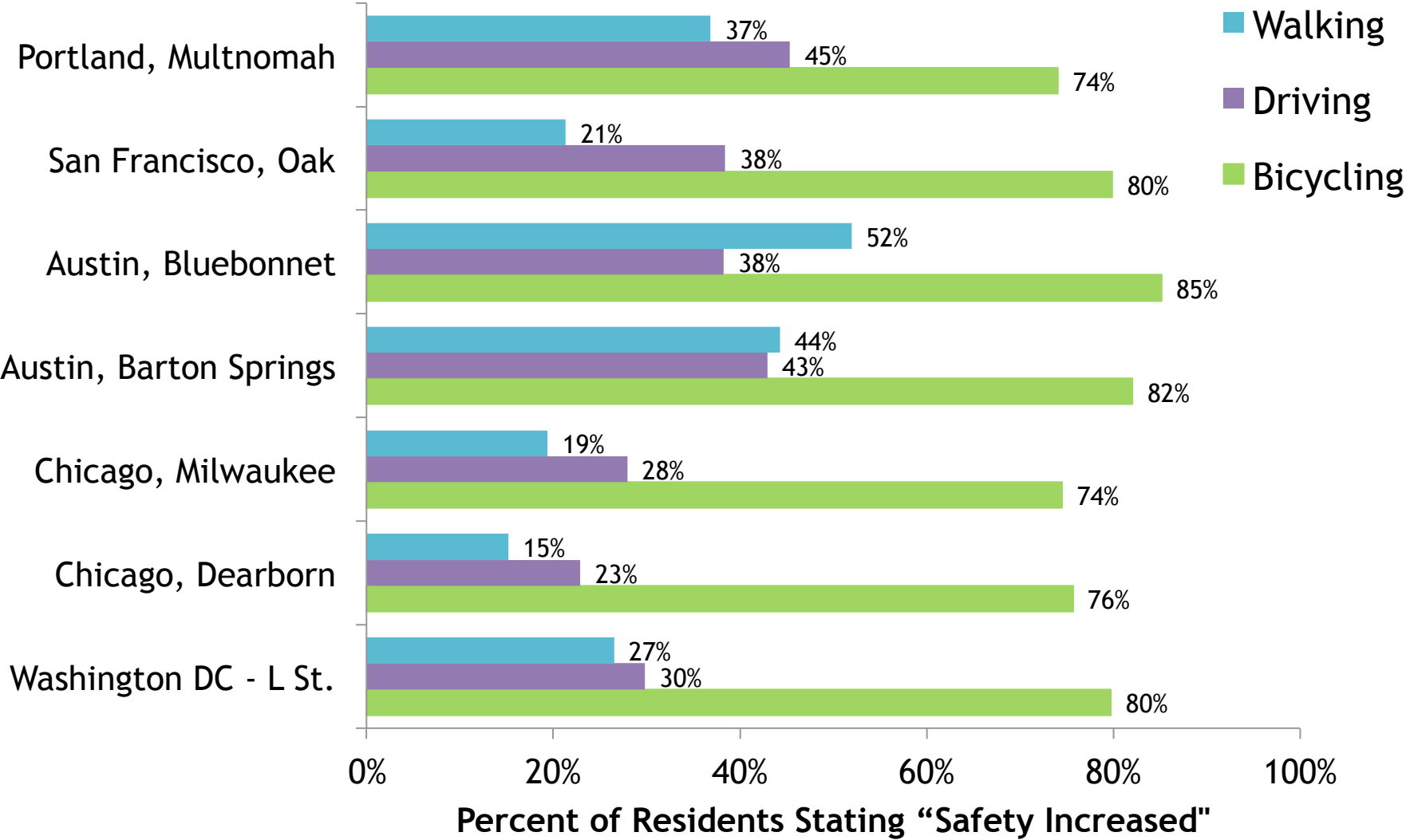
People in Motor Vehicles

■ Legal Turn on Green ■ Illegal Turn on Red Arrow ■ Jumped into crosswalk



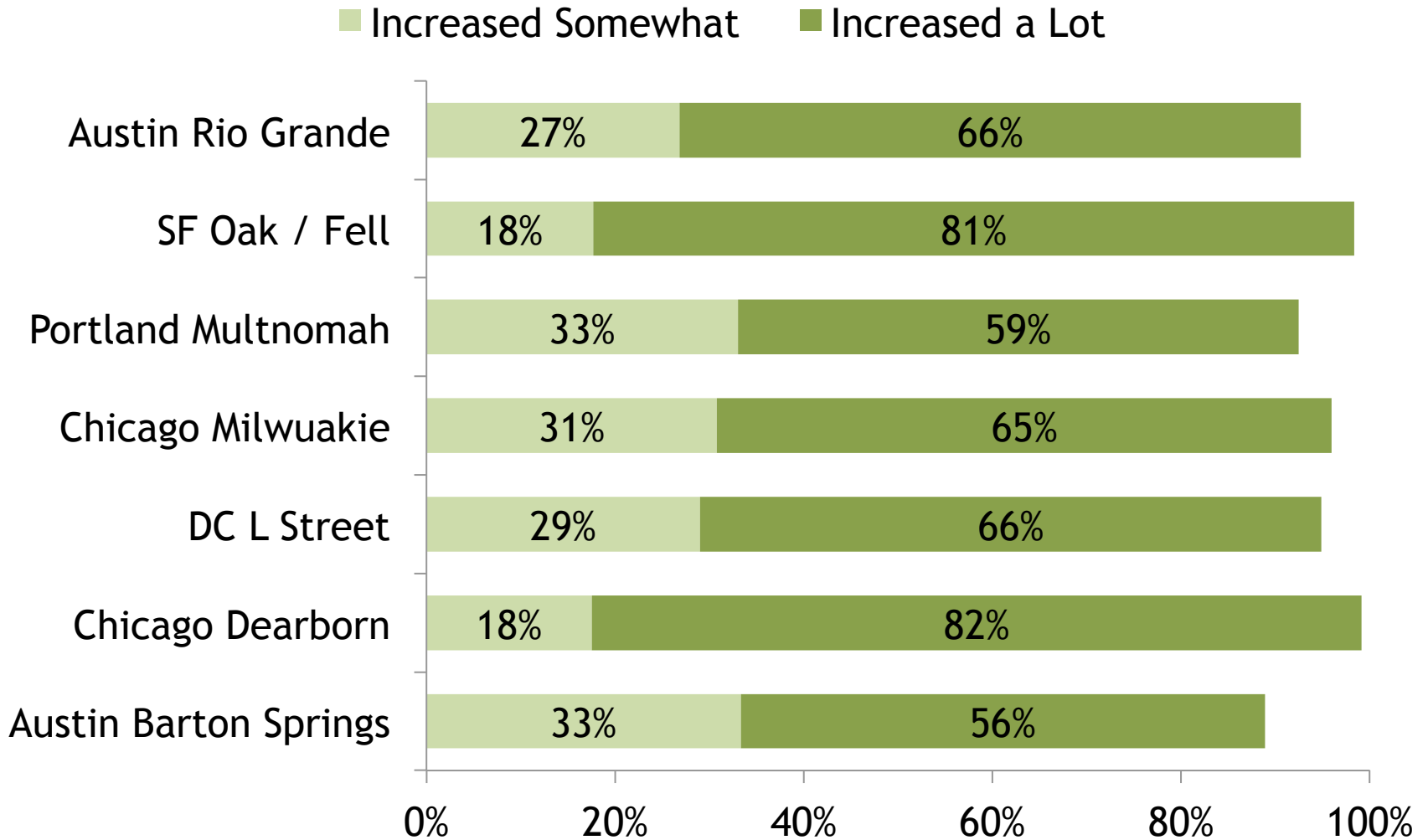
3. Do the lanes improve users' perception of safety?

Because of the protected bike lanes, the safety of _____ on the street has . .



Source: Resident Surveys, Green Lane evaluation

I feel the safety of bicycling on _____ has . .



Buffer type affects safety and comfort

Types of buffers used include:



Flexposts and painted buffer
(Fell Street, San Francisco)

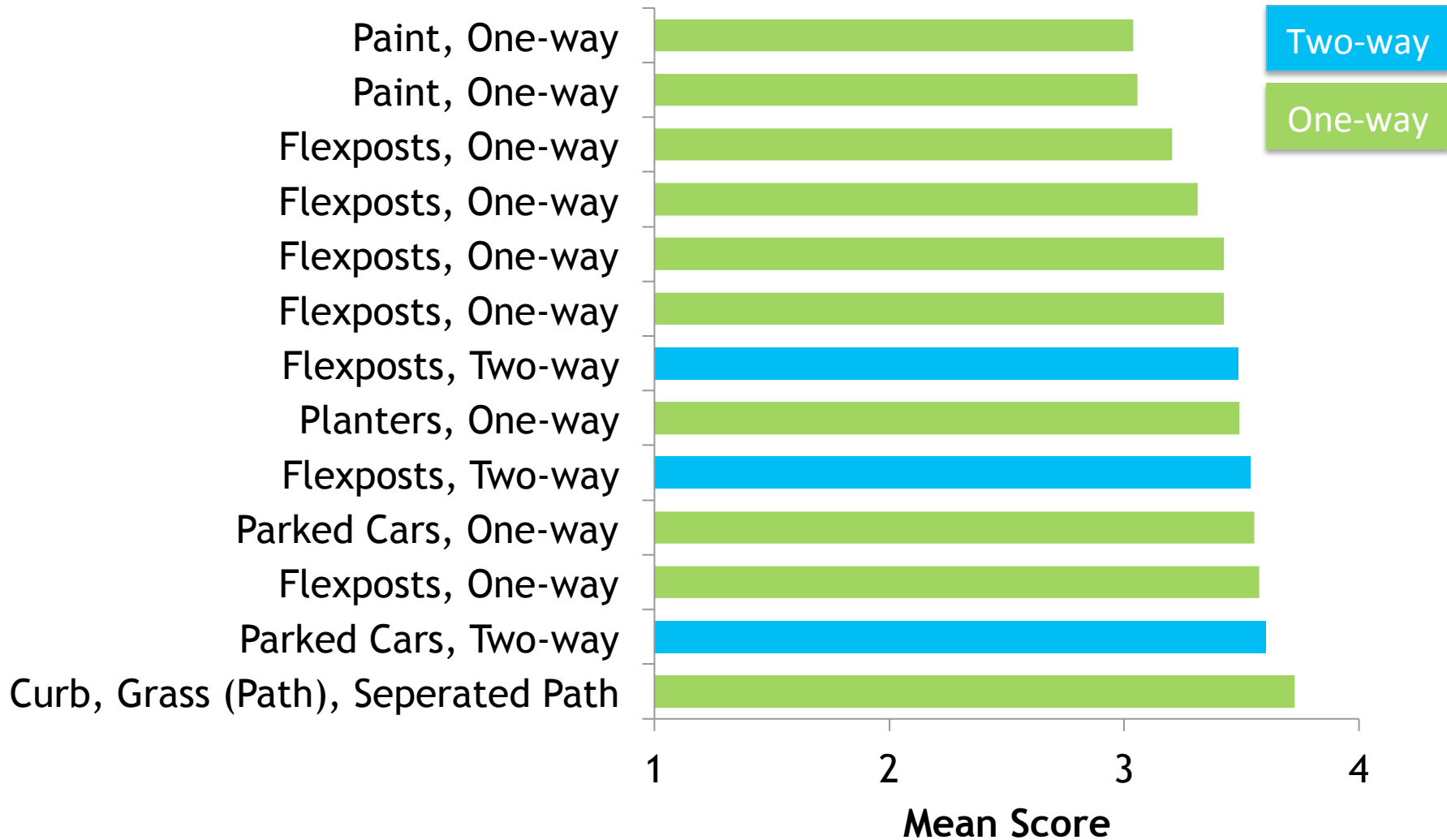


Parked vehicles and
flexposts
(Milwaukee Avenue,
Chicago)

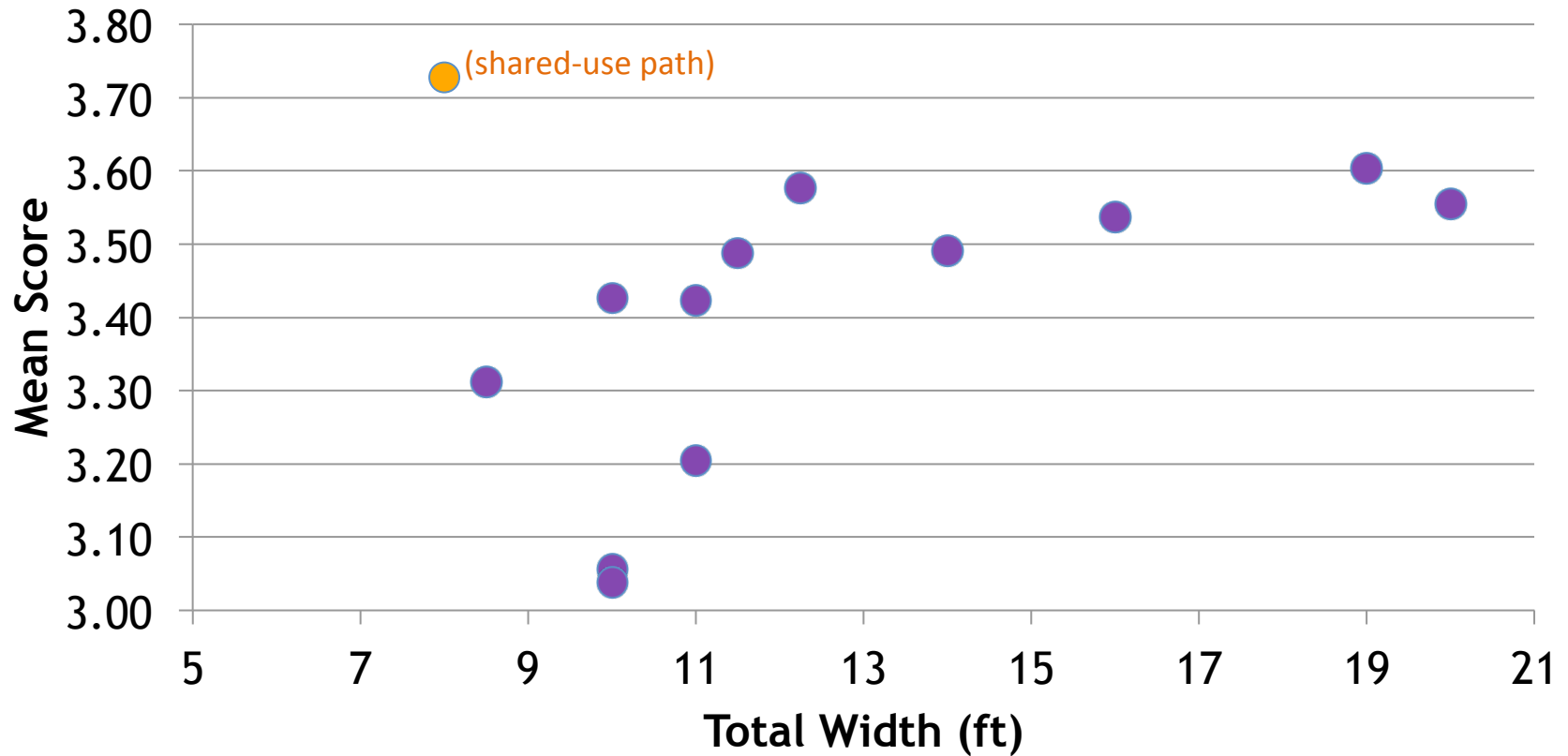


Semi-permanent planter with
colored pavement
(Multnomah St., Portland)

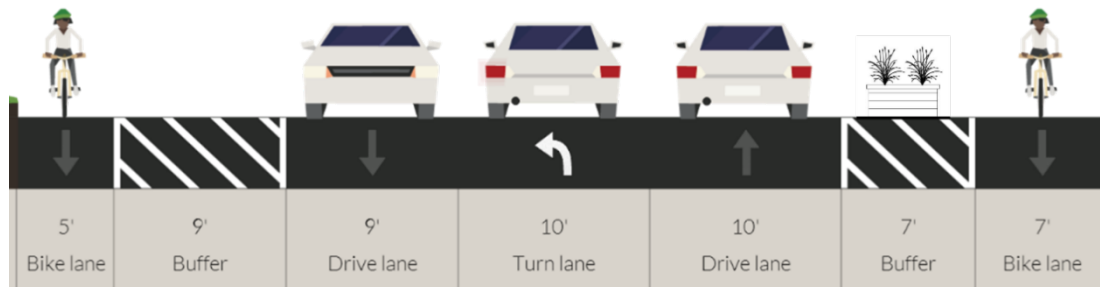
The buffer section with _____ between the traffic lanes and the bikeway makes me feel safe.



...buffer makes me feel safe



Far Edge of Bicycle Facility to Near Edge of Motor Vehicle Lane



Buffer comfort

■ Very Uncomfortable (1) ■ (2) ■ (3) ■ (4) ■ (5) ■ Very Comfortable (6)



With planters separating the bikeway



With a 2-3 foot buffer and plastic flexposts



With a raised concrete curb



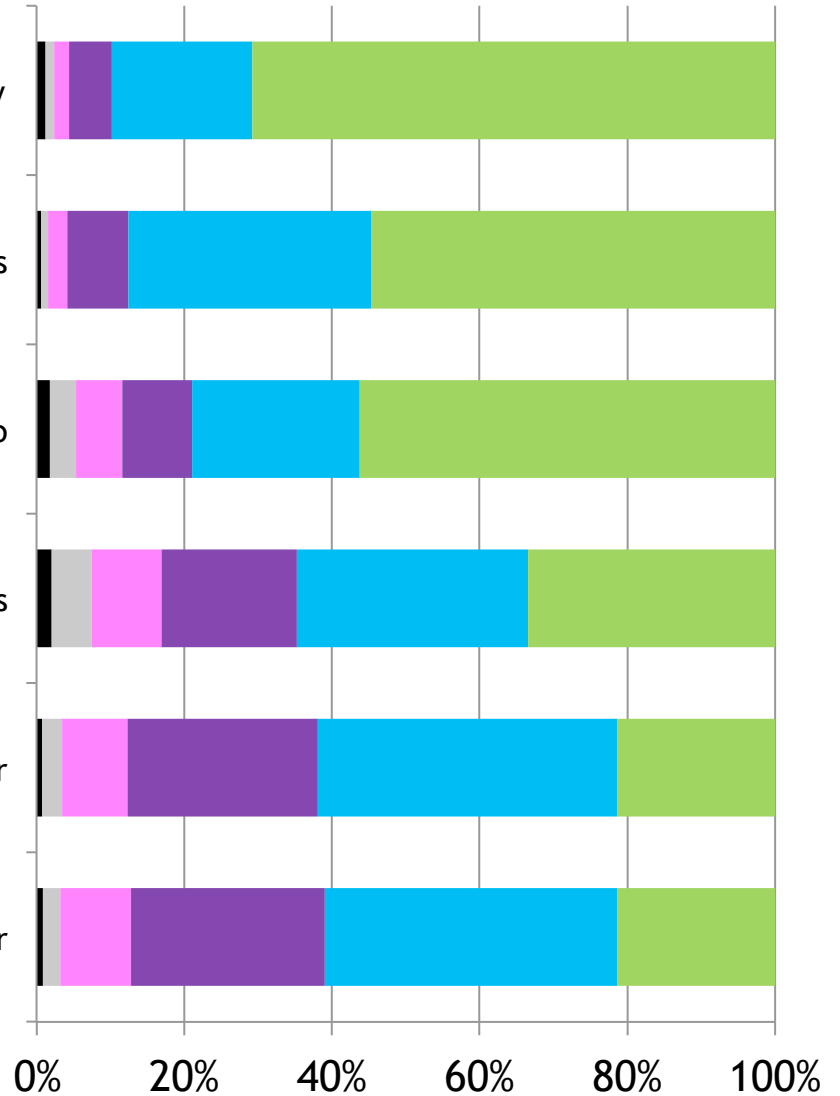
With a painted buffer and parked cars



With a painted 2-3 foot buffer



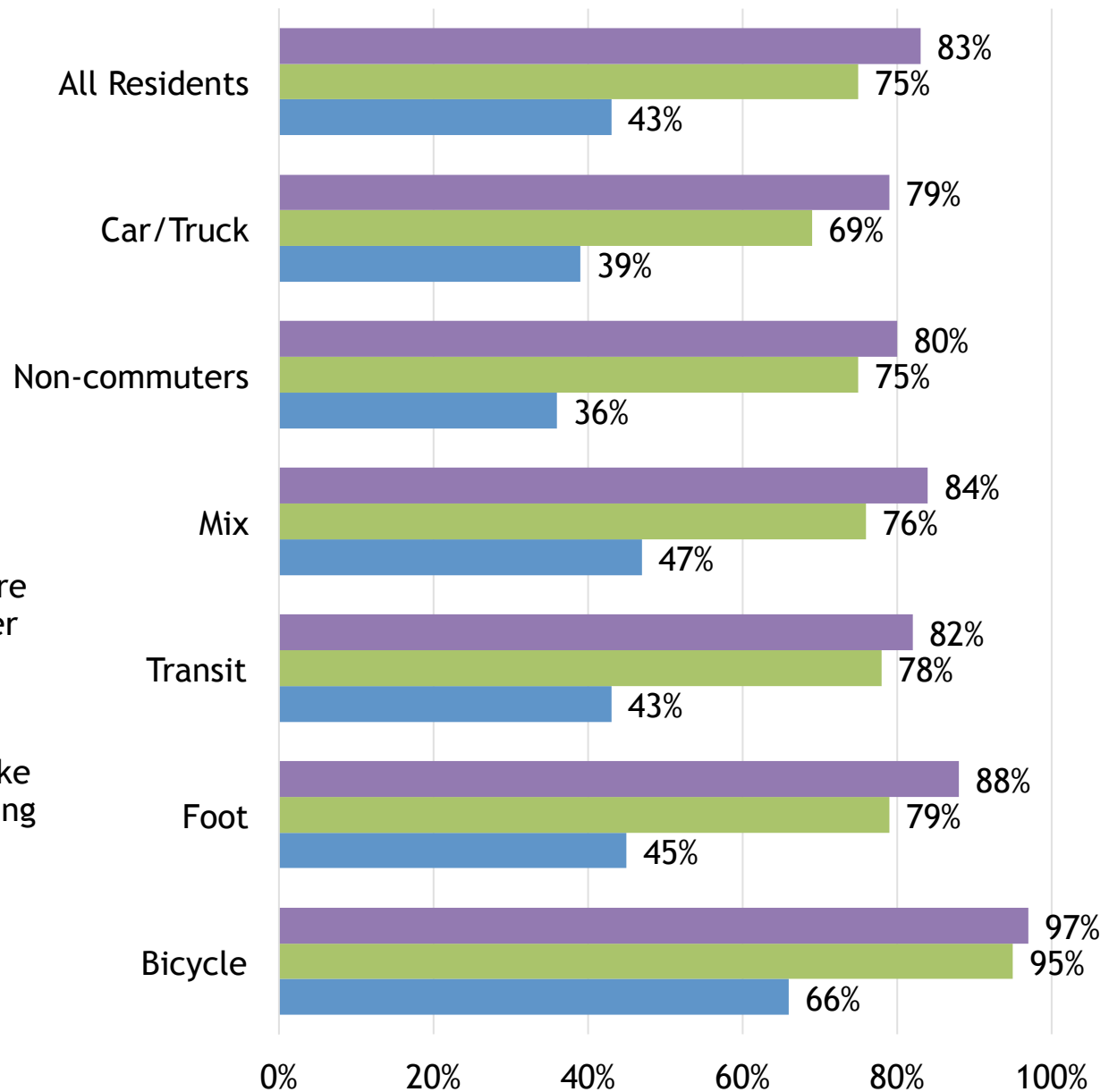
With a solid painted buffer



4. What do residents think about the lanes?

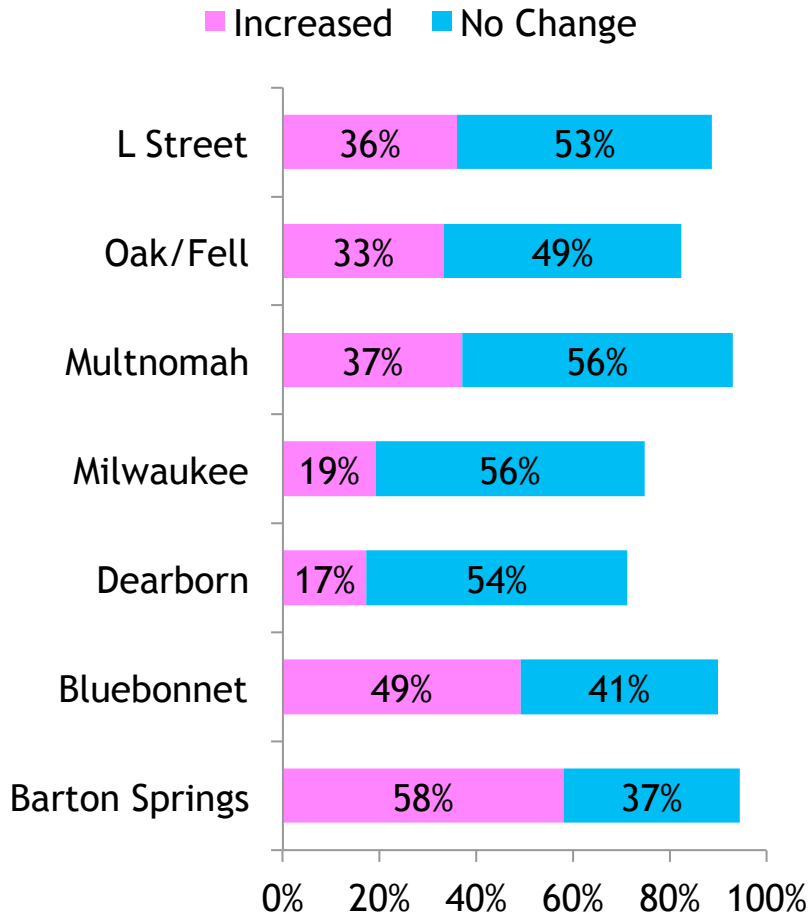
Support for Protected Lanes

- Facilities that encourage bicycling for transportation are a good way to improve public health.
- I would support building more protected bike lanes at other locations.
- Because of the protected bike lanes, the desirability of living in my neighborhood has increased

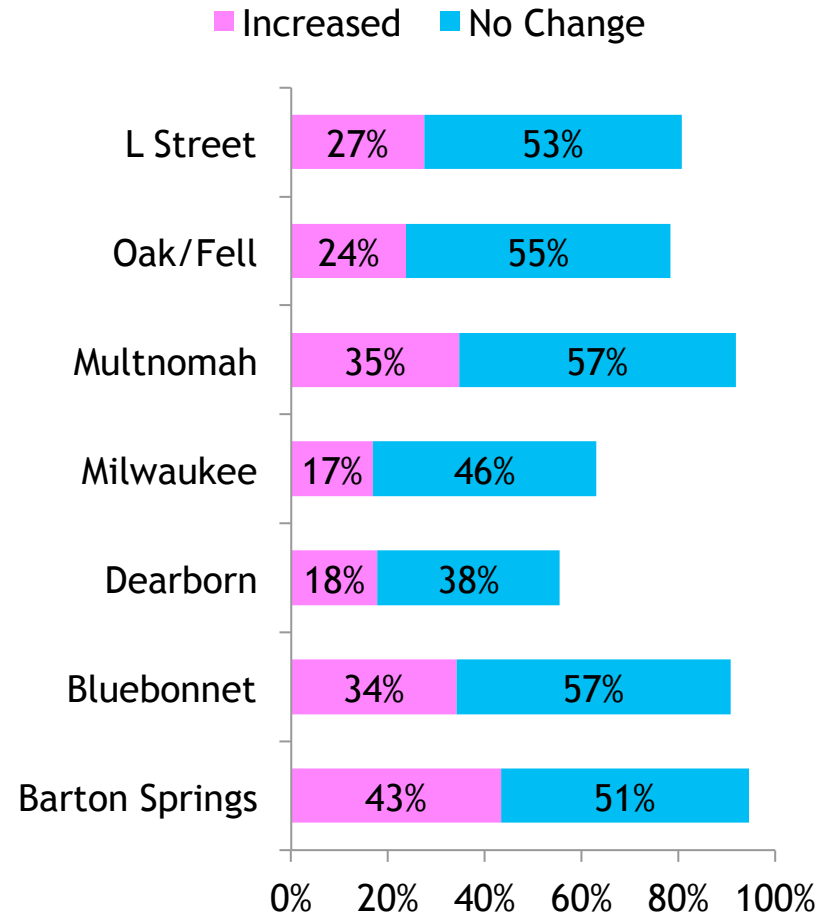


Because of the protected bike lanes,

...my satisfaction with the walking environment on this street

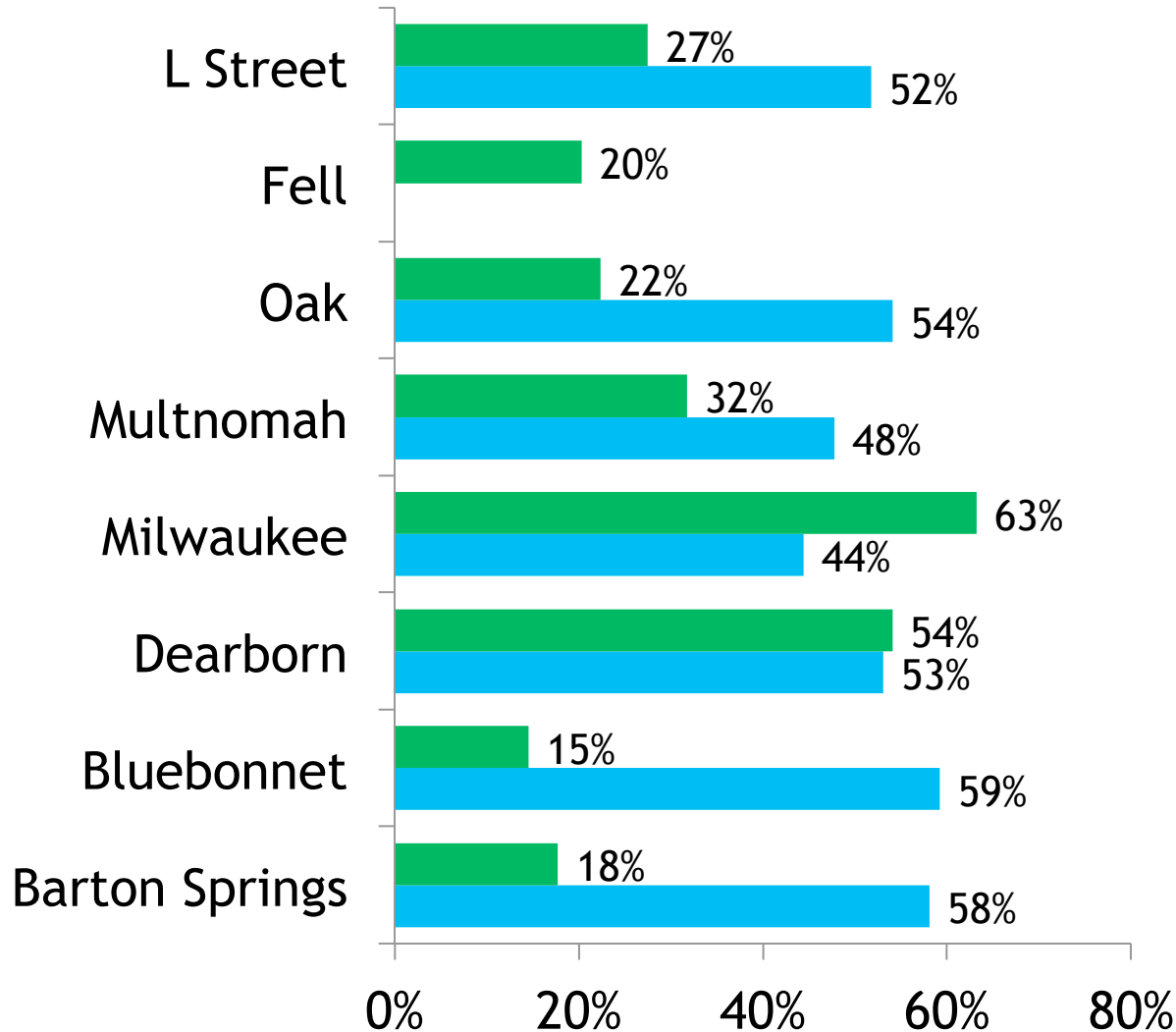


...my sense of safety when crossing this street has



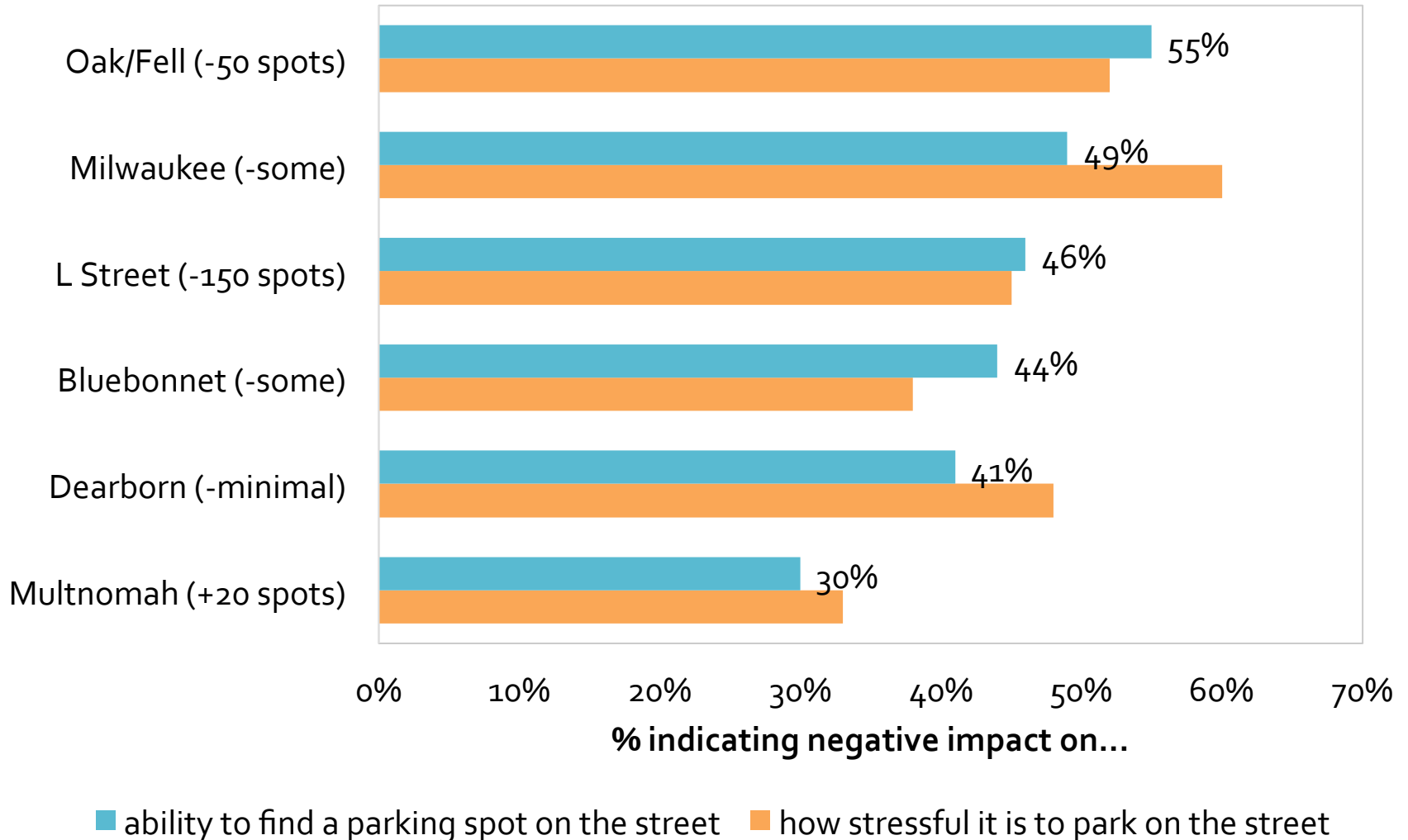
Perceptions of residents driving on street

Percent responding increased



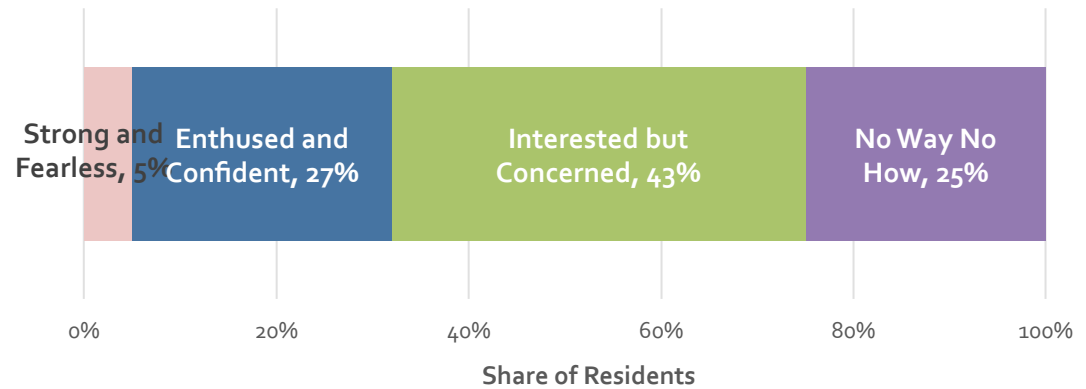
- Since the protected bike lanes were built, the amount of time it takes me to drive on this street has . . .
- Since the protected bike lanes were built, how safe and predictable bicyclists are acting has . . .

Perceptions about Parking

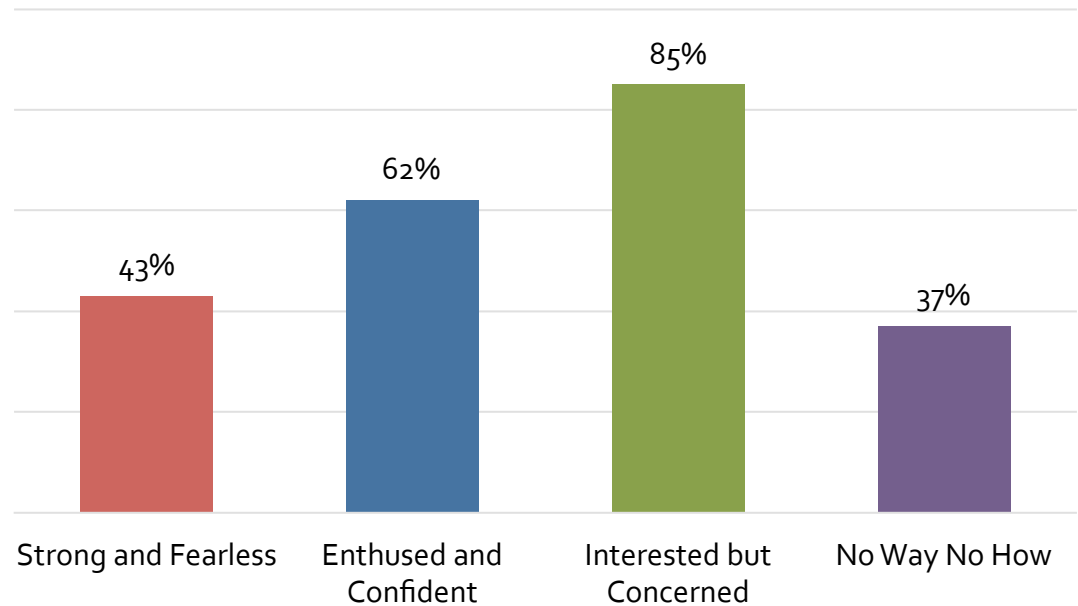


5. How attractive are the lanes for less comfortable cyclists?

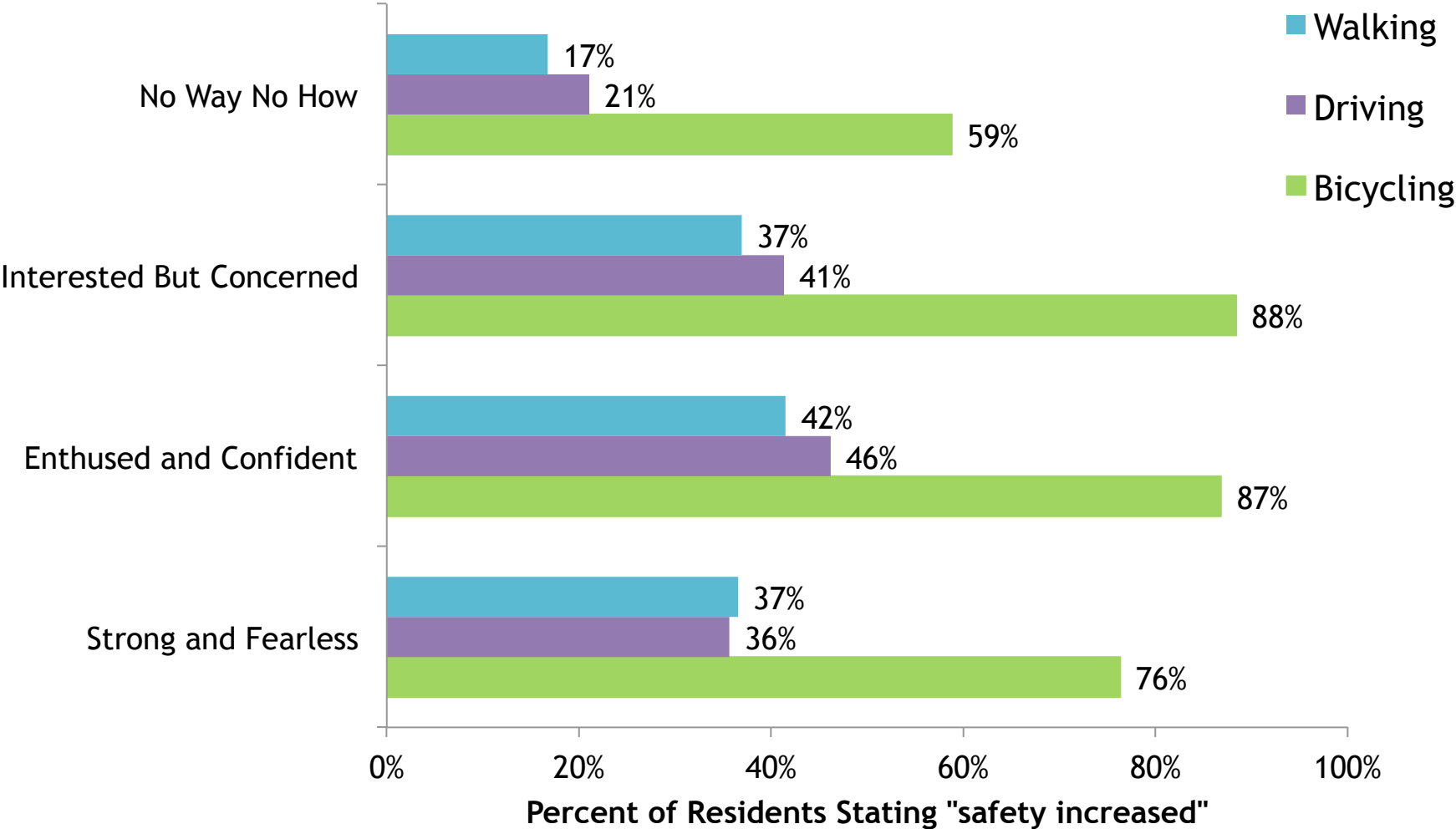
By the “Four Types”



I would be more likely to ride a bicycle if motor vehicles and bicycles were physically separated by a barrier.

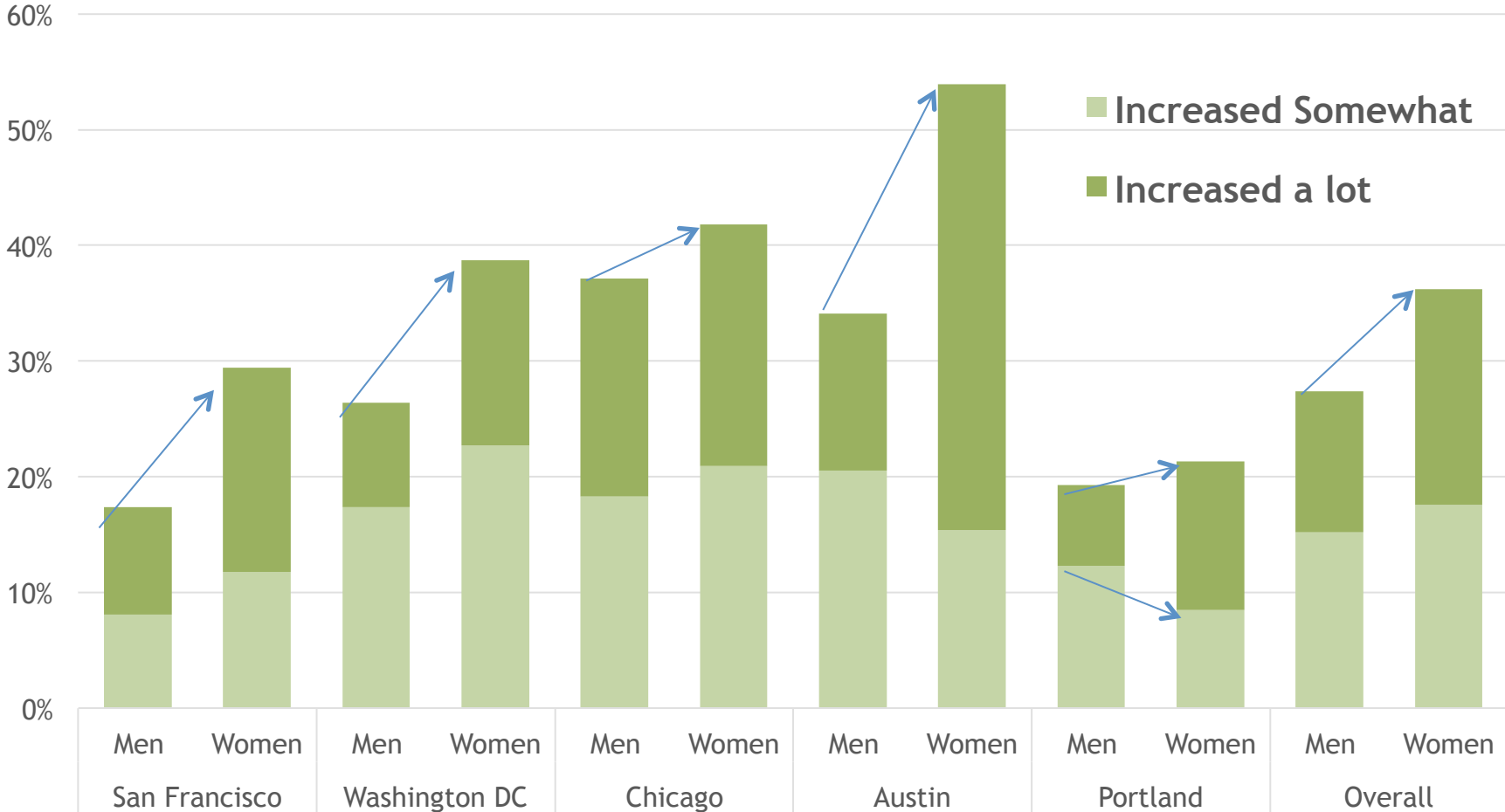


Because of the protected bike lanes, the safety of _____ on the street has . .



Source: Resident Surveys, Green Lane evaluation

Because of the _____ Street separated bikeway, how often I ride a bicycle overall has . . .



Source: Cyclist intercept surveys, Green Lane evaluation

Summary

- Analysis of data show increased bicycle volumes with some evidence of “attraction”
- Strong improved perception of safety for people riding on the facilities
- Generally positive perceptions for other road users
- Support for the protected lane concept
- Design choices affect safety and comfort
-more to come!

LET KNOWLEDGE SERVE THE CITY

Questions?

Thanks to students:

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Resident Survey

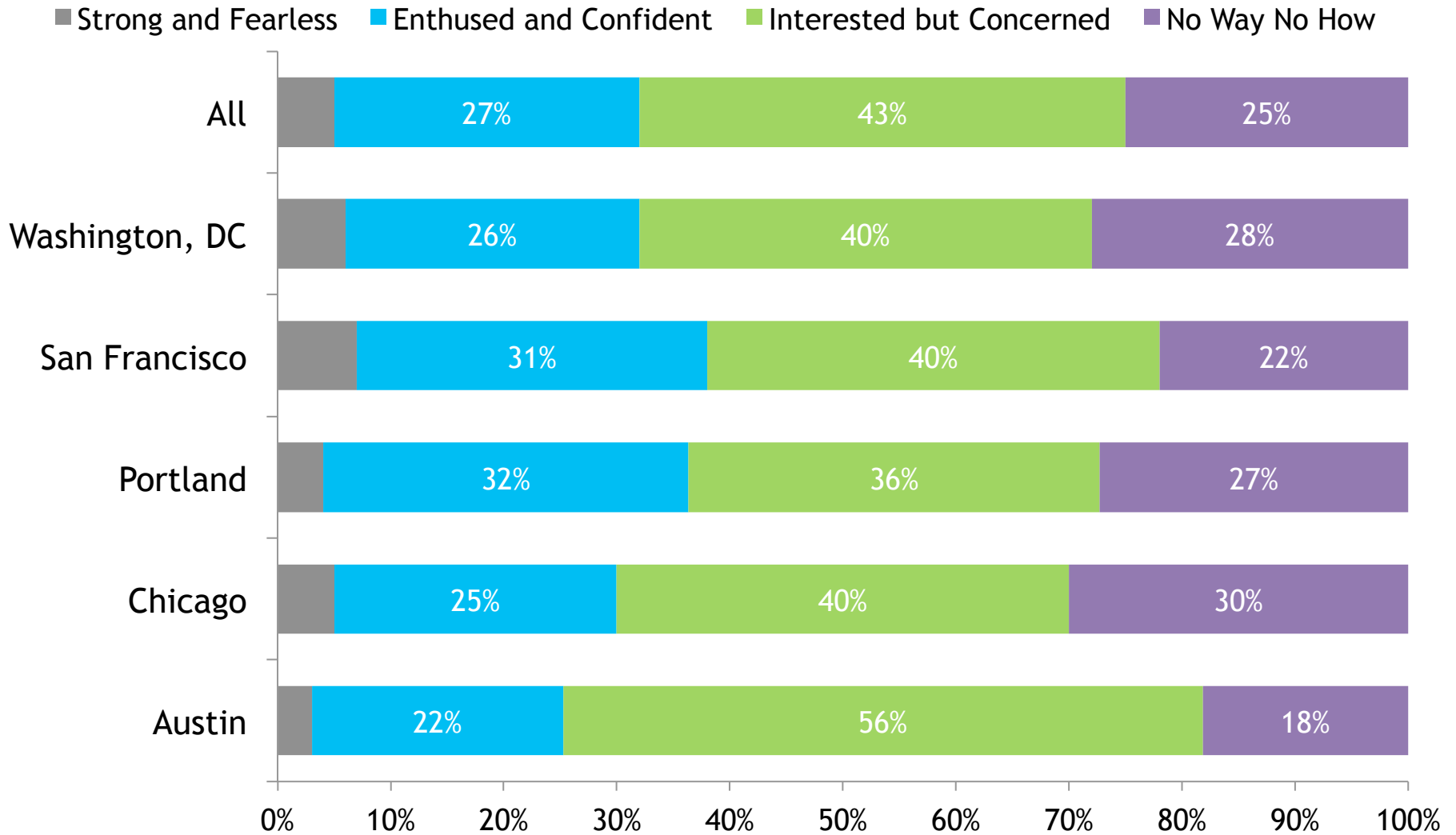
City	Route	Resident Survey				
		Distributed	Paper Returns	Web Returns	Returned	Response Rate
Washington, DC	L Street	1800	148	88	236	13%
Austin, TX	Bluebonnet Lane	1300	304	135	439	34%
	Barton Springs Road*	300	55	36	91	30%
	Rio Grande Street	-	-	-	-	-
San Francisco, CA	Oak /Fell	1967	318	199	517	26%
Chicago, IL	N/S Dearborn Street	1200	121	76	197	16%
	N Milwaukee Avenue	1500	185	126	311	21%
Portland, OR	NE Multnomah Street	1550	368	124	492	32%
Overall		9617	1499	784	2283	24%

Bicyclist Survey

City	Route	Bicyclist Survey		
		Distributed	Returned	Response Rate
Washington, DC	L Street	763	300	39%
Austin, TX	Bluebonnet Lane	-	-	-
	Barton Springs Road*	73	18	25%
	Rio Grande Street	98	43	44%
San Francisco, CA	Oak /Fell	900	278	31%
Chicago, IL	N/S Dearborn Street	600	124	21%
	N Milwaukee Avenue	775	236	30%
Portland, OR	NE Multnomah Street	200	112	56%
Overall		3409	1111	33%

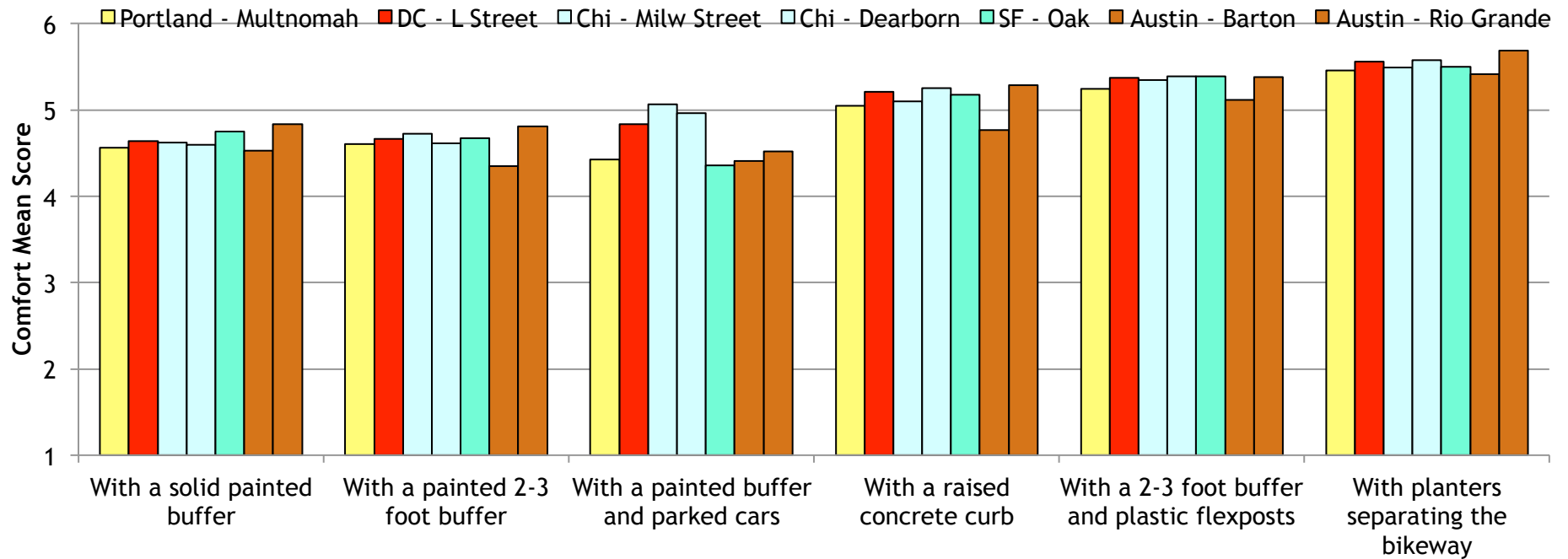
	Facility	Cross Street	Type	Description
Chicago	N/S Dearborn Street	Congress Parkway	Intersection	Two-way facility, MV left-turn signalized
		Madison Street	Intersection	Two-way facility, MV left-turn signalized
		Randolph Street	Intersection	Two-way facility, MV left-turn signalized
	N Milwaukee Avenue	Desplaines Street	Intersection	MVs and Bicyclists weave to make left-turns
		Elston Avenue	Intersection	Bicycle signal, right-turn over facility
		Grand Avenue	Intersection	Right-turn lane on right side of facility
Portland	NE Multnomah Street	7th Street	Intersection	Right turn over facility, skip crossing markings
		9th Street	Intersection	Mixing zone w/ right-turning MVs
		11th Street	Transit	Right turn over facility, skip crossing markings
San Francisco	Fell Street	Baker Street	Intersection	Mixing zone w/ left-turning MVs, green bars across mixing zone
	Oak Street	Broderick Street	Intersection	Mixing zone w/ right-turning MVs and green backed sharrows
		Divisadero Street	Intersection	Mixing zone w/ right-turning MVs and advisory bike lane (ABL)
D.C.	L Street NW	Btwn 19 th St and 18 th St	Hotel Zone	Loading zone with MV entrance and exit
		15th Street	Intersection	Mixing zone w/ left-turning traffic and ABL
		Connecticut Avenue	Intersection	Mixing zone w/ left-turning traffic and ABL

Residents Typed to Geller's Typology



Buffer design affects comfort

How comfortable would you feel bicycling on a commercial street with two lanes of traffic in each direction, with traffic speeds of 35 miles per hour, but with the following types of separation from traffic?



Since the _____ was built, do you travel on this route?

