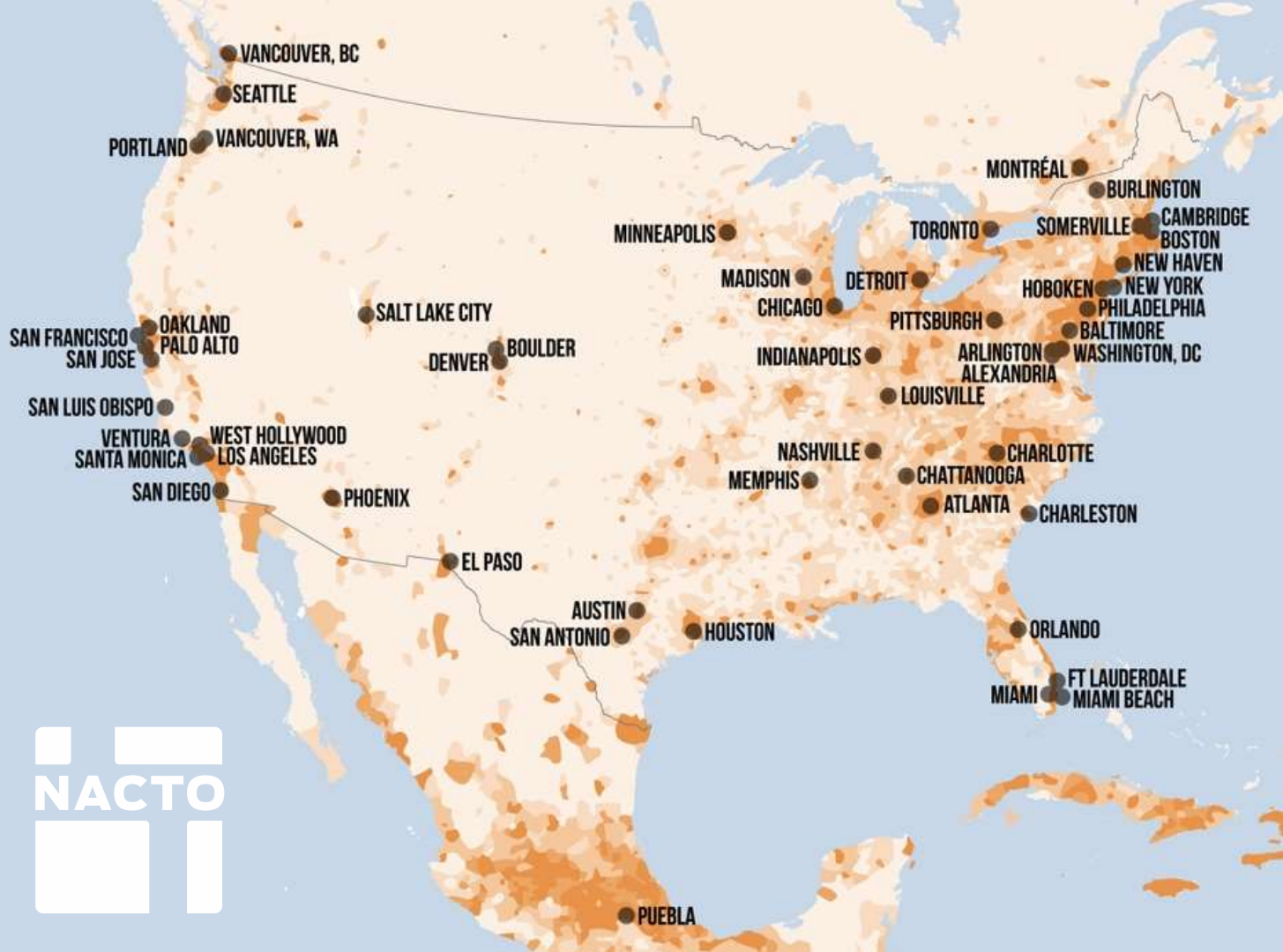


# Designing an All-Ages Bikeway Network

Craig Toocheck  
Design Coordinator, NACTO



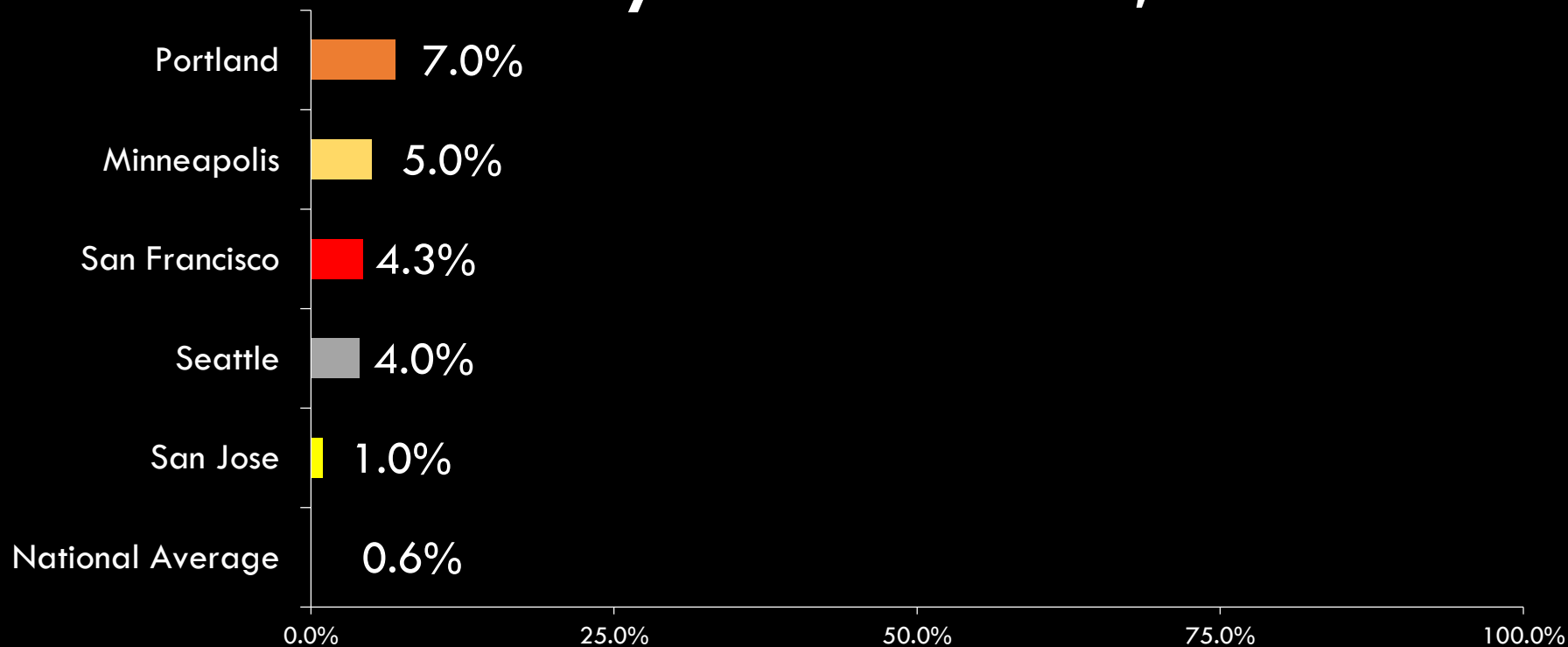


# Biking is ... ?



# Biking is ... Under-Performing

## Bicycle Mode Share, 2015



Who are we designing for?





# A bike lane is just a start



Photo: NYC DOT

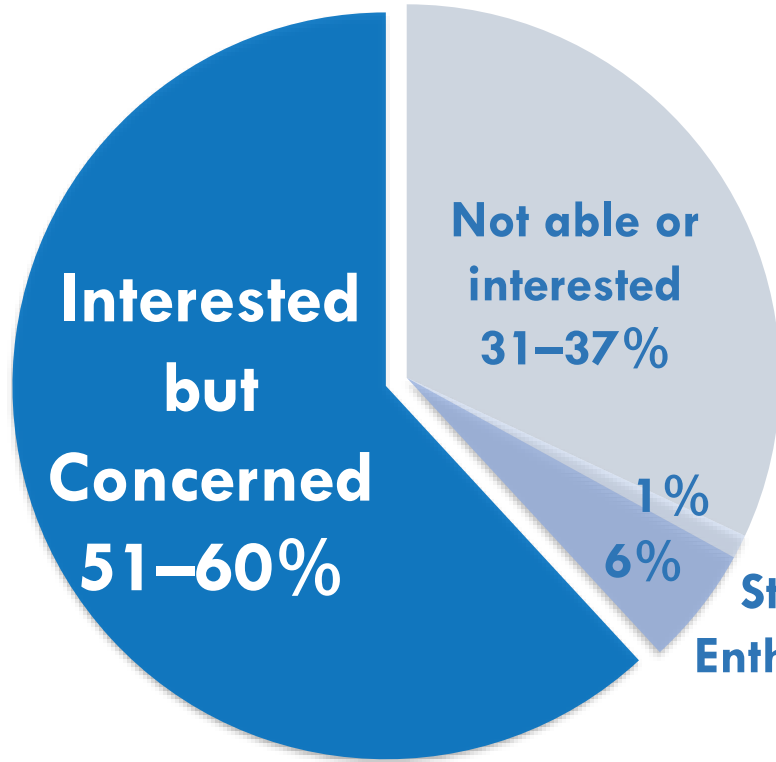
We can do much more.



Photo: NYC DOT



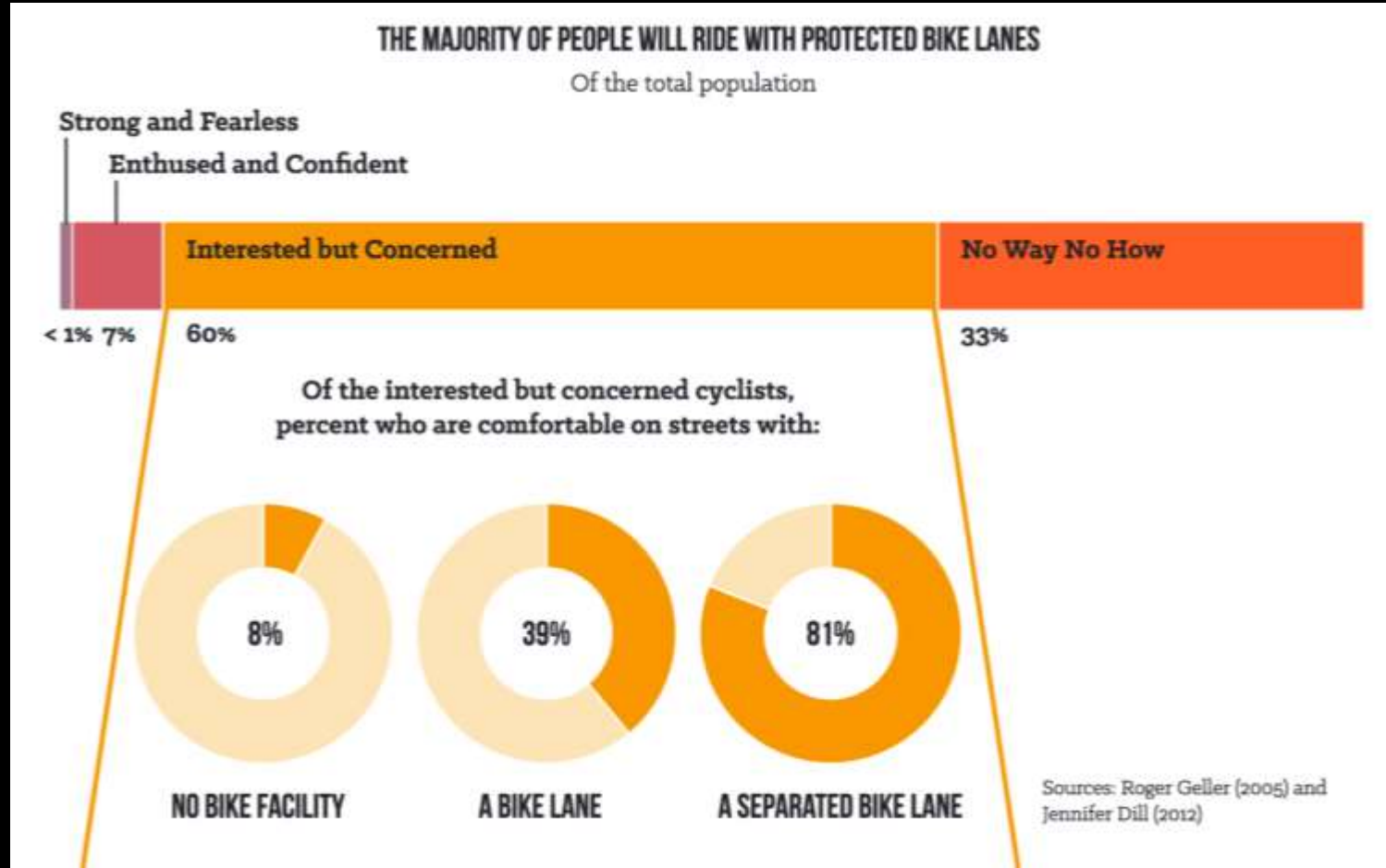
# Who are we forgetting?



## Who's still not counted?



# How to get more potential cyclists onto bikes?



# Who should our design user(s) be?



*Photo: People for Bikes*

# All Ages & Abilities means ...

**Safe**



**Attractive**



**Equitable**



Change requires commitment ...



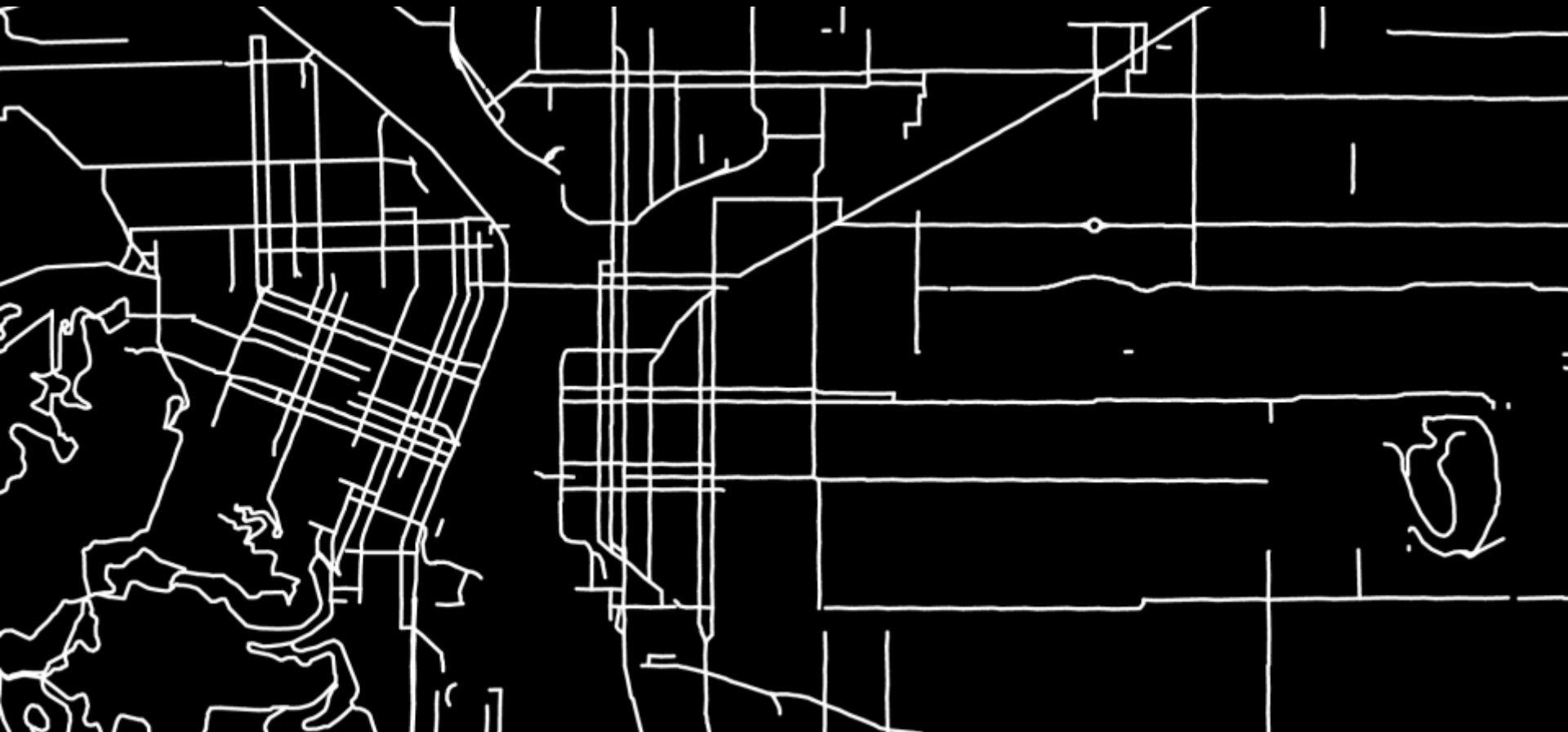
*Photo: Waterfront Toronto*

... to attractive projects ...



*Photo: Waterfront Toronto*

... and safe, equitable networks, on major corridors ...



... and neighborhood streets ...

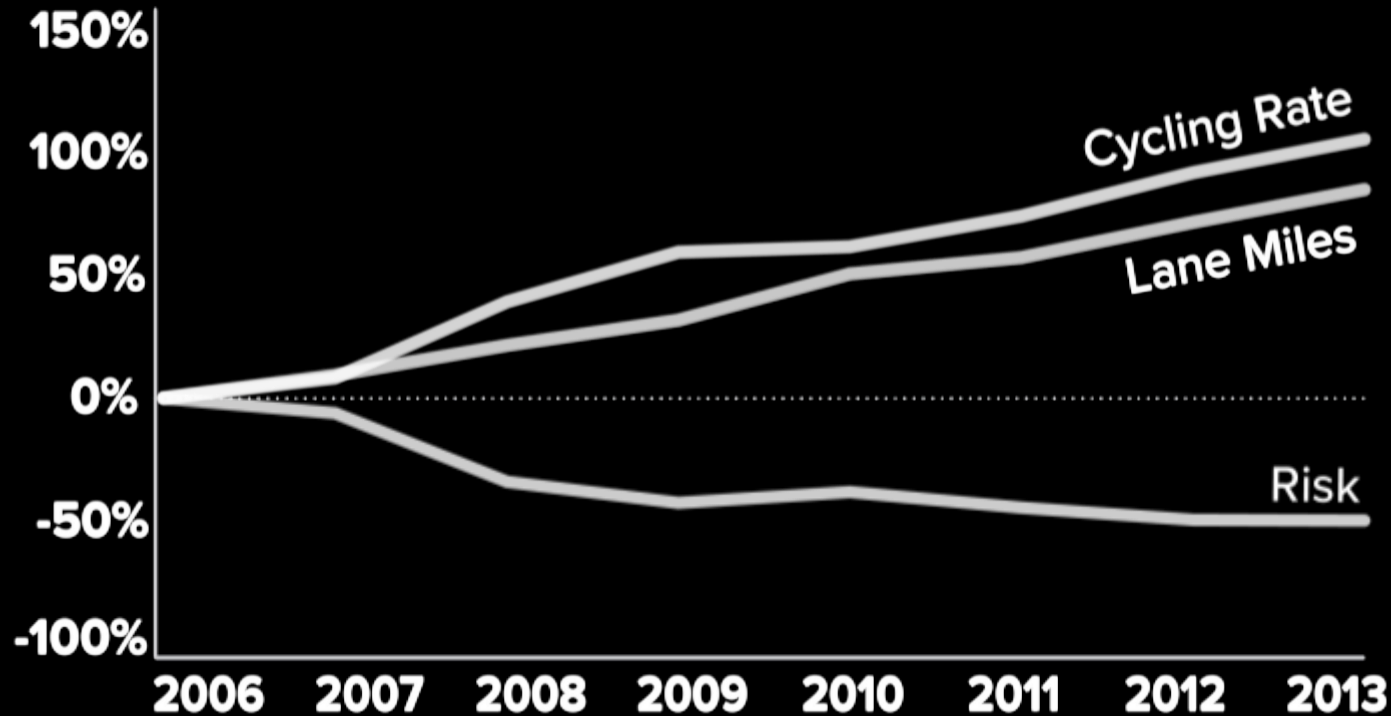




... to build a connected, all-ages network.

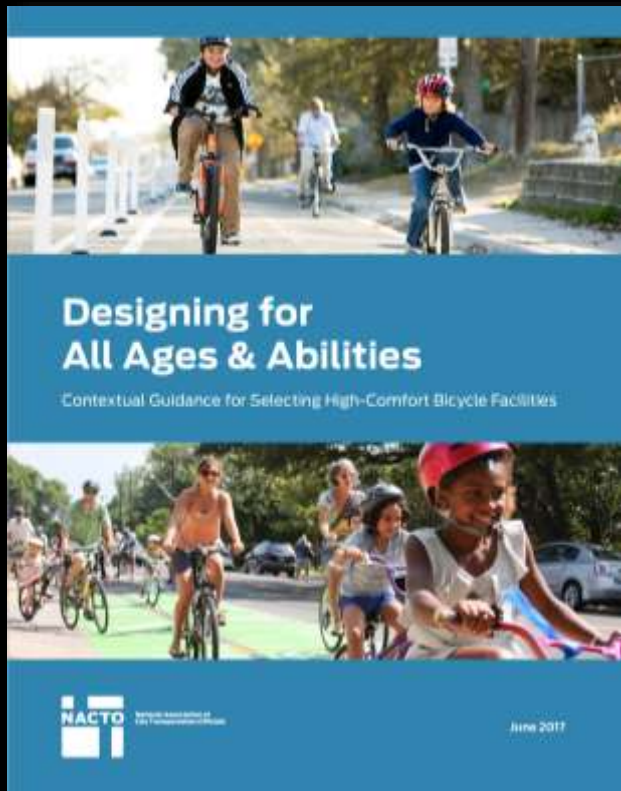


# Robust investments yield results!



Aggregate data from Portland, New York City, Chicago, San Francisco, and Philadelphia

# NACTO's *Designing for All & Ages & Abilities*



# Contextual Guidance

Roadway Context				All Ages and Abilities Bicycle Facility
Target Motor Vehicle Speed (95 <sup>th</sup> Percentile)*	Target Max. Motor Vehicle Volume (ADT)	Motor Vehicle Lanes	Additional Operational Considerations	
Any		Any	Any of the following: high curbside activity, frequent buses, motor vehicle congestion, or turning conflicts <sup>1</sup>	Protected Bicycle Lane
< 10 mph	Less relevant	No centerline, or single lane one-way	Pedestrians share the roadway	Shared Street
≤ 20 mph	≤ 1,000 – 2,000		≤ 100 motor vehicles per direction at peak hour	Bicycle Boulevard
	≤ 500 – 1,500			Conventional or Buffered Bicycle Lane
	≤ 1,500 – 3,000	Single lane each direction or single lane one-way		Buffered or Protected Bicycle Lane
≤ 20 – 25 mph	≤ 3,000 – 5,000		Low curbside activity, or low congestion pressure	Protected Bicycle Lane
	Greater than 5,000	Multiple lanes per direction		Protected Bicycle Lane, or Reduce Speed
	≤ 6,000	Single lane each direction	Low curbside activity, or low congestion pressure	Protected Bicycle Lane, or Reduce to Single Lane & Reduce Speed
Greater than 25 mph	Greater than 5,000	Multiple lanes per direction		Protected Bicycle Lane or Bicycle Path
	Greater than 5,000	Any	Any	
High-speed link roadways, natural corridors, or geographic features with limited conflicts	Limited access roadways, natural corridors, or geographic features with limited conflicts	Any	High pedestrian volume	Bike Path and separate walkway or Protected Bicycle Lane
			Low pedestrian volume	Shared-Use Path or Protected Bicycle Lane

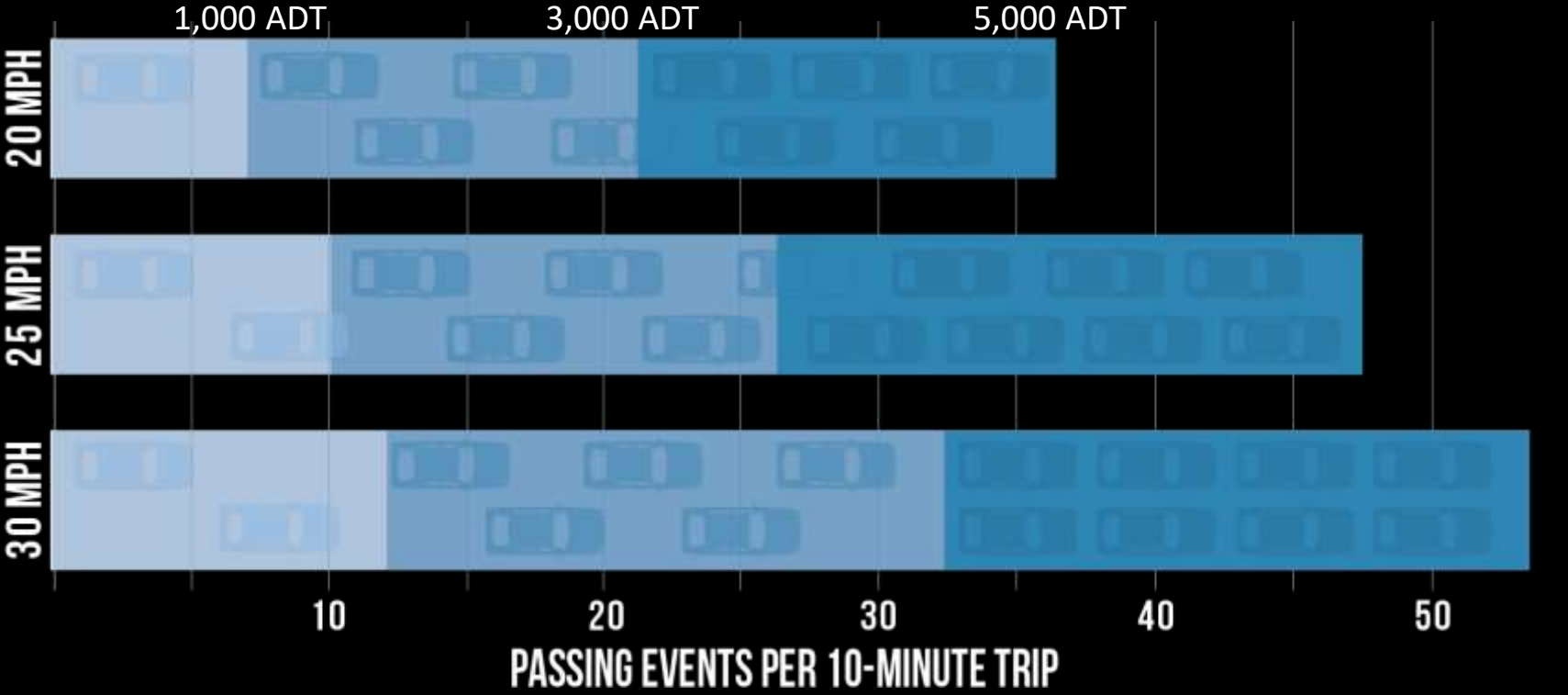
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	≤ 1,500 – 3,000			Buffered or Protected Bicycle Lane
	≤ 3,000 – 6,000	Multiple lanes per direction		Protected Bicycle Lane
	Greater than 6,000			

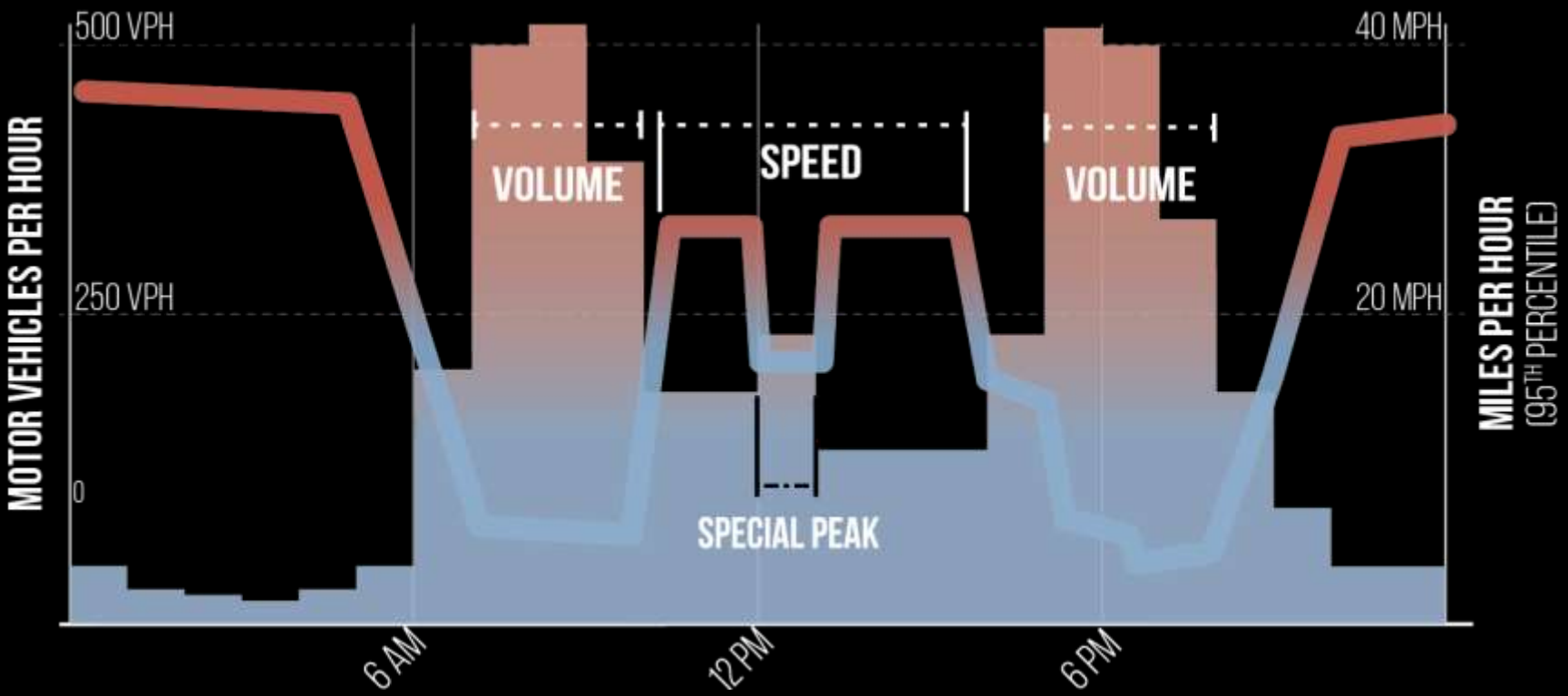
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	Greater than 6,000	Multiple lanes per direction		

# Speed & Volume Increase Stress



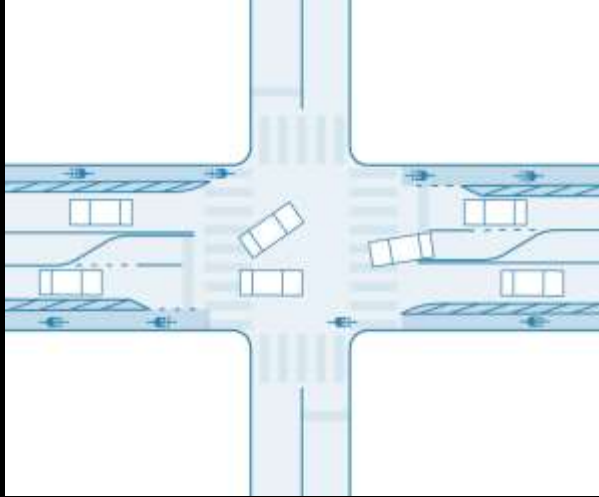
# Stress Changes During the Day



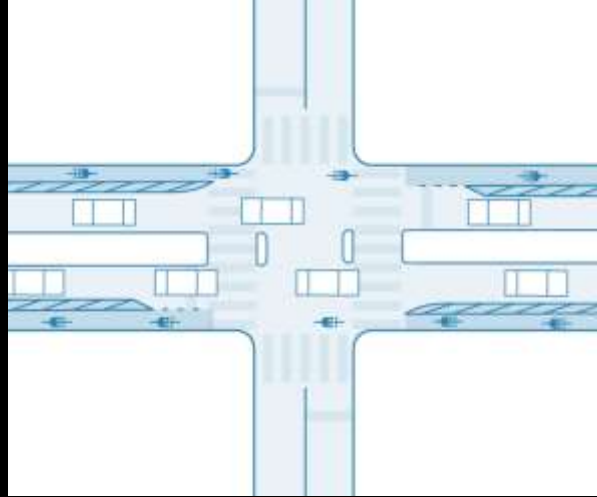


# Three Levers to Change the Street

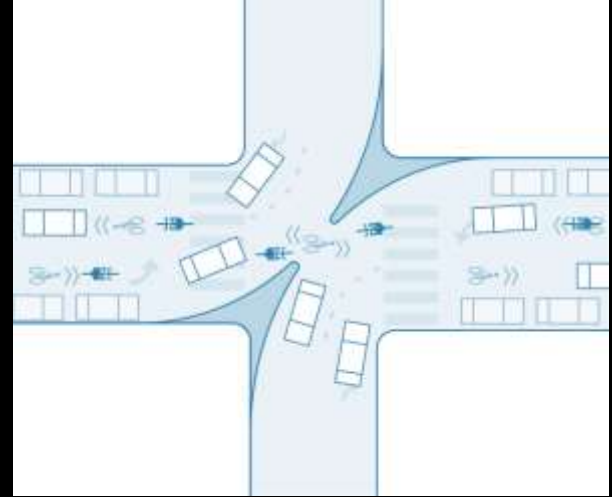
**Design**



**Operation**

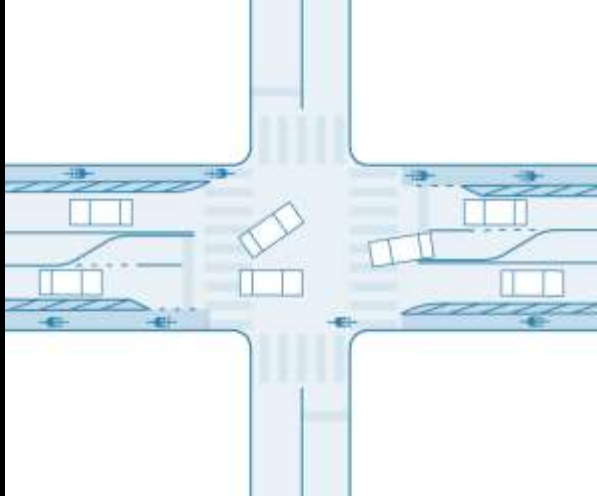


**Network**



# Three Levers to Change the Street

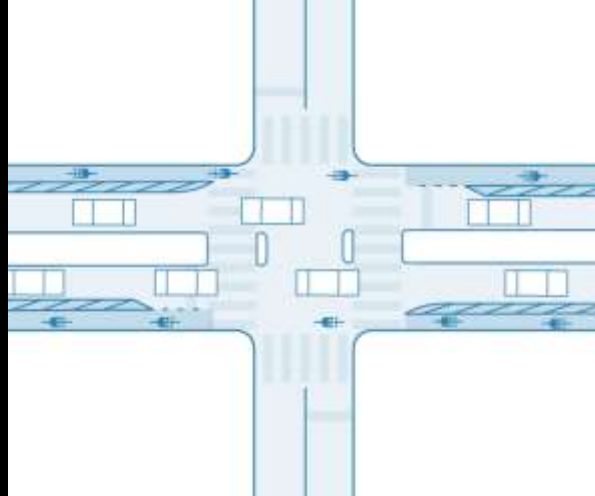
## Design



- Flip the Bike Lane & Parking Lane
- 4-to-3 Road Diet / Repurpose Motor Vehicle Lane

# Three Levers to Change the Street Operation

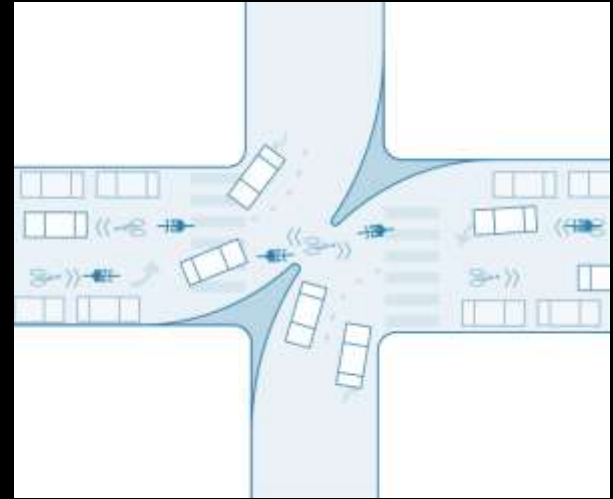
- Low-Speed Signal Progression
- Turn Prohibition
- Phase Separation



# Three Levers to Change the Street

- Forced turns / Diversion
- Time-of-Day Regulations
- Large Vehicle Prohibitions

## Network



# Low-Speed, Low-Volume Roadways Can Be Shared



*Photo: NACTO*

- Use both Peak Volume & Off-Peak Speed
- 20-25mph max Target Speed
- Manage high-end Speeds
- Reduce / Filter Volume
- Use Time of Day analyses for deliveries & stressors

# Conventional & Buffered Lanes Organize Only

- Set 95<sup>th</sup> Percentile below 25mph
- Reduce Motor Vehicle Volume
- Reduce Curbside Conflicts
- Address Intersection Conflicts
- Adjacent Traffic Decreases Comfort



*Photo: NYC DOT*

# Separate Bicyclists When Speed & Volume are High



*Photo: Adam Coppola for People for Bikes*

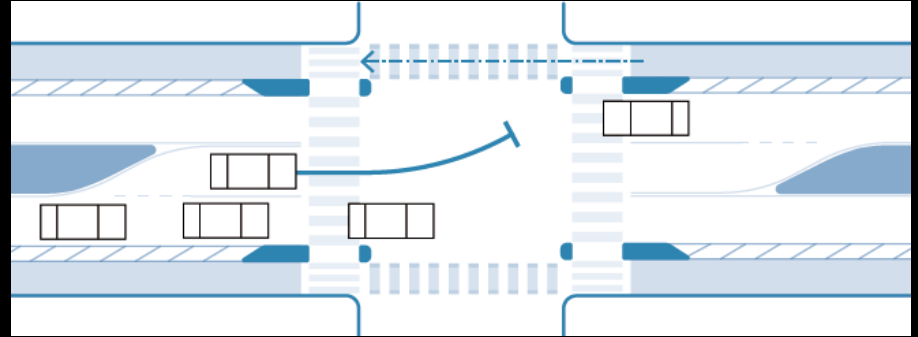
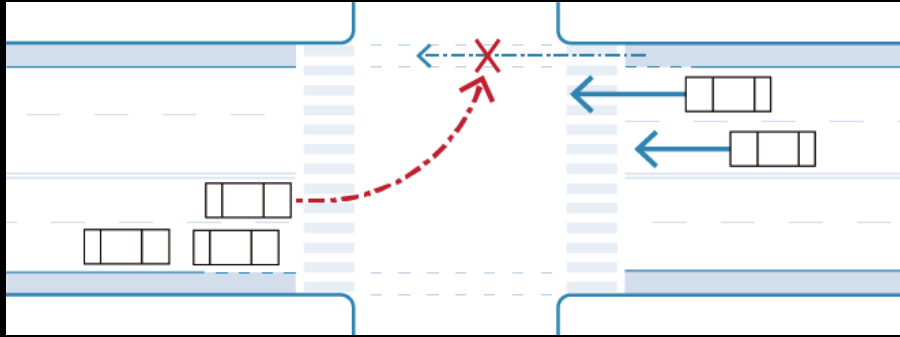
- Protect where 95<sup>th</sup> Percentile exceeds 25mph
- Carry protection through Intersections
- Reduce Curbside Conflicts
- Upgrade Separation as Stress Increases
- Minimize the number of travel lanes

# Address Common Sources of Stress





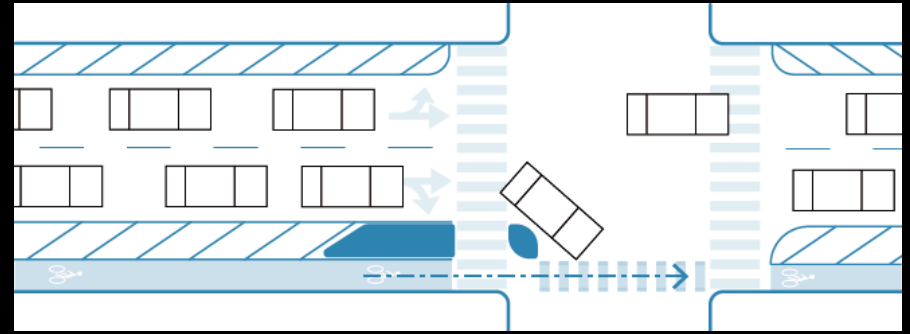
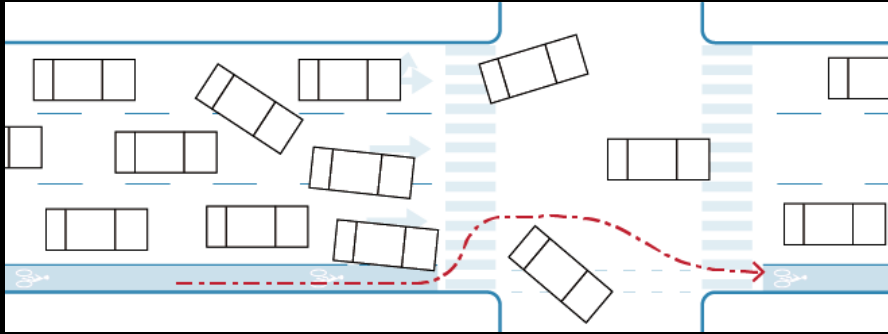
# Unorganized Multi-Lane Streets



# Address Common Sources of Stress



# Congestion, Queueing, & Intrusion



# Limit Conflicts at Intersections



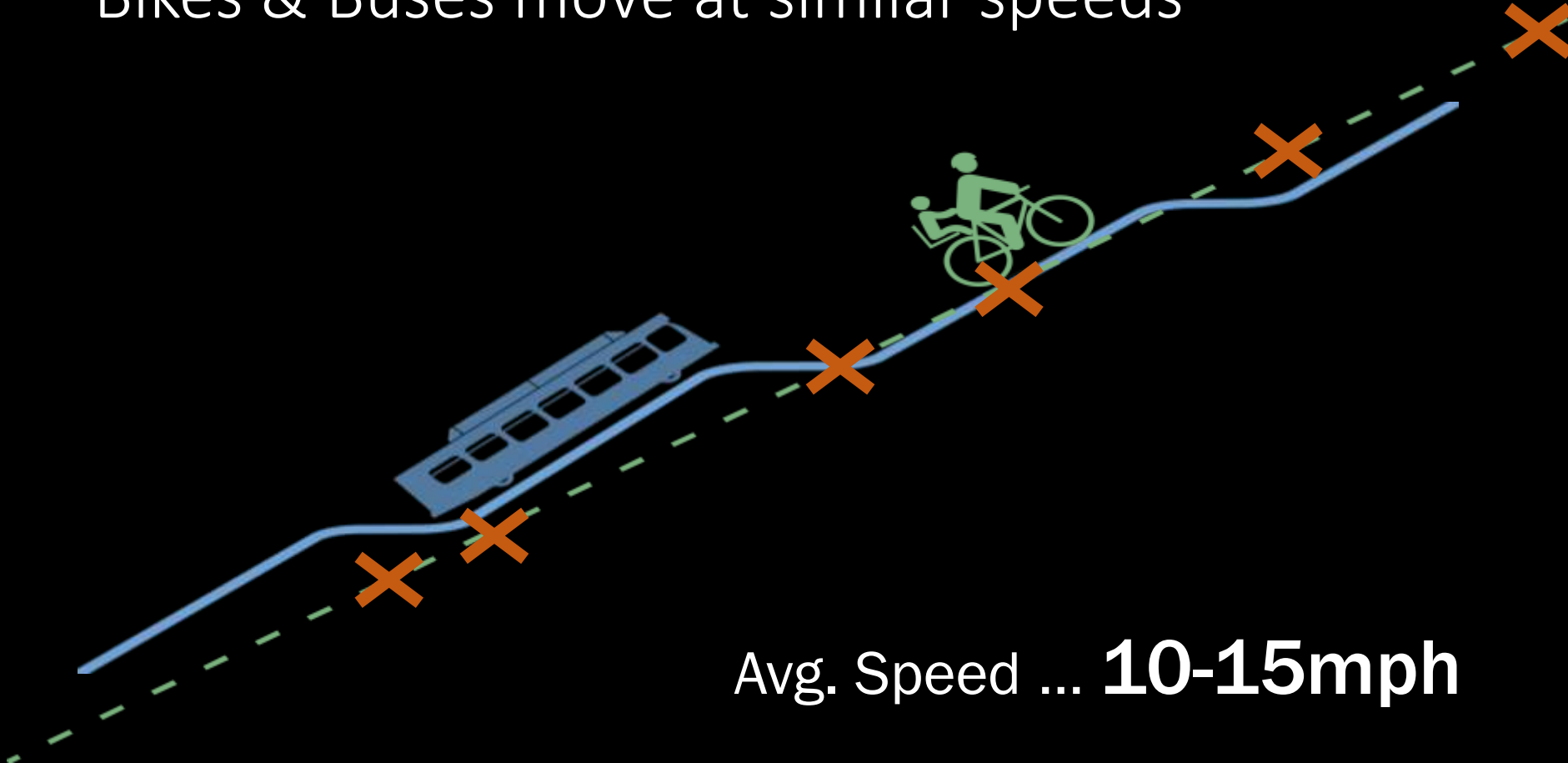
*Photo: Nate Roseberry, CDOT*

# Don't Force Bikes to Compete with Transit



*Photo: Michael Pieracci*

Bikes & Buses move at similar speeds



Avg. Speed ... **10-15mph**

# Give Each Their Space



*Photo: Adam Coppola for People for Bikes*

# Curbside Activity



*Photo: Dongho Chang, SDOT*



A woman wearing a light blue shirt, dark shorts, a tan hat, and sunglasses is riding a black bicycle towards the camera on a city street. She has a basket of red flowers on the handlebars. The street is lined with modern buildings, trees, and parked cars. In the background, other cyclists and pedestrians are visible, some behind orange safety barriers. The scene is bright and sunny.

# Thank you!

**Keep in touch:  
[craig@nacto.org](mailto:craig@nacto.org)  
[@nacto](https://twitter.com/nacto)**

*Photo: Adam Coppola for People for Bikes*