

BICYCLE MASTER PLAN

MULTNOMAH COUNTY, OREGON



August, 1990

PREPARED BY
Multnomah County
Department of Environmental Service
Transportation Division

ENACTING ORDINANCE

TO BE DONE

ACKNOWLEDGEMENTS

Development of the Multnomah County Bicycle Master Plan was made possible through the efforts of the following people:

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EXECUTIVE SUMMARY

TO BE DONE

INTRODUCTION

BACKGROUND

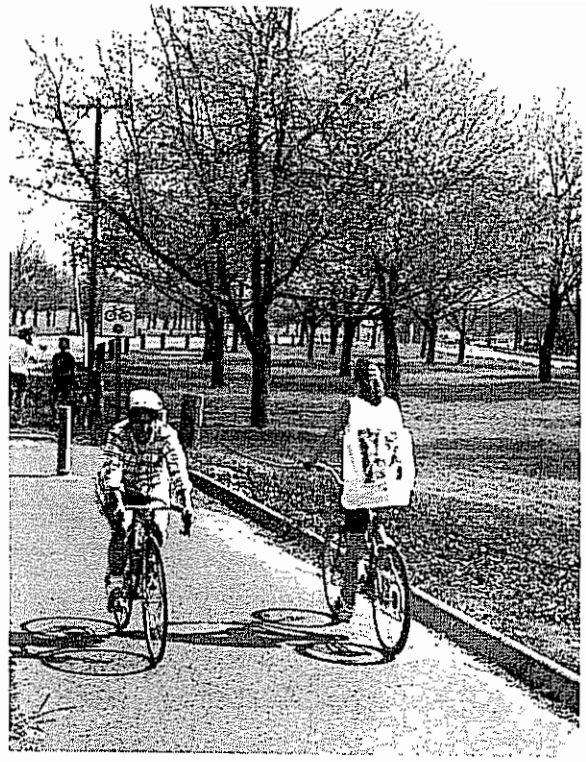
ENVISION THE FUTURE

PLANNING PROCESS

AMENDING THE PLAN

JURISDICTION

INTRODUCTION



An estimated 88,000,000 people currently ride bicycles in the USA, with the number of adult cyclists doubling from 1983 to 1988. Through most of the 20th Century, the bicycle has been an important means of recreation and transportation for children. With increased leisure time available for recreation, and greater awareness of the benefits of physical fitness and exercise, the bicycle has regained its popularity with both adults and young adults. Bicycling is now a family event shared by children, parents, and grandparents.

The bicycle can be utilized as the mode of choice for a variety of trips:

- Commuting - to work or school using the quickest and most direct route.
- Utility - for practical trips within your neighborhood and community.
- Recreation - riding for pleasure and exercise.
- Touring - traveling by bicycle for several days or even cross-country.
- Racing - in various competitive events.

Bicyclists include everyone from youths to senior citizens. Cyclists may ride only during fair weather or all year, regardless of the weather. They may ride because they enjoy the experience, or as an efficient and inexpensive alternative to motor vehicles. Other people ride because it is a primary means of transportation available to them.

The fastest growing style of bicycling in the USA, increasing over 40% from 1983-1988 is mountain bike riding which is not confined to paved roads. The acceptance of cycling as a sport and recreational activity suggests an optimistic outlook for growth during the next 5 years, and greater recognition and respect for cyclists sharing the road.

There are many benefits of bicycling to the community, both to bicyclists and non-bicyclists.

* Bicycles operate on human power and are the most energy efficient form of transportation
  --50 times more efficient than automobiles, and
  -- 3 times more efficient than walking.
* Bicycles produce no air or noise pollution.
* Bicycles can be a vital supplemental transportation mode during gasoline shortages and price increases.
* Bicycles require little space, reducing traffic congestion and parking needs.
* Bicycles are light weight and reduce wear on road surfaces.

Bicycling is regulated, along with motor vehicles in the Oregon Vehicle Code. Cyclists are legitimate user of public road rights-of-way and have equal access to roads in Multnomah County and throughout Oregon.

The State mandates that 1% of the County's share of State Highway Trust Fund monies shall be spent toward planning, design, construction, and maintenance of bicycle and pedestrian facilities within County road rights-of-way (ORS 366.514).

Bicycle facilities are developed in accordance with State of Oregon standards and American Association of State Highway and Transportation Officials (AASHTO) guidelines.

Within this context, and with increased awareness of the benefits of bicycling, Multnomah County has taken a proactive role in implementating bicycle facilities.

Bicyclists are subject to rules of the road as enforced by police agencies. Two-thirds of reported accidents involving bicyclists in Multnomah County from 1983-1988 were the fault of the bicyclists. Bicycle safety education programs and greater traffic enforcement of bicyclists may substantially reduce future bicycle accident rates. The sense of competition between cyclists and motorists on public roads is not improved by lack of awareness by motorists to the needs and rights of cyclists.

The Bicycle Master Plan coordinates continued development of a safe and efficient road and bicycle system. Having a bicycle-friendly bikeway infrastructure will improve the bicycling environment. The Plan identifies several education and information opportunities to further promote compatioility between cyclist and motorists. The aim is to reduce the rate and severity of bicycle-related accidents on Multnomah County roads, and encourage greater bicycle use.

BACKGROUND

Multnomah County addressed the needs of the bicycling public in 1978 by adopting policies within the Comprehensive Framework Plan specifying preparation of a County bicycle plan.

The Bicycle Corridor Concept Plan was prepared and adopted along with an ordinance directing implementation of the proposed routes. This Plan included:

1. Corridors for future bike routes.

2. Recreation routes linking scenic areas and parks.

3. Utilitarian (street) routes that were planned in conjunction with road projects.

Mechanisms to assess route safety, define route alternatives and build facilities were not well defined at this time. However, one major bike path and one bike route were implemented under this plan.

The Framework Plan was substantially revised in 1982 to satisfy State Land Conservation and Development Commission standards. The Bicycle/Pedestrian section of the Physical Support chapter was prepared in response to the transportation goal, within the Statewide Planning Goals. A Bikeways Plan map was adopted that identified future bike routes on County road rights-of-way. A bicycle/pedestrian policy was also adopted specifying:

1. Street improvement projects on roads designated for bikeways shall be constructed to accommodate bicyclists, based on AASHTO bicycle guidelines.

2. A bicycle capital improvement program shall be adopted that prioritized the use of limited Bicycle Fund monies.

3. Various implementation strategies were identified including land and road development projects.

4. Participation in the Metro regional bicycle planning process.

5. Promotion of bicycle travel, and provision of public bicycling information.

ENVISION THE FUTURE

Since 1978 Multnomah County has developed:

4.9 miles of shared bikeways
10.8 miles of bike lanes
2.0 miles of bike paths
17.7 Total miles of bikeways

In addition, many rural roads have been widened 4 additional feet to provide for improved lane sharing. Much of the County's portion of the 40-Mile Loop has been developed.

The 1990 Transportation Capital Improvement Program (CIP) lists over 14 miles of road improvements to be developed by 1995 that include bicycle facilities.

Much of the 133 miles of unbuilt bikeways will be provided as roads are reconstructed to urban standards, through the road capital improvement process. The most vital bikeways, needing to be constructed sooner than scheduled in the Road CIP, will be provided through the Bicycle Capital Improvement Program. Rural roads will be upgraded whenever possible with paved shoulders as repaving occurs. Finally, urban roads already built curb-to-curb can be signed and striped for bikeways relatively easily and without major capital costs.

The end result of the Bicycle Master Plan, after the bicycle system is built out and its policies implemented, will be an infrastructure that adequately accommodates the needs of bicyclists within the integrated and balanced transportation system. Population and economic growth will lead to additional bicycle travel. Developing bikeways and generally making County urban and rural roads safer for motorists and bicyclists to share will add to the comfort level of bicycling. Development of bike paths and completion of the 40 Mile Loop will further promote the growth of bicycling as a means of transportation and recreation.

Area residents and visitors will enjoy easy bicycle access to recreation resources such as the Columbia Gorge National Scenic Area. Increased cost of motor travel will eventually lead to non-motorized travel for certain types of trips. Recreation needs of an urban population will attract bicyclists to rural areas of Multnomah County. An extensive off-road bicycle/pedestrian system will be in demand. The bicycle will continue to be a means of independent transportation for children, and adults will increasingly use bicycles for recreation and utilitarian trips. Bicycling will be a popular family activity.

PLANNING PROCESS

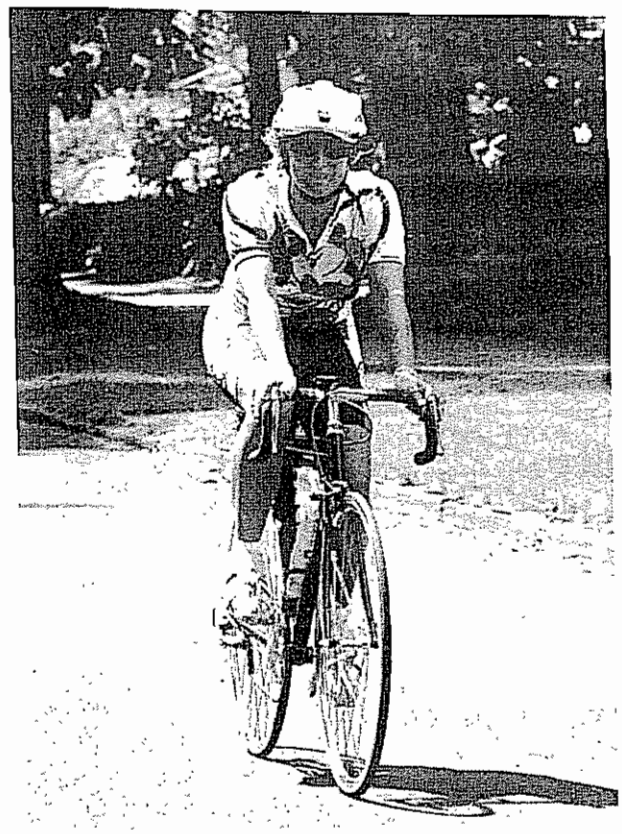
The Bicycle Master Plan is a component of the Multnomah County Master Transportation Plan and the Multnomah County Comprehensive Framework Plan. Local governments are required by the State of Oregon (ORS 197.175) to perform planning that interrelates land use and transportation, with the natural and human environments, and public infrastructure. Public involvement in the planning process is State mandated, as well as Plan adoption following hearings by the Multnomah County Board of Commissioners.

The Bicycle Master Plan includes objectives and policies that are consistent with the adopted County Comprehensive Framework Plan.

Providing a bicycle transportation system that serves residents and visitors, connecting homes to schools, work, shopping, and recreation destinations is consistent with County Policy 33a (Comprehensive Framework Plan) of providing a balanced, safe and efficient transportation system.

Implementation strategies are identified as opportunities to direct County resources towards achievable objectives, and satisfy public needs.

A bicycle capital improvement program will be prepared as a means to implement the Bicycle Master Plan. Potential bicycle capital projects will be evaluated as to their relative value to the community based upon criteria of need. Other opportunities to provide a safe bicycling environment are investigated in the Plan with implementation strategies identified regarding education, enforcement and infrastructure improvements.



Multnomah County Transportation Division undertook in 1989 to update the bicycle portion of the 1982 Comprehensive Framework Plan. The Countywide Bicycle Planning Task Force was formed of concerned citizens to assist in preparing the plan and making recommendations. A representative Sauvie Island Task Force was formed to address the specific needs of bicyclists and residents on Sauvie Island. These citizens in their advisory role provided vital community input to the planning process. Objectives, policies, routes, and strategies were reviewed and revised leading to the recommended Bicycle Master Plan.

The recommended Bicycle Master Plan underwent extensive public review and comment. The revised Bicycle Master Plan was submitted to the Multnomah County Board of Commissioners for public hearing and action on _____, 1990. The Board of Commissioners on _____ (adopted the Bicycle Master Plan by ordinance).

Input from the following local, regional and State governmental agencies was sought to assure that a coordinated countywide bicycle network will result.

City of Fairview
City of Gresham
City of Lake Oswego
City of Portland
City of Troutdale
City of Wood Village
Clackamas County
Washington County
Metropolitan Service District
Mt. Hood National Forest
Oregon Department of Transportation
Oregon Department of Fish and Wildlife
Columbia River Gorge Commission
Multnomah County Parks Services Division
Multnomah County Planning and Development Division
Multnomah County Sheriff's Office

AMENDING THE PLAN

Changes will occur in Multnomah County's demographics, transportation system and land uses patterns. These changes will need to be reflected in future Bicycle Master Plan revisions.

The Bicycle Master Plan is scheduled for revision every five years, coinciding with the update of the Multnomah County Transportation Plan. The Bicycle Capital Improvement Plan is scheduled for revision every two years.

The Bicycle Master Plan may also need to be amended if significant changes in the County occur such as new roads, major land or recreational developments or major government policy changes.

Recommended policy and plan map amendments to the Bicycle Master Plan shall be presented to the Planning Commission and Board of Commissioners for adoption, following public review. The Multnomah County Comprehensive Framework Plan may need to be amended to reflect bicycle policy and plan map changes, in accordance with County and State comprehensive plan amendment procedures.

JURISDICTION

The jurisdiction of the Bicycle Master Plan includes Multnomah County roads, bridges, and bikeways only. Excluded from bicycle planning are roads and bikeways belonging to cities or the State of Oregon, private roads and dedicated streets, and any other land not accepted as County rights-of-way.

Multnomah County roads are located in the following areas:

- Sauvie Island and rural west county
- Urban east county, outside of the City of Portland.
- The following Willamette River bridges:

    1. Sellwood Bridge
    2. Hawthorne Bridge
    3. Morrison Bridge
    4. Burnside Bridge
    5. Broadway Bridge.
    6. Sauvie Island

- Rural east County
- Several westside unincorporated pockets.

OBJECTIVES
POLICIES
PROGRAM
IMPLEMENTATION
AND
FUNDING

OBJECTIVE #1 Develop and maintain an extensive network of bicycle transportation facilities that provide safe, efficient, and enjoyable bicycle travel.

POLICIES

A: FACILITIES

Provide bicycle facilities that accommodate the various needs of the bicycling public.

1. Bicycles shall be an integral component of the balanced and integrated County transportation system such that Multnomah County roads and bridges shall be made safe and accessible to bicyclists.

2. A comprehensive and connected network of bikeway facilities shall be designated for ultimate development in the adopted Bikeway Plan map.

B. FUNDING:

Systematically budget and program County Bicycle Funds, based upon criteria of need, through a periodically revised and approved bicycle capital improvement plan and program; seek supplemental funds from a variety of other potential revenue sources.

C. DEVELOPMENT:

Continue to develop new or improved County bikeway facilities and bicycle-friendly streets and roads, in a systematic and programmed manner.

D. HAZARDS:

Enable safe bicycle use of County bikeways through timely maintenance, and through remedies to avoidable hazards and conflicts.

E. PARTICIPATION:

Actively seek public participation in County bicycle planning and development processes; continue to coordinate with other public agencies and the private sector in planning and providing for the bicycling public.

IMPLEMENTATION STRATEGIES:

1. Adopt by reference and implement Oregon Department of Transportation and the American Association of State Highway and Transportation Officials (AASHTO) bicycle standards or guidelines concerning design, construction and maintenance of bikeway facilities.

2. To the greatest extent possible, County roads shall be made safe, bicycle-friendly facilities through design and construction practices, and maintenance and traffic control procedures.

3. Identify opportunities and develop implementation means to provide bikeways outside of public road rights-of-way. Such potential future bikeways facilities as: utility corridors, greenways, railroad rights-of-way, levees and dikes, public and private land develop, and joint development projects are incorporated by reference in the Bikeway Plan map.

4. Promote greater use of intermodal trips in the region with the acquision or refitting, by transit authorities, of transit vehicles to accommodate bicycles.

1. Multnomah County road and bikeway improvement plans and programs shall fund the design and construction of bicycle facilities through biannual capital budget processes that:

   - List and prioritize possible bikeway projects in relation to criteria of greatest need.
   - Schedule capital expenditures in relation to actual income.
   - Implement projects on an annual basis.
   - Is revised and adopted by the Board of County Commissioners, following public review, on a biannual basis.

2. Discover and capture supplemental bicycle revenue and contributions to fund bicycle safety programs, and provide for bikeways outside of public road rights-of-way. Potential sources of funds and services may include:

   - Other governmental agencies.
   - Private donations, and contributions of materials or services.
   - Joint public/private projects.
   - Grants and other sources unknown.

1. Take advantage of opportunities to add to the County inventory of bikeways:

   - As new roads and bridges are developed.
   - As existing roads and bridges are reconstructed or upgraded.
   - As road and bridge maintenance programs are implemented, such as the County Pavement Management System.
   - In cooperation with the private sector through the land development permit and right-of-way permit processes.
   - By constructing bikeway capital projects through the Bicycle Capital Improvement Plan and Program.
   - Through joint projects with public agencies and the private sector.

2. Encourage or require through County permitting authority, secure and convenitent, weather-protected bicycle parking and storage facilities as new development or redevelop occurs.

1. Provide a relatively high level of regular scheduled maintenance of County urban and rural bikeways, including sweeping, mowing, pavement repair and drainage, that is sensitive to the particular needs of bicyclists.

2. Respond promptly to reports by the public and others, of potentially unsafe conditions for bicyclists on County roads and bikeways.

3. Implement traffic management solutions to bicycling hazards, and mitigate conflicts between bicyclists and other users of County rights-of-way.

1. Seek ongoing public input and involvement in revising the Bicycle Master Plan and Capital Improvement Plan, and addressing other bicycling needs and concerns.

   - Establish and staff a countywide citizen bicycle advisory committee to address current and future bicycling problems and opportunities.
   - Provide timely response to public inquiries for bicycling information by publishing and distributing informational and educational materials regarding bicycle safety and bicycling opportunities.
   - Cooperate with other government agencies in providing bicycling information.
   - Coordinate the Multnomah County bicycle system and program with other local, regional, State and federal governments in providing a comprehensive bicycle network and a safe, enjoyable bicycling environment.

OBJECTIVE #2 Increase bicyclist and motorist knowledge and awareness so as to resolve hazards and conflicts of bicycling and reduce the occurrence of bicycle related accidents.

POLICIES:

A. AWARENESS

Increase public awareness of bicycling opportunities and benefits, rules of the road, and safe riding skills by providing and distributing public bicycle information materials.

B. SAFETY

Support various organizations, and seek sources of funding and cooperation in providing bicycle safety education and training.

C. ENFORCEMENT

Encourage and facilitate a greater level of enforcement of vehicle laws so as to reduce the occurrence of bicycle/motor vehicle conflicts, and the rate of bicycle-related accidents.

IMPLEMENTATION STRATEGIES:

1. Revise the County bicycle information brochure as needed to provide current bicycling information.

2. Participate with other organizations in providing public bicycling information.

3. Provide adequate identification and traffic control signage on County bikeways so as to:

   - Alert bicyclists and motorists to the presence of designated bikeways.
   - Alert motorists of the bicycle rights of way and requie motorists to yield when appropriate.

1. Promote bicycle safety education and training through various channels including:

   - Multnomah County Sheriffs other police agencies, and courts.
   - Schools and Educational Service District (ESD).
   - Service organizations and bike clubs.
   - Private enterprises.
   - County community service agencies and vendors.

2. Seek sources of funding and support to provide bicycle safety education and training.

1. Work with the Multnomah County Sheriff's Office and other police agencies to:

   - Educate officers of the need to enforce lawful operation of bicycles.
   - Provide bicycle safety education.
   - Seek to reduce the number of bicycle-related accidents where the bicyclist is at fault.
   - Alert motorists of the rights of bicyclists on County roads.

PROGRAM IMPLEMENTATION

With the adoption of the Bicycle Master Plan, the process of achieving or implementing plan proposals and policies begins. Various opportunities and programs exist by which to further this implementation process. The following is a list of actions that will help to realize the bikeway plan through the Transportation Division Strategic Plan.

1. Construction of bikeway projects can begin based upon the bicycle capital improvement project schedule.

2. Existing streets that are 1) built curb-to-curb to urban standards, and 2) designated for a bikeway on the Bikeway Plan Map can be signed and striped for the type of bikeway facility appropriate to each street.

3. A higher level of bikeway maintenance can be identified as a County maintenance objective resulting in a more extensive and frequent mowing and sweeping program.

4. Culverts, foglines, and other road appurtenances can be modified to create a more bicycle-friendly environment.

5. Construction of bikeways as designated on the Bikeways Plan Map can occur as roads are constructed or reconstructed through the Transportation Capital Improvement Program.

6. Rural roads, where limited site distances or other hazards create potential conflicts between motorists and bicyclists, can be identified and shoulder bikeways paved to reduce conflicts and improve road safety.

7. Wider rural roads can also be implemented as part of the County pavement management system as roads are scheduled for repaving.

8. The County-published "Peddler's Pamphlet" can be revised with revised bicycling information.

9. Opportunities to provide mountain bike paths or trails such as unused County rights-of-way can be investigated as to their implementation feasibility.

10. The availability of bicycle-sensitive traffic control hardware should be assessed as well as the cost and process to install such hardware on bikeways.

11. Create a county-wide citizen committee to advise Multnomah County on bicycle problems and opportunities.

12. Work with various agencies, organizations and businesses to sponsor and provide bicycle safety training and education.

13. Continue to work with other local, regional and State governments, and the 40 Mile Loop Land Trust to coordinate bikeway planning and development efforts.

14. Incorporate standards and provisions for bicycle storage and parking within the County zoning ordinance.

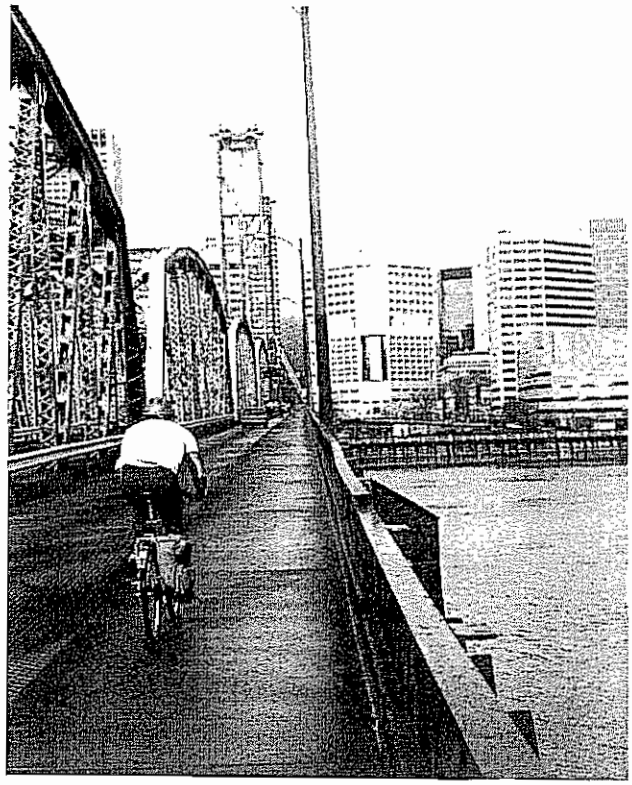
15. Work with public transit providers to facilitate the intermodal combination of bicycling and bus or train trips, with the addition of bicycle parking facilities at transit stops and the allowance of bicycles on transit vehicles.

PROGRAM FUNDING

Multnomah County bicycle funds are presently limited to State-collected gas tax monies in the Oregon Highway Trust Fund that are returned to the County. One percent of the gas tax monies retained by the County are dedicated to design, construction and maintenance of pedestrian and bicycle facilities. The remaining portion of the County gas tax monies are used for developing and maintaining other County transportation facilities, such as roads and bridges.

Gas tax monies are a reasonably secure source of revenue, but with spending restrictions. The level of income is relatively small in relation to the need for additional bikeways in Multnomah County. As bikeways continue to be developed by the County, available revenue for capital projects will decrease in relation to the increased cost to maintain the expanding system.

Another constraint to use of gas tax money for bikeways is the requirement to spend the money only within road rights-of-way. It is difficult for the County to develop and maintain 40-Mile Loop and mountain bike paths that are not within road rights-of-way, for example. This condition leaves future implementation of the Columbia/Sandy River and Johnson Creek 40-Mile Loop bike paths in questions. Funding for bicycle education programs is also uncertain given existing spending parameters.



One objective of the Funding Policy and Implementation Strategy of the Plan is to seek additional funds to supplement existing revenue sources, and to leverage available money to the greatest extent possible. Additional resources may be available within the County or through other governmental agencies. The private sector can be instrumental in the development of bikeways through land dedication, within development projects, and other creative possibilities such as joint development projects.

The intent of the funding proposal is to use gas tax revenue for bike projects within County rights-of-way, and seek additional, less restricted resources for the other necessary, or desirable bicycle facilities and services.

FACILITY CLASSIFICATION SYSTEM

Bikeways on Multnomah County roads can be classified into five types of facilities depending on traffic characteristics, street geometry, and level and type of bicycle usage. Unless bicyclists are prohibited by law from using a street or bridge, all Multnomah County streets are part of the bicycle network. Bikeway classifications on County roads include:

Bike paths are exclusive bicycle facilities that are physically separated from roads and motor vehicles. Bike paths provide excellent recreational and family riding having limited conflicts with motor vehicles.

Bike lanes are preferential or exclusive bicycle facilities, signed and striped within the roadway to provide separate bicycle and motor vehicle travel lanes. Bike lanes are preferred where traffic volumes or speeds are relatively high, and provide the urban bicycle network between neighborhoods and communities.

Lane-Sharing Bikeways are signed facilities that share the roadway with motor vehicles, usually on low volume and low speed urban streets. Lane-sharing bikeways connect neighborhoods to bike lane within the bikeway hierarchy.

Shoulder bikeways are provided on rural roads by widening and paving road shoulders. Shoulder bikeways offer added road width to better accommodate bicycle travel outside of motor vehicle travel lanes.

Shared Roadways are County roads where bikes share the road and right-of-way with other vehicles.

Development of bikeways can occur in several ways:

1. Streets that are built to urban standards can have the appropriate type of bicycle facility added to the roadway based on criteria as described on Page 26.

2. Existing substandard streets can be reconstructed to urban standards with bikeways if the street has been designated on the Bikeway Plan Map.

3. Entirely new streets may be developed. Bikeways can be included based on projected use.

4. Upgrading an existing bikeway, from a shared roadway to a lane-sharing bikeway for example can occur as conditions change, such as higher vehicle speeds or greater traffic volumes.

The bikeway classification system distinguishes urban from rural facilities, and is closely related to road functional classifications, i.e., collector or arterial streets. The following upgraded bikeway descriptions relate to:

A) Roads already built to standards; and
B) Roads to be built or reconstructed at a future date. General criteria are listed to guide the determination of bikeway type, however specialized or unique conditions may also affect the determination.

Upgrading a shared roadway to a lane-sharing bikeway provides greater awareness of bicyclists using the road, and offers bicyclists the use of the developed bicycle network to arrive at their destination. Prevailing traffic speeds should remain below 35 mph, with average daily traffic should be below 5000 vehicles. Minimum width of the shared lane should be 12 feet.

Lane-shared bikeways may be upgraded to bike lanes if prevailing traffic speeds exceed 35 MPH, or where traffic volumes or bicycle-related accidents warrant the addition of bike lanes.



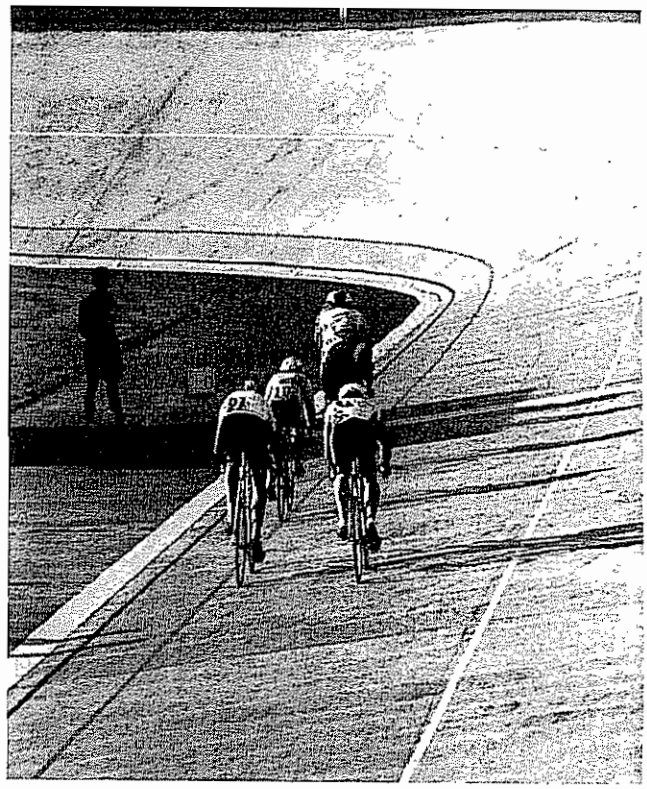
BIKEWAY FACILITIES ON COUNTY ROADS BUILT TO STANDARDS

		Bike Use	Travel Lanes	Median Lanes	Bike Lanes	Turn Lanes	Parking Lanes	Pavement	ROW	Average Daily Traffic @ Speed (MPH)	Shoulder	Bikeway Signing	Bikeway Striping	Notes
URBAN														
Locals														
Residential	A.	Shared Road	1-16'				2-8'	32'	50'	< 1000 @ 25				
		Lane-Share	1-16'				2-8'	32'	50'	< 1000 @ 25		Yes		
	B.	Shared Road	1-12'				2-8'	28'	50'	< 1000 @ 25				Parking May Be One Side Only
Commercial	A.	Shared Road	2-10'				2-8'	36'	50'	< 1000 @ 25				
	B.	Shared Road	2-12'				2-10'	44'	60'	< 1000 @ 25				High Truck Volume
		Lane-Share	2-12'				2-10'	44'	60'	< 1000 @ 25		Yes		High Truck Volume
Industrial	A.	Shared Road	2-11'				2-8'	38'	50'	< 1000 @ 25				
		Lane-Share	2-11'				2-8'	38'	50'	< 1000 @ 25		Yes		
	B.	Shared Road	2-12'				2-10'	44'	60'	< 1000 @ 25				Large Truck Use
		Lane-Share	2-12'				2-10'	44'	60'	< 1000 @ 25		Yes		Large Truck Use
Collectors														
Neighborhood	A.	Shared Road	2-11'				2-8'	38'	50'	1-4000 @ 30				
		Lane-Share	2-11'				2-8'	38'	50'	1-4000 @ 30		Yes		
Major	A.	Shared Road	2-12'				2-10'	44'	60'	4-13,000 @ 30				
	B.	Bike Lanes	2-11'		2-5'	1-12'		44'	60'	4-13,000 @ 30		Yes	Yes	No Parking
Arterials														
Minor	A.	Shared Road	2-12' & 2-14'	1-14'				66'	80'	13-20,000 @ 35-40				No Parking, Res./Comm. Mix
	B.	Bike Lanes	4-11'	1-12'	2-5'			66'	80'	13-20,000 @ 35-40		Yes	Yes	No Parking
	C.	Shared Road	2-12' & 2-13'			1-12'	2-8'	66'	80'	13-20,000 @ 35-40				
	D.	Shared Road	4-11'	1-12'			2-8'	72'	90'	13-20,000 @ 35-40				W/Turn Lanes
Major/	A.	Shared Road	2-12' & 2-14'	1-14'				66'	80'	20-30,000 @ 35-45				High Volume, No Parking
Principle	B.	Bike Lanes	4-12'	1-14'	2-5'			72'	90'	20-30,000 @ 35-45		Yes	Yes	High Volume, No Parking
	C.	Shared Road	4-12'	1-14'			2-8'	78'	100'	20-30,000 @ 35-45				High Volume, W/Parking
RURAL														
Locals		Shared Road	2-12'					24'	50'		2-4' Gravel			
Collectors		Shldr Bikeway	2-12'					32'	60'		2-8' Paved			

BIKEWAY PLAN MAPS

Bikeway Plan Maps designate routes that will ultimately be developed to standards that provide for bicycle travel. Adopted bikeway routes are shown on five Bikeway Plan Maps representing County jurisdiction in the following areas:

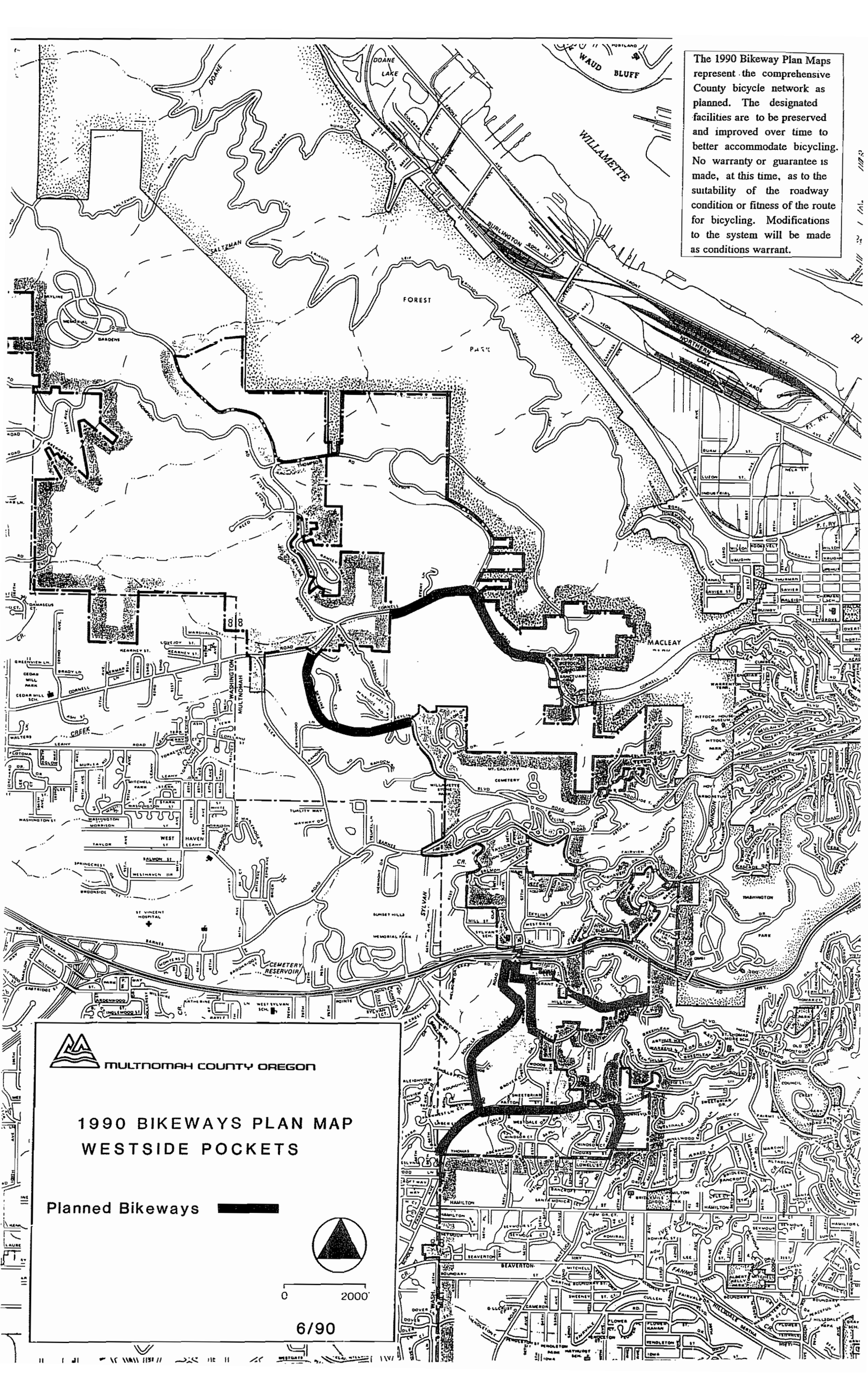
1. Southwest Unincorporated Areas
2. Westside Unincorporated Areas
3. Willamette River Bridges
4. Northwest County: Tualatin Hills and Sauvie Island
5. East County: Urban, Rural and Columbia River Gorge

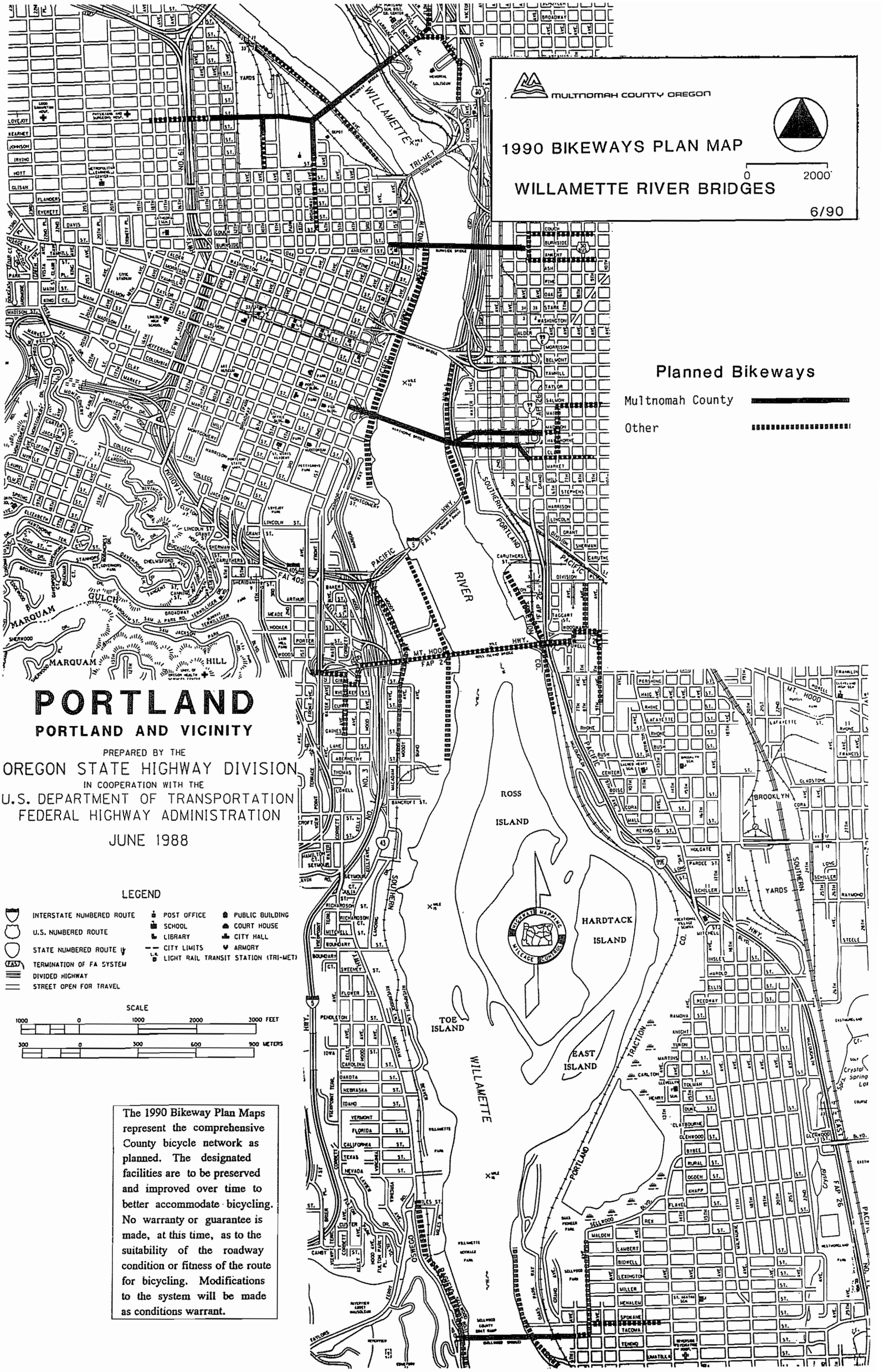


Northwest and East County Bikeway Plan Maps are included separately.

Routes not designated but adopted by reference include: unused County rights-of-way as potential mountain bike trails, future abandoned railroad rights-of-way, utility corridors, levees, dikes, and greenways.

The 1990 Bikeway Plan Maps represent the comprehensive County bicycle network as planned. The designated facilities are to be preserved and improved over time to better accommodate bicycling. No warranty or guarantee is made, at this time, as to the suitability of the roadway condition or fitness of the route for bicycling. Modifications to the system will be made as conditions warrant.


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MULTNOMAH COUNTY OREGON
1990 BIKEWAYS PLAN MAP
WESTSIDE POCKETS
Planned Bikeways
0
2000'
6/90
WILLAMETTE
FOREST
PARK
MACLEAY
BEAVERTON
SALTZMAN
THOMPSON
CORNELL
BARNES
BURNSIDE
SYLVAN
CEMETERY
RESERVOIR


MULTNOMAH COUNTY OREGON
1990 BIKEWAYS PLAN MAP
0 2000
WILLAMETTE RIVER BRIDGES
6/90
Planned Bikeways
Multnomah County
Other
PORTLAND
PORTLAND AND VICINITY
PREPARED BY THE
OREGON STATE HIGHWAY DIVISION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
JUNE 1988
LEGEND
INTERSTATE NUMBERED ROUTE
U.S. NUMBERED ROUTE
STATE NUMBERED ROUTE
TERMINATION OF FA SYSTEM
DIVIDED HIGHWAY
STREET OPEN FOR TRAVEL
POST OFFICE
SCHOOL
LIBRARY
CITY LIMITS
LIGHT RAIL TRANSIT STATION (TRI-MET)
PUBLIC BUILDING
COURT HOUSE
CITY HALL
ARMORY
SCALE
1000 0 1000 2000 3000 FEET
300 0 300 600 900 METERS
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WILLAMETTE
TRI-MET
BURNSIDE BRIDGE
MORRISON BRIDGE
HAWTHORNE BRIDGE
MARQUAM GULCH
MARQUAM HILL
PACIFIC HWY.
SOUTHERN PACIFIC
MT. HOOD HWY.
FAP 26
FAI 405
RIVER
ROSS ISLAND
HARDTACK ISLAND
TOE ISLAND
EAST ISLAND
WILLAMETTE
TRACTION
PORTLAND
YARDS
BROOKLYN
SOUTHERN
MT. HOOD
HIGHWAY
MULTNOMAH MARINE MILEAGE CORRIDOR

BICYCLE HAZARDS AND PROBLEMS BIKEWAY DESIGN AND MAINTENANCE GUIDELINES

The following section of road design, engineering and maintenance guidelines illustrates ways the County could implement the bikeway system. For specific bikeway guidelines and standards, reference must be made to the current American Association of State Highway and Transportation Officials bicycle guidelines; State of Oregon: Bicycle Master Plan and amendments; Federal Highway Administration: Manual on Uniform Traffic Control Devices; and the Illuminating Engineering Society: IES Lighting Handbook.

BICYCLE HAZARDS AND PROBLEMS

Bicyclists are considered by the State of Oregon to be legitimate users of public roads and have the same rights and duties as drivers of motor vehicles. Bicyclists are required to obey all rules of the road as apply to motor vehicles, except regulations which specifically exclude bicycles. County roads not specifically prohibited to bicyclists can, and probably will be used for bicycling. Multnomah County is pursuing a policy of providing an extensive connected network of designated bikeways and a bicycle-friendly road system.

Bicycles often require roadway design, engineering and maintenance practices that directly apply to the needs and characteristics of this non-motorized means of travel. This section describes some of the hazards and problems that maybe encountered by bicyclists.

Lane Sharing:

Where outside travel lanes are 12 foot wide or wider, motor vehicles exercising reasonable caution when overtaking a bicyclist should be able to "share the lane" and pass without crossing into the opposing traffic lane. However, the passing vehicle will often cross into the opposing lane and even delay the passing maneuver until it can be safely executed. With lane sharing, higher speeds and large vehicles, i.e., trucks add to the risk of the bicyclist, especially on narrower roads or where no paved shoulder exists.

Roads with uphill grades result in bicycles traveling at slower speeds while climbing. Overtaking motor vehicles would necessarily need to reduce speed until it is safe to execute the passing maneuver. Also where sight distance is impaired, overtaking motorists must follow bicyclists until it is safe to pass if the opposing lane is used to execute the pass.

Additional lane width or paved shoulders would be beneficial on uphill lanes and where sight distance is impaired. Sharing of the travel lane would be facilitated, and delays between bicyclists and motorists reduced.

On roadways with outside lanes less than 12 feet wide and without paved shoulders, overtaking traffic must use the opposing traffic lane to safely pass the bicyclist. Experienced bicyclists will realize that the lane is too narrow to effectively share with the motorist, and therefore will "take the lane."

In this manner, the unsafe situation of sharing a lane of substandard width is avoided. The unspoken message is sent to the overtaking motorist to pass using the opposing lane when it is safe to do so. Motorists unfamiliar with bicyclist behavior may not understand this maneuver, or resent the delay. Informing and educating motorists is an important component of the Bicycle Program to explain such situations as lane sharing.

Substandard lane widths of less than 12 feet should be remedied:

1. On uphill grades
2. Where sight distance is impaired
3. On shared bikeways
4. On rural County roads

Shoulder Bikeways:

Roads with paved shoulders can be quite useful for bicycle travel. There are several factors that need to be considered when designing shoulder bikeways.

1. Bicycles typically have narrow, high pressure tires that affect cyclists' balance and stability on irregular surfaces. Rural roads can best accommodate bicyclists if they have a smooth all-weather, paved shoulder. A clean and smooth shoulder can provide a rural bicycle facility, separated from motorized traffic, that is safer than shared lanes. Paved shoulders will result in more predictable bicycle travel and less congestion between motorist and bicyclist, by placing bicycles in a separate travel lane.

2. Bicycles are subject to lateral aerodynamic forces caused by large motor vehicles such as trucks, buses, and recreational vehicles. The effect of air turbulence increases with increased speed of the motor vehicle and decreased distance between the two vehicles.

On roads with substantial truck or bus traffic, and particularly roads where the prevailing speed of motor vehicles is greater than 45 MPH, precautions should be taken to reduce the hazard and risk of accidents to bicyclists from lateral aerodynamic forces.

3. Regardless of the width of shoulder bikeway, the outside edge is seldom used by bicyclists. Along this edge there may be drainage problems, intrusion by vegetation, debris not swept off or blown off by motor vehicles, and raveling of pavement edges. The effective width of the shoulder bikeway is therefore reduced.

   The riding style and confidence level of the bicyclist, and traffic conditions (speed and volume) will determine where the bicyclist will ride within the effective width of the shoulder bikeway. As a general principle, bicyclists will ride further to the right as traffic volumes and traffic speeds increase.

Road Hazards:

Road conditions that are usually not hazardous to motorists, present special problems to bicyclists. Potential road hazards to bicycles should be considered during road design and construction, and in road maintenance procedures. The following is a list of bicycle road hazards and problems that the County can affect:

a. Drainage grate inlets can pose a hazard to bicycle travel. Multnomah County has sought to eliminate all drainage grate conditions that trap the bicycle wheel and cause the bicyclist to loose control. However when wet, drainage grates become slippery and can cause the bicyclist to loose control. Bicyclists tend to steer away from drainage grates to avoid this hazard. By steering left, the bicyclist may encounter another hazard from overtaking vehicles.

   One remedy would have drainage grates located outside of bicycle travel lanes. A drainage facility used recently by the County sits inside and flush with the curb and thus eliminates this bicycle hazard.

b. Upon new construction, reconstruction or resurfacing, in-road fixtures such as utility covers and drainage grates need to be adjusted so that they are flush with the finish grade rather than sunken below or projecting above grade.

c. Raised roadway reflectors provide valuable safety benefits to motorists. However, "buttons" are a surface irregularity that can pose a hazard to bicyclists. This is especially true when the reflectors are placed in or near bicycle travel lanes where they may deflect the bicycle into the traffic lane. If no other alternative is available, reflectors need to be installed outside of the bikeway and have a beveled front edge.

d. Extruded curbs, when used as a barrier between motorist and bicyclist, can be a hazard to both. Extruded curbs also cause debris to collect inside the bikeway, and are a maintenance problem when sweeping or overlaying the roadway. Extruded curbs should not be used to delineate bikeways. If a physical barrier is necessary, 32" G.M.-type concrete barriers are superior since they provide safety advantages and discourage accumulation of debris.

e. Sand, gravel, glass, and other debris in the bicycle travel lane is hazardous to bicycling. Regular sweeping of the bikeway can control the accumulation of debris, but cannot eliminate the problem. Debris is often drawn onto the pavement from adjacent unpaved streets, driveways, parking areas, and farming operations. An effective solution to this problem is to pave an apron or approach to the roadway from unpaved areas. This practice will lessen the need for debris removal on the bikeway.

Intersections:

Bicyclists are subject to the same means of traffic control as motorists. For bicyclists to properly obey traffic control devices such as traffic lights, these devices must be selected and installed to accommodate bicycles as well as motor vehicles.

Traffic control devices should be placed so they can be seen by bicyclists who are correctly positioned on the roadway. If the signal is unable to detect a bicycle, the bicyclist may opt to proceed through the intersection against the light. Detectors for traffic-activated signals may need to be placed in the bicycle travel lane and capable of detecting bicycles. Push button signal activators, placed to be visible and accessible to the bicyclist, can remedy this problem.

Bicycle lanes often begin or end short of the intersection. This alignment does not provide necessary traffic control for motorists and bicyclists. Congestion may result, particularly if the motorist or bicyclist is inexperienced with this situation. One notable problem is the routing of bicyclists through an intersection while motorists seek to turn right correctly from the right-hand lane. Traffic solutions that have been successfully implemented in other communities should be evaluated with the objective of providing a more comprehensive bicycle network and reducing congestion.



Railroad Crossings:

Railroad crossings are particularly hazardous situations to bicyclists. The problem is aggravated by diagonal crossings and frequent wet, rainy conditions. Slippery railroad crossings, irregular surfaces, and the chance that the bicycle wheel will be caught in the rail flangeway could each lead to loss of control. Several engineering and design solutions are available to mitigate these problems, and should be used where bikeways intersect with railroad crossings.

Road Maintenance Needs:

Bicycling safety can be compromised by inadequate maintenance. A safe road surface is essential for a pleasurable riding experience. Potholes, bumps, seams, and debris can have a minor impact on motor vehicles. However, these conditions can cause loss of control of the bicycle, or conflicts with motorists as the bicyclist avoids these hazards.

Bicycles require a higher standard of road maintenance than motor vehicles. Bicycle travel lanes need to be maintained free of potholes, bumps, corrugations, seams, fragmented pavement edges, gravel, glass, vegetation, and other debris or obstacles that detract from a smooth and safe riding surface.

Maintenance of road facilities frequented by bicyclists does not require changes in the type of maintenance activities that occur. Instead, road maintenance in these situations needs to focus on the particular and unique needs of bicyclists.

LANE SHARING ROADS

A shared roadway should safely accommodate both motor vehicles and bicycles, and is a reasonable bicycle facility for most County roads. Lane sharing occurs where bike lanes or paved shoulders are not available to the bicyclist.

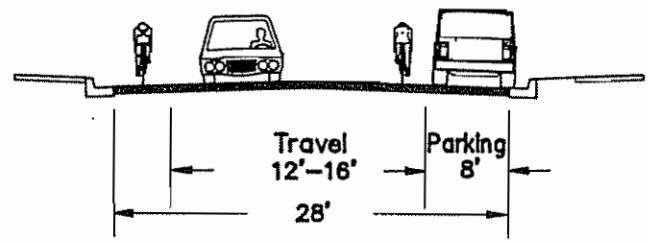
Sufficient lane width along with traffic volumes and speeds are important variables in developing shared roadways. The objective is for motorists and bicyclists to each use the shared roadway without unduly compromising the other's level of service and safety.

The optimum width of the shared lane is 14 feet which allows bicyclists and motorists to operate side-by-side. Lanes wider than 14 feet would encourage motorists to travel two abreast. Lane width on shared roadways is based on usable pavement width and is measured from lane strip to pavement edge line excluding curbs, gutters or raveled pavement edges.

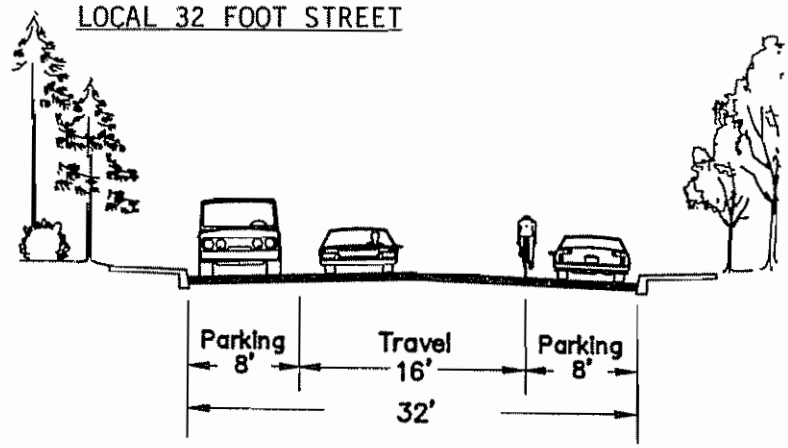
Minimum lane width of a shared roadway should be 12 feet which is most appropriate where traffic volumes and speeds are relatively low. On uphill slopes greater than 5%, where sight distance is impaired, or where traffic volumes exceed 4,000 vehicles daily, additional lane width is needed for added safety.

Lane sharing should not be encouraged on roads having heavy usage by large vehicles such as trucks or buses, or where the prevailing traffic speed is greater than 45 MPH. In such cases, shoulder bikeways, bike lanes or alternate bikeway routes should be considered.

LOCAL 28 FOOT STREET



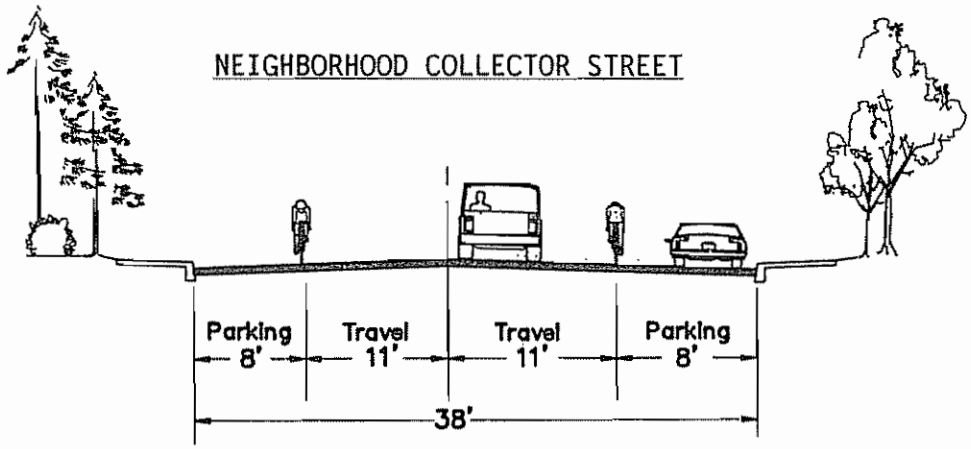
LOCAL 32 FOOT STREET

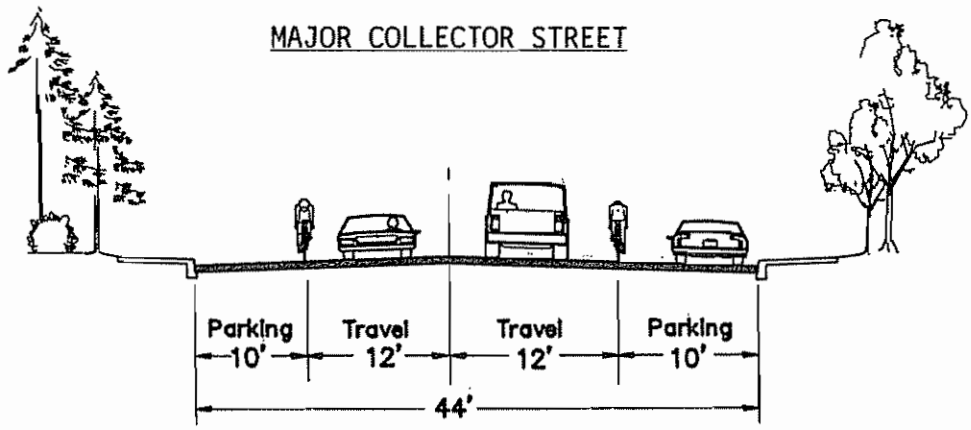


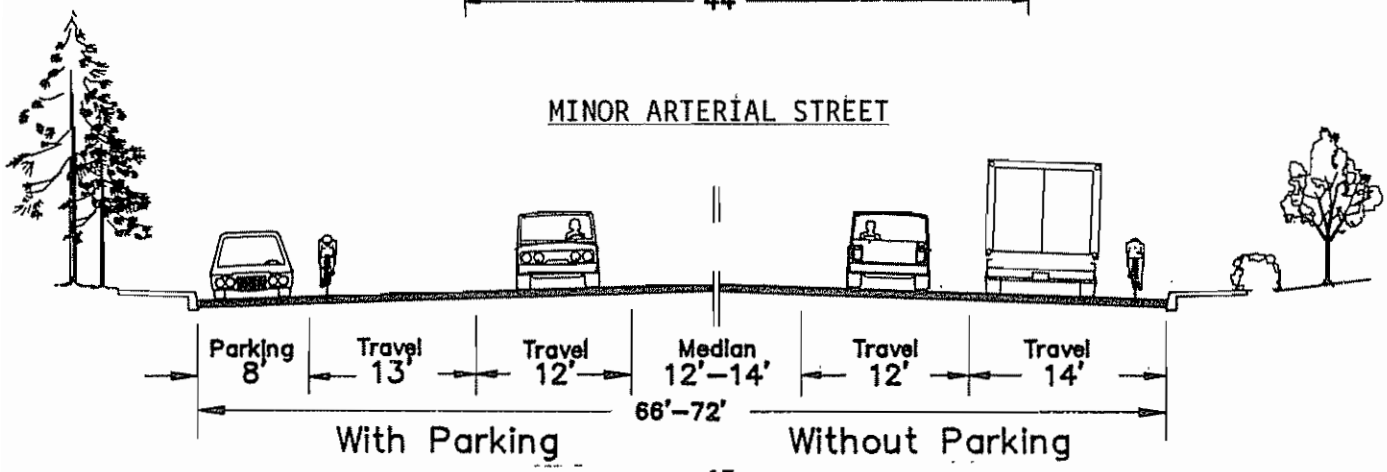
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Multnomah County has developed arterial and collector streets with 8 to 10 foot parking lanes that are often used by bicyclists. However, a bicyclist, when passing a parked car may enter into the adjacent travel lane - possibly into the path of an overtaking vehicle. This problem is most acute where the outside travel lane is less than 12 feet wide, or the parking lane is only 8 feet wide.

Where no alternate bikeway route is available, outside lanes on arterial streets should be 12 feet wide. This added width will promote safer lane sharing on arterial streets, especially where traffic volumes are relatively high. Parking should be prohibited on arterial streets with bike lanes.







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SHOULDER BIKEWAYS

The rural road bikeway standard is to add paved shoulders wherever possible. Rural collector roads are specified as having two 4 foot wide paved shoulders. Shoulder bikeways should be a minimum 4 feet wide, 6 feet is preferred.

Paved shoulders significantly reduce risks to bicyclists and motorists on rural roads, and where grades are greater than 5% or where sight distance is impaired. To create a safer, more bicycle-friendly rural bicycle system, shoulders should be added as a priority on roads with steep slopes and poor visibility.

Paved shoulders have added benefits: as travel lanes for farm equipment, lower road maintenance costs than gravel shoulders, and safer roadways for motorists and other users of the right-of-way (school buses, mail delivery, and pedestrians). A policy of adding paved shoulders on rural local and collector roads should be considered wherever it is cost-effective or significantly improves safety. Paved shoulders not only provides safer rural bikeways, but has the added benefit of a more accommodating roadway for a wide variety of users.

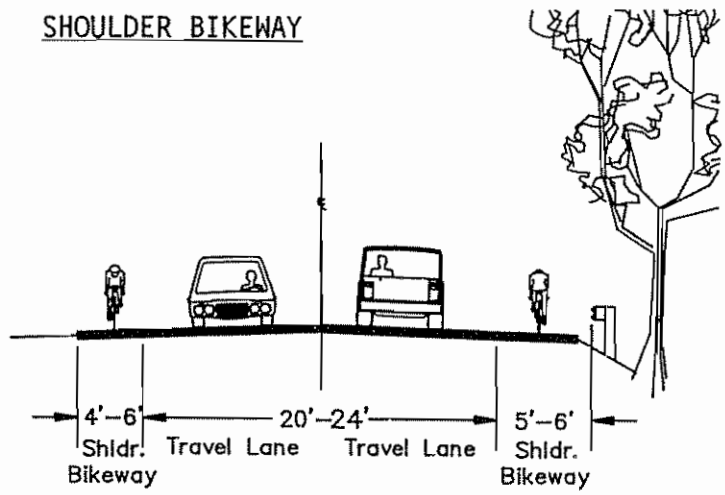
BIKE LANE WIDTH AND PLACEMENT

The objective of bicycle lanes is to provide a clear riding zone of 4 feet minimum width for the exclusive use of bicyclists. Parking is not allowed in bike lanes per State law.

Bike lanes on County roads should always be one-way facilities, traveling with the flow of traffic and located on the right side of the road. The exception is one-way streets where the bike lane may be located on either side of the street.

Minimum 5 foot wide bike lanes can be placed between parking lanes and traffic lanes. It is much safer however, to design streets without parking adjacent to bike lanes because of limited visibility, and the threat of car doors suddenly opening into the bike lane.

SHOULDER BIKEWAY

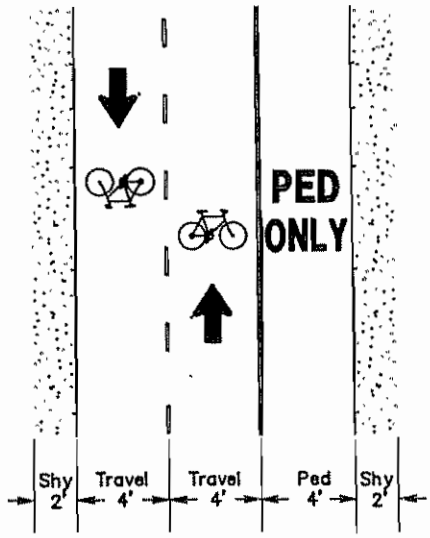


A 12 foot wide bike path is recommended when:

1. The volume of bicycle traffic will be relatively heavy.
2. The facility will be shared frequently with joggers, pedestrians and other non-bicycle users.
3. Heavy maintenance vehicles will use the facility.
4. On steep uphill grades.
5. Riding two abreast is likely such as pathways where group rides or family recreational riding is likely to occur.

All bike paths should be designed to reduce the risk of crime with consideration given to openness, visibility and lighting

BICYCLE/PEDESTRIAN PATH





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Design Speed:

For bikeways on County roads, the design speed of the roadway is generally adequate for bicycle speeds.

The speed that a bicyclist travels on a bike path is dependent on several factors including:

- Type and condition of the bicycle,
- Purpose of the trip,
- Condition and location of the path,
- Wind speed and direction,
- Physical condition and skill level of the bicyclist.

Bicycle paths should be designed for travel speeds that are at least as high as the prevailing speed of faster bicyclists.

Minimum design speed of a bike path is 20 MPH. When a bike path grade exceeds 4 percent, or where strong prevailing tail winds exist, such as East Multnomah County, a design speed of 30 MPH is advisable.

Radius of Curvature:

Radius of curvature is generally adequate for bikeways developed on County roads built to urban standards.

Care must be taken when designing bike paths to avoid sharp angles and short radius curves, particularly on long downhill grades where the velocity of a descending bicycle can be quite high.

The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate of the bike path surface, the coefficient of friction between bicycle tires and the bike path surface, and the speed of the bicycle. AASHTO specifies minimum design radii of curvature derived from the following formula.

$$R = \frac{V^2}{15\,(e+f)}$$

Where R = Minimum radius of curvature (ft),
V = Design speed (MPH),
e = Rate of superelevation,
f = Coefficient of friction.

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For most bike paths the superelevation rate will vary from a minimum of 2 percent (the minimum necessary for adequate drainage) to a maximum of 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tricyclists may occur). The minimum superelevation rate of 2 percent will be adequate for most conditions.

The coefficient of friction between bicycle and bike path depends on: surface type, road roughness and condition, tire type and condition, and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed. Extrapolating from values used in highway design, design friction factors for paved bike paths can be assumed to vary from 0.30 at 15 MPH to 0.22 at 30 MPH.

Based on a superelevation rate (e) of 2 percent, minimum radii of curvature can be selected from the following table.

DESIGN RADII FOR BICYCLE PATHS*

Design Speed-V (MPH)	Friction Factor f	Design - R (Feet)
20	0.27	95
25	0.25	155
30	0.22	250
35	0.19	390
40	0.17	565

*e = 2%

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When substandard radius curves must be used on bicycle paths because of right-of-way or topographical or other considerations, standard curve warning signs and supplemental pavement markings should be installed in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and the State Bicycle Master Plan. The negative effects of substandard curves can also be partially offset by widening the pavement through the curves.

Grade:

Grades on bike paths should be kept to a minimum, especially on long inclines. It is most desirable that sustained grades be no greater than 4 percent, especially if a wide range of riding skills need to be accommodated.

Grades greater than 5 percent are undesirable because the ascents are difficult for bicyclists to climb and the descents cause some bicyclists to exceed speeds at which they are competent. Where terrain dictates, grades over 5 percent and less than 500 feet long are acceptable when a higher design speed is used and additional bike path width is provided.

Bike paths on a grade should have a level ramp at least 15 feet in length at intersections. This level area will permit the bicyclist to remain stopped without rolling into the intersection.

Drainage:

Drainage grates and other surface irregularities should be kept outside of bicycle travel lanes. Drainage inlets and other fixtures in the pavement should be kept flush with the riding surface on County roads. New road construction and reconstruction of existing roads should include curb inlet drainage grates whenever possible.

The recommended minimum pavement cross slope of 2 percent on bike paths will generally provide adequate drainage. Sloping in one direction, instead of crowning, is preferred and usually simplifies bike path drainage and construction. A smooth surface is essential to prevent water ponding and ice formation.

Where a bicycle path is constructed on a hillside, a ditch of suitable dimensions should be placed on the uphill side to intercept the run off. However, such ditches should not create hazard to bicyclists. Catch basins and culverts may be necessary to carry the intercepted water under the path. To reduce drainage from adjacent areas, bike path construction should include natural ground cover with seeding, mulching and sodding of adjacent slopes, and other erodible areas.



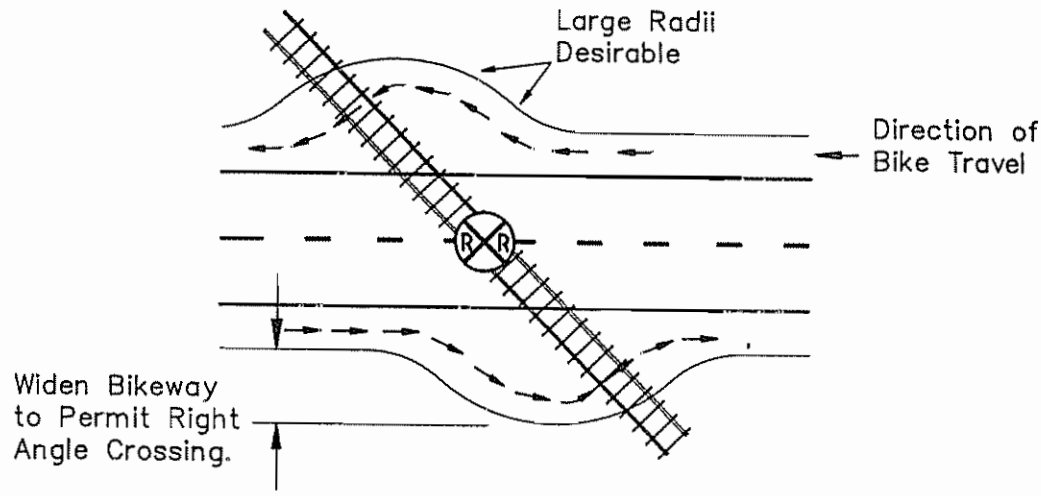
All parallel bar drainage grates located on County roads shall have steel cross straps welded perpendicular to the parallel bars. This will prevent bicycle wheels from dropping into the grate, potentially resulting in damage to the bicycle and injury to the rider.

Railroad Crossings:

Railroad/bikeway crossings should be at right angles. Crossings that deviate from a 90 degree angle create the potential for a bicyclist's front wheel to be trapped in the flangeway, possibly causing loss of steering control. It is also important that the bikeway approach be at the same elevation as the rails.

Crossing surface material and flangeway depth and width are important design parameters of bikeways at railroad crossings. The bicycle travel lane can be widened where the crossing angle is less than 90 degrees. This allows bicyclists adequate room to approach the tracks at a right angle. Where this is not possible, compressible flangeway fillers will improve bicycle safety. Whenever possible, abandoned tracks should be removed. Railroad warning signs and pavement markings will need to be installed on bikeways in accordance with MUTCD.

BIKEWAY RAILROAD CROSSING



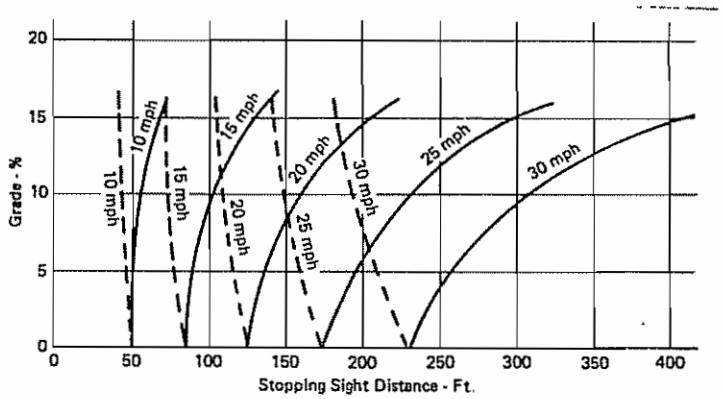
Sight Distance:

Sight distance is the length of bikeway ahead that is clearly visible to bicyclists. Sufficient unobstructed sight distance must be provided so that bicyclists can either stop or take evasive action to avoid a collision. Adequate lateral vision is required at intersections and driveways.

A bike path should be designed with adequate stopping sight distances, per AASHTO guidelines. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist's perception and braking reaction time, speed of the bicycle, coefficient of friction between tires and pavement, and braking ability of the bicycle.

The following chart illustrates minimum stopping sight distances for various design speeds and grades based on a total perception and brake reaction time of 2.5 seconds, and a coefficient of friction of 0.25. This rate accounts for the poor wet-weather braking characteristics of many bicycles. For two-way bicycle paths, the sight distance in the descending direction, that is where "G" is negative, will control sight distance design.

STOPPING SIGHT DISTANCE



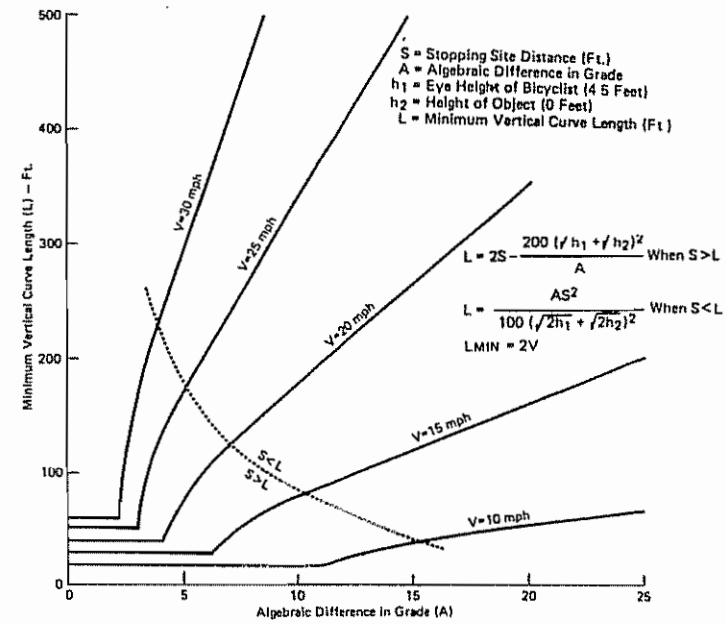
$$S = \frac{V^2}{30(f \pm G)} + 3.67\,V$$

Where: S = Stopping Sight Distance, Ft.
V = Velocity, mph
f = Coefficient of Friction (use 0.25)
G = Grade Ft./Ft. (rise/run)

Decend (–G) ——
Ascend (+G) — — —

The table below illustrates minimum length of vertical curve necessary to provide minimum stopping sight distance at various speeds on crests. Eye heighth of the bicyclist is assumed to be 4.5 feet, object height is assumed to be zero assuming hazards to bicycle travel exist at pavement level.

STOPPING SIGHT DISTANCE: CREST VERTICAL CURVES



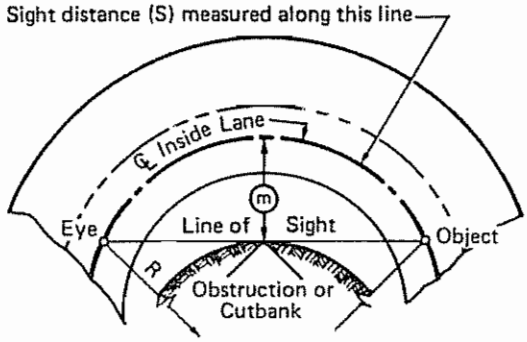
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The Lateral Curve tables indicate minimum clearance that should be used to line-of-sight obstructions for horizontal curves. The desired lateral clearance is obtained by entering Lateral Curve data with stopping sight distance and the proposed horizontal radius of curvature.

Bicyclists frequently ride beside each other on bike paths. On narrow paths, bicyclists have a tendency to ride near the middle of the path. For these reasons, and because of the serious consequences of head-on bicycle accidents, lateral clearances on horizontal curves should be calculated based on the sum of the stopping sight distances for bicyclists traveling in opposite directions around the curve. Where this is not feasible, consideration should be given to:

- Widening the path through the curve,
- Installing a yellow center stripe,
- Installing a curve ahead warning sign,
- Some combination of these.

LATERAL CLEARANCE ON HORIZONTAL CURVES



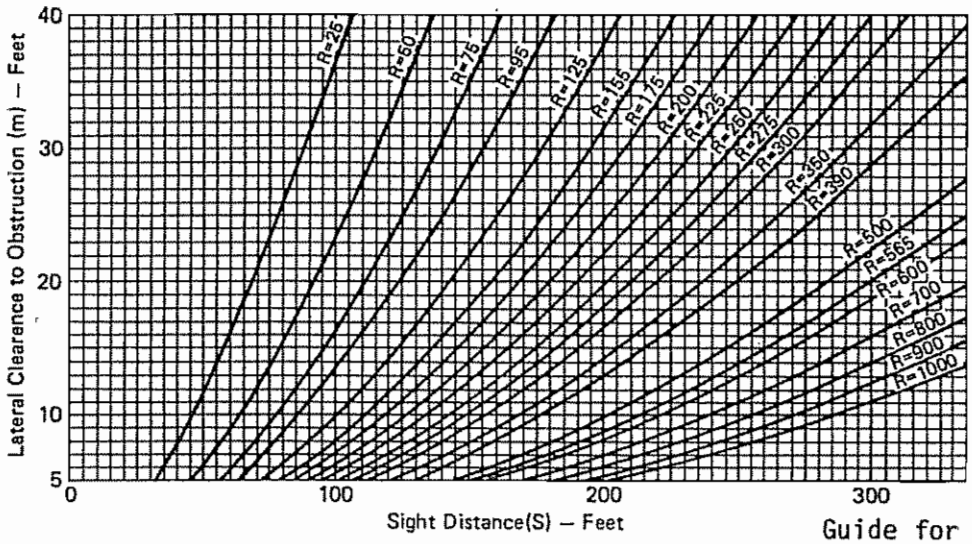
Line of sight is 2.0' above ℄ inside lane at point of obstruction

S = Sight distance in feet
R = Radius of ℄ inside lane in feet.
m = Distance from ℄ inside lane in feet.
V = Design speed for S in mph.
Angle is expressed in degrees

$$m = R\left[\text{vers}\left(\frac{28.65S}{R}\right)\right]$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-m}{R}\right)\right]$$

Formula applies only when S is equal to or less than length of curve



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Lighting:

Fixed-source lighting may be necessary to reduce conflicts along bikeways and at intersections. Lighting allows bicyclists to see better the travel lane ahead, and is a deterrent to crime. Lighting should be considered where night riding is expected, such as bikeways serving college students or commuters.

Lighting is important at major intersections, through underpasses or tunnels, and when nighttime security could be a problem. Depending on the location, average maintained horizontal illumination levels of 0.5 foot-candle (5 lux) to 2 foot-candles (22 lux) is desirable. Where special security problems exist, higher illumination levels may be necessary. Light standards (poles) should meet recommended horizontal and vertical clearances. Luminaires and standards need to be at a scale appropriate for the bikeway and vandal resistant. The IES Lighting Handbook Applications Edition provides more specific illuminance standards.

Restrictions to Motor Vehicles:

Bike paths may need a physical barrier or adequate signing to prevent unauthorized motor vehicles from using the exclusive bikeway. Removable posts or bollards restrict motor vehicle access while permitting entrance by authorized vehicles. Any barrier should be highly visible to cyclists. Posts and bollards need to be permanently reflectorized for nighttime visibility and painted a bright color for improved daytime visibility. When more than one post is used, a 5-foot spacing is recommended. Wider spacing can allow entry to motor vehicles, while narrower spacing might prevent entry by adult tricycles and bicycles with trailers.

Intersections:

Intersections are an important consideration in bikeway design. If alternate locations for a bikeway are available, the route with the fewest intersections or the most favorable intersection conditions should be selected. To cross freeways and other high speed, high volume roads, a grade separated structure may be the best solution. Cost of a structure will be relatively high but reduced congestion and level of safety gained will support the decision to provide grade-separated crossings.

For at-grade intersections, turning movements must be considered, and motor vehicle and bicycle rights of way defined. Motor vehicles turning right at an intersection can be particularly hazardous to bicyclists. The type of traffic control to be used (signal, stop sign, yield sign) should be selected by application of warrants from the MUTCD. Bicycles are counted as vehicles in these determinations and may be given priority at some intersections.

Where bikeways cross high speed, or high volume multiple lane roads, a median island refuge area or bicycle activated signal is advisable to accommodate the crossing movement.

Bicycles and motor vehicles should be controlled at intersections of major streets and bikeways by using standard traffic control devices.

The type, size and location of traffic signs should also be in accordance with the MUTCD. Care is needed to ensure that bikeway signs are located so they do not confuse motorists. Conversely, road signs need to be located where they do not confuse bicyclists.

Traffic detection devices need to be sensitive to bicycles. A bicyclist can usually cross an intersection under the same signal phasing as motor vehicles. However, multi-lane streets require special consideration to ensure that short clearance intervals are not used. To check the signal clearance interval, a bicycle speed of 10 MPH and a perception/reaction/ braking time of 2.5 seconds should be used.

Detectors for traffic-actuated signals that are sensitive to bicycles, should be located in the bicyclist's expected path, including left turn lanes. Bicyclist activated signals should be conveniently located so that dismounting is not required. Programmed visibility signal heads should be checked to ensure that heads are visible to bicyclists who are properly positioned on the road.

It is preferable that a bike path crossing an arterial street be located away from other congestion, such as highways and shopping centers.

Bike path intersections and approaches should be on relatively flat grades with adequate stopping sight distances. Advance warning must be given to permit bicyclists to safely stop prior to reaching the intersection, especially on downgrades.

Normal rules of the road (ORS 811.005-811.730) should apply to separate bike path/street intersections. Where constraints preclude development of separate intersections, other options should be considered that minimize congestion and hazards to bicyclists. Bike paths may need to cross major streets at, or adjacent to pedestrian crossings. Intersection design and control should not result in unconventional vehicle turning movements that compromise bicyclist safety.

The MUTCD and Oregon Bicycle Master Plan should be consulted for guidance on signs and pavement markings. Where bicyclists are expected to use different routes than motorists, directional signing is necessary, confirming to cyclists that the bike route leads to their desired destination.

Vertical and Horizontal Clearance

A minimum 2 foot shy distance on both sides of a bikeway is necessary for safe operation. Three feet is preferable. Vertical clearance to obstructions including tunnels and undercrossings should be a minimum of 8 feet. Vertical clearance may need to be greater to permit passage of maintenance vehicles. A vertical clearance of 10 feet is preferred.

Fencing or other barriers may be necessary to insure safety for bikeways located in close proximity to steep slopes or waterways. Hedges, trees, and native growth can be an effective aesthetic barrier.

A minimum 5 foot separation between a bike path and an adjacent roadway is required, confirming to both bicyclist and motorist that the bike path is a separate, non-motorized right-of-way. When the distance between the edge of the roadway and the bike path is less than 5 feet, a suitable physical divider such as a fence, dense shrubs or other barrier should be provided. Dividers prevent bicyclists from moving between the path and the roadway, and reinforce the concept that the bike path is an independent facility. Barriers should be a minimum 4.5 feet high.

Road Surface Materials:

Portland cement concrete is the preferred material for bikeways. Concrete provides a smooth riding surface with low maintenance costs. It does not become brittle, cracked and rough with age, or deformed with roots and weeds as often occurs with asphalt concrete.

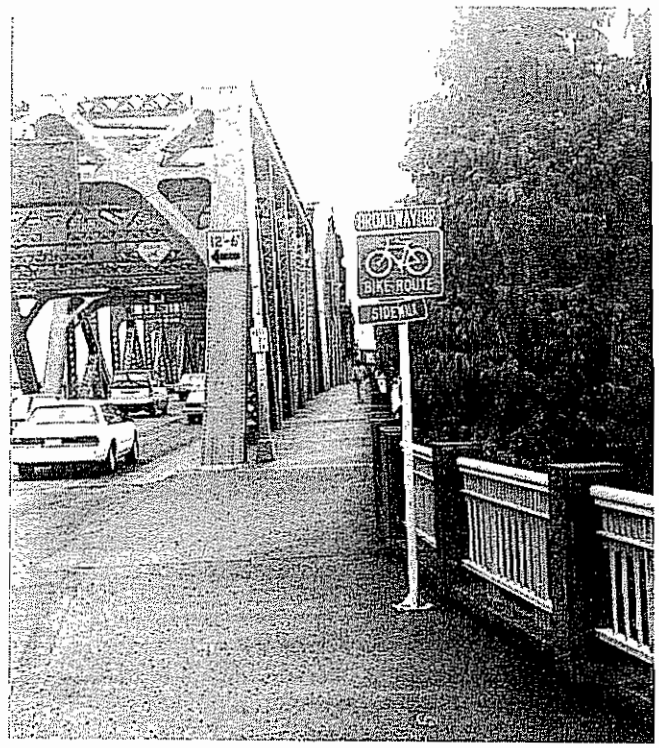
Bicycle lanes are usually built of the same material as the adjacent road. Therefore, bike lanes are most often constructed of asphalt concrete which is also a suitable choice for a bicycle riding surface.

Oil mat roads generally do not have an adequate base and provide a substandard, uneven riding surface. Oil mat is discouraged for most types of bikeways, except low volume facilities and rural roads.

Gravel roads and shoulders would not be used by most bicyclists except mountain bike riders who would also favor dirt trails.

Paved County bikeways should have the standard road base material and thickness to accommodate motor vehicles. Bike paths need to be designed and constructed to accommodate maintenance and emergency vehicles.

To protect paved bikeways from future damage, tree roots and other vegetation should be removed from the bikeway prior to paving. Vegetation control may be necessary to prevent tree roots, berry bushes and other plants from damaging the riding surface.



BRIDGES, RAMPS, AND OTHER STRUCTURES

Bridges:

Bridges are essential links in the regional transportation system. Those bridge crossings that are hazardous, inefficient, or prohibited to cyclists are detrimental to regional bicycle travel. Most bridges, such as those crossing the Willamette River and area freeways, are vital connectors that span barriers and assure regional accessibility.

Many existing bridges and ramps were built without consideration for preferential bicycle travel. Some have been improved to accommodate bicyclists. The Broadway Bridge, for example, has a bikeway and traffic signal that allow cyclists to safely access downtown Portland.

Provisions should be made to accommodate safe bicycling on any new or rehabilitated County bridge or ramp.

These may include:

- Bike lanes
- Wide outside lanes (12 - 14 feet) for shared use with motor vehicles.
- Wide walkways for shared use with pedestrians.
- Exclusive bike paths.

The expected traffic (motorized, bicycle and pedestrian) and cost will be considered in determining which type of facility should be used.

New Structures:

Overpasses, underpasses, and other bicycle facilities on County bridges and ramps may be necessary to provide continuity to the regional bikeway network.

On new structures, the minimum clear unobstructed width should be the same as, or greater than the approaching bikeway. Preferred clearance should include the minimum 2 foot wide shy areas. Carrying the clear area continuously across the structure has two advantages:

1. It provides a consistent shy distance between railings and barriers, and;

2. It provides needed maneuvering space to avoid conflicts with pedestrians and other bicyclists on the bridge.

Access by emergency and maintenance vehicles should be considered in establishing the design clearances on bridge and ramp bikeways. Bridges designed exclusively for bicycle traffic should also be designed for pedestrian live loads.

New or rehabilitated bridges, ramps, and culverts should be designed to:

a. Be wide enough to provide for paved shoulders, curb lanes or other bikeway facilities, including railings;
b. Eliminate narrow constrictions that force bicyclists to abandon the shoulder or curb lane and merge into motor vehicle lanes.

On all bridge decks and ramps, special care should be taken to ensure that bicycle safe expansion joints are used.

Railings, fencings or barriers on both sides of a bridge bikeway should be a minimum of 4.5 feet high. Smooth rub rails need to be attached to the barriers at a handlebar height of 3.5 feet.

Retrofitting:

Where it is necessary to retrofit a bikeway onto an existing County bridge or ramp, several alternatives should be considered depending on the geometrics of the structure.

1. Provide one-way bicycle lanes over the bridge or ramp where:

    a. The bike lanes connect to bicycle facilities at both ends of the bridge; and,
    b. Sufficient width exists or can be obtained by widening or restriping.

2. Provide a two-way bicycle path on a bridge on one side only. This should be done where:

    a. The bridge or ramp connects to a bikeway at both ends; and,
    b. Sufficient width exists on one side of the bridge, or can be obtained by narrowing or restriping lanes to allow two-way bicycle travel; and,
    c. Provisions are made to physically separate bicycle and motor vehicle traffic.

3. Using existing sidewalks as one-way or two-way facilities. This may be appropriate where:

   a. Conflicts between bicyclists and pedestrians will not exceed tolerable limits; and
   b. Sidewalks have adequate width to accommodate both.

4. Provide wide curb lanes where sufficient width exists or can be obtained.

Because of the large number of variables involved in retrofiting bicycle facilities onto existing bridges and ramps, compromises in desirable design criteria are often inevitable. Therefore, the facility to be provided may be determined, on a case by case basis, after thoroughly considering all the opportunities and constraints.

In certain situations where bicycles and pedestrians cannot safely share a constricted sidewalk, bicyclists may be required to dismount and walk their bikes even though the bridge is connected on both ends to bikeways.

BIKEWAY MAINTENANCE

Bicycle facilities require a higher level of maintenance service than facilities for motor vehicles.

Sweeping and Mowing:

Sweeping streets and mowing occurs on a continuous cycle and at the present level of service appears adequate in the urban area. Sweeping should occur more often in the following instances:

a. Where specific problem locations are known along bikeways e.g., where debris accumulates and requires more frequent removal.
b. Where a potentially hazardous situation is reported to the County by a concerned citizen, the standard for maintenance response should be within two working days of the report.
c. Following snow and ice storms where road sanding was required. Bike ways should receive priority attention to remove the sand that has been blown onto the bikeway.
d. Immediately following mowing if vegetation from mowing accumulates on the bikeway.

Sweeping and mowing of non-curbed and rural bikeways should be scheduled on a timely basis to eliminate debris and overhanging vegetation on bike lanes, bike routes and shoulder bikeways. This is especially critical during good weather months when more people use their bicycles as a means of travel and recreation, and vegetation is likely to intrude into bikeways.

As Multnomah County implements rural bikeways, to support the Columbia River Gorge Scenic Area for example, greater attention will need to be focused on providing well maintained rural bikeways.

Debris often collects where motor vehicles cross bikeways from unpaved areas such as: driveways and gravel roads, unpaved parking areas, and access to fields and timberland. More frequent sweeping will be necessary at these locations to remove the dirt and gravel that is certain to accumulate on the bikeway.

Particular maintenance care and attention needs to be directed to bikeways that receive heavy usage by families and inexperienced riders, such as the bike path east of Blue Lake Park, to assure that the riding surface is relatively hazard free.

Resurfacing:

When resurfacing a road segment, drainage grates, utility covers and other irregularities in the road should be adjusted to be flush with the finish grade.

When patching pavement and repairing potholes, the edge between old and new pavement should be flush to maintain a smooth riding surface. Ridges in pavement at railroad crossings, and utility cuts should also be ground down to provide a smooth travel lane.

A 10 foot deep apron can be added during resurfacing, to entrances from unpaved surfaces that cause debris to accumulate on the bikeway.

Resurfacing should not result in seams or longitudinal cracks within the bikeway. Care is needed to provide a smooth transition between the existing pavement and resurface material when adding shoulders or widening an existing road. Base material should be added before widening the road to better accommodate cyclists, with the same or better specifications as the existing roadbed.

TRAFFIC CONTROL

Even with the greatest attention to bicycle compatible road design, there may be instances or locations where it is not feasible to fully implement bicycle guidelines. Bicyclists, like motorists, need to be regulated in their use of the public right-of-way, or advised as to hazards or necessary cautions. The Manual of Uniform Traffic Control Devices (MUTCD) will determine what traffic control means are appropriate. The five objectives of traffic control are:

1. Fulfill a need
2. Command attention
3. Convey a clear, simple meaning
4. Command respect of right-of-way users
5. Give adequate time for proper responses

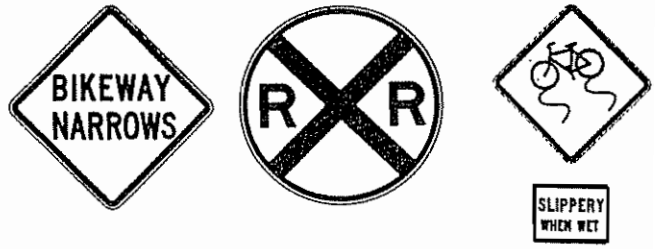
Design, placement, operation, maintenance and uniformity of traffic control facilities are all important in regulating and advising bicyclists and motorists. Bicycle signs perform one of three basic purposes:

Bicycle Signage:

1. Regulatory signs inform cyclists, pedestrians, and motorists of traffic laws and regulations, and indicate the applicability of legal requirements that would not otherwise be apparent. Regulatory signs should be erected at the point where the regulation applies. The message should be clearly indicated, and easily visible and legible to cyclists and motorists.



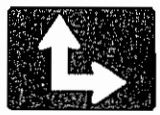
2. Warning signs are used to warn bicyclists and motorists of existing or potential hazardous conditions on, or adjacent to a road or path. Warning signs in the MUTCD do not cover all potentially hazardous conditions. If other warning signs are needed, they should be of standard shape and color with brief, easily understood messages. Warning signs include:



3. Guide signs are special bikeway route signs that are erected at decision points along the route. They may be informational- describing route direction changes, or confirming signs- assuring that the route direction has been accurately perceived. Guide signing should be repeated at regular intervals, letting cyclists know of the designated bikeway. Similar guide signing is appropriate for lane sharing and shoulder bikeways to assure that bicyclists do not stray from the facility and loose their way. Supplemental plaques are recommended that furnish such information as distances and destinations.













Conservative use of regulatory and warning signs is best as they tend to lose their effectiveness if used to excess. Frequent use of guide signs does not lessen their value, and keeps bicyclists on the bikeway system and on course to their destination.

Locations where unavoidable obstacles remain such as narrow bridges or roads that are substandard for lane sharing, warning signs and pavement striping should be employed to:

1. Inform bicyclists as to the condition
2. Alert motorists to the possible presence of bicyclists
3. Identify alternative bicycle routes
4. In some other way, mitigate the condition.

Multnomah County street standards and functional street classification system both influence the type of bikeway and traffic control to be provided on County roads. In some cases, these standards may need to be revised to provide greater opportunities to develop a comprehensive bicycle network.

Pavement Marking:

Pavement marking is important on bicycle lanes and paths. Markings indicate the separation of bike lanes from motor vehicle lanes, identify the preferential bicycle facility, provide advance information regarding turning and crossing maneuvers, and separate bicycle and pedestrian traffic on bicycle/pedestrian paths.

Pavement markings should be reflectorized on bikeways, using standard MUTCD markings. The frequent use of symbols and simple word messages stenciled on bike lanes and paths can be an effective method of supplementing sign messages.

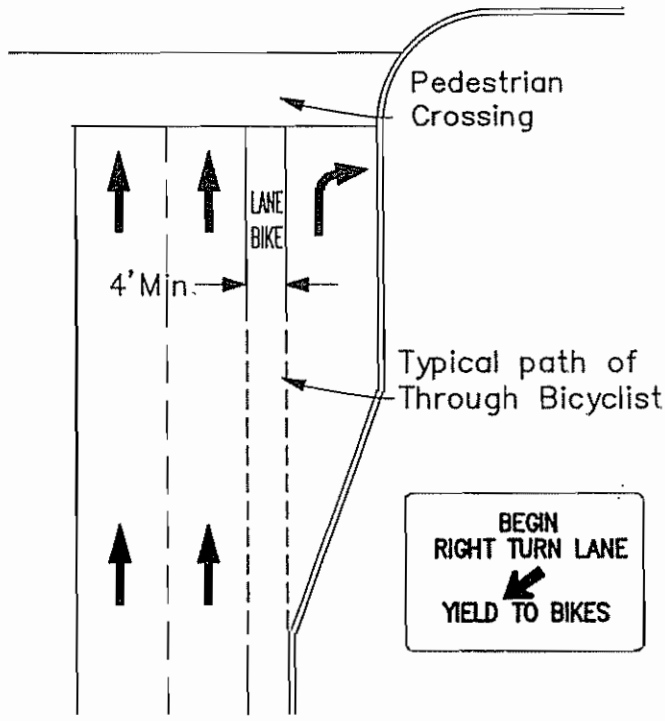
Bikeways are generally not marked through intersections. However, if necessary to direct traffic or reduce congestion, a dotted line may be used to distinguish the bikeway from other travel lanes.

Centerlines may be necessary on bike paths with high traffic volumes, where sight distance is limited, or where traffic control is otherwise needed. A double solid yellow line should be used to designate no passing or no traveling to the left of center. A broken yellow line should be used to separate two directions of bike traffic. A solid white lane is be used to separate pedestrians from cyclists on a joint use facility.

The diamond-shaped preferential lane symbols are used on streets where bike lanes are designated. This marking is used immediately after the intersection to inform motorists of the restricted lane.

Objects located adjacent to bikeways can be avoided with little difficulty if clearly visible to the rider. Such objects should be marked with highly visible markings to make their identification by approaching riders more certain.

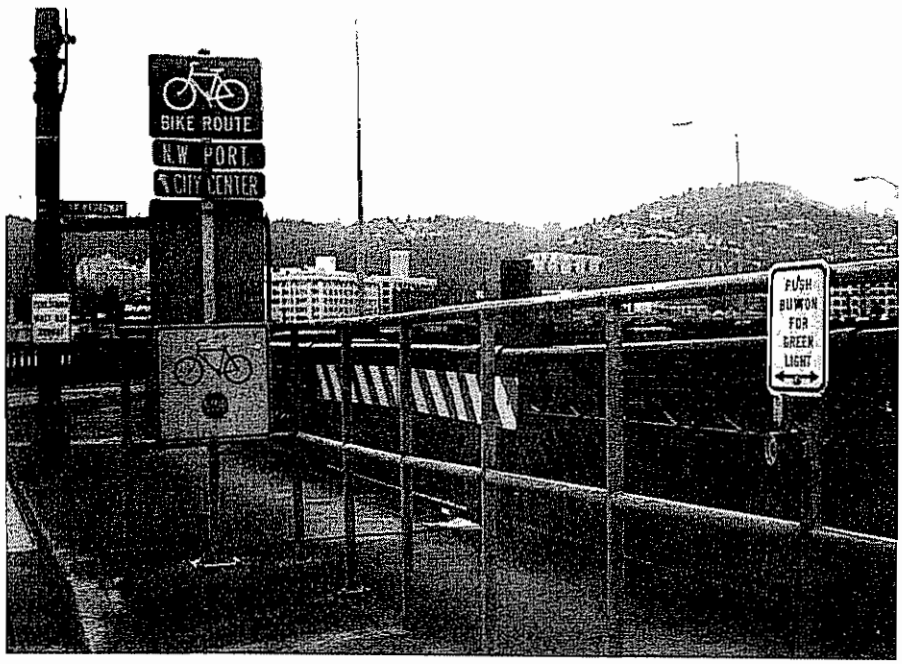
Preferred Intersection Marking



Traffic Signals:

At intersections where programmed signals are used, attention should be given to adjusting the signals so that bicyclists in their travel lanes can easily see the signals. If programmed signals cannot be adjusted to serve the bicyclist, then separate signals should be provided. Bicycles generally can cross intersections under the same signal timing arrangements as motor vehicles. Where bicycle use is expected, short signal intervals should not be used.

Traffic detector loops used along bikeways should be able to detect a bicycle. As an alternative, a signal activating push button should be considered on some types of streets. Push buttons should be located for convenient access by cyclists.



APPENDICES

BICYCLE ACCIDENT DATA
OREGON VEHICLE CODE
GLOSSARY

BICYCLE ACCIDENT DATA

BICYCLE ACCIDENTS

Accidents involving bicyclists are not uncommon in Multnomah County. A review of the reported accident data demonstrates the need for safe bicycle facilities, reduced conflict with motorists and perhaps most importantly, training and education on safe and defensive riding behavior.

The State of Oregon gathers accident data from incident reports of State and local police agencies. Accidents involving bicycles on County roads from 1984 through 1988 were examined for relevant information. The most severe bicycle accidents, all bicycle fatalities and many injury accidents are reported to police authorities. Many non-injury, or property damage, or single bike injury accidents may not be reported. The data included here is biased towards the worse cases. However, within this context, valuable insights can be gained by the conclusions drawn from accident data.

A total of 209 accidents involving bicycles on County roads were reported over the five year period 1984-89, averaging 42 incidents per year. The following table illustrate that most bicycle accidents occur during the week (85%) as opposed to weekend bicycling (15%). Seventy-three percent of reported bicycle accidents occur from 1 p.m. to 8 p.m. on any given day.

BICYCLE ACCIDENTS BY DAY OF WEEK: 1984-1988

Day of Week	Number of reported accidents	Percent of total records
Sun	9	4%
Mon	29	14%
Tue	34	16%
Wed	39	19%
Thr	31	15%
Fri	43	21%
Sat	24	11%
	209 Total Accidents	

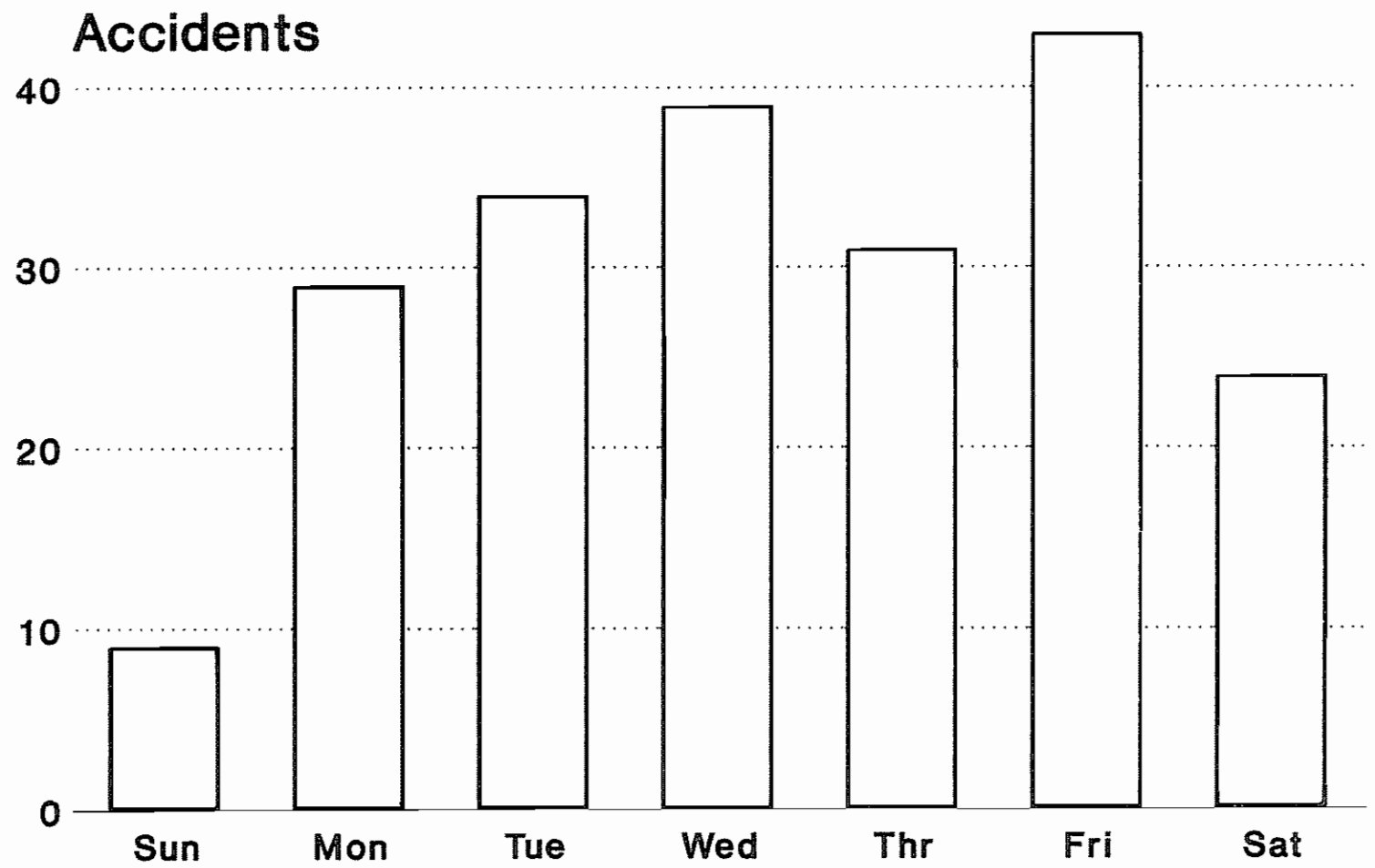
It would seem that wet weather conditions do not contribute to conditions causing most bicycle accidents: Road conditions were dry for 87 percent of accidents (74% clear and 12% cloudy conditions). Road conditions were wet for 13 percent of bicycle accidents (3% cloudy and 10% rainy conditions).

BICYCLE ACCIDENTS BY WEATHER CONDITIONS: 1984-1988

WEATHER	ROAD CONDITIONS				TOTALS	
	Dry		Wet			
Clear	154	74%	0	0%	154	74%
Cloudy	26	12%	6	3%	32	15%
Rain	0	0%	20	10%	20	10%
Fog	0	0%	1	0%	1	0.5%
Unknown	0	0%	1	0%	1	0.5%
TOTALS	181	87%	28	13%	209	100%

Multnomah County Bicycle Safety Program

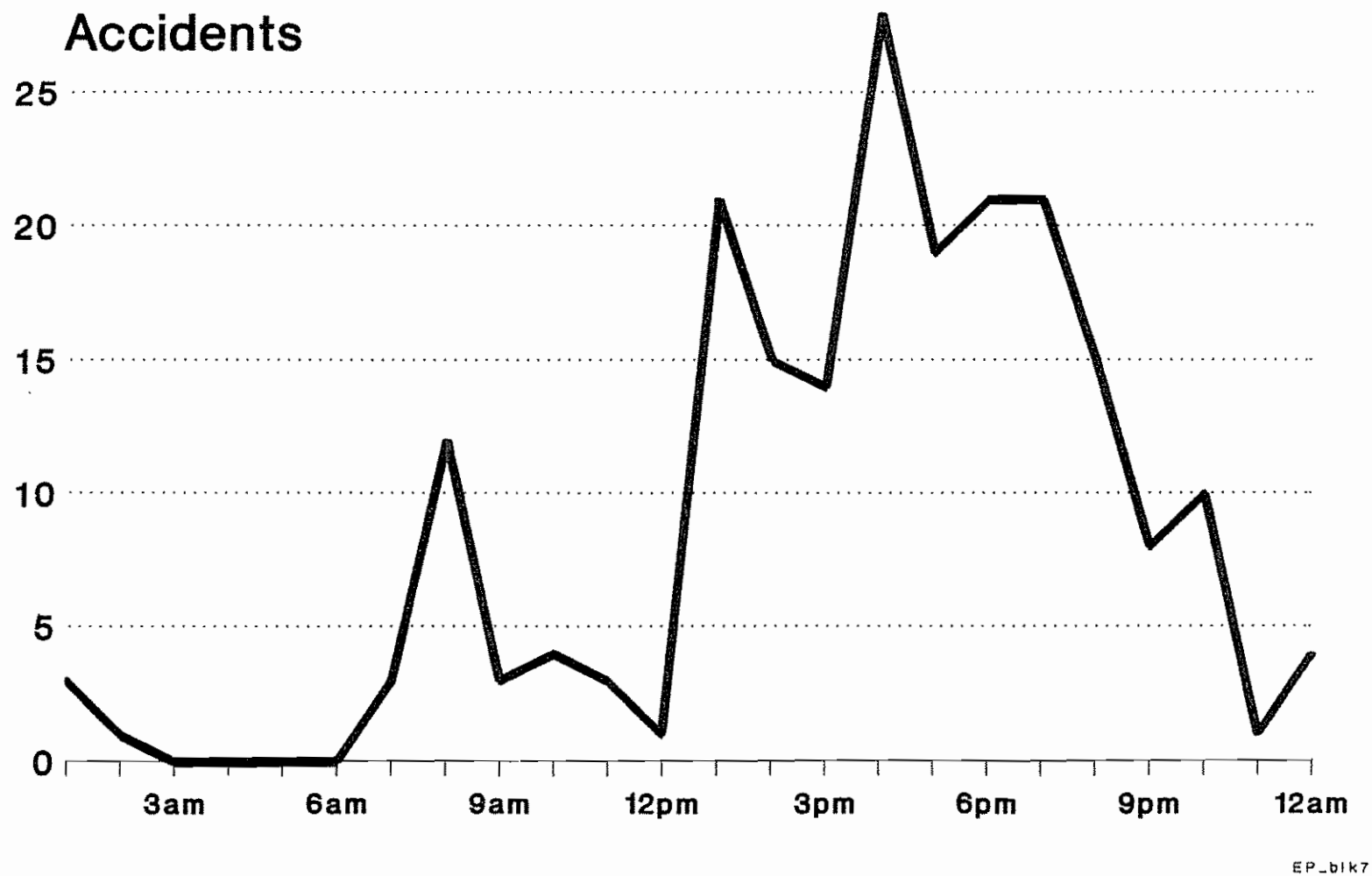
Bicycle Accidents by Day of Week



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Multnomah County Bicycle Safety Program

Bicycle Accidents by Time of Day



Two of the most revealing statistics concerning bicycle accidents involve who was at fault in causing the accident and age of bicyclist. Over the five year period, the bicycle operator was in error 65% of the time, motorists 26% of the time, both 7% and undetermined 2%. The conclusion to be drawn is that bicyclists riding unsafely or unlawfully are responsible much of the time for bicycle accidents.

Bicycle Accidents by Age of Cyclist: 1984-1988

Age of Bicylist	Number of reported accidents	Percent of total records
0	21	10.0 %
5	3	1.4 %
6	8	3.8 %
7	5	2.4 %
8	4	1.9 %
9	10	4.8 %
10	8	3.8 %
11	10	4.8 %
12	14	6.7 %
13	16	7.7 %
14	10	4.8 %
15	12	5.7 %
16	9	4.3 %
17	15	7.2 %
18	10	4.8 %
19	10	4.8 %
20	6	2.9 %
21	1	0.5 %
22	4	1.9 %
23	3	1.4 %
27	2	1.0 %
28	1	0.5 %
29	5	2.4 %
30	1	0.5 %
32	1	0.5 %
33	3	1.4 %
34	2	1.0 %
35	3	1.4 %
37	1	0.5 %
38	1	0.5 %
39	3	1.4 %
41	1	0.5 %
42	1	0.5 %
44	1	0.5 %
50	1	0.5 %
51	1	0.5 %
68	1	0.5 %
86	1	0.5 %
	209 Total Accidents	

Bicycle accidents often involve children and teenagers. Sixty-nine percent of bike accidents involve cyclists between the ages of 6 and 19.

PERCENT ACCIDENTS BY AGE

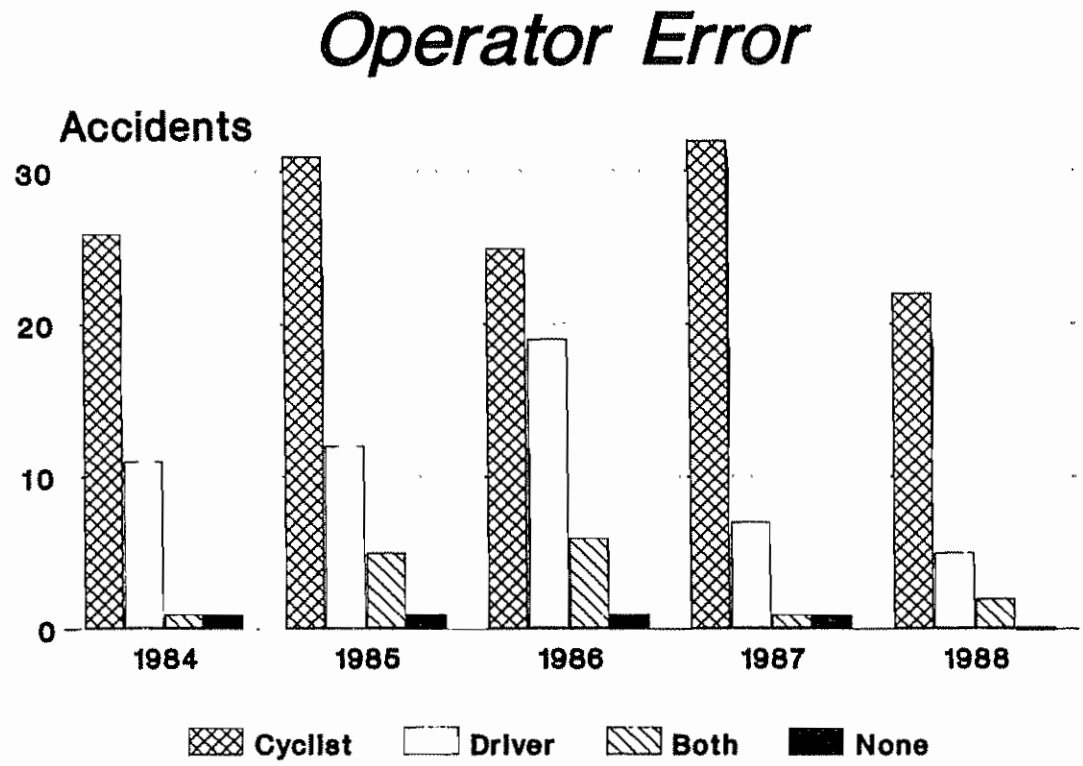
18% 10 years and younger
51% 11 to 19 years of age
18% 20 years and older
10% age unknown.
100%

The population under 20 years of age is the group most susceptible to bicycle accidents. A large portion of these accidents occur in the urban area, on the arterial and collector road system where traffic volumes are relatively high.

The accident profile most strongly suggested by this data is that bicycle accidents happen weekday afternoons during good weather involving young people who are most likely at fault. While this scenario is greatly over simplified, it is helpful in designing a bicycle safety program. A definable and measurable objective is to reduce the number of accidents involving young bicyclists on County roads.

Aside from building a relatively safe network of bikeways, changing bicyclists' behavior is another essential component to reduce accidents. Providing information, education and training, as well as greater enforcement of vehicle laws, are necessary to improve the awareness and skill level of bicyclists.

The County Bicycle Program can provide public information and education materials as a means to improve safety and reduce bicycle accidents. However, there are funding constraints that limit the level of direct County involvement. Other providers may be in a better position to change cyclists' behavior. Schools, police agencies and courts, service organizations and the private sector each have the potential to contribute to improving the awareness and skills of bicyclists. The County Bicycle Program would have an indirect role of coordinating and facilitating others in this effort to improve the bicycling environment throughout Multnomah County.



7463V

OREGON VEHICLE CODE

BICYCLES

814.400 Application of vehicle laws to bicycles. (1) Every person riding a bicycle upon a public way is subject to the provisions applicable to and has the same rights and duties as the driver of any other vehicle concerning operating on highways, vehicle equipment and abandoned vehicles, except:

(a) Those provisions which by their very nature can have no application.

(b) When otherwise specifically provided under the vehicle code.

(2) Subject to the provisions of subsection (1) of this section:

(a) A bicycle is a vehicle for purposes of the vehicle code; and

(b) When the term "vehicle" is used the term shall be deemed to be applicable to bicycles.

(3) The provisions of the vehicle code relating to the operation of bicycles do not relieve a bicyclist or motorist from the duty to exercise due care. [1983 c.338 §697; 1985 c.16 §335]

814.410 Unsafe operation of bicycle on sidewalk; penalty. (1) A person commits the offense of unsafe operation of a bicycle on a sidewalk if the person does any of the following:

(a) Operates the bicycle so as to suddenly leave a curb or other place of safety and move into the path of a vehicle that is so close as to constitute an immediate hazard.

(b) Operates a bicycle upon a sidewalk and does not give an audible warning before overtaking and passing a pedestrian and does not yield the right of way to all pedestrians on the sidewalk.

(c) Operates a bicycle on a sidewalk in a careless manner that endangers or would be likely to endanger any person or property.

(d) Operates the bicycle at a speed greater than an ordinary walk when approaching or entering a crosswalk, approaching or crossing a driveway or crossing a curb cut or pedestrian ramp and a motor vehicle is approaching the crosswalk, driveway, curb cut or pedestrian ramp. This paragraph does not require reduced speeds for bicycles either:

(A) At places on sidewalks or other pedestrian ways other than places where the path for pedestrians or bicycle traffic approaches or crosses that for motor vehicle traffic; or

(B) When motor vehicles are not present.

(2) Except as otherwise specifically provided by law, a bicyclist on a sidewalk or in a crosswalk has the same rights and duties as a pedestrian on a sidewalk or in a crosswalk.

(3) The offense described in this section, unsafe operation of a bicycle on a sidewalk, is a Class D traffic infraction. [1983 c.338 §699; 1985 c.16 §337]

814.420 Failure to use bicycle lane or path; exceptions; penalty. (1) Except as provided in subsection (2) of this section, a person commits the offense of failure to use a bicycle lane or path if the person operates a bicycle on any portion of a roadway that is not a bicycle lane or bicycle path when a bicycle lane or bicycle path is adjacent to or near the roadway.

(2) A person is not required to comply with this section unless the state or local authority with jurisdiction over the roadway finds, after public hearing, that the bicycle lane or bicycle path is suitable for safe bicycle use at reasonable rates of speed.

(3) The offense described in this section, failure to use a bicycle lane or path, is a Class D traffic infraction. [1983 c.338 §700; 1985 c.16 §338]

814.430 Improper use of lanes; exceptions; penalty. (1) A person commits the offense of improper use of lanes by a bicycle if the person is operating a bicycle on a roadway at less than the normal speed of traffic using the roadway at that time and place under the existing conditions and the person does not ride as close as practicable to the right curb or edge of the roadway.

(2) A person is not in violation of the offense under this section if the person is not operating a bicycle as close as practicable to the right curb or edge of the roadway under any of the following circumstances:

(a) When overtaking and passing another bicycle or vehicle that is proceeding in the same direction.

(b) When preparing to execute a left turn.

(c) When reasonably necessary to avoid hazardous conditions including, but not limited to, fixed or moving objects, parked or moving vehicles, bicycles, pedestrians, animals, surface hazards or other conditions that make continued operation along the right curb or edge unsafe or to avoid unsafe operation in a lane on the roadway that is too narrow for a bicycle and vehicle to travel safely side by side. Nothing in this paragraph excuses the operator of a bicycle from the requirements under ORS 811.425 or from the penalties for failure to comply with those requirements.

(d) When operating within a city as near as practicable to the left curb or edge of a roadway that is designated to allow traffic to move in only one direction along the roadway. A bicycle that is operated under this paragraph is subject to the same requirements and exceptions when operating along the left curb or edge as are applicable when a bicycle is operating along the right curb or edge of the roadway.

(e) When operating a bicycle along side not more than one other bicycle as long as the bicycles are both being operated within a single lane and in a manner that does not impede the normal and reasonable movement of traffic.

(f) When operating on a bicycle lane or bicycle path.

(3) The offense described in this section, improper use of lanes by a bicycle, is a Class D traffic infraction. [1983 c.338 §701; 1985 c.16 §339]

814.440 Failure to signal turn; exceptions; penalty. (1) A person commits the offense of failure to signal for a bicycle turn if the person does any of the following:

(a) Stops a bicycle the person is operating without giving the appropriate hand and arm signal continuously for at least 100 feet before executing the stop.

(b) Executes a turn on a bicycle the person is operating without giving the appropriate hand and arm signal for the turn for at least 100 feet before executing the turn.

(c) Executes a turn on a bicycle the person is operating after having been stopped without giving, while stopped, the appropriate hand and arm signal for the turn.

(2) A person is not in violation of the offense under this section if the person is operating a bicycle and does not give the appropriate signal continuously for a stop or turn because circumstances require that both hands be used to safely control or operate the bicycle.

(3) The appropriate hand and arm signals for indicating turns and stops under this section are those provided for other vehicles under ORS 811.395 and 811.400.

(4) The offense described under this section, failure to signal for a bicycle turn, is a Class D traffic infraction. [1983 c.338 §703; 1985 c.16 §341]

814.450 Unlawful load on a bicycle; penalty. (1) A person commits the offense of having an unlawful load on a bicycle if the person is operating a bicycle and the person carries a package, bundle or article which prevents the person from keeping at least one hand upon the handlebar and having full control at all times.

(2) The offense described in this section, unlawful load on a bicycle, is a Class D traffic infraction. [1983 c.338 §704]

814.460 Unlawful passengers on bicycle; penalty. (1) A person commits the offense of unlawful passengers on a bicycle if the person operates a bicycle and carries more persons on the bicycle than the number for which it is designed or safely equipped.

(2) The offense described in this section, unlawful passengers on a bicycle, is a Class D traffic infraction. [1983 c.338 §705]

814.470 Failure to use bicycle seat; penalty. (1) A person commits the offense of failure to use a bicycle seat if the person is operating a bicycle and the person rides other than upon or astride a permanent and regular seat attached to the bicycle.

(2) The offense described in this section, failure to use bicycle seat, is a Class D traffic infraction. [1983 c.338 §706]

814.480 Nonmotorized vehicle clinging to another vehicle; penalty. (1) A person commits the offense of nonmotorized vehicle clinging to another vehicle if the person is riding upon or operating a bicycle, coaster, roller skates, sled or toy vehicle and the person clings to another vehicle upon a roadway or attaches that which the person is riding or operating to any other vehicle upon a roadway.

(2) The offense described in this section, nonmotorized vehicle clinging to another vehicle, is a Class D traffic infraction. [1983 c.338 §707]

Source: Oregon Revised Statutes, 1987

811.050 Failure to yield to bicycle on bicycle lane. (1) A person commits the offense of failure of a motor vehicle operator to yield to a bicycle on a bicycle lane if the person is operating a motor vehicle and the person does not yield the right of way to a person operating a bicycle or moped upon a bicycle lane.

(2) This section does not require persons operating mopeds to yield the right of way to bicycles if the mopeds are operated on bicycle lanes in the manner permitted under ORS 811.440.

(3) The offense described in this section, failure of a motor vehicle operator to yield to a bicycle on a bicycle lane, is a Class B traffic infraction. [1983 c.338 §698; 1985 c.16 §336]

811.055 Failure to yield to bicyclist on sidewalk. (1) The driver of a motor vehicle commits the offense of failure to yield the right of way to a bicyclist on a sidewalk if the driver does not yield the right of way to any bicyclist on a sidewalk.

(2) The driver of a motor vehicle is not in violation of this section when a bicyclist is operating in violation of ORS 814.410. Nothing in this subsection relieves the driver of a motor vehicle from the duty to exercise due care.

(3) The offense described in this section, failure to yield the right of way to a bicyclist on a sidewalk, is a Class C traffic infraction. [1983 c.338 §702; 1985 c.16 §340]

811.395 Appropriate signals for stopping, turning, changing lanes and decelerating. This section establishes appropriate signals, for purposes of the vehicle code, for use when signals are required while stopping, turning, changing lanes or suddenly decelerating a vehicle. This section does not authorize the use of only hand and arm signals when the use of signal lights is required under ORS 811.405. Vehicle lighting equipment described in this section is vehicle lighting equipment for which standards are established under ORS 816.100 and 816.120. Appropriate signals are as follows:

(1) To indicate a left turn either of the following:

(a) Hand and arm extended horizontally from the left side of the vehicle.

(b) Activation of front and rear turn signal lights on the left side of the vehicle.

(2) To indicate a right turn either of the following:

(a) Hand and arm extended upward from the left side of the vehicle. A person who is operating a bicycle is not in violation of this paragraph if the person signals a right turn by extending the person's right hand and arm horizontally.

(b) Activation of front and rear turn signal lights on the right side of the vehicle.

(3) To indicate a stop or a decrease in speed either of the following:

(a) Hand and arm extended downward from the left side of the vehicle; or

(b) Activation of brake lights on the vehicle.

(4) Change of lane by activation of both front and rear turn signal lights on the side of the vehicle toward which the change of lane is made. [1983 c.338 §635; 1985 c.16 §314]

811.435 Operation of motor vehicle on bicycle trail; exemptions; penalty. (1) A person commits the offense of operation of a motor vehicle on a bicycle trail if the person operates a motor vehicle upon a bicycle lane or a bicycle path.

(2) Exemptions to this section are provided under ORS 811.440.

(3) This section is not applicable to mopeds. ORS 811.440 and 814.210 control the operation and use of mopeds on bicycle lanes and paths.

(4) The offense described in this section, operation of a motor vehicle on a bicycle trail, is a Class B traffic infraction. [1983 c.338 §643]

811.440 When motor vehicles may operate on bicycle lane. This section provides exemptions from the prohibitions under ORS 811.435 and 814.210 against operating motor vehicles on bicycle lanes and paths. The following vehicles are not subject to ORS 811.435 and 814.210 under the circumstances described:

(1) A person may operate a moped on a bicycle lane that is immediately adjacent to the roadway only while the moped is being exclusively powered by human power.

(2) A person may operate a motor vehicle upon a bicycle lane when:

(a) Making a turn;

(b) Entering or leaving an alley, private road or driveway; or

(c) Required in the course of official duty.

(3) An implement of husbandry may momentarily cross into a bicycle lane to permit other vehicles to overtake and pass the implement of husbandry. [1983 c.338 §645]

811.490 Improper opening or leaving open of vehicle door; penalty. (1) A person commits the offense of improper opening or leaving open a vehicle door if the person does any of the following:

(a) Opens any door of a vehicle unless and until it is reasonably safe to do so and it can be done without interference with the movement of traffic, or with pedestrians and bicycles on sidewalks or shoulders.

(b) Leaves a door open on the side of a vehicle available to traffic, or to pedestrians or bicycles on sidewalks or shoulders for a period of time longer than necessary to load or unload passengers.

(2) The offense described in this section, improper opening or leaving open a vehicle door, is a Class D traffic infraction. [1983 c.338 §655; 1985 c.16 §320]

Excerpted from Oregon Revised Statutes, 1989

GLOSSARY

GLOSSARY

ADT: Average Daily Traffic, based on a 24-hour count and adjusted for fluctuations by the day of the week and the month.

AASHTO: American Association of State Highway and Transportation Officials and including their publications.

Bicycle: A vehicle that operates on the ground, propelled solely by human power.

Bicycle Facilities: A general form denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking facilities, all bikeways and shared roadways not specifically designed for bicycle use.

Bicycle Route (Bike Route): A segment of a system of bikeways.

Bike Lane: A portion of a roadway which has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

Bike Path: A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the road right-of-way or within an independent right-of-way.

Bikeway: Any road, path or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

Clearance, Lateral: Width required for safe passage of a bicycle as measured in a horizontal plane.

Clearance, Vertical: Height necessary for the safe passage of a bicycle as measured in a vertical plane.

Commuter Cyclist: A person who uses a bicycle for transportation to the workplace.

Dual-Purpose Bike Path: A wide bike path with separate lanes for bicycle use and pedestrian use.

Grade Separation: Vertical isolation of travel ways through use of a structure so that traffic crosses without interference.

Lane-Sharing Bikeway: A road designated and signed as a bike route, where bicycles and motor vehicles share the travel lanes. Lane-sharing bikeways are typically on roads with low traffic volume and low speeds.

Motor Vehicle: A vehicle that is self-propelled or designed for self-propulsion.

Mountain Bike: A bicycle with wide tires and upright handlebars, designed for recreational riding on unpaved surfaces.

MUTCD: Abbreviation for Manual on Uniform Traffic Control Devices, approved by the Federal Highway Administration as a national standard for placement and selection of all traffic control devices on or adjacent to all roadways open to public travel.

Pavement Marking: Painted or applied line(s) placed on any bikeway surface for regulation, guiding or warning traffic.

Pedestrian: A person whose mode of traffic is on foot. A person walking a bicycle is a pedestrian.

Recreational Cyclist: An individual who uses a bicycle for the enjoyment of bicycle travel. Ultimate destination is of secondary importance.

Right-of-Way: A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

Right of Way: The right of one vehicle or pedestrian to proceed in a lawful manner in preference to another vehicle or pedestrian.

Roadway: The portion of the road right-of-way for vehicle use.

Rules of the Road: That portion of a vehicle law which contains regulations governing the operation of vehicular and pedestrian traffic.

Shared Road: Any road not prohibited to bicycle use, where travel must be shared by bicyclists and motorists.

Shoulder: A portion of the road right-of-way that is primarily for use by pedestrians, bicyclists, and emergency use of stopped vehicles.

Shoulder Bikeway: A type of bikeway where bicycle travel is designated on the shoulder of the roadway.

Shy Distance: The distance between the bikeway's edge and any fixed object capable of injuring a cyclist using the bikeway.

Sidewalk: The portion of a highway or street designed for preferential or exclusive use by pedestrians.

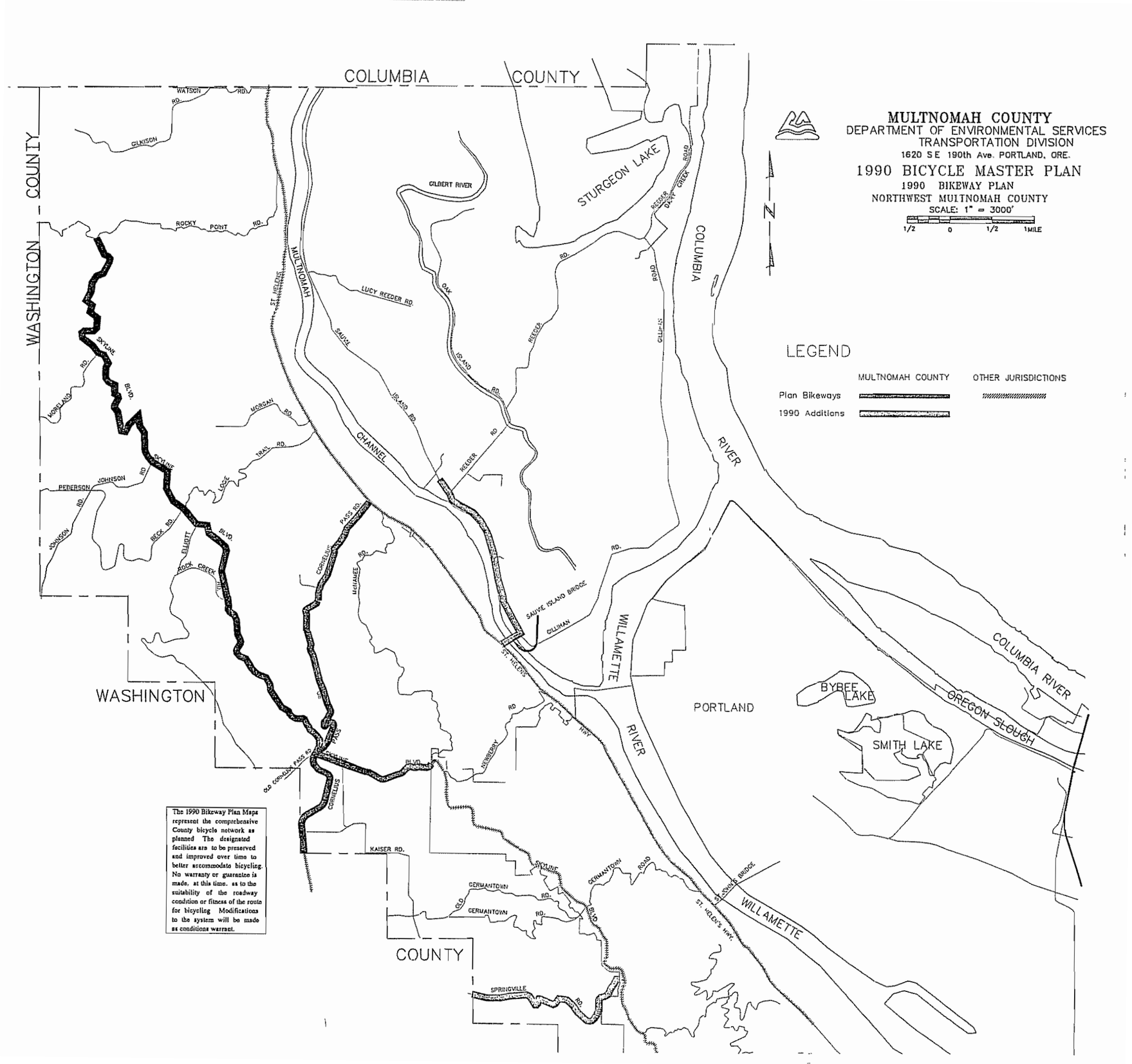
Sight Distance: A measurement of the cyclist's visibility, unobstructed by traffic, along the normal travel path to the furthest point of the roadway surface.

Sport Cyclist: A person who uses a bicycle for exercise, fitness, and sport.

Traffic Control Devices: Signs, signals or other fixtures, whether permanent or temporary, placed on or adjacent to a travel way by authority of a public body having jurisdiction to regulate, warn or guide traffic.

Traffic Volume: The given number of vehicles that pass a given point for a given amount of time (hour, day, year).

Vehicle: A device for transporting a person or goods along a public road. A vehicle maybe powered by human, gasoline, or other energy sources.



MULTNOMAH COUNTY
DEPARTMENT OF ENVIRONMENTAL SERVICES
TRANSPORTATION DIVISION
1620 S E 190th Ave. PORTLAND, ORE.

1990 BICYCLE MASTER PLAN

1990 BIKEWAY PLAN
NORTHWEST MULTNOMAH COUNTY
SCALE: 1" = 3000'

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LEGEND

	MULTNOMAH COUNTY	OTHER JURISDICTIONS
Plan Bikeways	▬▬	▬▬
1990 Additions	▬▬	

The 1990 Bikeway Plan Maps represent the comprehensive County bicycle network as planned. The designated facilities are to be preserved and improved over time to better accommodate bicycling. No warranty or guarantee is made, at this time, as to the suitability of the roadway condition or fitness of the route for bicycling. Modifications to the system will be made as conditions warrant.