LEFT
BY THE SIDE OF THE ROAD

Puget Sound Regional Bicycle Network Study:
Assessment and Recommendations

bicycle club Cascade

SEATTLE, WASHINGTON

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Disclaimer

The Regional Bicycle Network Study reflects, to the best of our ability and knowledge, current bicycling conditions on the recommended routes. Field surveys were conducted in 2002 and 2003. Spot updates were made through early 2005.

It is not the intent of this study to design the bicycle facility improvement needed when a route segment is judged as failed. Although in some instances we offer suggestions, it is not within the scope of this study to make specific-facility design recommendations.

The Cascade Bicycle Club staff and volunteers made every effort to ensure the accuracy of the findings and recommendations in this report. However, given the scope and duration of the Study, conditions may have changed. Cascade Bicycle Club accepts no liability for any inaccuracies or errors contained within this report, and Cascade Bicycle Club accepts no responsibility for any harm to any person or property that may result from traveling these routes.

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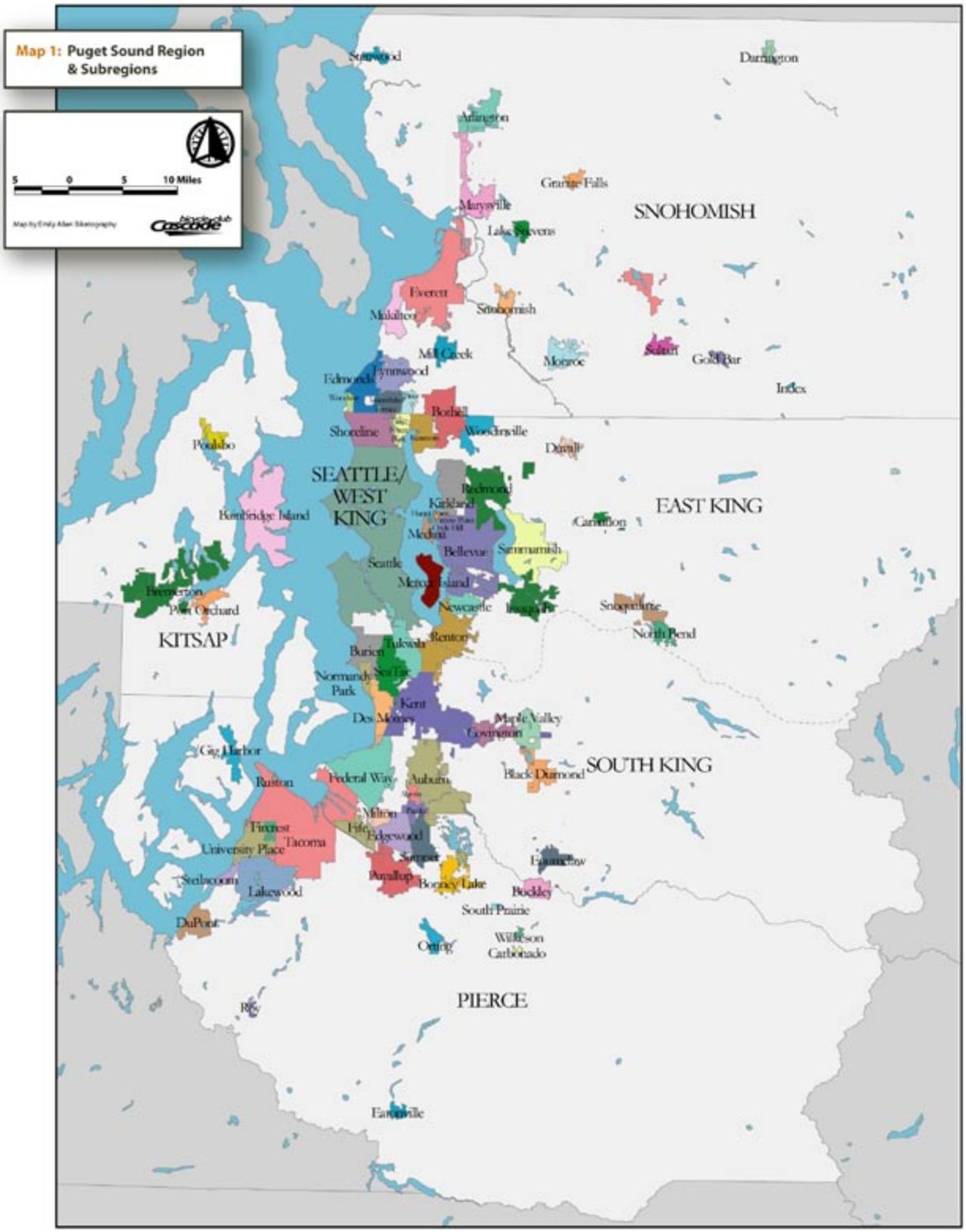
Map 1: Puget Sound Region & Subregions
5 0 5 10 Miles
Map by Emily Allen Stenography
Cascade Bicycle Club
Stanwood
Darrington
Arlington
Granite Falls
Marysville
SNOHOMISH
Lake Stevens
Everett
Mukilteo
Snohomish
Mill Creek
Monroe
Sultan
Gold Bar
Index
Edmonds
Lynnwood
Shoreline
Bothell
Woodinville
Duvall
Poulsbo
SEATTLE/ WEST KING
Redmond
Kirkland
EAST KING
Bainbridge Island
Medina
Carnation
Bellevue
Sammamish
Seattle
Mercer Island
Bremerton
Port Orchard
Newcastle
Issaquah
Snoqualmie
North Bend
KITSAP
Tukwila
Renton
Burien
Normandy Park
SeaTac
Kent
Des Moines
Maple Valley
Covington
Gig Harbor
Ruston
Federal Way
Auburn
Black Diamond
SOUTH KING
Milton
Fife
Edgewood
Tacoma
Fircrest
University Place
Sumner
Puyallup
Orting
Steilacoom
Lakewood
Bonney Lake
Buckley
South Prairie
DuPont
Wilkeson
Carbonado
PIERCE
Eatonville

EXECUTIVE SUMMARY

With its temperate climate, breathtaking natural features, and extensive road network, the Puget Sound Region should be a first-class area for bicycle travel, whether for commuting, destination travel, or recreational purposes. Unfortunately, current conditions within the region do not foster bicycle travel and, in many cases, actually discourage it.

The benefits of bicycle use—both to the cyclist and to the community—have long been recognized. Improved personal fitness reduces health costs, reduced pollution from automobile emissions reduces respiratory distress, and diminished noise levels enhance quality of life. Bicycle traffic requires less than half the paved surface area that motorized traffic requires, and an increase in bicycle commuting reduces roadway congestion by motorized vehicles. However, despite these obvious advantages, transportation planning has largely failed to incorporate bicycle travel into state, regional, and local projects.

The Puget Sound Regional Bicycle Network Study, conducted from 2001 through 2005, is the most detailed assessment of bicycle routes ever performed in this region. The Study looked at what a Regional Bicycle Network could look like, and considered what work needed to be done to make it happen. Hundreds of volunteers, traffic engineers, environmental scientists, and others collected data on over 4,000 miles of roads and trails, and came up with an impressive 1,521-mile Regional Bicycle Network. On the basis of these data, the study committee identified deficits such as missing or inadequate on-road and trail segments, barriers to access, and insufficient signage. Remediation options were assessed, and ultimately the committee prioritized these options in the form of specific recommendations.

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Key Findings:

- A 1,521-mile Regional Bicycle Network for Puget Sound is readily identifiable using mostly existing trails and roadways. This is promising; many parts of the system are up and running and need no more than maintenance and improved route signing. However, a quick glance at Map 1 indicates that many needed improvements are necessary to turn this proposed Puget Sound Regional Bicycle Network into a true, working system.

- In the Puget Sound Region, 27 percent (404 of 1,521 miles) of the Network's bicycle route mileage fails to meet the basic needs of bicyclists. This means that bicyclists attempting to navigate the region face severe safety hazards and sometimes insurmountable accessibility challenges—and there are no practical alternative routes.

- While we recommend completion of the Regional Bicycle Network over the next ten years, it should be noted that the recommended application of routine accommodation in transportation planning would remedy many of the deficient regional route segments.

The Puget Sound Regional Bicycle Network Study is the most detailed assessment of bicycle routes ever performed in this region.

OPPOSITE PAGE
Map 1 shows extent of region and sub-regions surveyed for Puget Sound Regional Bicycle Network Study. Coloring indicates urban or suburban areas.

Current practices in roadway design frequently use what can be called "centerline" planning, where roads are typically designed from the centerline out. Consequently, motor vehicles are always accommodated, whereas bicycle lanes and sidewalks receive the lowest design priority and are often left out. As long as planners continue to use this type of road design, the needs of bicyclists will continue to be placed on the back burner.

In addition to the recommended Regional Bicycle Network, this report offers an alternative that would help make bicycling a safer, more integrated part of the transportation system: routine accommodation. Recently adopted by the U.S. Department of Transportation, the policy of routine accommodation recommends that pedestrian and bicycle facilities be factored into all transportation projects, both new construction and reconstruction. However, there is no formal local or regional requirement to do so within the Puget Sound Region.

Implementation of the recommendations in this report will create a smoothly functioning network of bicycle routes throughout King, Pierce, Snohomish, and Kitsap Counties that will provide a safe and efficient means of accessing local and regional destinations by bicycle. This can be achieved only through the cooperation of local, regional, and state transportation entities and with a desire to make the Puget Sound Region a first-class area for bicycling. Cascade Bicycle Club wishes to assist in this effort in whatever ways feasible.

Implementation of the recommendations in this report will create a smoothly functioning network that will provide a safe and efficient means of accessing local and regional destinations by bicycle.

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INTRODUCTION

Bicycling in the Puget Sound Region

The Puget Sound Region has long been considered well suited for bicycling. The region is blessed with relatively gentle topography, a mild climate, an extensive road network, and numerous established bicycle routes. The U.S. Census Bureau report *Journey to Work: 2000* cites bicycling as the fastest-growing commute mode in the Seattle-Puget Sound Region,[1] and other counts show a 57% increase in the number of bicyclists riding in and out of downtown Seattle between 1992 and 2000.[2] On a regional basis, nearly two-thirds of the population (59%) own at least one bicycle, and many of them use their bikes: organized rides such as the Seattle to Portland (STP) and Ride Around Puget Sound (RAPSody) successfully take advantage of Puget Sound's exceptional regional characteristics to draw upwards of 50,000 bicycling participants each year.[3] Despite these circumstances, there is not an established regional network for bicycles to utilize for everyday transportation and recreation.

The Puget Sound Region is home to 3.4 million residents,[4] of whom nearly five percent of households have no access to an automobile.[3] The regional population is projected to exceed 4.5 million before 2030, a 32-percent increase over 2004 population figures.[4] This population increase will certainly add to the region's workforce and will severely impact transportation efficiency in this region if we continue to primarily plan for and choose single-occupant-vehicle travel.

The *Household Transportation Survey* shows that half of all automobile trips are shorter than five miles in length.[3] Trips of this length are ideally suited for bicycle travel and would occur more frequently if proper facilities existed. If bicycle facilities such as on-road bike paths and off-road trails are provided, people will use them. Indeed, a report on the correlation between number of bicycling facilities and use of bicycling facilities, indicates "a positive association…between miles of bicycle pathways per 100,000 residents and the percentage of commuters using bicycles. It is speculated that one problem with shifting the mode of commuting away from automobiles may simply be an inadequate supply of bicycle facilities."[5]

Despite the presence of existing bicycle routes in the region, Puget Sound cyclists are often discouraged from riding because of safety and efficiency concerns. In many instances, bicycling routes have not been laid out from a multi-jurisdictional point of view nor have route segments been designed with an eye toward efficient and safe bicycle transportation. The lack of cooperative regional planning has led to a fragmented collection of routes in which bicyclists are frequently left by the side of the road due to poor road design, poor signage, and/or the absence of connector routes. Furthermore, funding priorities consistently favor motor vehicles to the detriment of non-motorized travel.

In the *Household Transportation Survey*,[3] nearly 60 percent of respondents felt that the region and/or their community was *not* as pedestrian- and bicycle-friendly as it should be. Our region's bicycling infrastructure lags far behind those of many other regions with regard to comparative mileage and equivalent bicycling infrastructure. In numerous cities and regions, including Portland, Chicago, the San Francisco Bay Area, and others, comprehensive strategies for accommodating bicycling in all surface transportation projects have already been adopted.

It is time for the Puget Sound Region to do the same.

CASCADE BICYCLE CLUB

One problem with shifting the mode of commuting away from automobiles may simply be an inadequate supply of bicycle facilities.

The regional infrastructure for cycling has not kept pace with the growing needs of the region.

Historical Background

Without bicycling, the proliferation of the automobile in the early twentieth century would have been considerably slower, since it was the rise of bicycling in the 1880s that generated the "Better American Roads" campaign. American industry responded to the campaign by developing innovations in surfacing, drainage, and alignment of streets in order to accommodate bicycles.

Since the 1950s, the influx of mass-produced cars along with accompanying increases in standards of living has led to the domination of the transportation system by single-occupant-vehicle use. Cars have come to be a flexible and attractive option for many people, and city planners and traffic engineers have come to provide for cars in preference to other transportation modes, such as pedestrian, bicycle, and transit, for many decades. These circumstances decrease the given space and convenience for other modes. This is especially true in the case of bicycling.

In 1990, the Federal Highway Administrator described bicycling and walking as "the forgotten modes" of transportation because, for much of the preceding decades, non-motorized transportation options had been largely overlooked by federal, state, and local transportation agencies. Only after 1990 did bicycle facilities in the Puget Sound Region begin to benefit from new federal programs included in the Intermodal Surface Transportation Efficiency Act (ISTEA), which for the first time specifically sought to "increase use of bicycling and encourage planners and engineers to accommodate bicycle…needs in designing transportation facilities for urban and suburban areas."[6] Despite the attention given bicycling as a result of ISTEA, the Puget Sound Region lags behind other regions in providing the infrastructure and a destination-based network suitable for bicyclists.

There have been several attempts to outline the transportation needs for the Puget Sound Region, including the Puget Sound Regional Council's (PSRC) *Destination 2030:*

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Metropolitan Transportation Plan for the Central Puget Sound Region[7] and *Vision 2020*.[8] A major theme underlying the principles and policies of both V*ision 2020* and *Destination 2030* is that the region must develop a transportation system that creates and encourages the use of more travel choices such as transit, biking, walking, and ridesharing. The *Regional Bicycle and Pedestrian Implementation Strategy for the Central Puget Sound Region*[9] offers specific guidance regarding the most expeditious implementation of the regional bicycle and pedestrian system outlined in *Destination 2030*.

Each of these documents has essential, if underutilized and unrealized, bicycling components for this region. Despite the potential for bicycling and the high number of bicycle owners in the region and despite the publications and ensuing improvements over the past 15 years, it has become clear that the regional infrastructure for cycling has not kept pace with the growing needs of the region. The time is ripe to recognize the economic, health, and transportation benefits of implementing a comprehensive bicycling system for the central Puget Sound Region.

Benefits of Bicycling As Transportation

In the Puget Sound Region, nearly eight in ten people commute by car only, and 87 percent of them choose to drive alone (single occupants).[3] Commute time has been on the rise for decades and currently hovers around the 25–30 minute range for the vast majority of drivers.[10] The Texas Transportation Institute consistently rates traffic congestion in the Seattle-Puget Sound Region as "high."[11]

Excessive reliance on automobiles for transportation generates car traffic and affects mobility through congestion, thus generating the need for traffic management and mitigation. As traffic levels increase, the impacts of the reliance on automobiles begin to add up: noise, water, and air pollution; adverse health outcomes due to inactive lifestyles; and costs of owning and operating a vehicle; to name a few. Our nation now faces an obesity epidemic due in part to the amount of time spent behind the wheel of an automobile.[12] As these detractions grow, the economic, health, social, and environmental benefits of bicycling become more and more attractive.

There are many reasons to plan and build for bicycling as a transportation mode for commute, recreation, travel, and health purposes:

- Bicycling is a non-polluting, efficient, inexpensive mode of travel for work, shopping, and recreational trips;
- Bicycling helps reduce the number of motorized vehicles on the road;
- Bicycling can be used as transportation by all, including the young, old, disabled, and poor, as well as others who may not drive;
- Bicycling is an attractive and financially viable tourism opportunity.

Whether the bicyclist is a commuter, a destination traveler, or a recreational cyclist, the personal and societal benefits are numerous:

- Bicycling promotes good health;
- Bicycling is an activity that families and friends can enjoy;
- Bicycling is environmentally friendly;
- Bicycling breaks down barriers between people and their environment;
- For many commuters, bicycling is a far more efficient and enjoyable way to get to work.

This report identifies and evaluates the adequacy of a Puget Sound Regional Bicycle Network. It describes the methodology of data collection used in the 2001-2004 Regional Bicycle Network Study and presents the study's findings. *It identifies an efficient network of 1,521 miles of roads and trails that compose a regional network serving the central Puget Sound Region—King, Kitsap, Pierce, and Snohomish Counties.* It recommends practical measures and guides to improve problem areas and make the regional bicycle network safe and efficient for all users.

Bicycling is a non-polluting, efficient, inexpensive mode of travel that can be used as transportation by all.

OBJECTIVES

The identification of a region-wide bicycle network enables jurisdictions to plan for and prioritize future improvements in the region.

The Puget Sound Regional Bicycle Network Study

Under the aegis of Cascade Bicycle Club, the Puget Sound Regional Bicycle Network Study committee surveyed more than 4,000 miles of potential bicycle routes within the region comprising King, Pierce, Snohomish, and Kitsap Counties from 2001 through 2004. Many individuals, including urban and regional planners, civil and traffic engineers, environmental and computer scientists, and professionals in related fields, participated in the exhaustive and comprehensive collection of data as well as in the interpretation and assessment of the findings. Bicycle clubs and government entities provided feedback and input. No other bicycle network planning effort in this region has matched the scope and character of the Study.

Study participants analyzed transportation databases, plans, and proposals; pursued formal and informal contacts with over 100 local, regional, state, and federal jurisdictions governing bicycle facilities or services; conducted outreach activities within the bicycling community and the broader public; and interacted with various jurisdictional entities. At every step of the process, feedback and other input were solicited.

Thanks to their coordinated efforts, the Puget Sound Regional Bicycle Network can be made safe and efficient for public use—but only if the recommended improvements suggested in this report are implemented and this system is realized.

Purpose and Objectives

The overarching purpose of the Study was to identify and promote the development, maintenance, and preservation of a regional network of bicycle routes within King, Pierce, Snohomish, and Kitsap Counties. A major objective of the Study was to serve all areas and key destinations of the region. Another major objective of the plan was to identify for bicyclists the safest, most direct, and most reasonable routes available to access those regional destinations by bicycle.

The identification of a region-wide bicycle network will enable the PSRC and other jurisdictions to plan for and prioritize future improvements in the region. In order to accomplish this, four primary goals were established:

- Identify existing bicycle routes and assess their suitability for accommodating bicycle traffic;
- Identify missing links, deficient route segments, and other problems needing remediation in order to establish a viable regional network;
- Catalog and prioritize improvements necessary for completing and upgrading the system over the next ten years;
- Design a Regional Bicycle Network and promote its adoption and implementation by the agencies responsible for planning, design, construction, maintenance, and operation of bicycle routes and facilities.

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Implicit in this commitment to a Regional Bicycle Network is the understanding that it should be a well integrated *network,* not merely a haphazard collection of routes. The network should be designed to serve the needs of current and future cyclists—commuters, destination travelers, and recreational cyclists. The jurisdictional complexity involved in this undertaking requires that city, county, state, and federal agencies be involved in all phases of research, development, and maintenance of the system.

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Envisioning a Puget Sound Regional Bicycle Network

A regional bicycle network is a network of principal bicycle routes supported by and integrated with local bicycle routes. Such a network incorporates multi-modal transfer and interchange facilities (e.g., transit stops and transit centers) and provides bicycle parking and storage facilities at origins and destinations, such as schools and employment centers. Ideally, it favors on-street routes and route segments (over multiple-use trails that exclude motor vehicles) because such on-street routes already exist and serve these destinations.

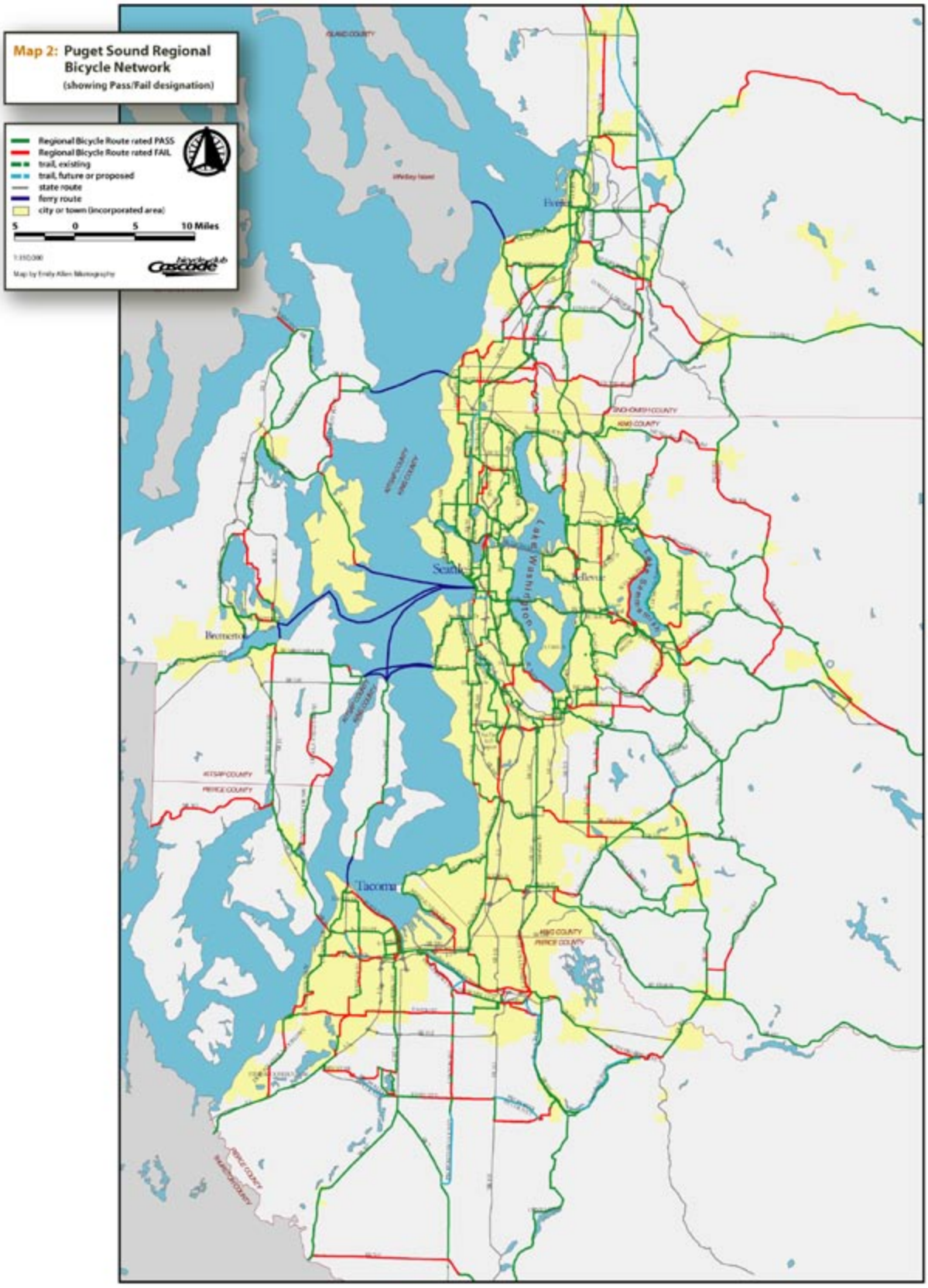
Although useful and efficient bicycle transportation routes rely primarily on arterials, collector streets, and roads, many communities focus on improving bicycle routes by means of paved, multi-use paths or trails that exclude motor vehicles. However, the future success of regional bicycling relies on improving the on-street bicycle network because in the majority of cases, it readily connects to employment and retail centers, schools and colleges, and other primary destinations.

Through the scope of this study, it was determined that such a system in the Puget Sound Region needs to address the particular characteristics of the region, many of which are dictated by its unique topography. The system must:

- Safely serve the most important travel-demand corridors in King, Pierce, Snohomish, and Kitsap Counties. In most cases, these corridors are identical to or adjacent to major corridors accommodating motor vehicle and transit travel within the region.
- Link and serve major activity nodes such as centers of employment, education, commerce, and public services. These include (but are not limited to) ferry, bus, and rail terminals; transit centers; and airports. All cities and towns must be accessible by the system.
- Recognize the need for parallel or alternate bicycle routes or route segments in response to impediments posed by topography, freeways, and limited street density and/or connectivity.
- Access major outdoor recreational areas within the region as well as the gateways to such areas outside the region, such as the Olympic Peninsula, the Hood Canal, the San Juan Islands, and mountain passes to Eastern Washington.
- Include routes and route segments of statewide interest and provide access to other bicycle routes and networks throughout the state.
- Accommodate and promote current and future demand in accordance with standards for geometry and traffic control as described in the *Guide for the Development of Bicycle Facilities*.[13]

Of paramount importance is the need for proper design and operation of the system in order to assure bicycle safety, appropriate level of service, and ease of future expansion of the system.

The future success of regional bicycling relies on improving the on-street bicycle network.


Map 2: Puget Sound Regional Bicycle Network
(showing Pass/Fail designation)
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, existing
trail, future or proposed
state route
ferry route
city or town (incorporated area)
5 0 5 10 Miles
Seattle
Tacoma
Bremerton
Everett
Bellevue
Lake Washington
KING COUNTY
PIERCE COUNTY
KITSAP COUNTY
SNOHOMISH COUNTY

METHODOLOGY

Scope of Data Collection

The Regional Bicycle Network Study committee consisted of numerous experienced bicyclists: current and former agency staff of local and state non-motorized advisory committees and bicycle advisory boards; urban and regional planners; civil and traffic engineers; environmental scientists; and allied technology professionals.

The project team reviewed data pertaining to traffic and road use in the four-county, 6,300-square-mile area, including county and city plans for non-motorized use of roads. The four-county region was divided into sub-regions of Seattle/West King, East King, South King, Pierce, Kitsap, and Snohomish Counties. Workshops and interviews were conducted on a regional and sub-regional basis. Public outreach included a booth at the 2001–2004 Bike Expo in Seattle.

Establishing the Route Network

The committee started the task of identifying a route network by reviewing existing bicycle data, including regional and city bicycle maps as well as current and proposed bicycle projects. Accommodation of utilitarian travel on routes that are reasonably direct, safe, and convenient was the primary objective in the route selection process. The committee developed criteria to help establish the draft route network; this process yielded seven criteria with various sub-criteria. These criteria are ranked below from most important to least important; it should be noted that the rankings for the top three criteria (connectivity, continuity, safety) were very close.

OPPOSITE PAGE
Map 2 shows the Puget Sound Regional Bicycle Network. Red indicates failed segments.

TABLE 1: Assessment Criteria for Routes or Route Segments

Connectivity
- Origin/destination
- Percentage of accessible cities between origin and destination
- Use of major transportation corridors
- Access to urban centers, schools, and transit centers
- Access to shopping, recreation, entertainment, and public services
- Residential density

Continuity
- Continuity throughout multiple jurisdictions
- Connections/access to other regional bicycle systems

Safety (*See also* Discussion, Safety Concerns, p. 31)
- Real vs. perceived safety
- Geometry of roadway (cross-section and alignment)
- Volume, speed, and composition of traffic
- Bicycle and non-bicycle user groups
- Potential for conflict
- Security

Potential Use of Existing Plans and Facilities
- Feasibility of implementation
- Cost

Minimal Energy Path
- Grade
- Topography
- Directness
- Navigability (signage and impediments)

Attractiveness and Comfort
- Proximity to freeways (noise, buffering, fumes, etc.)
- Scenic character (proximity to water, open views, etc.)

Accommodation of Additional Users
- Emergency vehicles
- Pedestrians and other non-motorized users
- Congestion mitigation
- Availability of alternate routes (to avoid congestion)

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Field Surveys

In arriving at the 1500-plus-mile Puget Sound Regional Bicycle Network, the project team began field surveys of approximately 4,000 miles of highways, roads, streets, and trails in 2001 and continued to update surveys through February 2004. Because bicycling guide maps vary considerably with regard to level of precision and degree of descriptive detail, field inspections were critical in determining route suitability and conditions. The committee developed criteria for regional bicycle routes, consolidated them into key criteria, and ranked the criteria by importance (see Table 1). Sub-regional committees conducted field reconnaissance of the initially identified routes. Committee members evaluated potential route additions, deletions, and other modifications. Additionally, the committee conducted outreach to local, state, and federal jurisdictions for review and comment.

Apart from identifying route features such as on-road bike lanes, paved shoulders, or separated trails, field inspectors noted steep grades (especially extended grades of 10 percent or greater), road segments with more than two lanes, the presence of sidewalks or paved pedestrian side paths (generally in low-density and rural areas and on bridges), and hazards or pitfalls for cyclists (e.g., complex intersections, narrow bridges, or restricted sight distances). Physical impediments such as railroad tracks, locked gates, bridges (especially drawbridges), highway interchanges, left-hand exits, and poor signage were noted. Where applicable, bus capacity for bicycles was documented. Route segments were designated as new whenever a significant feature—number of lanes, bicycle facilities, speed limit, and so on—changed.

Pass/Fail Designation

After the preliminary network identification phase was completed, criteria to ensure a safe, direct, and convenient bicycle route network were developed and refined. Guidelines were established to evaluate, on a pass/fail basis, existing accommodations for bicycles on each route segment. The committee concluded that use of a

simple, combined, qualitative, and semi-quantitative assessment of bicycling conditions and needed facility improvements was sufficient, given the basis and large scale of this project. Potentially hazardous or deficient road segments were closely evaluated. It is important to note that a "fail" rating did not necessarily exclude a road segment from the network, especially when no alternative was available.

The route segments were designated pass" or "fail" primarily on the basis of road-width guidelines, as outlined in Table 2.

Quality Control

Field surveyors made preliminary assessments of the route segments and assessed the need for facility or safety improvements on potential routes. Quality control for accuracy, uniformity, and consistency in the field surveys and recommendations was accomplished through office studies, committee meetings and correspondence, and additional field reviews. Ninety-eight percent of the route network was checked and evaluated in the field by the project chair by bicycling and/or driving the route.

TABLE 2: Criteria for "Pass" Designation of Bicycle Accommodation

Rural two-lane road:
- Pavement width ≥30 feet
  - 10 foot lane + 5 foot striped, paved shoulder or
  - 11 foot lane + 4 foot striped, paved shoulder or
  - 12 foot lane + 3 foot striped, paved shoulder

Rural road with speed limit ≥50 mph:
- Paved shoulder ≥4 feet

Curbed three-lane street with no parking
(one lane in each direction + continuous, two-way, median left-turn-lane):
- Curb lane ≥13 feet

Curbed multi-lane (≥4 lanes) streets with no parking:
- Curb lane ≥14 feet (measured from face of curb)

Curbed streets with parking (minimum width from curb face to left edge-stripe of first traffic lane):
- Low traffic volume and low parking turnover = 23 fee t
- High traffic volume and high parking turnover = 25 feet

NOTES:
- These are evaluation criteria and may differ from facility design standards.
- Minimum required widths may need to be increased by at least one foot when one or more of the following conditions is present: high traffic volume, high speed limit (≥50 mph), high percentage of trucks or transit buses in traffic stream, steep grades or extended grades, impaired sight distance (winding alignment, sharp curves, crest vertical curves, other roadside sight-line obstructions such as vegetation, retaining walls, etc.), frequent driveways or intersections.
- Some route segments do not meet these minimum-width criteria but are otherwise deemed adequate (i.e., received a "pass" rating) owing to extremely low traffic volume, low speeds, and/or other extenuating conditions. Typical here are low-volume neighborhood streets, traffic-calmed streets, rural byways, and some downtown business districts.
- Route segments were labeled "pass" (i.e., conditions are acceptable for bicyclists, and the segment would need only regular maintenance) or "fail" (i.e., conditions are unacceptable for bicyclists on at least one level, but bicyclists may still use the facility, even with knowledge of current "failed" conditions.

FINDINGS

OPPOSITE PAGE
Map 3 shows Network overlaid onto public road-and-street system of more-developed western three-quarters of region. The state highway system plays particularly strategic intra- and interregional roles in this aspect of the Network.

Geographic Area and Mileage of the System

The Regional Bicycle Network Study surveyed an area of 6,300 square miles (see Map 1) in the four central Puget Sound Region counties: King, Pierce, Snohomish, and Kitsap. The Study found that a regional bicycling system could easily be recognized by using, for the most part, existing roadways and key major trails. The Study identified a 1,521-mile Regional Bicycle Network for the Puget Sound Region (see Map 2).

Regional Bicycle Network Mileage

The Regional Bicycle Network mileage is not split evenly among the four counties, reflecting both variations in county size and geography, as well as disparity in bicycle facility investments from county to county. King County has the largest share of mileage, with 43 percent of the routes. Pierce and Snohomish Counties each contain about 25 percent of the overall miles, and Kitsap County has the remainder, eight percent (see Table 3).

TABLE 3: Regional Bicycle Network Mileage

County	Mileage	Percent of Total Mileage in Region
King	649	43
Snohomish	386	25
Pierce	367	24
Kitsap	119	8
Regional Total	**1,521 miles**	**100%**

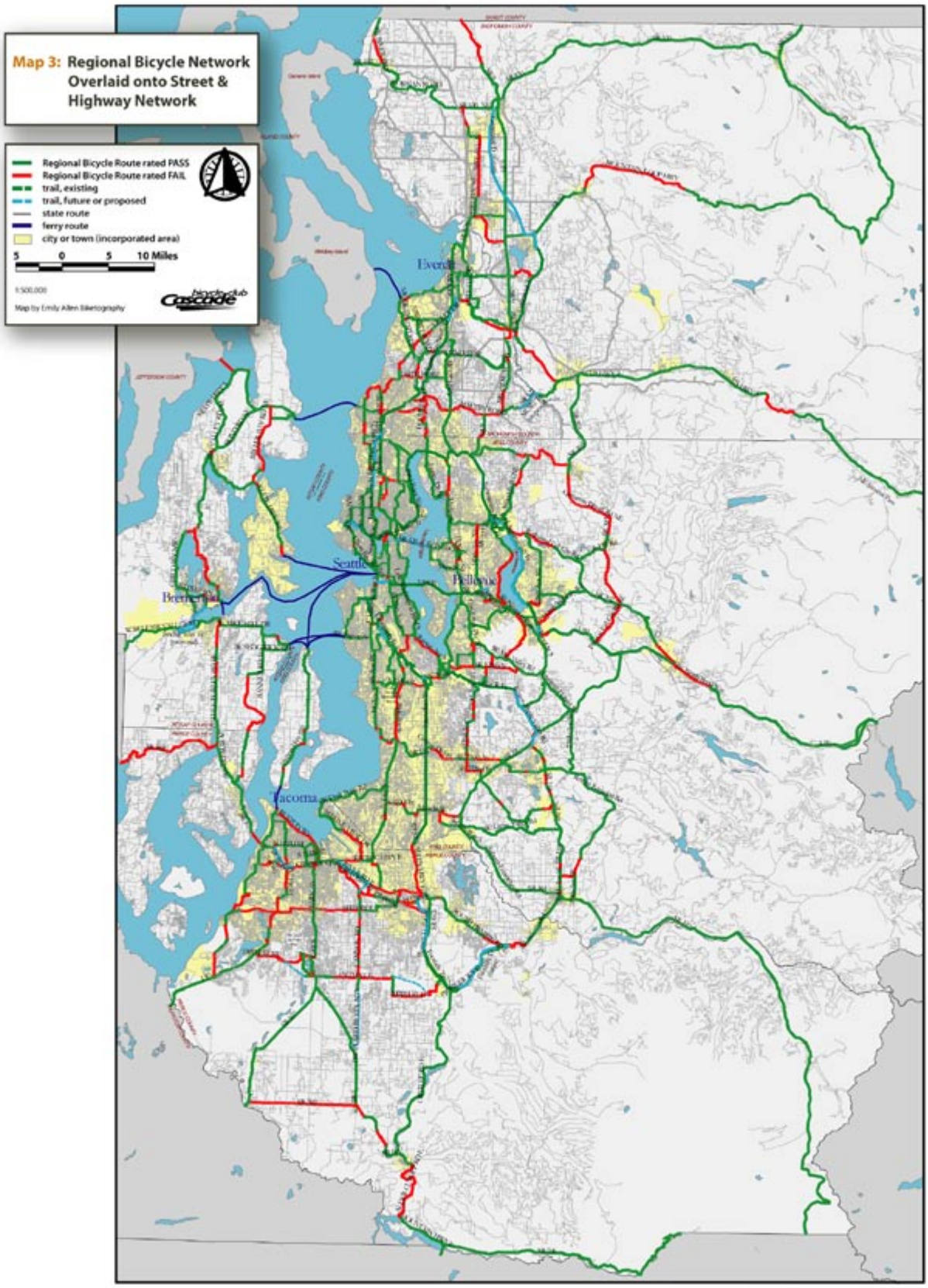
ABOVE
Table 3: With 649 route miles and 43% of the routes, King County has the largest share. Pierce and Snohomish Counties each contain about 25% of the overall miles, and Kitsap County has the remainder (8%).

A regional bicycling system for Puget Sound could easily be recognized by using existing roadways and key major trails.

The Regional Bicycle Network and Existing Roadway Alignment

Not surprisingly, the Study found that numerous segments of the Puget Sound Regional Bicycle Network occur on or near major roadways used by motor vehicles. The relationship of bicycle routes to existing patterns of development and population is readily conveyed by the Network map overlaid onto the street-system map (see Map 3).

A pull-out poster of the Regional Bicycle Network and enlarged single-sheet maps for the downtown-and-vicinity areas of Seattle, Tacoma, Everett, Redmond, and Renton can be found at the end of this report.


Map 3: Regional Bicycle Network Overlaid onto Street & Highway Network
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, existing
trail, future or proposed
state route
ferry route
city or town (incorporated area)
5 0 5 10 Miles
1:500,000
Map by Emily Allen Bikelography
bicycle alliance Cascade
Everett
Seattle
Bellevue
Bremerton
Tacoma

Bicyclists attempting to navigate the region face severe safety hazards and sometimes insurmountable accessibility challenges.

Major Trails and On-road Routes

The Study identified the following major existing trails and on-road routes in the Puget Sound Region, all of which are included in the Network to one degree or another:

- *Interurban Trail*
  The paved Interurban Trail (south King County to Everett) is the longest-existing trail in the region. The north-south trail contains on- and off-road segments in south King County, south Seattle (Duwamish Trail), Shoreline, and south Snohomish County. Major gaps exist in north and south Seattle, Shoreline, and Everett.

- *Centennial Trail*
  The Centennial Trail runs north-south through Snohomish County, connecting Snohomish, Lake Stevens, Arlington, and points between. A future segment between Arlington and Skagit County is planned but not yet completed. It may eventually extend north along the SR-9/ rail corridor to the Canadian border.

- *I-90/Mountains-to-Sound Greenway*
  This trail is the most important east-west trail within the region, beginning in downtown Seattle and running parallel to the Interstate 90 corridor to the Issaquah foothills. The segment crossing Lake Washington is one of the highest-volume cycling routes in the region. Major gaps exist from the Seattle waterfront to the John Wayne Pioneer Trail near North Bend.

- *Burke-Gilman Trail and Sammamish River Trail*
  The Burke-Gilman Trail runs north from Seattle around the northern end of Lake Washington, where it loops southeastward to Redmond. At this point, it connects with the Sammamish River Trail. Together, these trails constitute a continuous, flat, railbed trail leading from Seattle to the I-90/Cascade gateway at Issaquah. The Burke-Gilman segment supports a very large existing bicycle population that is fed by the Sammamish River Trail and several popular on-street routes on the eastern side of Lake Washington. These trails are also part of the Lake Washington Loop (see below). Major gaps exist on the westernmost end of the trail (Seattle), and significant user conflicts exist on certain segments of the trail.

K. CASEY

- *Lake Washington Loop*
  This loop around Lake Washington consists of numerous on-street and trail-segment routes. This extremely popular utility and recreational route is vital to cross-lake and around-the-lake travel as well as to regional circulation beyond its perimeter. Major gaps exist, most significantly the lack of access across the lake via SR-520 Bridge (see Special Impediments, p. 22).

- *Interbay Trail and Elliott Bay Trail*
  In downtown Seattle, several short paths and trails connect strategically to form the Interbay Trail, which leads north from Elliott Bay and Spokane Street corridors. Night-hour prohibitions limit trail access (see Special Impediments, p. 22).

Failed Mileage

The committee was successful in surveying the region in an attempt to identify a working regional Bicycle Network. Frequently, however, the network necessarily included failed segments because there were no viable alternatives to complete the system. On Map 1, green segments are deemed adequate to meet current bicycle access needs; red segments are deemed failed.

In the Puget Sound Region, more than one-quarter (404 of 1,521 miles, 27 percent) of the Network's bicycle route mileage fails to meet the basic needs of bicyclists; therefore, bicyclists attempting to navigate the region face severe safety hazards and sometimes insurmountable accessibility challenges. Notable examples are the Evergreen Point Bridge (SR-520), the Tacoma Narrows Bridge (SR-16), the Hood Canal Bridge (SR-104), the Agate Pass Bridge (SR-305), portions of SR-2 in King and Snohomish Counties, and the West Lake Sammamish Parkway in Bellevue. Table 4 shows the percentage of failed mileage, ranging from 12 percent in the Seattle/West King Country sub-region to 39 percent in Pierce County.

More than one-quarter of the Network's bicycle route mileage fails to meet the basic needs of bicyclists.

TABLE 4: Failed Mileage by County and King County Sub-region

County	Total Mileage	Failed Mileage	Percentage Failed (Within County)
King County	649	128	20
Snohomish County	386	102	26
Kitsap County	119	32	27
Pierce County	367	142	39
Total (Region)	**1,521**	**404**	**27**

King County Sub-region	Total Mileage	Failed Mileage	Percentage Failed
East King	280	82	29
South King	206	27	13
Seattle/West King	163	19	12
Total	**649**	**128**	**20**

LEFT
Table 4 shows the number and percentage of failed miles within each county or sub-region as well as totals for the entire four-county region.

Few of the region's bicycle trails and paths have sufficient signage to aid bicyclists in navigation.

Special Impediments

The Study found that unique challenges await the Puget Sound–area cyclist:

- *Bridges*
  Segments spanning bodies of water are often temporarily interrupted due to bridge openings. The University, Fremont, and Montlake Bridges over the Lake Washington Ship Canal are notorious for frequent openings; furthermore, the latter two bridges offer only narrow, pedestrian-busy sidewalks on and approaching the bridges.
- *Closures*
  Certain restrictions affect bicycle access to some segments: there are night-time-use prohibitions on the Elliott Bay Trail and at the Hiram Chittenden Locks (where gates are locked at night); passage on the Interbay Trail is occasionally interrupted by rail traffic, requiring a shift to a much longer alternative route; and the Spokane Street Trail leads over a swing bridge spanning an industrial waterway with a few openings each day.
- *Bus Access*
  Bicycle access on the westernmost segment of the SR-520 route corridor is a bike-on-front-of-bus-rack-only operation across Lake Washington, with a limit of two or three bicycles per bus. Consequently, bicycle capacity (especially during peak commute periods) on this vital link in an increasingly heavily congested corridor is grossly insufficient and can be unreliable throughout much of the day. By contrast, the SR-520 bridge carries more than 100,000 weekday vehicles containing more than 140,000 people.


SUSAN NILES

The insufficiency of buses to accommodate bicycles in the SR-520 corridor distorts the magnitude of perceived bicycle demand. Potential usage cannot be extrapolated on the basis of current actual usage because there is presently restricted capacity and too few options for cyclists to cross Lake Washington using this corridor.

Signage

The Study found that few of the region's bicycle trails and paths have sufficient signage to aid bicyclists in navigation. Virtually all bicycle trails in the region would benefit from better signage. Signage must respond to the needs of cyclists in a vast, largely metropolitan area with a challenging topography and a complex street and highway system.

RECOMMENDATIONS

The Puget Sound Regional Bicycle Network

After analyzing more than 4,000 miles of potential routes, we propose an improved, maintained, signed bicycle network of 1,521 miles of largely existing bicycle routes to serve the needs of all bicyclists—commuters, destination travelers, and recreational cyclists—to be implemented over the next ten years (see Map 2).

SUSAN HILES

Remediation and Policy Recommendations

The design and implementation of recommended facilities improvements lie outside the scope of this study. However, the principal improvements considered should include:

- Bike lanes
- Paved shoulders
- Outer (curbside) traffic lanes wide enough to accommodate bicyclists
- Paved multi-use bike trails or paths
- Adequate signage

All trails and on-street facilities should feature visible signage. Routine facility upgrades and maintenance are necessary to prevent minor deficits from becoming crises.

In addition to the following specific recommendations, *we strongly urge road designers to abandon traditional centerline planning in favor of a new approach to designing streets and highways.* Design should begin at the right-of-way limits and work its way in to the centerline. This "complete-the-streets" approach to roadway design ensures consideration of pedestrian traffic and bicycle traffic as critical elements in road design and results in a bicycle network congruent with the motorized route network.

The U.S. Department of Transportation recently adopted a "routine accommodation" policy statement suggesting that bicycling and walking facilities be incorporated into all transportation projects—both new-construction and reconstruction projects—unless exceptional circumstances exist, such as where non-motorized use is not permitted (e.g., in the case of some segments of urban freeways) or where the cost of non-motorized facilities would be excessively disproportionate to the need or probable use.[14]

Although the estimated cost of routine accommodation is typically low, there is as yet no formal local or regional requirement to do so. This approach would remedy many of the deficient regional route segments over a period of 20–25 years.

We recommend that a policy of routine accommodation be adopted for the Puget Sound Region, both at a regional planning level and at the local jurisdictional level.

We propose an improved, maintained, signed bicycle network of 1,521 miles to serve the needs of all bicyclists.

Five high-priority corridors represent 50 percent of the Network. Left unimproved, these routes jeopardize accessibility and bicyclist safety. These corridors should be given precedence for immediate improvement to complete the Network and ensure bicyclists' safety.

Specific Recommendations for the Regional Bicycle Network

Failed Routes or Route Segments in the Network

In all, 404 miles (27 percent) of the 1,521-mile Network were categorized as failed. These failed routes or route segments were retained within the proposed network when no viable alternative was available. As a result, some routes contain deficient segments as well as segments that meet or exceed criteria. Notable examples of included failed segments with no viable alternatives for the system are the Evergreen Point Bridge (SR-520) crossing Lake Washington, the Tacoma Narrows Bridge (SR-16), the Hood Canal Bridge (SR-104), the Agate Pass Bridge (SR-305) to Bainbridge Island, and portions of SR-2 in King and Snohomish Counties.

Map 2 shows route segments designated as failed (in red).

We recommend that these segments receive priority attention from regional and local jurisdictional planning authorities in the next regional and local funding cycles.

High-priority Corridors

We identified up to five high-priority corridors within each of eight sub-regions that, left unimproved, jeopardize accessibility and bicyclist safety. These 33 corridors should be given precedence for immediate improvement to complete the network and ensure bicyclists' safety. These corridors represent 202 miles (50 percent) of the 404 failed miles included in the Network. These improvements, when implemented, represent a huge step toward completion of the Network (see Map 4).

We recommend:

- **That jurisdictions immediately assess failed route segments for improvements;**
- **That these segments receive immediate attention for improvement;**
- **That these segments receive priority in the next regional funding cycle.**

Detailed descriptions of needed improvements in these high-priority corridors can be found in Table 5, following Map 4.

OPPOSITE PAGE
Map 4 shows failed route segments (red) as well as recommended highest-priority corridors crossing sub-regions.

SUSAN THIES

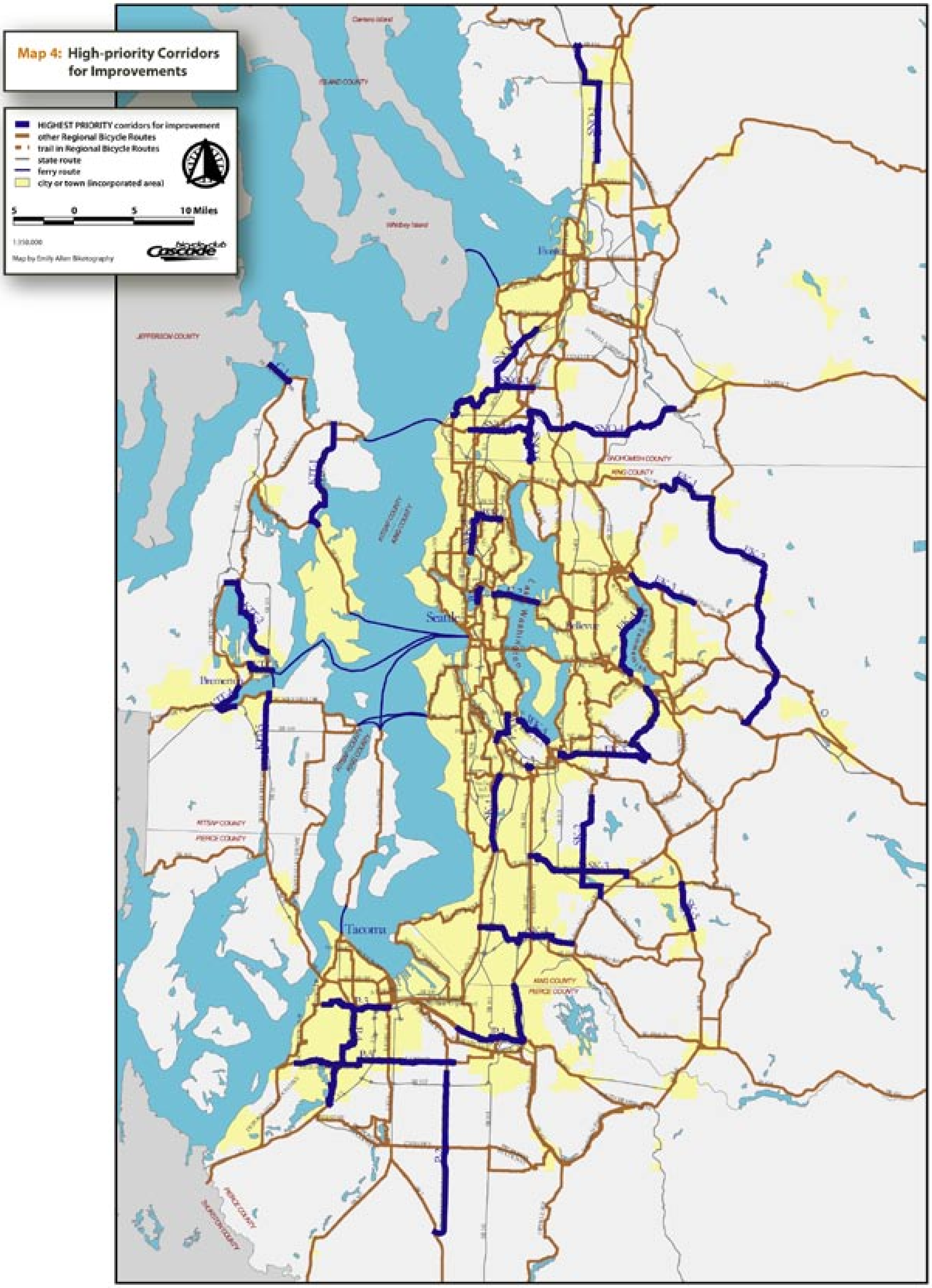

Map 4: High-priority Corridors for Improvements
HIGHEST PRIORITY corridors for improvement
other Regional Bicycle Routes
trail in Regional Bicycle Routes
state route
ferry route
city or town (incorporated area)
5 0 5 10 Miles
1:350,000
Map by Emily Allen Biketography
Cascade
JEFFERSON COUNTY
ISLAND COUNTY
KITSAP COUNTY
PIERCE COUNTY
SNOHOMISH COUNTY
KING COUNTY
Seattle
Bellevue
Bremerton
Tacoma
Lake Washington

TABLE 5: High-priority Corridors for Improvements, by Sub-region

County/ Sub-region	Map Location	Vicinity	Principal Road/ Street Name	From	To	Length (miles)	Improvement Needed*
Seattle/ West King	WK-1	NE Seattle	NE 125th, Roosevelt, NE 130th	Lake City Wy 92nd NE	1st Ave NE 100th NE	1.6	WCL or BL
	WK-2	N Seattle	Wallingford, Meridian	Northgate Way	Greenlake	2.6	WCL or BL
	WK-3	Lake Union	Eastlake, Harvard	E Newton	Harvard E	0.9	WCL or BL
	WK-4	S Seattle, Tukwila	MLK Wy, Boeing Access Road, Pacific Hwy S	S Henderson	Duwamish River Trail	1.5	PS or BL
	WK-5	SE Seattle, Renton	Rainier Ave S (Lake WA Loop)	S 118th	56th Av S	2.6	WCL or BL
						9.2	
East King	EK-1	Woodinville, Duvall	Woodinville-Duvall Rd	Avondale Rd	SR-202	5.7	BL, PS
	EK-2	Duvall, Preston	SR-203, Preston-Fall City Rd	Woodinville-Duvall Rd	I-90	18.6	PS
	EK-3	Sammamish	SR-202	E Lake Samm Pkwy	244th Ave NE	5.2	BL, PS
	EK-4	Bellevue	W Lake Samm Pkwy	NE 24th	I-90	6.7	PS or BL
	EK-5	Renton, Issaquah	3rd, 4th, SE 128th, SR-900	Factory Ave	I-90	9.3	BL, PS
						45.5	
South King	SK-1	Sea-Tac	SR-99 (Pacific Hwy/ Intl Blvd)	S 154th	SR-516	5.0	BL, PS
	SK-2	Kent, Covington	140th, 132nd, 152nd SE, SR-516	SE 171st Pl	SR-18	8.8	BL, PS
	SK-3	Kent, Covington	James, Smith, SR-516, SE 256th	Interurban Trail	SR-18	7.4	BL, PS
	SK-4	Federal Way, Auburn	S 320th, Peasley Canyon Rd, W Main, Auburn-Black Diamond Rd	SR-99	SR-18	7.5	BL, PS
	SK-5	Maple Valley, Black Diamond	SR-169	SR-516/ S 272nd	Auburn-Black Diamond Rd	3.2	PS
						31.9	
Kitsap	KIT-1	Kingston, Port Madison	Miller Bay Rd, Suquamish Wy, SR-305 Agate Pass Br	SR-104	SR-305 Bridge	8.1	PS
	KIT-2	Silverdale, Bremerton	Bucklin Hill Rd, Tracyton Blvd	Silverdale Wy	Sheridan Rd	6.1	BL, PS
	KIT-3	Central Bremerton	Kitsap Wy (SR-310), Burwell St (SR-304)	11th	Washington Ave	1.7	WCL, BL
	KIT-4	Sinclair Inlet (Gorst)	SR-304, SR-3, SR-16, SR-166, Bay St	Puget Sound Naval Shipyard	SR-16/ SR-166	4.2	Trail, Bike Bridges
	KIT-5	Port Orchard	Bethell Ave, Bethell-Burley Rd	Bay St	Mullenix Rd	5.0	PS
						25.1	

cont. next page

TABLE 5: High-priority Corridors for Improvements, by Sub-region (continued)

County/ Sub-region	Map Location	Vicinity	Principal Road/ Street Name	From	To	Length (miles)	Improvement Needed*
Pierce	P-1	Sumner, Puyallup	W Valley Hwy, Valley Ave, N Levee Rd	3rd SW (in King Co)	66th E Bridge	9.3	PS
	P-2	Puyallup South Hill, Frederickson	Canyon Rd & planned extension	N Levee Rd	SR-7 & 260th E	14.8	PS
	P-3	Tacoma, Univ Place	Jefferson, Center, 27th W	25th/ Jefferson	Bridgeport Wy	5.3	WCL, BL
	P-4	Tacoma, Lakewood	Tyler, Lakewood Dr, Gravelly Lake Dr, Nyanza	19th S	I-5	8.3	BL, PS
	P-5	Lakewood, S Tacoma	Steilacoom Blvd, Tacoma Wy, 84th	Farwest Dr	58th E	11.1	WCL, BL, PS
						48.8	
Snohomish	SNO-1	North of Marysville	84th, 88th, 51st	84th/47th NE	172nd NE	5.8	PS
	SNO-2	Edmonds, Everett	Olympic View, 168th, 52nd, Beverly, Holly	9th/Puget Dr	100th SW	10.0	WCL, BL, PS
	SNO-3	Lynnwood	164th St SW	52nd W	I-5	2.2	WCL, BL
	SNO-4	Edmonds, Monroe	212th SW, Larch Wy, Locust, SR-524, SR-522	80th W	Tester Rd	15.2	WCL, BL, PS, Trail
	SNO-5	Brier	Locust, 218th, 14th W, Carter	Larch Wy	Lockwood Dr	2.1	BL, PS
						35.3	
Kitsap-Jefferson	C-1	North Kitsap	SR-104 (Hood Canal Bridge)	SR-3 (Jefferson Co)	Shirie Rd	1.8	
Seattle-E King	C-2	Seattle, Medina	SR-520 (Lake WA Bridge)	Evergreen Point Rd	Montlake Blvd	3.1	Trail
	C-3	Renton, Tukwila	Proposed Black River Trail	68th S/ Monster Rd	Interurban Trail	0.2	Trail
					REGIONAL TOTAL	200.9	

NOTES:
1) These high priority corridors may include route segments designated "pass."
2) * Improvement Needed Key **WCL**: Wide curb lane **BL**: Bike lane **PS**: Paved shoulder **Trail** : Off-street/separated bicycle trail

Recommendations for Major Routes in the Network

Some of the major routes in the Network contain critical missing links already scheduled for construction. Other major routes contain segments that we recommend for geometric or traffic-engineering upgrades:

- *Interurban Trail*
  Major planned but unconstructed gaps exist in south Seattle, north Seattle, Shoreline, and parts of Everett. The proposed regional network includes existing trail segments and street links that eliminate these gaps.

We recommend completing these important links.

- *Centennial Trail*

We recommend completing the Arlington-to-Skagit County segment of the trail.

- *I-90/Mountains-to-Sound Greenway*

We recommend finishing the missing link connections for a Greenway bike and pedestrian trail corridor from the Seattle waterfront to the John Wayne Pioneer Trail near North Bend, as outlined by the Mountains-to-Sound Greenway Trust.

- *Burke-Gilman Trail and Sammamish River Trail*

We recommend completing the missing links of the Burke-Gilman Trail: NW 11th to the Locks and NW 60th to Golden Gardens.

We recommend replacing stop signs with yield signs and installing stop signs on private driveways on the Burke-Gilman Trail in Lake Forest Park.

- *Lake Washington Loop*
  The loop will be significantly enhanced by replacement of the SR-520 floating bridge. The new bridge is scheduled to include a non-motorized trail adjacent to the roadway.

Until then, we recommend immediate implementation of supplemental bicycle service on the SR-520 bridge in the form of special roll-on/roll-off "bicycle buses" until the bridge replacement with its non-motorized trail is constructed and opened to use.

We recommend a western supplemental trail connection to the new trail on the SR-520 bridge, making the connection to the Madison Park neighborhood, and thereby granting direct access from the bridge to the Lake Washington Loop as well as facilitating a lake-level alternative to the Loop's routing through the Arboretum corridor.

In Renton, we recommend routing the Loop via a short section of Cedar River; the private Boeing airplane bridge across the Cedar River should be retained for bicyclists.

- *Interbay Trail and Elliott Bay Trail*

We recommend removing nighttime-use prohibitions on the Elliott Bay Trail and Centennial Trail and at the Chittenden Locks.

- *Bridges*
  Special attention should be given to current and future users as they cross bridges.

We recommend separating pedestrian and bicycle facilities in addition to lateral separation from vehicular traffic.

We recommend appropriate "through bicycle" markings across free right turns and slip lanes.

Proposed New Trails for the Network

Several major routes throughout the Puget Sound Region cannot be adequately served by on-road accommodation. In these instances, traffic volume, traffic speed, interchange ramps, or other factors dictate the construction of new multi-use trail links.

With this in mind, we recommend the following remediation measures be undertaken:

SR-522 Trail
Construction of a new trail segment along SR-522 in Snohomish County from the Fales Road/Echo Lake intersection to Tester Road just north of the river will complete the long-needed direct cycling corridor from the Woodinville urban fringe to Monroe and the SR-2/Stevens Pass corridor. This link should be incorporated into the scheduled SR-522 roadway dualization project that will feature a new, parallel span across the Snohomish River.

Sinclair Inlet Trail
This southwesterly route would run along SR-304 in Kitsap County from the southwest corner of the Puget Sound Naval Shipyard in Bremerton to the interchange with SR-3, along SR-3 to SR-16 Gorst interchange, then east to the SR-166 Bay Street interchange. A segment of this trail should be located parallel to the water's edge adjacent to the rail line or the highway or between them. Grade-separated pedestrian-bicycle connections should be included at SR-3/SR-304 to the Auto Center Way-Bayview Drive (SR-3) regional route link, at the Gorst interchange, and at the SR-16/SR-166 interchange.

Black River Connector Trail
This badly needed short trail link would directly connect the Lake Washington Loop at Renton with the Interurban (Duwamish) Trail at Fort Dent Park. The proposed 700-foot trail link would follow an existing fenced informal path extending west from Monster Road SW (an extension of the SW 7th Street link) and cross under low, wooden, railroad trestles to connect directly with the Interurban/Duwamish River Trail in Fort Dent Park.

Signage for the Network

Recommendations for sign geometry, materials, and text/symbols need to be developed. Features such as font type, colors, symbols, legends, and route numbers should be standardized throughout the four counties (see Figure, right).

We recommend that the jurisdictions of the region join Cascade Bicycle Club in a Task Force to establish guidelines for Regional Bicycle Network sign design and installation.

We recommend the task force also study methods and programs to promote funding and implementation of signage.

To kick off Task Force activities, Map 5 shows suggested recommendations for early-action trail signing on six major corridors:

- Kitsap Peninsula Route
- Kingston-Stevens Pass Route
- Cascade Foothills Route
- Cross-Sound—Snoqualmie Pass Route
- Rainier-Chinook Route
- Puget Sound Route (East and West)

ABOVE
Figure : Example of Concept Route Sign

NEXT PAGE
Map 5 shows recommendations for six major corridors for an early-action trail-signing program.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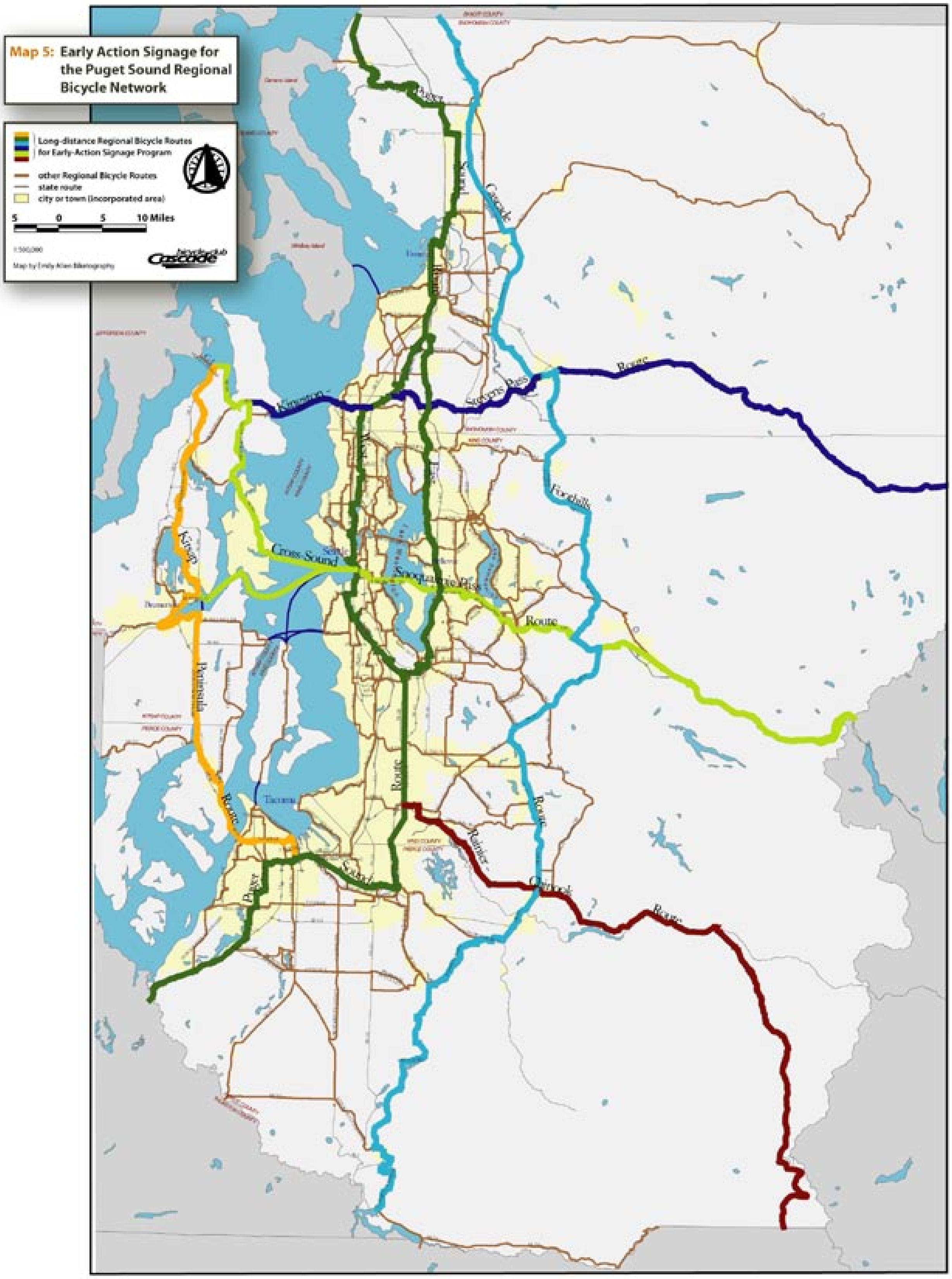

Map 5: Early Action Signage for the Puget Sound Regional Bicycle Network
Long-distance Regional Bicycle Routes for Early-Action Signage Program
other Regional Bicycle Routes
state route
city or town (incorporated area)
5 0 5 10 Miles
Map by Emily Allen Bikeography
Kingston
Stevens Pass
Route
Puget
Sound
Route
Cascade
Foothills
Route
Cross-Sound
Snoqualmie Pass
Route
Kitsap
Peninsula
Route
West
Tacoma
Route
Rainier
Chinook
Route
Puget
Sound

DISCUSSION

Although useful and efficient bicycle transportation routes rely primarily on arterials and collector-class streets, many communities focus on improving bicycle routes by means of paved, multi-use paths or trails that exclude motor vehicles. However, the future success of regional bicycling relies on improving the on-street bicycle network because in the majority of cases, it readily connects to employment and retail centers, schools and colleges, and other destinations.

The 1,521-mile regional bicycling route network for Puget Sound is readily identifiable using mostly existing trails and roadways. This is promising; many parts of the system are up and running and need nothing more than maintenance. However, a quick glance at Map 2 indicates that many needed improvements are necessary to turn this proposed Puget Sound Regional Bicycle Network into a true, working system.

Need for Improvements

The findings of the Study illuminate the deficiencies in a Regional Bicycle Network for the central Puget Sound Region. The human and environmental consequences of a deficient, non-intact, unsafe, and inefficient Regional Bicycle Network are significant. Deficiencies include incomplete "major" routes, lack of system connectivity, substandard roadways, and numerous safety concerns. By mileage, 404 miles (27 percent) of the identified Network fail to satisfy basic criteria for safe and efficient bicycle transportation.

Safety Concerns

Although concern for safety was among the highest-priority criteria in assessing routes and route segments, transportation professionals attempt to distinguish between *documentable* levels of safety and *perceived* levels of safety. Documentation of safety, risk, and hazard is typically provided by means of accident and road-use data. Perceived safety is more difficult to assess.

Because of real or perceived risk, countless cyclists are discouraged from using current or potential bicycling routes. Various factors on a given route affect bicyclist safety, and most of them derive from roadway design flaws, lack of planning for bicycle facilities, and/or underfunded construction projects that fail to include bicycle facilities in their planning. Factors such as narrow or unpaved road shoulders, roadside vehicle parking, uneven pavement, and hidden driveways all endanger bicyclists. Traffic volume, traffic flow, and pedestrian traffic volume can distract and endanger bicyclists; moreover, drivers in heavy traffic can easily miss spotting a cyclist. Improving safety for all users should be the highest priority of all planning departments.

"Centerline" Planning vs. Routine Accommodation

The limited progress in ensuring that our street network safely and efficiently accommodates bicycle and vehicular traffic arises largely from endemic lapses in traffic planning and engineering in the United States. Traditionally, transportation assets have been approached with one purpose: to build a system that is safe, convenient, and comfortable for *motorists*. In most instances, despite evidence of need, requests for inclusion of bicycle facilities are rejected as regressive, costly, or unnecessary. This posture belies the fact that, according to the *Household Transportation Survey*,[3] half of all automobile trips are shorter than five miles in length. Trips of this length are ideally suited for bicycle travel, and many more would likely be taken by bicycle if proper facilities existed.

Traditional "centerline" planning favors motor vehicles over bicycles: highways and streets are designed from the centerline out, with the number of lanes determined by the projected number of vehicles using the roadway. Paved motor vehicle lanes have the highest priority in road design,

Trips of five miles or less are ideally suited for bicycle travel, and many more would likely be taken by bicycle if proper facilities existed.

Improving safety for all users should be the highest priority of all planning departments.

and engineers try to provide enough paved lanes to accommodate anticipated increases in traffic volume. Not surprisingly, they frequently run out of space at the road shoulders; consequently, they repeatedly claim that there is not enough space to accommodate both pedestrian walkways and/or bicycle lanes. As a result, bicycle lanes are regularly excluded from new construction and reconstruction plans.

As an improvement to such planning, the U.S. Department of Transportation recently adopted a "routine accommodation" policy statement suggesting that bicycling and walking facilities be incorporated into all transportation projects—both new-construction and reconstruction projects—unless exceptional circumstances exist where non-motorized use is not permitted (e.g., in the case of some segments of urban freeways) or where the cost of non-motorized facilities would be excessively disproportionate to the need or probable use.[14]

Although the estimated cost of routine accommodation is low (typically between 1% and 4% of the project cost), there is no formal local or regional requirement to do so in the Puget Sound Region. A routine accommodation policy would remedy many of the deficient regional route segments over a period of 20–25 years.

Paved Multi-use Trail vs. Shared Roadway

In this Study, the choice of using a paved multi-use trail designed for pedestrians and non-motorized vehicles instead of using an existing road or highway was made on a case-by-case basis. In keeping with federal policy regarding accommodation of bicycles on streets used by motor vehicles, there was consensus to establish both multi-use trails and on-street facilities for bicyclists. In cases where future trails are constructed, we always advise maintaining the existing on-street facility unless dangerous or extenuating circumstances exist.

Signage

Signage for navigating the system can be as much a necessity to the Network as a "pass" route designation. Basic sign types can be categorized as follows:

- *Full-copy Sign*
  Displays the route name and/or number, major destinations on the route, connections to other corridors or to off-route destinations, and directional arrows. Full-copy signs are used at route origins, regional route junctions, and other access points and at suitable intervals along the route (see conceptual example on p. 29).

- *Reduced-copy Sign*
  Gives limited but pertinent information as needed (e.g., "Route Turns Here").

- *Follow-up/Confirmation Sign*
  Reassures cyclists or confirms previous information. For example, a confirmation sign identifying the route name/number would appear shortly after a turn or a junction of routes, as is the custom with highway signage. If two routes merge, confirmation signs would identify both routes by name or number.

- *Trailblazer Sign*
  Alerts cyclists of need to leave regional route in order to access another regional route. Trailblazer signs also guide cyclists to a regional route from key off-route locations.

Costs

In recent history, bicycle transportation has not comprehensively and routinely been a standard component of road engineering, construction, and maintenance in the Puget Sound Region. Consequently, we are faced with network deficits and must often implement their remediation via implementation of stand-alone projects. Although as many as 21 percent of Washington residents choose to bike for reasons of recreation, running errands, or commuting,[15] less than one percent of the

state transportation budget is allocated for bicycle improvements.[16] In the Puget Sound Region, an average of about $1.7 billion is spent each year on all transportation improvements, whereas non-motorized (bicycle and pedestrian) spending in the region is estimated to be between $40 and $60 million per year. A mere two percent of transportation spending is currently allocated to *both* pedestrian and bicycle improvements.[9]

Given that this report does not attempt to stipulate how the recommended improvements should be carried out, it is difficult to estimate the associated costs. However, it should be noted that as many as 21 percent of residents currently choose to travel by bicycle—yet less than two percent of funding is currently allocated for bicycle improvements. *If spending matched use more closely, there would be ample funds available to make the necessary improvements to the bicycle network over the next ten years.*

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SUSAN HILES

CONCLUSION

The Puget Sound Region can become the first-class bicycling region that it should be; however, the deficits outlined in this report slow the growth of bicycle transportation and should be remedied.

Although the Study identified a Regional Bicycle Network for Puget Sound, it also uncovered two glaring failures with regard to local bicycle routes that connect cities, towns, and gateways throughout the four counties in the central Puget Sound Region.

The first failure is acknowledged by the PSRC, albeit with no discernible action to date: there is little focus on cross-jurisdictional (regional) planning and development of bicycle travel facilities.

With proper facilities, this region can become the first-class bicycling region that it should be. Given safe and convenient conditions, many individuals would prefer a ten-minute bike commute to being stuck in traffic for 30 minutes, and many more would choose bicycling for recreational, economic, and health purposes. Yet under current conditions, too many people are unable to make that choice. It is time for state, regional, and local transportation departments to change their priorities and focus more resources on making local streets safe and friendly for bicyclists as well as for motorized vehicles and pedestrians.

Second, agencies responsible for providing safe, comfortable bicycle transportation assets have not done so. The Study shows that more than one-quarter of the identified Regional Bicycle Network fails to meet bicyclists' most basic needs.

K. CASEY

The limited progress in ensuring that our street network safely and routinely accommodates bicycling in addition to vehicular transportation is due largely to endemic failures within our planning, transportation, and traffic engineering communities. For too long, we have approached transportation assets with one purpose: building a system that is safe, convenient, and and comfortable for motor vehicles only. Facilities for bicyclists, when requested, have routinely been rejected as unnecessary, costly, or regressive. The resulting environment discourages bicycling and reinforces the perceived lack of need for bicycling facilities.

The deficits outlined in this report slow the growth of bicycle transportation, which in turn adds to the region's air pollution, detracts from efforts to improve the health of the region's inhabitants, squanders limited construction resources, and jeopardizes the safety of those individuals who travel by bicycle. It is vitally important that the responsible agencies rise to the challenge of addressing these issues by prioritizing the implementation of this Regional Bicycle Network and by adopting the policy and practice of routinely accommodating bicycling in all phases of planning, design, construction, and

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maintenance of roadways.
A more balanced approach to road design and maintenance is needed now to accommodate all forms of transportation. Roadway design that begins at the right-of-way limits and works its way in to the centerline will ensure that both pedestrian and bicycle traffic are included as critical elements in a network that is congruent with the motorized route network.

Accommodation of bicycles on the region's network of roads and highways requires that bicycling be safely and conveniently supported by roadway geometry and traffic controls. Furthermore, the network must be well maintained and provide reasonable access to most destinations. Although routine accommodation and connectivity pose slightly more difficult multi-jurisdictional coordination and funding challenges, transportation planners in the Puget Sound region must now bear responsibility for completing the streets by accommodating all modes of transportation.

This approach, together with implementation of the specific improvements recommended in this report, will result in a well integrated, safe, and efficient **network**—rather than a haphazard collection of route segments. It will serve the needs of hundreds of thousands of current and future cyclists—commuters, bicycle tourists, and recreational cyclists. The cooperation of city, county, state, and federal agencies in all phases of research, development, and maintenance is vital to the success of this project.

We look forward to helping make it happen.

A more balanced approach to transportation planning will ensure that both pedestrian and bicycle traffic are included as critical elements in a network that is congruent with the motorized route network.

GLOSSARY

PSRC: Puget Sound Regional Council

FHWA: Federal Highway Administration

ISTEA: Intermodal Surface Transportation Efficiency Act

AASHTO: American Association of State Highway and Transportation Officials

Geometry: The configuration or arrangement of a roadway, roadside, and/or right-of-way

Right-of-way: The publically-owned strip or cross-section of land over which facilities such as streets, highways, railroads, power lines, or bicycle facilities are built.

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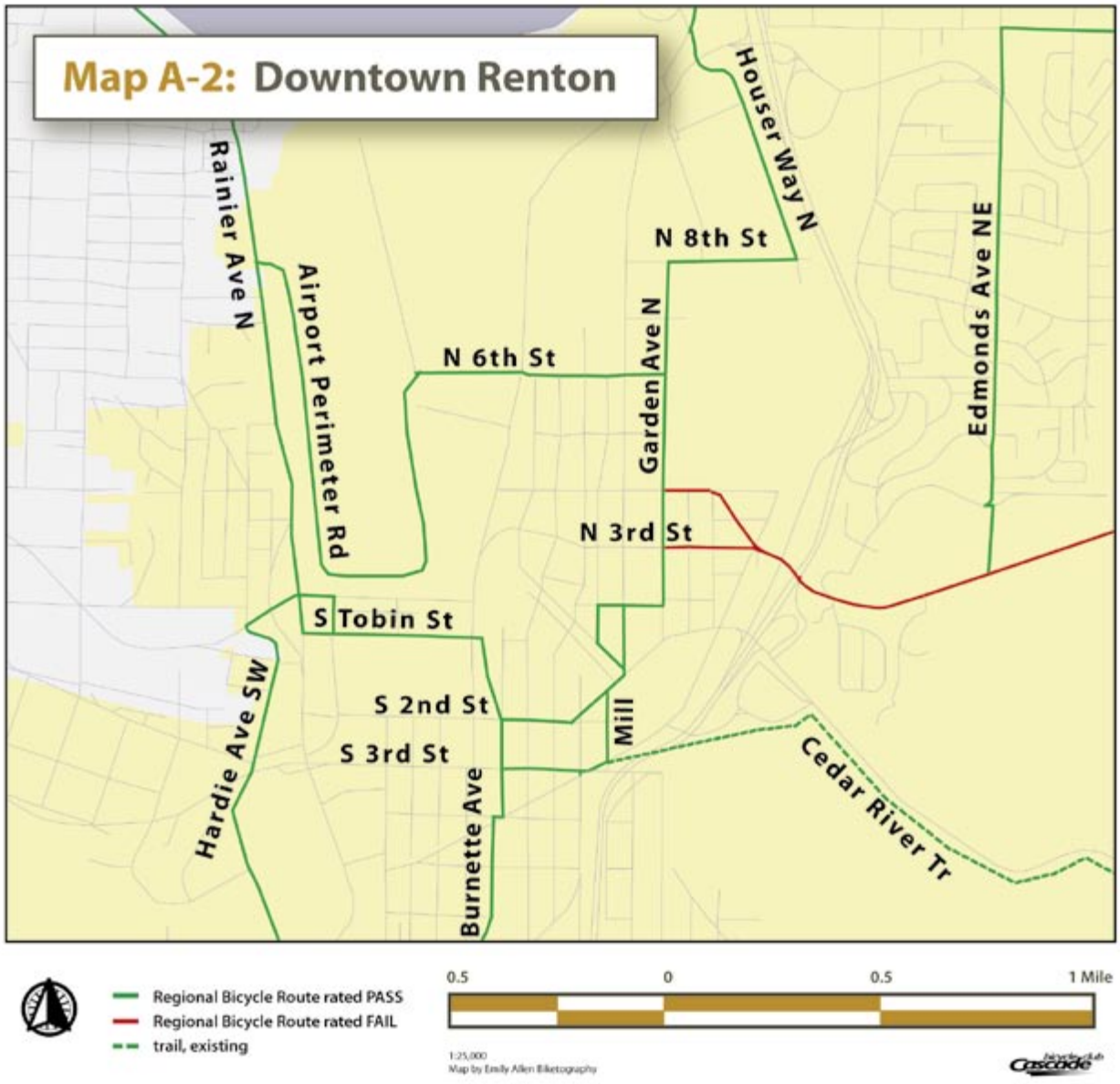
LEFT
BY THE SIDE OF THE ROAD

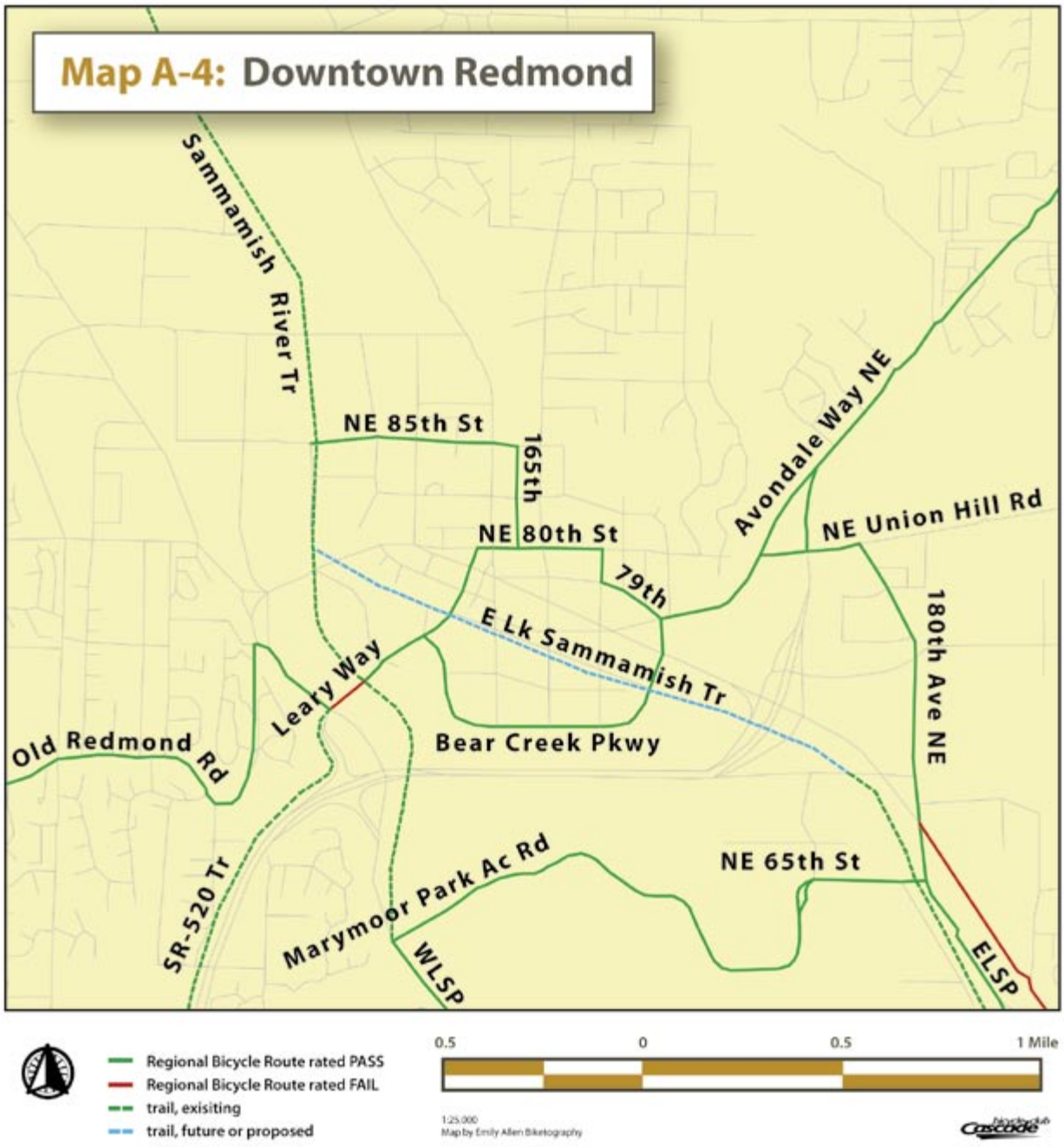
Puget Sound Regional Bicycle Network Study:
Assessment and Recommendations

MAPS


Map A-1: Downtown Everett
Colby Ave
E Marine View
E Grand Ave
Harrison Ave
Fulton St
Everett Ave
California St
Hewitt Ave
Pacific Ave
Smith Ave
43rd Ave SE
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, existing
0.5
0
0.5
1 Mile
1:25,000
Map by Emily Allen Bikertography


Map A-2: Downtown Renton
Rainier Ave N
Airport Perimeter Rd
Houser Way N
N 8th St
Edmonds Ave NE
Garden Ave N
N 6th St
N 3rd St
S Tobin St
Hardie Ave SW
S 2nd St
S 3rd St
Burnette Ave
Mill
Cedar River Tr
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, existing
0.5
0
0.5
1 Mile
1:25,000
Map by Emily Allen Bikelography


Map A-3: Downtown Seattle
Dexter Ave N
Eastlake Ave E
10th Ave E
Harrison St
12th Ave E
7th Ave
Wall St
Bell St
Blanchard St
Alaskan Way
E Pine St
Pine St
Pike St
8th Ave
1st Ave
12th Ave
Marion St
Columbia St
2nd Ave S
Yesler Way
S Jackson St
S King St
Alaskan Way S
Golf Dr S
I-90-to-Sound Tr (proposed)
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, future or proposed
trail, existing
0.5
0
0.5
1 Mile
1:25,000
Map by Emily Allen Biketography


Map A-4: Downtown Redmond
Sammamish River Tr
NE 85th St
165th
NE 80th St
79th
Avondale Way NE
NE Union Hill Rd
180th Ave NE
E Lk Sammamish Tr
Leary Way
Old Redmond Rd
Bear Creek Pkwy
SR-520 Tr
Marymoor Park Ac Rd
NE 65th St
WLSP
ELSP
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
trail, exisiting
trail, future or proposed
0.5
0
0.5
1 Mile
1:25,000
Map by Emily Allen Biketography


Map A-5: Downtown Tacoma
N 11th
N Ainsworth
Division Ave
S Ainsworth Ave
St Helens Ave
Market St
Pacific Ave
S 9th St
S 15th St
Dock St
Puyallup Ave
S 25th St
Yakima Ave
Center St
Regional Bicycle Route rated PASS
Regional Bicycle Route rated FAIL
0.5
0
0.5
1 Mile
1:25,000
Map by Emily Allen Biketography