

# Walking Along the Road



# Learning Outcomes:

2-2

- At the end of this module, you will be able to:
- Describe the operational and safety benefits of shoulders and sidewalks
- Select the appropriate design for sidewalks

# Calculating Reduction in Number of Crashes

2-3

Crash Modification Factor (CMF): factor used to compute the expected number of crashes after implementing a given countermeasure.

Crash Reduction Factor (CRF): % fewer crashes experienced on a road with a given countermeasure than on similar road without the countermeasure

Relationship between CMF and CRF:

$$\text{CMF} = 1 - (\text{CRF}/100)$$

$$\text{CRF} = 100 * (1 - \text{CMF})$$

(Examples on next slide)

CMF/CFR Clearinghouse: [www.cmfclearinghouse.org](http://www.cmfclearinghouse.org)

# Shoulders and Sidewalks



2-4

- Walking along the road accounts for 10-15% of fatal pedestrian crashes:
  - Fewer in urban areas
  - More in rural areas
- They're easily preventable
- Paved shoulders reduce pedestrian crashes by 70% (CRF)
  - $CMF = 0.3$ 
    - Gan et al. study
- Sidewalks reduce pedestrian crashes by 88% (CRF)
  - $CMF = 0.12$ 
    - McMahon Study

# Shoulders improve safety for all users

2-5

Sonoma Co. CA



For motorists: room to avoid crashes

# Shoulders improve safety for all users

2-6



For bicyclists: a place to ride

# Shoulders improve safety for all users

2-7

Benton Co. OR



*6' width preferred*

For pedestrians: a place to walk

CMF = 0.3 (CRF = 70%)



2-8

Canyonville OR

At a certain point, sidewalks are needed





2-9

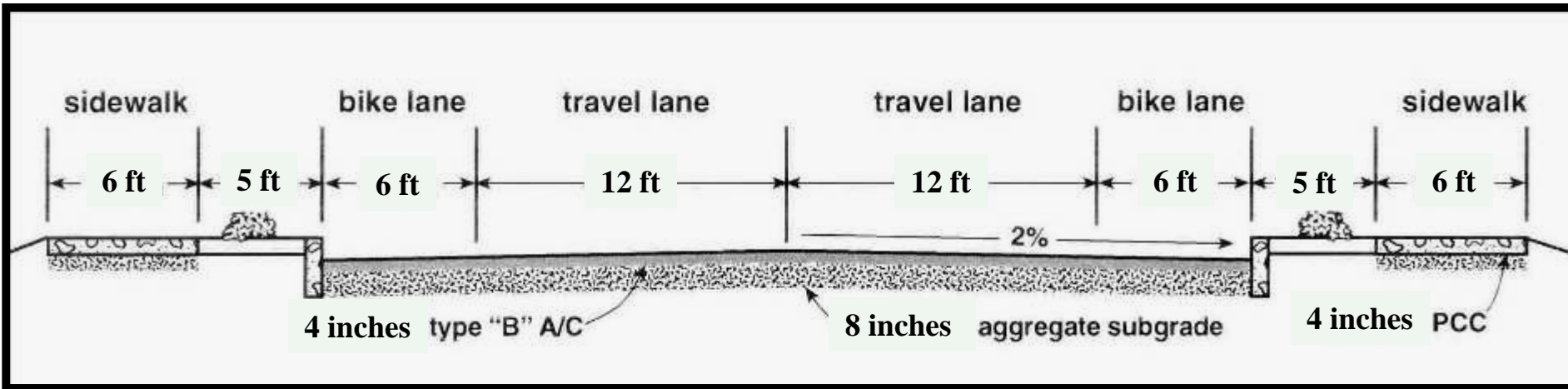
Manitou Springs CO

“Goat trail” indicates sidewalks are needed

The 2011 AASHTO “Green Book” states:

“Sidewalks are an integral parts of city streets”

2-10 Quote from 2011 AASHTO Green Book 4.17.1 Sidewalks



Sidewalks are not added to streets,  
they are part of the street



2-11

Bellevue WA

Sidewalks reduce pedestrian crash risk by 88%

# Curbs & sidewalks slow traffic more than speed sign

2-12

Coburg OR



Sidewalks define an urban street

# Discussion: Why are sidewalks discontinuous?

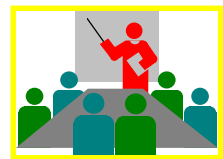
2-13

Beaverton OR



# Discussion: Why are sidewalks on one side not OK?

2-14



Answer: Pedestrians walk in street, or cross twice

# Sample Implementation Strategy to retrofit existing streets w/sidewalks

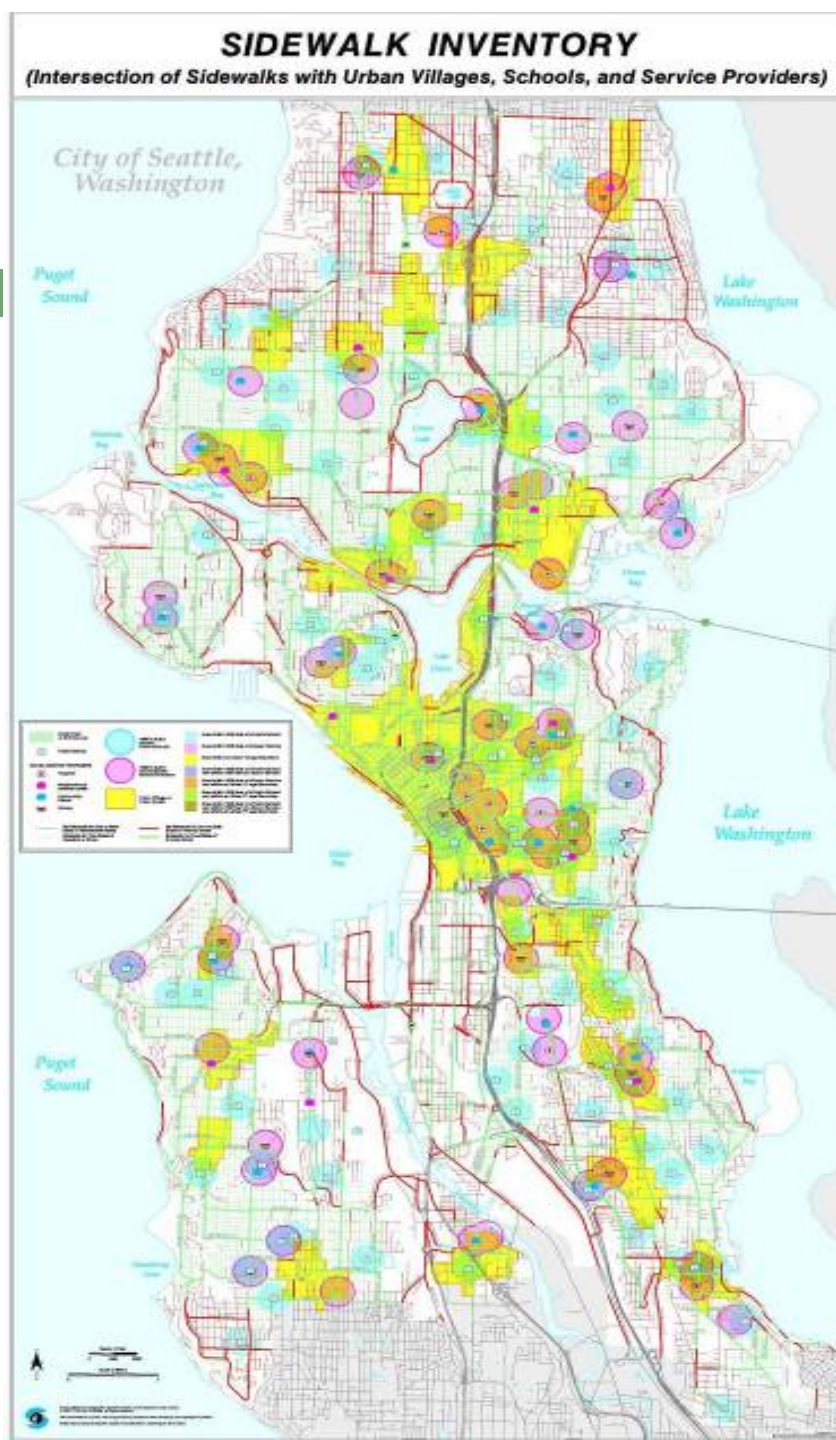
2-15

Seattle WA



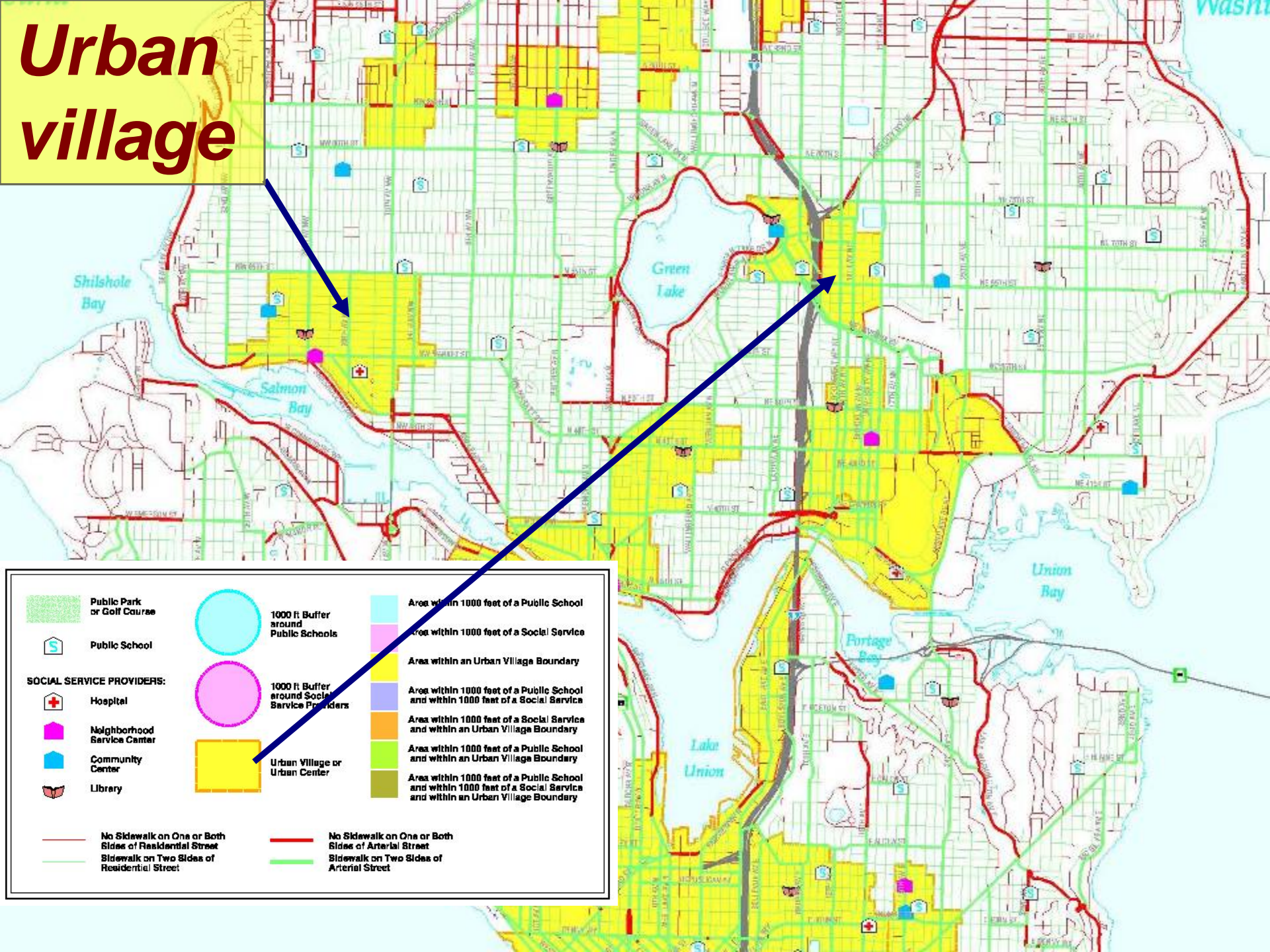
Develop a program to fill in missing sidewalks over 20 years






















- How do you make such a daunting task manageable?
- Seattle example: divide it into bite-size chunks, with overlapping priorities



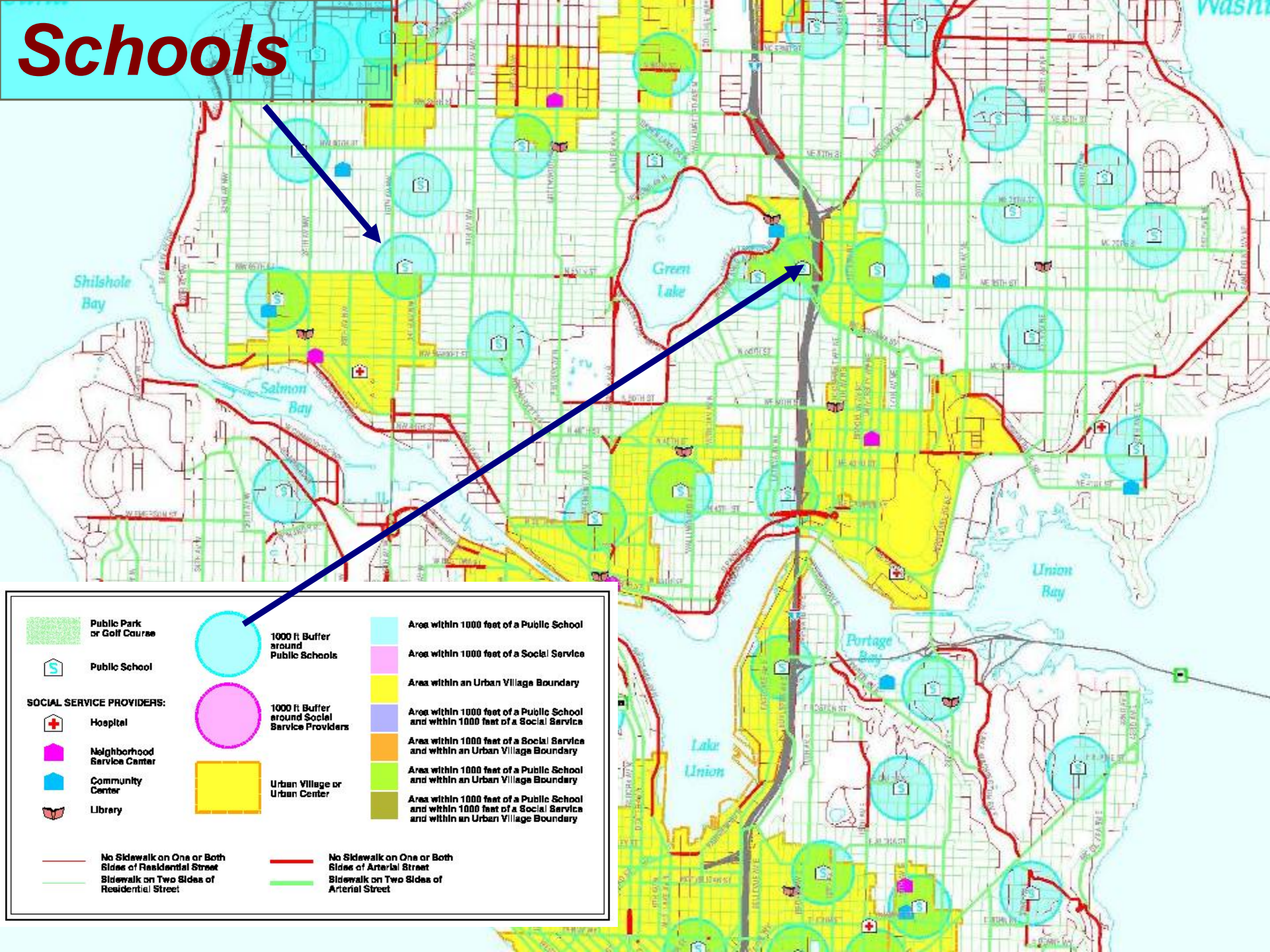


# Urban village



	Public Park or Golf Course		1000 ft Buffer around Public Schools		Area within 1000 feet of a Public School
	Public School		1000 ft Buffer around Social Service Providers		Area within 1000 feet of a Social Service
<b>SOCIAL SERVICE PROVIDERS:</b>					Area within an Urban Village Boundary
	Hospital				Area within 1000 feet of a Public School and within 1000 feet of a Social Service
	Neighborhood Service Center				Area within 1000 feet of a Social Service and within an Urban Village Boundary
	Community Center				Area within 1000 feet of a Public School and within an Urban Village Boundary
	Library		Urban Village or Urban Center		Area within 1000 feet of a Public School and within 1000 feet of a Social Service and within an Urban Village Boundary
	No Sidewalk on One or Both Sides of Residential Street		No Sidewalk on One or Both Sides of Arterial Street		Sidewalk on Two Sides of Residential Street
	Sidewalk on Two Sides of Residential Street		Sidewalk on Two Sides of Arterial Street		

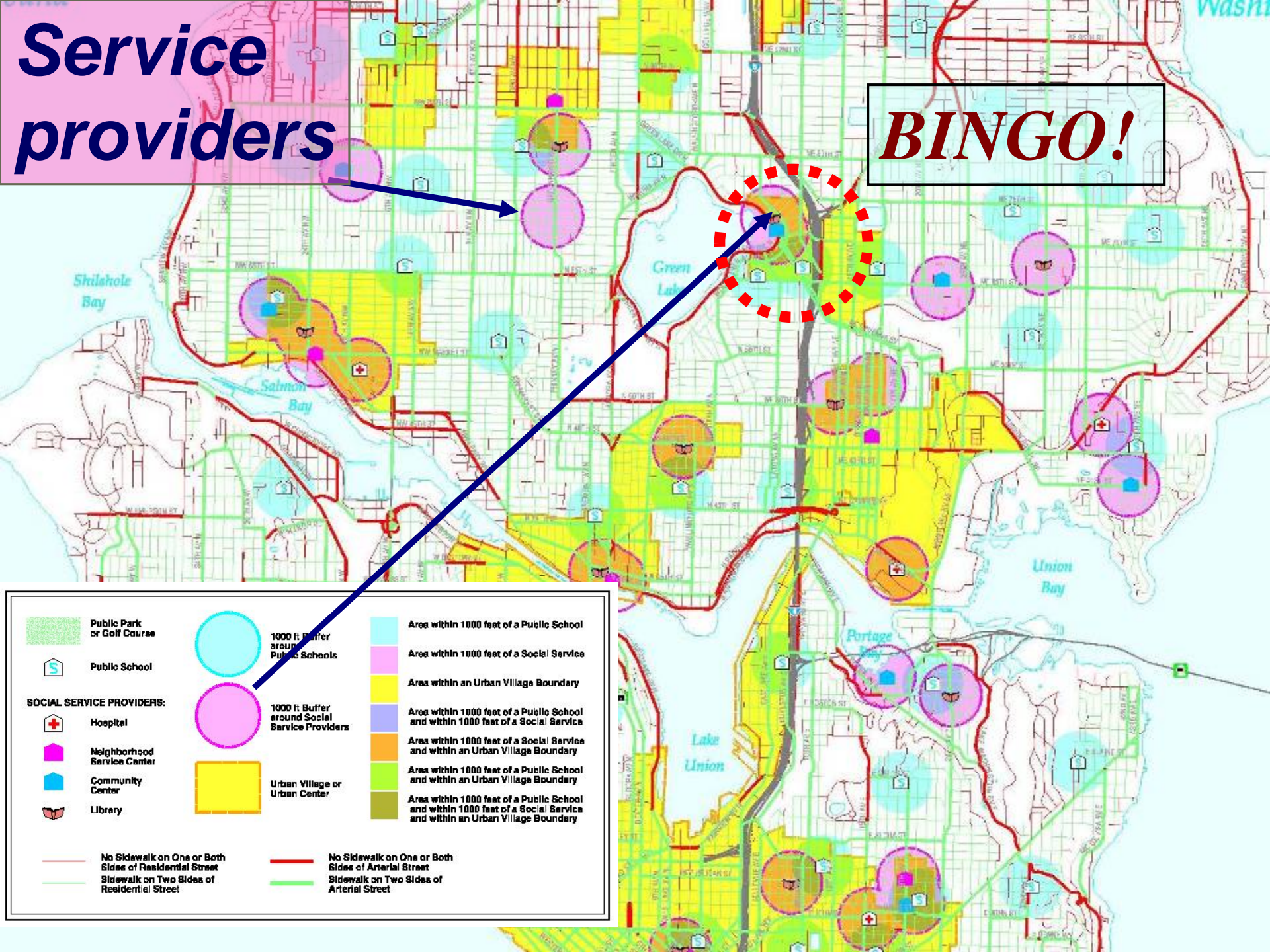
# Schools



	Public Park or Golf Course		1000 ft. Buffer around Public Schools		Area within 1000 feet of a Public School	
	Public School		1000 ft. Buffer around Social Service Providers		Area within 1000 feet of a Social Service	
<b>SOCIAL SERVICE PROVIDERS:</b>				Urban Village or Urban Center		Area within an Urban Village Boundary
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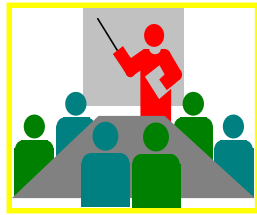
# Service providers

**BINGO!**



Public Park or Golf Course	1000 ft Buffer around Public Schools	Area within 1000 feet of a Public School
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# Discussion:



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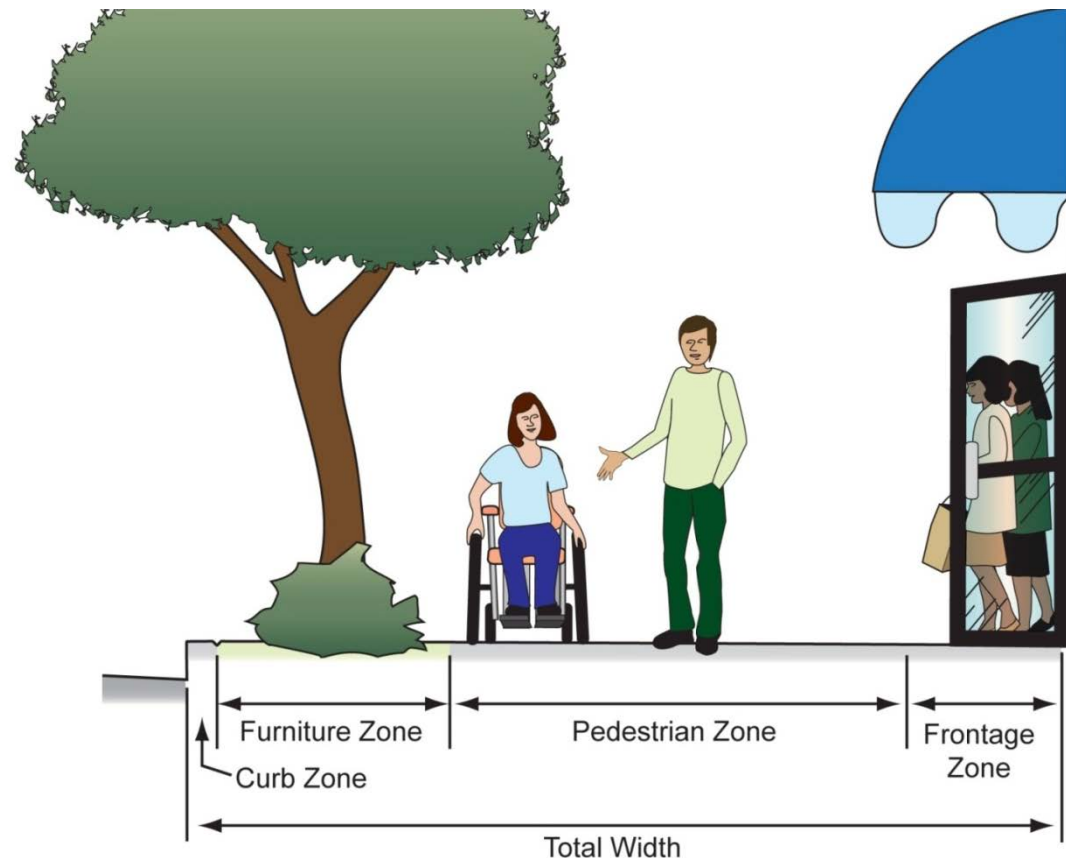
- What are your requirements for sidewalks:
- What are the triggers?
- Who pays for them?
- Who maintains them?

# Sidewalk Corridors – The Zone System

2-21

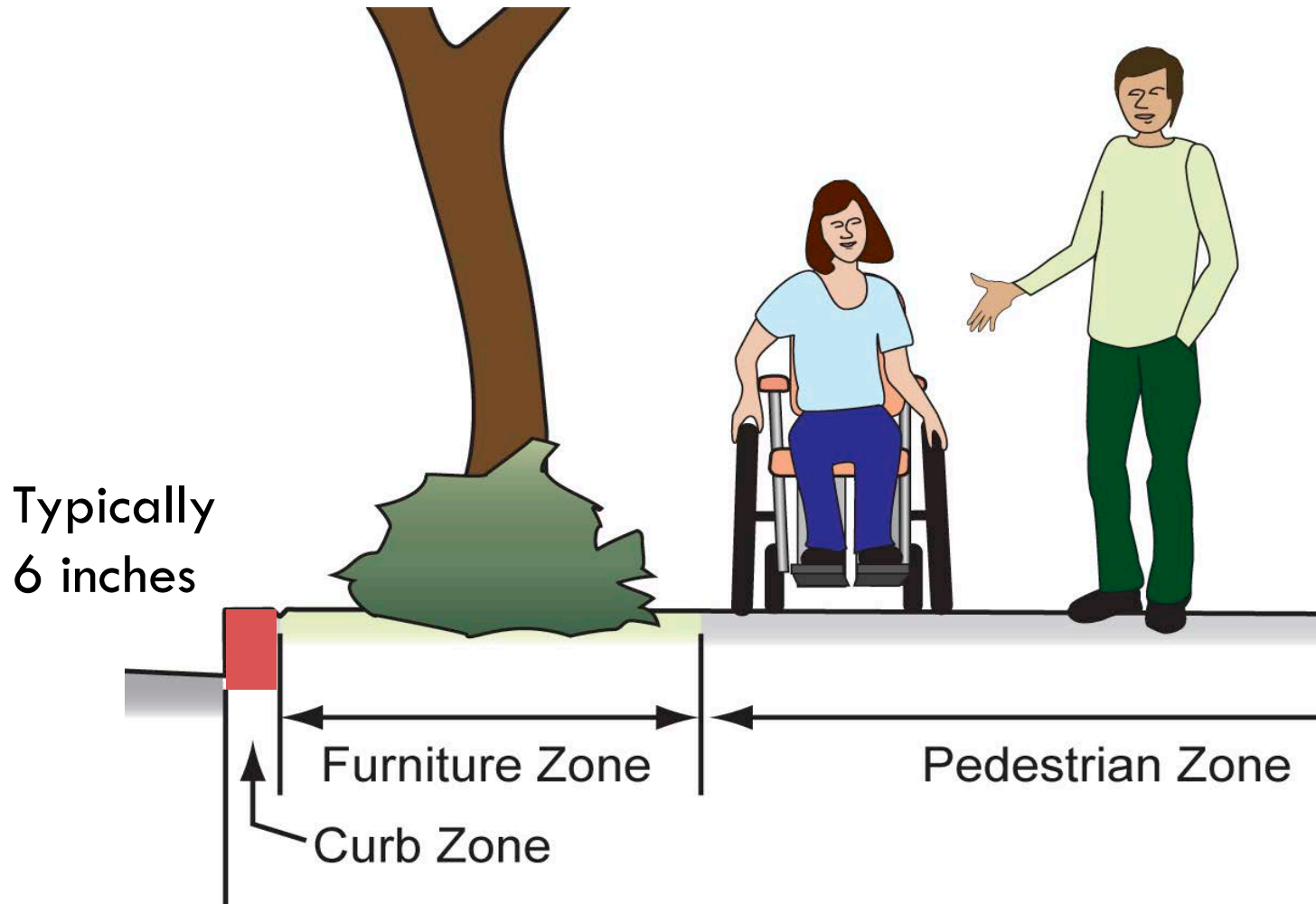
The sidewalk corridor extends from the edge of roadway to the right-of-way and is divided into 4 zones:

- Curb zone
- Furniture zone
- Pedestrian zone
- Frontage zone



# Curb Zone

2-22





2-23

Sacramento

Why the curb zone matters: Mountable curbs are inappropriate on local streets



2-24

Salem OR

Why the curb zone matters: It's where pedestrians transition from/to the street





2-25

Grants Pass OR

Curbs & drainage are the greatest sidewalk cost



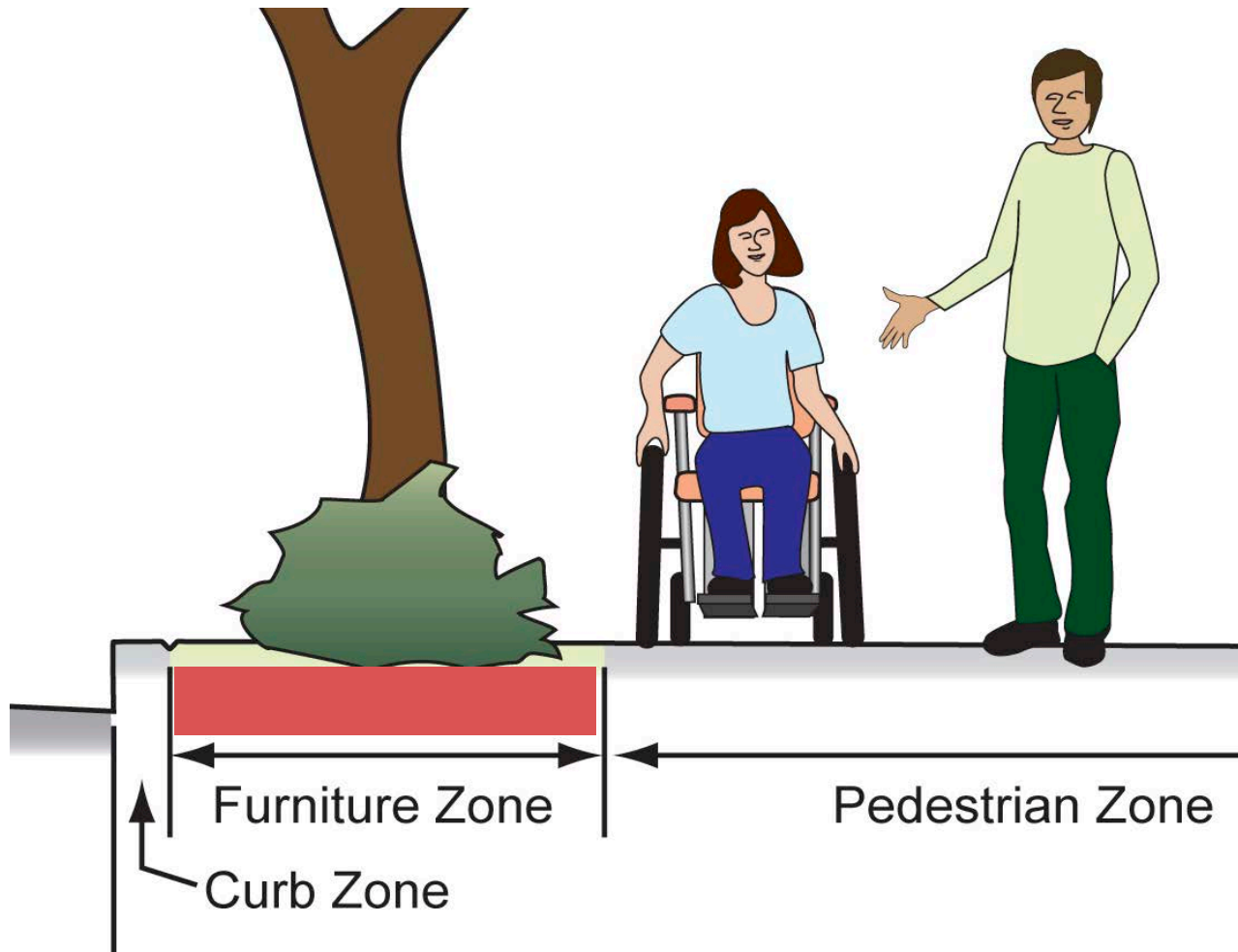
2-26

Amity OR

This sidewalk cost little to install w/o curb

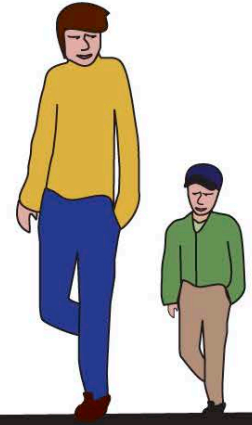
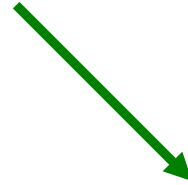
# Furniture Zone

2-27



- Local or collector streets 2 to 4 ft
- Arterial or major streets 4 to 6 ft

*All these things go here!*



All the “stuff” goes in the furniture zone



2-29

Jacksonville OR

The furniture zone keeps the sidewalk clear



2-30

Reno NV

Sidewalk with furniture zone is pleasant to walk on



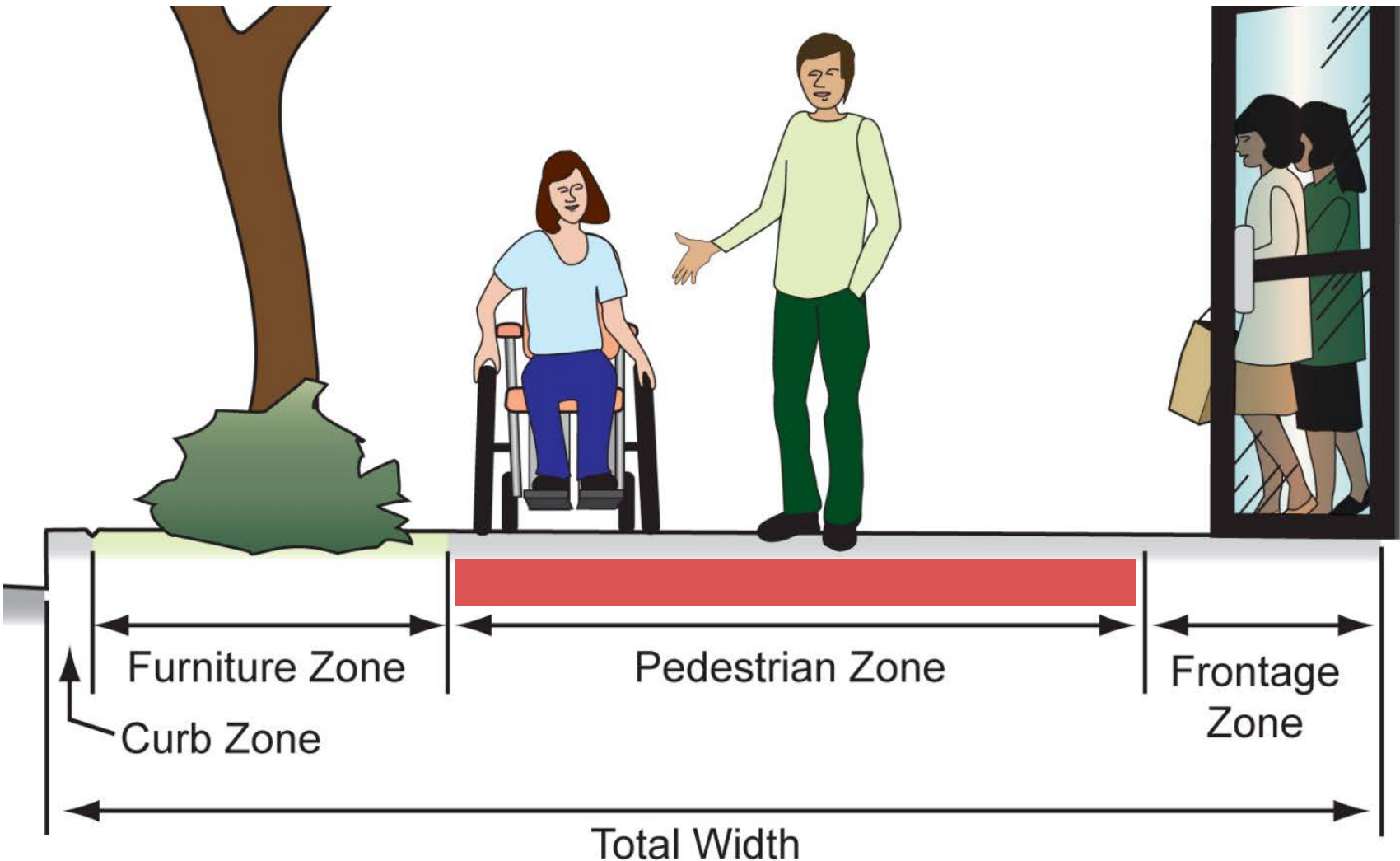
2-31

Corvallis OR

Planter strip helps define driveways, it's easier for drivers to find them and they're more likely to yield to pedestrians

# Pedestrian Zone

2-32







2-33

Henderson, NV

5 feet necessary for two people to walk comfortably side by side or to pass each other; 6' preferred



2-34

Salem OR

Sidewalk should be as wide as needed to serve anticipated pedestrian use (use HCM ped LOS)

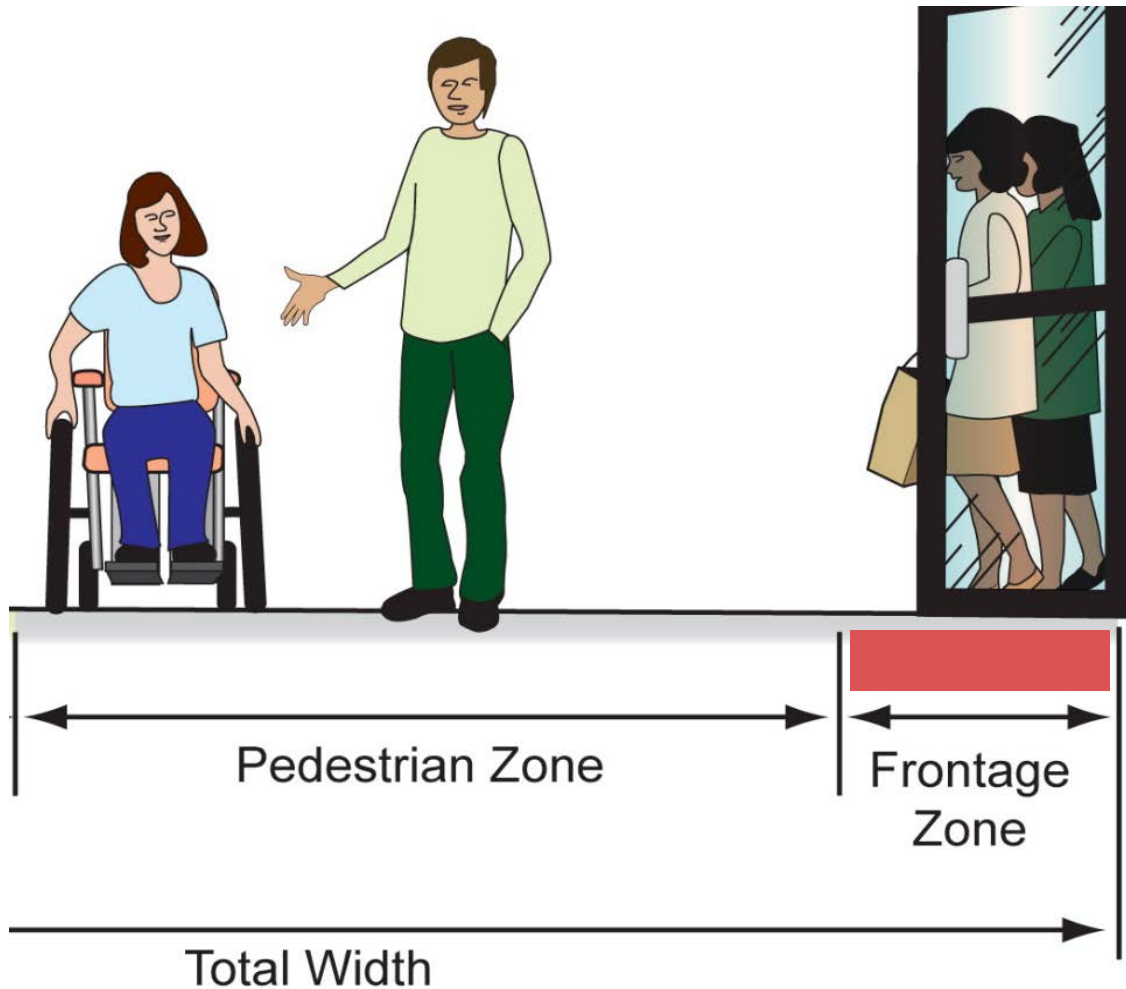
# Minimum Sidewalk Recommendations

2-35

- Local or collector streets 5 ft
- Arterial or major streets 6 to 8 ft
- Along parks, schools, and other major pedestrian generators 8 to 10 ft
- CBD areas 8 to 12 ft
  - 8-ft minimum in commercial areas with a planter strip,  
12-ft minimum in commercial areas with no planter strip

# Frontage Zone

2-36



- Doors, planters, etc...
  - 3 feet
- Café seating
  - 8 feet



2-37

Reno NV

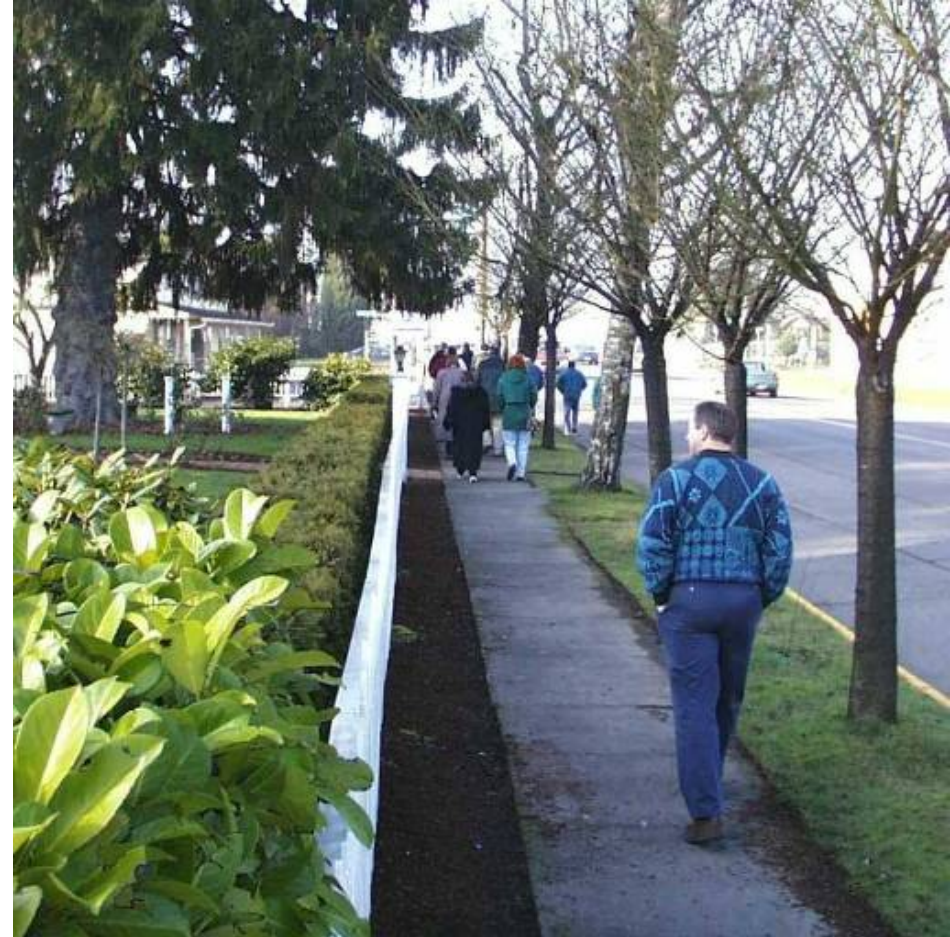
Shy distance concept applies to pedestrians, who will shy away from a vertical face; extra width is needed



2-38

Madison WI

An interesting façade makes narrow sidewalks feel wider

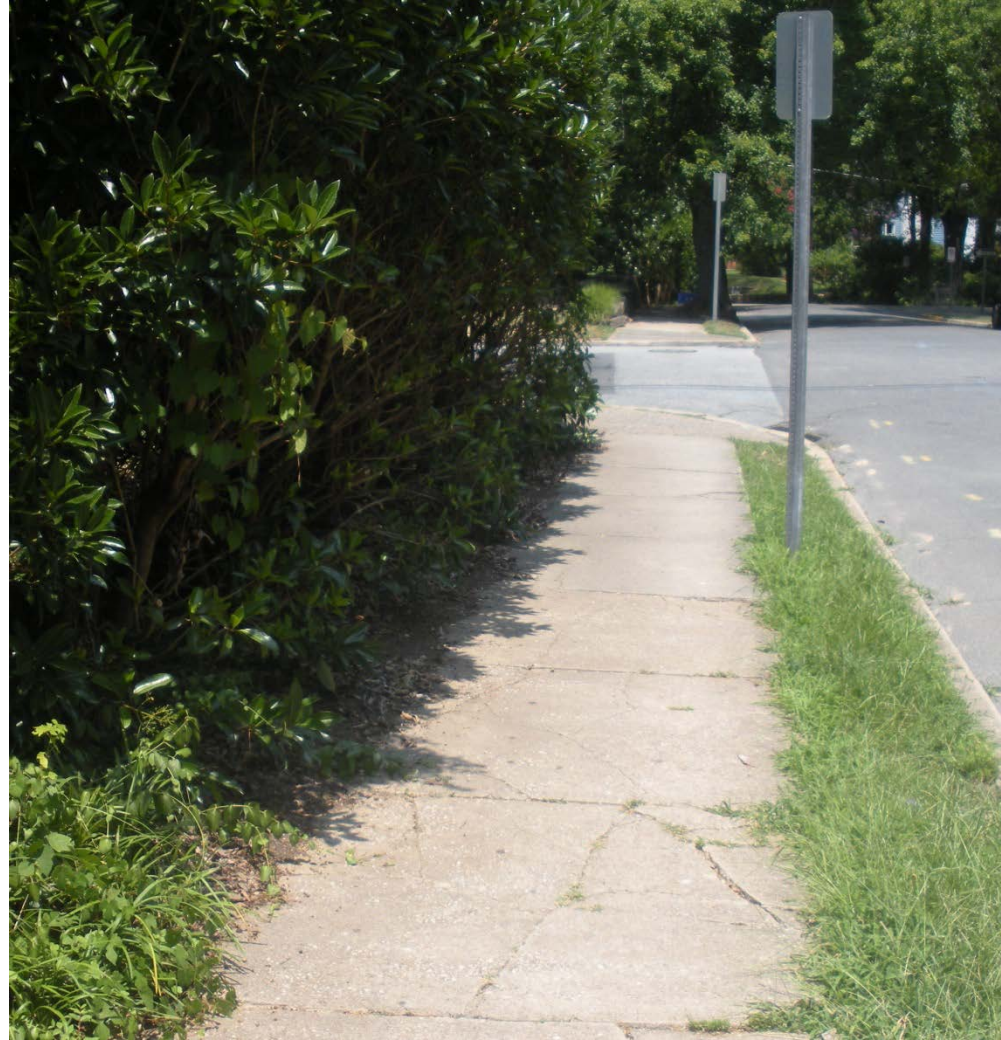


2-39

- Fence placement and type impacts pedestrian comfort: the sidewalk on the left is wider, but feels narrow due to high and adjacent chain link fence



***Before***



***After***

One foot of frontage zone between right-of-way line and sidewalk makes maintenance easier



# The Zone System - Summary

2-41



Residential street

# The Zone System - Summary

2-42

Washington DC



Commercial street

# With Zone System

2-43

Washington DC



Street furniture arranged in zones leaves sidewalk clear

# Without Zone System

2-44

Silverton OR



Randomly placed street furniture clutters sidewalk

# Without Zone System

2-45



No buffer between pedestrians and traffic

# ADA requirements for sidewalks

2-46

- Well-designed sidewalks meet ADA:
- Sidewalks should be clear of obstructions:
  - 3' min clearance, 4' proposed
- Sidewalk should have smooth surface
- Sidewalk should be at 2% max cross-slope including at driveways



- The zone system creates a safer and more pleasant place to walk, and makes it easier to meet ADA requirements.

***Best resource for ADA: Public Right-of-Way Accessibility Guidelines (PROWAG) draft. <http://www.access-board.gov/prowac/draft.htm>***



2-47

Las Vegas NV

Utilities & poles should not obstruct sidewalk



2-48

Depoe Bay OR

Mitigate around obstacles on narrow curbside sidewalk



# Recommendations from Model Design Manual for Living Streets

	Boulevard	Avenue	Street
Low / Medium-Low Density Residential	Not applicable	Frontage: 18" Pedestrian: 5' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 11'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 6" Min. Width: 11'
Med / High Density Residential	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 12'
Neighborhood Commercial	Not applicable	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 12'
General Commercial	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Not applicable
Mixed / Multi-use	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4' Curb: 6" Min. Width: 12'

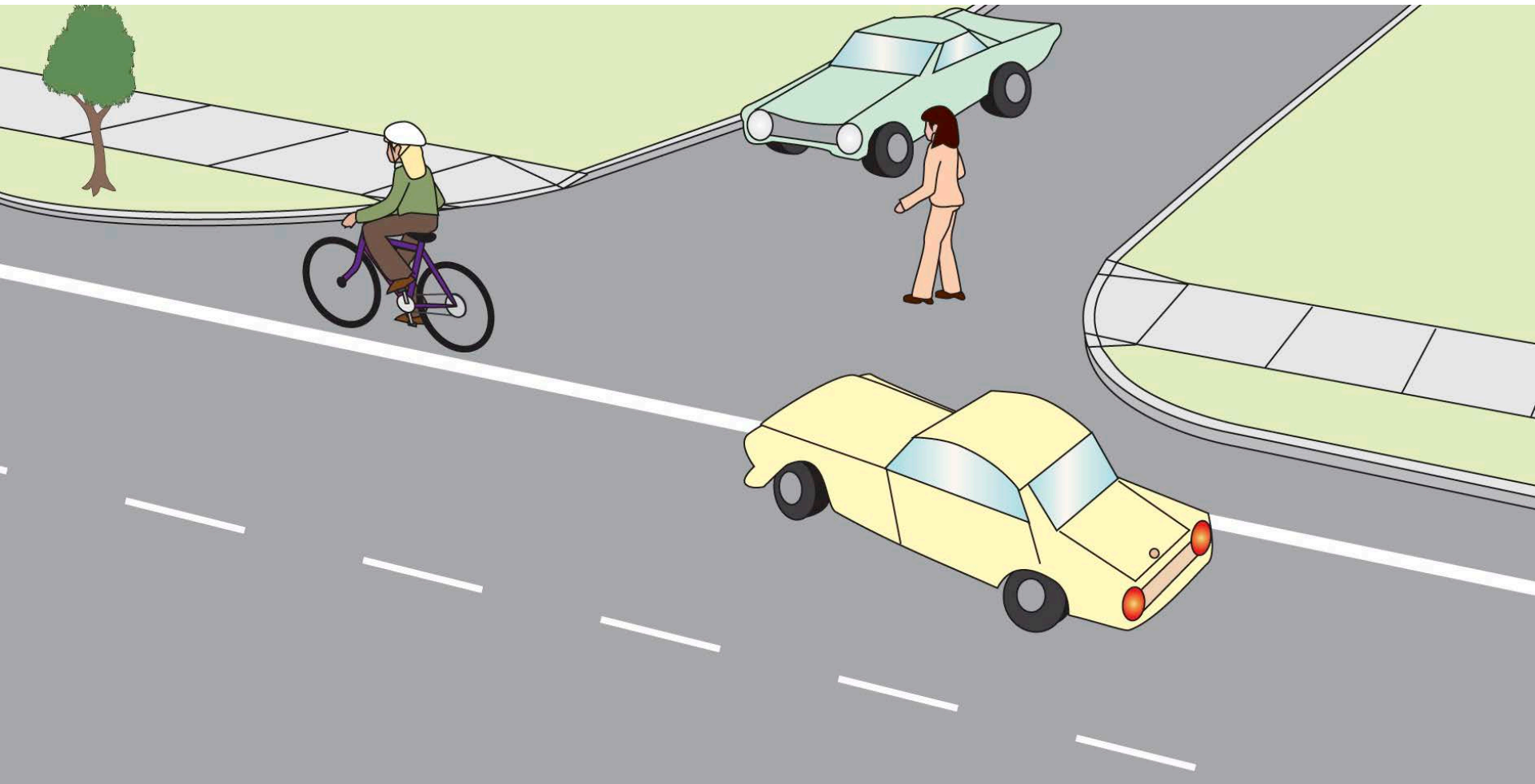
	Boulevard	Avenue	Street
Industrial	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 18" Min. Width: 13'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 18" Min. Width: 12'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 18" Min. Width: 12'
Downtown Core / Main Street	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5' Curb: 6" Min. Width: 14'
Transit-Oriented Districts	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'
Office Park	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 6" Min. Width: 12'	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 6" Min. Width: 12'	Not applicable
Public Facilities	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'

2-50

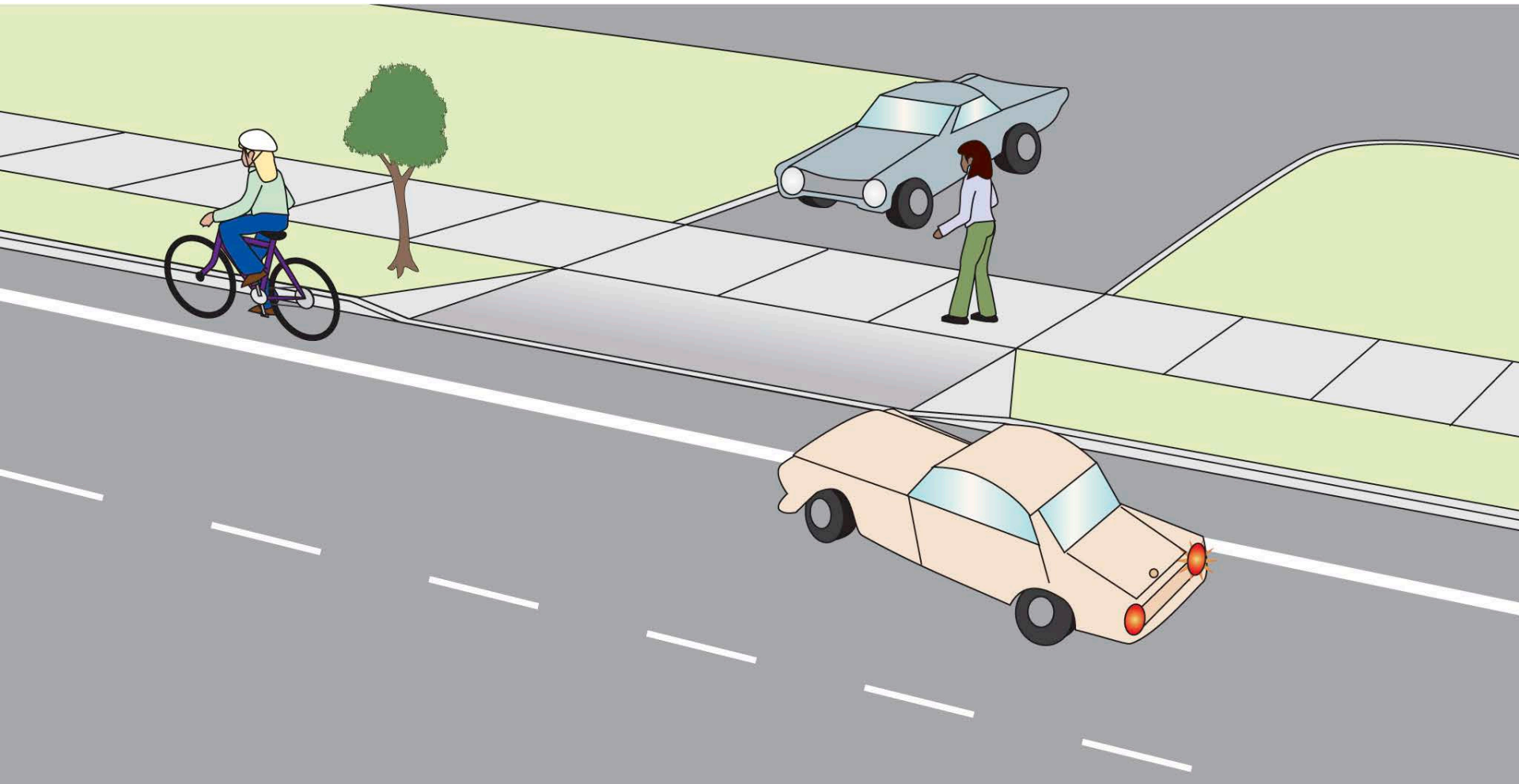
# Driveways

Driveways are the source of most conflicts with motor vehicles on sidewalks





Driveways built like intersections encourage high-speed turns



Driveways built like driveways encourage slow-speed turns

# Intersection or Driveway?

1-53





2-54

Reno NV

- This driveway was built like an intersection
- Driver exits at high speed, not looking at pedestrians



This driveway tells drivers watch for pedestrians



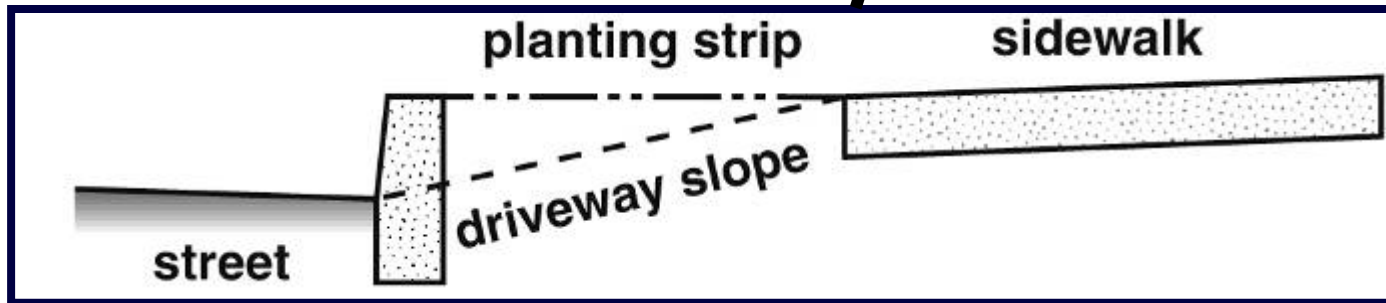
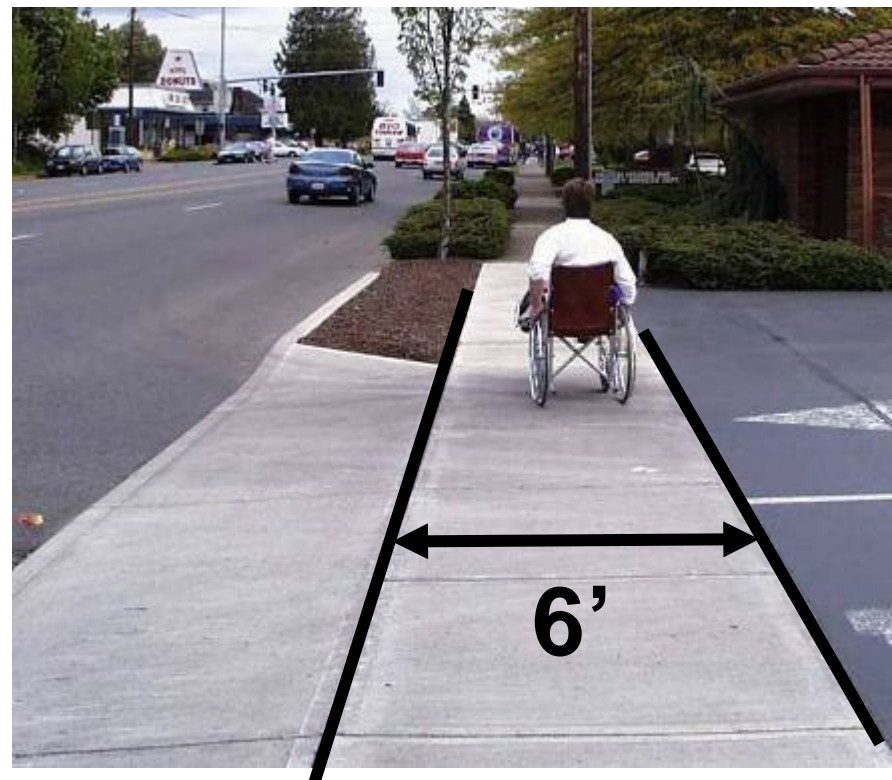
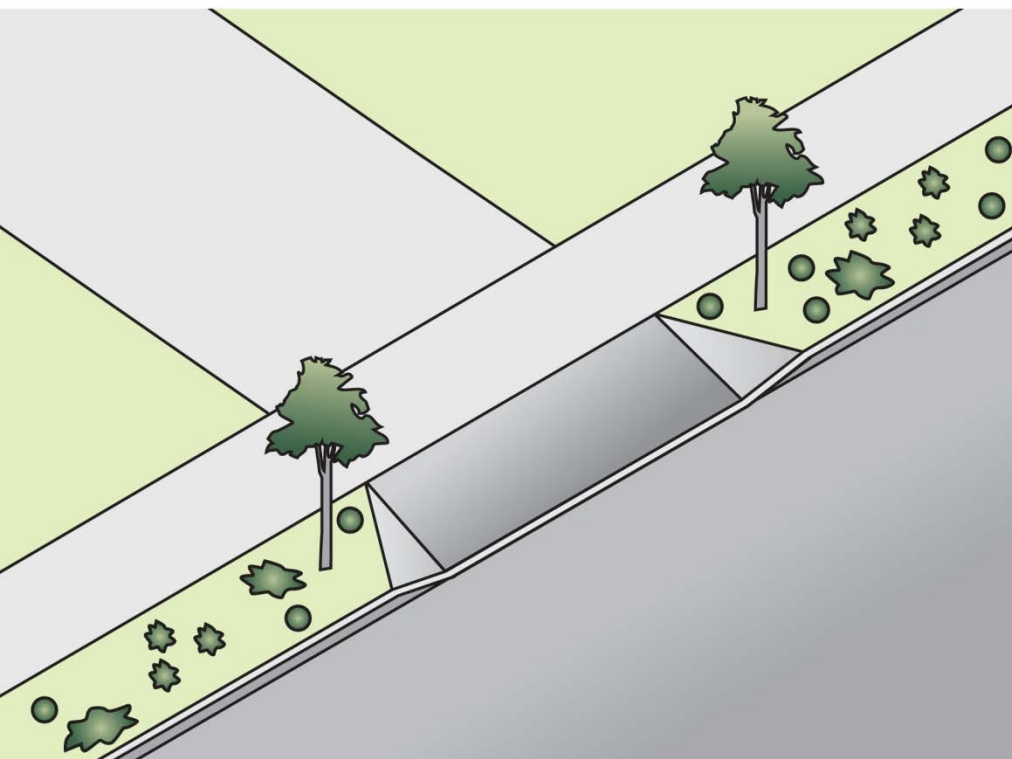
ADA requirements for driveways: minimum pedestrian access route of 3' (soon to be 4') at 2% max cross-slope



# Easier to maintain level access with separated sidewalks

2-57

Salem OR



# Without zone system hard to meet ADA

2-58

Sweet Home OR





2-59

Olympia, WA

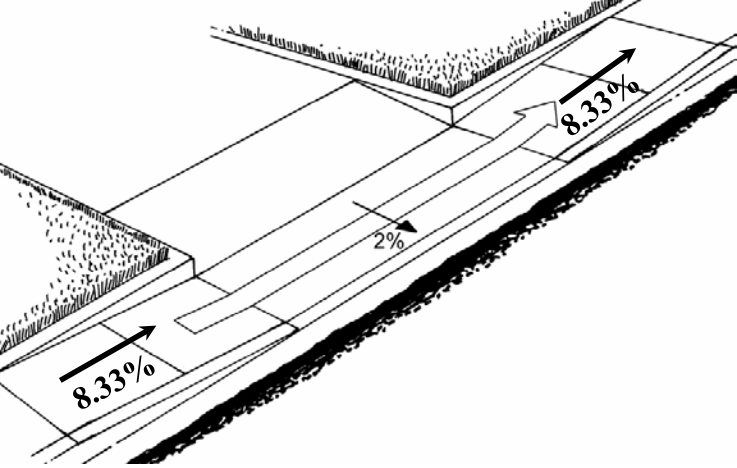
For narrow curbside sidewalks, wrap sidewalk around apron

# Driveway Coaster

2-60



- Most common reason given by wheelchair users using the street
- Driveways are not flat



- Max Ramp Slope 8.33%
- Max Cross Slope 2%

2-61

University Place, WA

- For narrow curbside sidewalks
- Fully lowered sidewalk

# Walking Along the Road – Let's Recap

2-62

## 1. Crash Reduction Factors:

- Rural environments:
  - Paved shoulders reduce ped crashes up to 70%
- Urban environments:
  - Sidewalks reduce ped crashes up to 88%
    - (most sidewalk crashes occur at driveways)

# Walking Along the Road – Let's Recap

2-63

## 2. Sidewalk Design: The zone system

### ▣ What are the 4 zones?

1. The curb zone
2. The furniture/planter/buffer zone
3. The pedestrian/walking zone
4. The frontage zone

# Walking Along the Road – Let's Recap

2-64

## 3. Sidewalk Design: Key characteristics

How should the walking zone be designed?

- Smooth
- Separated from traffic
- Clear of obstructions
- Level cross-slope (max 2%)
- Wide enough to accommodate expected pedestrian volumes



# Walking Along the Road

## Learning Outcomes:

2-65

You should now be able to:

- Describe the operational and safety benefits of shoulders and sidewalks
- Select appropriate designs for sidewalks

2-66

Questions?