QUILCEDA/ALLEN

WATERSHED MANAGEMENT PLAN

WASHINGTON STATE DEPARTMENT OF ECOLOGY

January 1999

Snohomish County

Public Works

Surface Water Management

Working together for people, streams & fish.

QUILCEDA/ALLEN WATERSHED VISION STATEMENT

PLACE: QUILCEDA/ALLEN WATERSHED

Year: 2025

The Quilceda/Allen watershed provides an outstanding natural setting for people to live, play, work, and learn. Both old and new watershed residents are committed to protecting and enhancing water resources and to returning them toward their former pristine condition.

The streams, wetlands, and estuaries are important in keeping people in touch with the natural environment, maintaining cultural heritage, and providing important habitat. All the streams are shaded and the stream waters are clean and cool with salmon and other fish and aquatic animals increasing in abundance. The increased wooded stream tracts and wetland buffers provide wildlife habitat, help clean runoff, and afford protection. Open space--parks, wetlands, areas along the streams, farmlands, and woodlands--is protected and provides visual relief from the urban environment and allows water to resupply the underlying aquifers. These aquifers provide drinking water, help to maintain flow, and cool the stream waters. Forested and revegetated land is maintaining the water cycle balance.

The watershed has undergone changes to the natural drainage system from human impacts. In the past, streams have been channeled and streamside vegetation has been removed; water quality has been degraded and fish numbers have declined; streambank erosion, sedimentation, and flooding have increased. As the watershed continues to change, recognition of the importance of maintaining the natural drainage system is changing the look of development in the watershed. Agencies are working with each other and with citizens for the good of the watershed. Together we are reversing negative impacts, learning more about the system, and watching the salmon spawn.

Quilceda/Allen Watershed Management Committee

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

May 3, 1999

Watershed Action Plan Committee
C/o Ms. Janet Carroll
Senior Planner
Snohomish County Surface Water Management
2930 Wetmore Ave., Suite 101
Everett, Washington 98201

Dear Watershed Action Plan Committee:

RE: Quilceda/Allen Watershed Action Plan - Statement of Approval

Please accept my compliments on the completion of Quilceda/Allen Watershed Nonpoint Action Plan. Much hard work has gone into the preparation of this plan. I sincerely appreciate the perserverance, committment and efforts that have gone into this plan for the protection of the watershed in the Quilceda/Allen Watershed.

We have reviewed the plan dated January 1999 which constitutes Ecology's Northwest Regional Office approved version of the Plan. This version of the Plan meets the applicable requirements of the rule for Local Planning and Management of Nonpoint Source Pollution (Chapter 400-12 WAC). Therefore, the plan is approved.
With this approval, no changes are required to the final version of the plan. "Ecology Approved" and the date of this letter should be cited on the cover of the plan's printed for distribution.

Snohomish County has responsibility to oversee plan implementation and prepare annual reports. Ecology has responsibility to conduct an audit of implementation and effectiveness every two years. The first audit of this plan is anticipated in May of 2001.

We look forward to receiving annual reports on how implementation of your Plan is proceeding. We recognize that most implementation efforts will occur at the local level, but we are prepared to assist you with your efforts in any way we can.

We look forward to the successful implementation of your Plan and its water quality benefits to the Quilceda/Allen Watershed. For any questions or concerns, please contact Joan Snyder at (425) 649-7213.

Sincerely,

John Glynn
Water Quality Section Manager
Northwest Regional Office

QUILCEDA/ALLEN WATERSHED MANAGEMENT PLAN

PREPARED FOR
THE QUILCEDA/ALLEN WATERSHED
MANAGEMENT COMMITTEE

PREPARED BY

Janet Carroll, Senior Planner

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January 1999

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EXECUTIVE SUMMARY

Introduction

The draft Quilceda/Allen Watershed Management Plan was prepared by the Quilceda/Allen Watershed Management Committee (WMC) and Snohomish County Public Works, Surface Water Management Division (SWM). The plan is funded in part by a Centennial Clean Water Fund grant administered by the Washington State Department of Ecology. Local funding for the plan was provided through Watershed Management Area fees collected for the Quilceda/Allen watershed by SWM.

Location

The Quilceda/Allen watershed is in west central Snohomish County just north of the City of Everett. The watersheds for the two stream systems have been combined because of the proximity of the streams to each other and because both discharge into Ebey Slough in the lower Snohomish River delta. The combined watershed encompasses an area of 49 square miles (31,360 acres); Allen Creek drains about 11 square miles and Quilceda Creek drains about 38 square miles.

The Quilceda/Allen Watershed As a Natural Resource

The Quilceda/Allen watershed is a public resource to be managed and enjoyed by a variety of watershed users. Managing the watershed is not just about protecting the streams, wetlands and their inhabitants, but about protecting watershed residents, homes, and businesses as well.

Fish and Wildlife Habitat

Streams, wetlands, and riparian corridors provide habitat for fish and wildlife in and along Quilceda and Allen creeks. Chum and coho are the most common salmon species that spawn in these streams. Cutthroat trout are stream residents all year long. These fish depend on the pools and riffles in the streams and off-channel wetlands during their life cycle. Pools are created by fallen logs and other woody debris from streamside forests. Streamside habitat is also a source of food for

aquatic animals. In addition, it provides food, cover, and nesting sites for other species including the bald eagle, great blue heron, red-legged frog, and mule deer.

Clear, cool water from wetlands and ground water provide a constant water source to streams during the hot summer months when there is little rainfall. Even when some streams naturally dry up, pools in off-channel wetlands provide a summer home for young salmon and other fish. From this water, salmon and other aquatic animals and plants derive life giving oxygen and nutrients.

Commercial and sport fishing provide economic benefits from continued salmon production in Quilceda and Allen creeks. Many people depend on the salmon fishery for their livelihood. The salmon is also an important cultural resource to Tulalip tribal members.

Clean Water For Recreation

Clean water is essential to outdoor recreation in the watershed. Many children play in the water and ravines of Quilceda and Allen creeks. Jennings Park is located along a scenic stream section in lower Allen Creek. Children swim, wade, and play in the park's creek and pond, while adults watch the ducks, geese, gulls, and great blue herons there. Children are attracted to streams as places to explore. Kayakers, canoeists, and other recreational boaters use the lower Quilceda estuary for bird and wildlife watching. Stream and wetland buffers provide natural relief from the urban environment in many parts of the watershed.

Clean and Plentiful Water for Drinking

Drinking water reserves draw on the watershed's water storage capacity. The Tulalip, Getchell-Snohomish, and Marysville trough aquifers serve the watershed. Many residents, business owners, farmers, and the City of Arlington rely on the volume and quality of these ground water reserves. Forests and other open lands ensure that water can filter into the ground providing adequate ground water for the watershed.

Water Quality and Water Resource Problems in the Quilceda/Allen Watershed

Watershed residents have noticed a change in the watershed's streams. No longer do they observe the salmon that once were abundant in the creeks. Habitat along the creeks has changed, streams carry heavy sediment loads, and hillside forests have been replaced by houses and roads. These changes and others affect the quality of the streams and the quality of life of the area.

Stormwater Runoff

Stormwater runoff is water from precipitation that enters streams during storms. The amount, timing, and velocity of runoff is changed as impervious surfaces are

constructed preventing water from infiltrating into the ground. Impacts to watershed hydrology include flooding, streambank erosion, stream channel downcutting, and loss of habitat for fish and wildlife. These problems are significant for the watershed's people and salmon, and they will increase as future development causes loss of open space and creation of more impervious surfaces. Computer modeling has shown that without mitigation stream flows in upper Quilceda Creek will increase by 82 percent when future development is complete.

Sediment

One of the most visible and destructive types of pollution to watershed salmon habitat and aquatic animals is excess sediment. The sediment fills in spawning gravel, smothers salmon eggs, and can kill young salmon if their gills become clogged. Stream channels slowly become filled with sediment that provides a substrate for vegetation to grow and causes flooding and habitat destruction. The major sediment source occurring today is from construction. There is continual land clearing and exposing and moving of earth for all types of development related activities--new homes and businesses; roads; water, sewer, and power lines; and culverts. Heavy rains carry large amounts of sediment from exposed soils to the stream. Some watershed streams are already unsuitable for salmon spawning and rearing because of sediment, and watershed development is rapidly increasing. A walk down Allen Creek west of 67th Avenue NE reveals a stream particularly hard hit by heavy sediment loads.

Bacteria, Nutrients, and Urban Pollutants

In rural and agricultural areas, water quality has been degraded by fecal coliform bacteria and high nutrient levels from livestock waste and failed septic systems. Water quality testing has found extremely high bacteria levels in almost all watershed streams and high nutrient levels as well. Bacteria levels have exceeded state standards by as many as ten times, and lead and copper levels exceed the chronic limit in most watershed streams. Excessive nutrients in water cause excessive plant growth that can deplete the stream's oxygen supplies. Low dissolved oxygen is a problem in both upper and lower Allen Creek. Urban runoff collects chemicals from fertilizers, herbicides, pesticides, fungicides, petroleum, detergents, and heavy metals and discharges them into stream water. These pollutants can be toxic to aquatic animals and harmful to humans as well.

Solid Waste and Garbage

Streams along roads and through residential areas are littered with garbage, and streambanks are lined with grass clippings, compost piles, and pet waste that adds nutrients as rainwater washes them into streams. Dump sites along the stream contain lead acid batteries and other car parts, adding metals and toxic chemicals to stream water. Residential neighborhoods along streams and roadside streams, especially Allen Creek along 67th Avenue NE, receive the largest amounts of garbage.

Stream and Wetland Habitat Degradation

Stream channel alteration along roads, around fields, and through developed areas have resulted in aquatic habitat loss. Channeled streams have no structural diversity and usually have little streamside vegetation. These stream sections were found to have poor salmon rearing habitat. Livestock access to the channeled streams has caused streambank erosion and water pollution. People regard these channeled streams as ditches and often use them as garbage dumps.

Streamside vegetation removal has occurred throughout the watershed. In urban areas, even where regulated buffers have been left along the streams, vegetation is still removed to create lawns and openings to the stream. Farmers clear their land to the stream edge. The result is streambank erosion and fish and wildlife habitat degradation.

Logging activities along the ravine edges above the creeks have resulted erosion; logging of forested wetlands has caused loss of water storage capacity. Sedimentation from logging activities has also occurred. Streambank stability has been affected by logging along a segment of the Middle Fork Quilceda Creek.

Wetlands have been drained and filled or have been degraded from livestock grazing, human trampling, and garbage dumping. Wetlands play a very important role in this watershed in maintaining water quality, allowing for aquifer recharge, providing fish and wildlife habitat, storing water, and as a source of water for streams. However, wetlands continue to be lost despite protective regulations. Over 100 acres of wetlands has been lost in the Munson Creek drainage basin alone.

Ground Water

Ground water is a little understood resource. To many residents it is the source of flooding problems in their crawl spaces and yards as homes were constructed without regard to the high water table. The importance of ground water to the watershed is its contribution to stream flow and its use as drinking water. Both ground water contamination and depletion could result from more development. A U. S. Geological Survey study done for the county found that the Marysville trough aquifer was highly susceptible to contamination, and an Ecology study stated that creation of impervious surfaces over the water table that prevents water from filtering into the ground could lower the water table and decrease stream flows.

Flooding and Drainage

Localized but serious drainage problems result in road flooding. Crawl spaces and yards fill with water, even in areas where upstream development has not yet occurred. The primary causes are the high ground water table, loss of wetlands and their storage function, and nonexistent drainage systems or systems in need of repair, replacement, or upgrading. For example, the road and subdivision near the intersection of 140th Avenue NE and 23rd Street NE flood during heavy rains. Despite the flooding, a considerable amount of development is proposed upstream.

Projecting The Future of the Quilceda/Allen Watershed

The future of the watershed can be projected by comparing developed portions of the watershed with less developed areas, looking at other watersheds with high density development, and using computer modeling to predict future stream flows.

Salmonid Rearing Habitat Loss

Within the watershed, the Allen basin has undergone more development than the Quilceda basin. Although the salmon numbers have declined in both basins, there appear to be fewer salmon returning to the Allen stream system than Quilceda. A comparison of instream salmon rearing habitat in Quilceda, Middle Fork Quilceda, and Allen creeks shows significantly better habitat in both Quilceda and Middle Fork Quilceda creeks than Allen Creek.

Mainstem Allen Creek receives the combined impacts of urban and agricultural development. Stream habitat is less diverse, and streamside vegetation is sparse along Allen Creek. Almost all of Quilceda Creek has riparian areas of trees and shrubs, including deep, wide, forested ravines in lower Quilceda Creek. The Middle Fork has sustained greater impacts from agriculture than the mainstem Quilceda. However, instream habitat diversity remains high in both streams because of the large area of undeveloped forest surrounding the headwaters and fewer impacts along the stream.

With greater development infringing on the Quilceda stream system, removal of riparian vegetation will cause of loss of streamside and instream habitat diversity, the future will bring further reductions of coho salmon numbers.

Water Quality Problems

A comparison of the less developed Quilceda/Allen watershed with the more densely developed North and Swamp Creek watersheds illustrates differences in water quality. Although the hydrologic characteristics of these two watershed are different, the impacts to North and Swamp creeks are typical of densely developed watershed. Water temperatures measured in North and Swamp creeks were higher than temperatures in Quilceda and Allen creeks. Water temperature in urbanized areas rises with removal of riparian vegetation and lowering of stream flows. Dissolved oxygen levels were considerably lower in North and Swamp creeks than Quilceda and Allen creeks reflecting the higher level of urban pollutants in the water. Bacteria, nitrate, and phosphate levels were all higher in Quilceda and Allen creeks from agricultural and rural land uses. These differences suggest the importance of maintaining riparian habitat for shade and to filter pollutants, and strengthening water quality efforts in all new development. Education for streamside residents is also needed to maintain and improve the riparian corridors.

Increased Stormwater Runoff

In many Snohomish County areas, streams that once flowed throughout the year are now dry in the summer. This condition results from the increased construction of impervious surfaces that changes runoff patterns to streams and the conversion of significant amounts of forest land. Without water, these streams cannot support fish populations.

Computer streamflow modeling in the Quilceda/Allen watershed predicts high winter flows under future land use conditions, due to the loss of forest and increased impervious surfaces that come with development. There could be a concomitant decrease in summer stream flows. Hillside salmon spawning streams will sustain some of the most severe impacts as increased flows scour out hillside spawning gravel.

Management Recommendations

This watershed plan has strong management recommendations to address watershed problems. These management recommendations were selected because they would best maintain the salmon resource, protect water quality, and prevent flooding given the land use decisions that have been made for the watershed.

Controlling Stormwater Runoff

The major watershed concern is controlling stormwater runoff. The best way to prevent an increase in stormwater runoff is to maintain watershed forests, wetlands, and low density land use. This plan recommends forest and wetland preservation along the Quilceda and Middle Fork Quilceda headwaters. The plan also recommends that further computer modeling be conducted to determine what specific actions must be taken in each sub-basin to maintain stream flows at current levels. Until that is accomplished, the standards in Ecology's Stormwater Manual for the Puget Sound Basin should be used by all jurisdictions. Infiltration facilities should be constructed where possible to decrease discharge into streams and allow for aquifer recharge.

Proper maintenance of detention, retention, and water quality facilities insures that they function as designed to slow and reduce stormwater runoff and clean the water. When regular maintenance is not done, sediment and other pollutants build up in these facilities until they no longer function properly. The plan calls for actions that ensure routine maintenance procedures by all jurisdictions and individuals.

Reduction of Nonpoint Pollution

There are several recommendations that are designed to reduce nonpoint pollution from the variety of sources. The plan proposes to "reduce unnatural sediment input into stream to levels that can be transported out of the system by stream flow at all

times of the year." Since sediment is one of the biggest problems, the plan recommends that clearing ordinances be developed and grading ordinances strengthened. A rating system for clearing and grading activities for new development on steep slopes would be developed to prevent erosion. The plan also recommends training programs to demonstrate appropriate erosion control techniques.

Reduction of nutrient and fecal coliform bacteria in stream water is addressed through farm plans and workshops in agricultural areas and through a septic system inventory and septic maintenance education program in unsewered areas. A campaign to educate residents on their pollutant contributions is proposed. Maintaining wetlands and buffers that provide water quality functions is important as well to meet water quality objectives.

Enhancing Water Resources

The main strategy to prevent streams, wetlands, and ground water from degradation is through retention of forest, riparian corridors, and open space, combined with economic incentives. Development of a recovery plan for coho salmon is a strategy designed to build upon the information collected as part of the planning process. This recovery plan will develop further strategies to protect coho salmon habitat and to prioritize stream sections and wetlands for enhancement and rehabilitation.

Ground water protection in the Marysville trough is addressed through maintaining low density land use and limiting the amount of impervious surface in new development through design standards. The Marysville trough aquifer is recommended for critical aquifer recharge designation because of the ground water's contribution to stream flow. These recommendations meet the objective of supporting land uses and policies to protect ground water quality and quantity.

Preventing Drainage and Flooding Problems

Drainage and flooding issues throughout the watershed are addressed through design of drainage plans for both developed and developing areas. The watershed plan also identifies several areas where culverts need replacing and drainage systems need upgrading.

Cultural Resources

Cultural resources are addressed through education. An oral history video will be produced that will record the stream history by interviews with watershed residents. The plan encourages the use of natural systems located near schools as outdoor laboratories.

Plan Adoption

It is the Watershed Management Committee's intent that the plan be adopted by each watershed jurisdiction as part of the comprehensive plan for that jurisdiction. In Snohomish County the procedure for adoption could include the following:

Phase I

1. Developing and passing a ordinance to adopt the Quilceda/Allen Watershed Management Plan.
2. Setting a schedule for adoption of new regulations and regulation amendments.
3. Establishing interlocal agreements with cities and tribes to implement the Quilceda/Allen Watershed Plan through adoption.

Phase II.

1. Adoption of new ordinances and amendment of existing ordinances.
2. Council budget approval for watershed plan implementation.

Implementation

Agencies and jurisdictions that will implement individual plan actions, an implementation schedule, and estimated costs are included in the implementation section of this document (tables 9 and 10, pages 168 and 172). The schedule and cost estimates are preliminary and are included as a planning tool to assist in budgeting. Any implementation done under this plan is subject to the implementing agencies and groups obtaining funding to carry out the management recommendations. Final responsibility for implementation and cost sharing will be subject to negotiation between Snohomish County, local cities, The Tulalip Tribes, and agencies and through interlocal agreements.

Conclusion

The Quilceda/Allen Watershed Management Committee believes it is essential to implement strong management recommendations to meet the watershed's goals. These goals include maintaining salmon habitat and productivity, improving water quality, protecting wetlands and ground water, educating watershed citizens, and providing for cultural opportunities for watershed residents. The committee is optimistic that this plan can make a difference.

SECTION 1. INTRODUCTION

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The Watershed Plan

The Quilceda/Allen Watershed Management Plan presents a program to control nonpoint pollution and protect water resources. This plan has been developed by the Quilceda/Allen Watershed Management Committee (WMC), which consists of watershed residents, representatives of watershed businesses, and agencies having jurisdiction in the watershed.

The plan presents recommendations that will be considered for adoption by each local jurisdiction (Marysville, Arlington, The Tulalip Tribes, Snohomish County) as part of the comprehensive plans applicable to the watershed. The plan document is a blueprint for long term implementation of the management program.

Document Organization

The plan has seven sections. Section 1 covers the plan, its organization, and the watershed planning process. The planning process describes the formation of the WMC and the committee's work in determining the problems and management strategies, as well as the public involvement efforts conducted in the watershed.

Section 2 discusses the importance of maintaining the integrity of the watershed's hydrology and introduces the goals and objectives developed by the committee for the plan. This section also provides a general description of the watershed's problems and the problem prioritization. Section 3 summarizes the watershed's biological and physical characteristics. The summary was condensed from the Quilceda/Allen Watershed Characterization (see technical supplement).

The next two sections describe specific actions to address water quality and water resource issues. Section 4 presents management strategies to address problems having watershedwide impacts. Preceding each management recommendation is a discussion of the problems, and the regulations and programs that address the problems. Each recommendation is described and the implementing entity identified. Section 5 provides a summary of the problems of smaller planning areas and describes the management recommendations specific to each.

The final section addresses plan implementation. Implementation strategy, costs, and potential funding sources are covered.

Planning Process

Plan Development

This watershed plan was developed in accordance with the Puget Sound Water Quality Management Plan and Nonpoint Rule (WAC 400-12). Development of the plan is funded by a Centennial Clean Water Fund Grant provided to Snohomish County through its Surface Water Management Division (SWM) and administered by the Washington State Department of Ecology (Ecology).

Watershed planning areas are selected for Centennial Clean Water funds on a priority basis. In Snohomish County, the Quilceda/Allen watershed was ranked second in priority by the county's Watershed Ranking Committee in 1988. (Watershed plans for the top priority North Creek and Swamp Creek watersheds have already been completed.)

The WMC first convened in April 1993. The committee was assembled by SWM, the lead agency, and includes representatives of local governments, the conservation and health districts, The Tulalip Tribes, citizen organizations, and watershed residents and businesses. Representation on the WMC balances county, tribal, and city representatives with individuals representing environmental, agricultural, and development interests. A technical advisory committee (TAC) was also established, including representatives of the agencies involved in water resource and planning issues. The TAC's job was to review technical documents and provide advice and information to the WMC as requested. The names of WMC and TAC members appear under "Acknowledgments."

Watershed Studies

Comprehensive watershed information was gathered to provide the WMC with as much information as possible about water pollution and water resource problems. Sources for this information included: water quality reports prepared by SWM and The Tulalip Tribes; spawner data from Washington Department of Fish and Wildlife (WDFW); historical information from local libraries; studies conducted on the Snohomish River delta; ground water reports, geologic maps, and watershed well logs; Snohomish County wetland and stream inventory data; Snohomish County watershed plans; comprehensive plans for all jurisdictions; information on rare plants and animals from state agencies; and drainage complaints compiled by SWM. From these sources, a watershed characterization was prepared to present an initial analysis of the watershed and its problems (see technical supplement).

It became apparent during preparation of the watershed characterization that additional studies were needed for plan development. Studies were conducted to fill in data gaps as follows: water quality monitoring, stormwater characterization, stream flow modeling, fish habitat assessment, ground water study, wetland function and value assessment, drainage analysis, and an agricultural survey. Reports on these studies are included in the technical supplement.

Development of Management Recommendations

The WMC developed a list of management recommendations to address each watershed problem. These recommendations were given to technical committees consisting of TAC members and other experts in various technical disciplines to choose the best management recommendations for the watershed and to add recommendations if needed. These technical committees also prioritized the management recommendations. The WMC then decided through consensus which of the recommendations to include in the plan.

Public Involvement

Early in the planning process, the WMC developed a public involvement program for the watershed. The program goals were as follows:

- To inform the public about the watershed planning process.
- To identify citizens' watershed concerns.
- To provide public learning opportunities about water resource issues.
- To develop a constituency of support for the planning process and plan.

To meet these goals, the WMC participated in and organized a number of events and activities. Approximately 400 people attended these events. Following are the highlights:

Booths at the Marysville Strawberry Festival (1993, 1994) to provide information on the watershed plan.

Watershed Open House and Stream Walk (October 1993) held on the Tulalip Reservation and at Jennings Park to introduce residents to the watershed planning process and to listen to their watershed concerns.

Evening of Watershed Planning and Environmental Theater (June 1994) held at Cedarcrest Elementary School to present study results and receive ideas about solving watershed problems.

Stream Enhancement Projects used volunteers to stabilize a streambank on a tributary to Quilceda Creek (November 1993) and to plant streamside vegetation on Earth Day (1994).

Timberbrook Stream Team formed during the Earth Day planting to involve neighborhood residents in maintaining planted vegetation and supporting ongoing education.

Kayak Tour of Lower Quilceda Creek (September 1994) to show residents the pristine estuarine and intertidal wetlands and stream.

Quilceda/Allen Watershed Volksmarch (October 1994) in the lower Allen basin with the Puget Sloshers Volksmarch group to highlight water resource and water quality problems in this area.

Quilceda/Allen Watershed Tour (October 1994) to follow the stream system up the Allen basin and down the Quilceda basin to point out the watershed's good and bad aspects.

Six **slide** presentations were given to inform watershed residents, school classes, and staff about the watershed plan and problems in the Quilceda/Allen watershed.

Six **articles** were published in local newspapers to inform residents about the watershed, watershed activities, and projects.

A Traveling Watershed Exhibit was displayed at watershed locations to describe the watershed planning process and watershed issues.

SECTION 2. WATERSHED CHARACTERISTICS

SECTION 2. WATERSHED CHARACTERISTICS

Introduction

Following is a summary description of the physical and biological characteristics of the watershed. For more detailed information, refer to the Quilceda/Allen Watershed Characterization in the technical supplement.

Location and Jurisdictional Boundaries

The Quilceda/Allen watershed is located in the lower Snohomish River Basin north of the city of Everett. The watershed is approximately 49 square miles in area and has from 60 to 70 miles of streams. Both the Quilceda and Allen stream systems empty into Ebey Slough at the mouth of the Snohomish River (figure 1).

The Quilceda/Allen watershed crosses several jurisdictional boundaries (see figure 1). The following are the proportions of the watershed by jurisdiction:

Jurisdiction	Percent of the Watershed
Snohomish County	59
Tulalip Reservation	22
City of Marysville	14
City of Arlington	5

Existing Land Use and Land Cover

Much of the watershed has been developed for industrial, commercial, and urban residential land use (figure 2). Residential development is concentrated within the City of Marysville; between State Avenue and 51st Avenue NE; north of 172nd Street NE near Interstate 5 (I-5); and near 67th Avenue NE. This area covers about 25 percent of the watershed. The industrial areas cover about 10 percent of the land area, and commercial development covers about 5 percent of the watershed, mainly close to I-5 and in downtown Marysville.

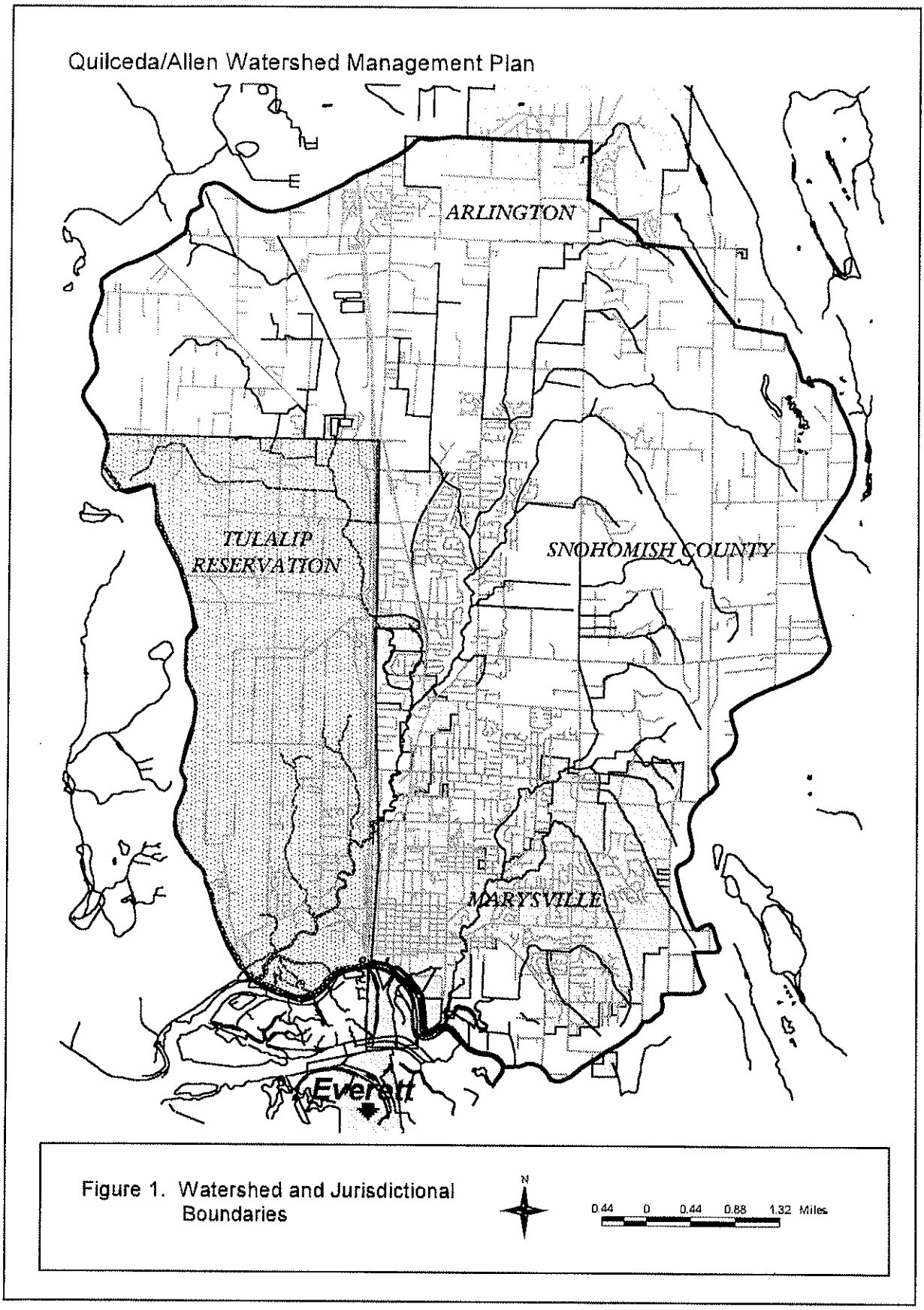

Figure 1. Watershed and Jurisdictional Boundaries

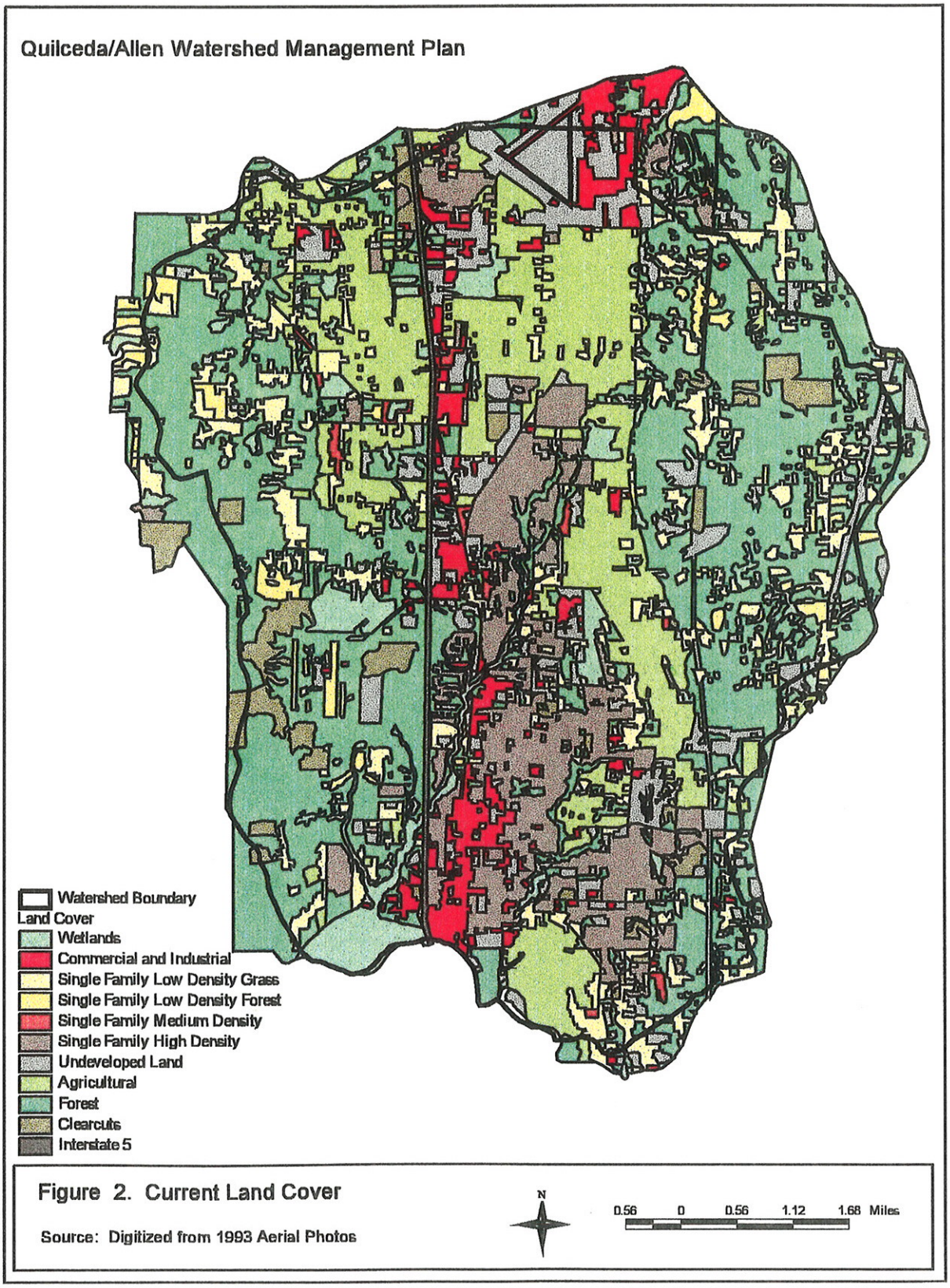

Figure 2. Current Land Cover

Source: Digitized from 1993 Aerial Photos

The remainder of the watershed is agricultural (30%) or is rural (30%). There are 251 farming enterprises; 70 are commercial, and of these, 15 are dairy farms (Bachert 1993). Much of the agricultural area consists of small farms, or fallow fields. Small farms, low density single family homes, and forest lands are found in areas with rural zoning. About 15 percent of the watershed is undeveloped forest land, mainly on the eastern hillside and on the Tulalip Reservation.

Land Use Trends

Planning for future land use is now occurring under the Growth Management Act. Watershed urban growth boundaries have been designated by Snohomish County; within these boundaries higher density residential, industrial, and commercial development has been proposed (figure 3). The greatest change was the conversion of most agricultural land to other land uses. Approximately 25 percent of the watershed will be zoned for commercial and industrial uses, as compared to 15 percent under previous zoning. About 5 percent of the watershed will be zoned for agriculture, as compared to the previous 30 percent.

Protection for wetlands, streams, steep slopes, geologic hazard areas, fish and wildlife habitat, and floodplains has been established through the Marysville Sensitive Areas Ordinance and county Critical Areas Regulation. The county has also adopted an Interim Groundwater Ordinance. The Tulalip Tribes has adopted a watershed plan establishing water resource management recommendations. Arlington has not yet developed this type of ordinance.

Impacts of Future Land Use and Population Growth

According to Growth Management projections, approximately 20,000 additional people will be living within urban growth boundaries and on the Tulalip Reservation in the watershed in the next 20 years (Toy pers. comm.). This population increase, combined with increases in commercial, business, and industrial land use, will result in a proliferation of roads, parking lots, and buildings. These greater areas of impervious surface will result in overland surface water flow increases during storms with the potential for downstream flooding and streambank erosion. Little area will remain for water infiltration to underlying aquifers. Neither stormwater detention standards nor water quality facilities are currently in place to address these problems, although all jurisdictions are working on new or revised stormwater standards to reduce development effects.

Observations in the watershed's developed portions indicate that greater human caused impacts to streams will occur from the following: riparian vegetation removal, further stream channel alteration, dumping garbage and yard waste into streams, increased fertilizer and pesticide use on lawns and gardens, and stormwater runoff.

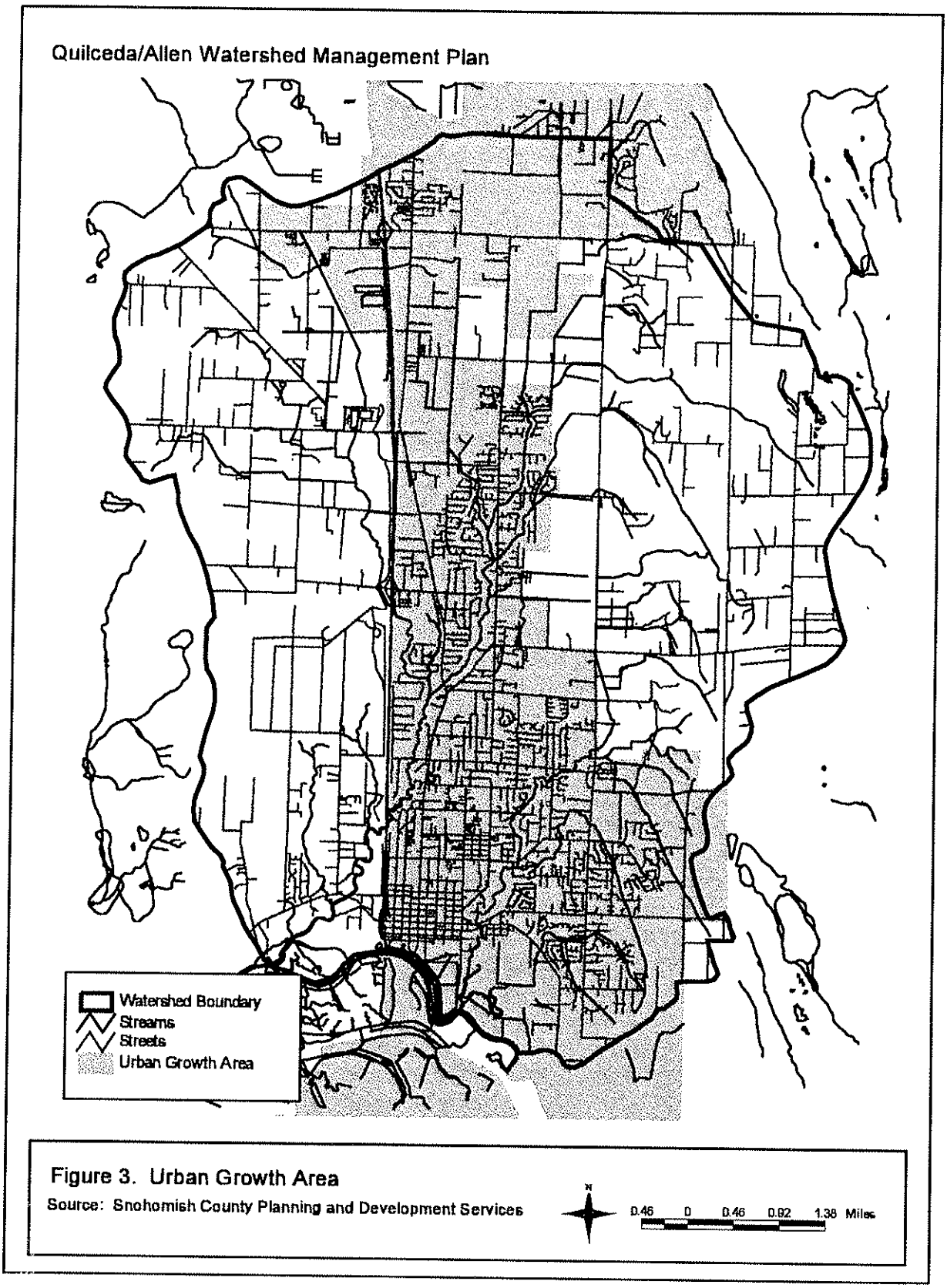

Figure 3. Urban Growth Area

Source: Snohomish County Planning and Development Services

Key Findings:

- Population will increase by about 50%, resulting in additional housing construction and commercial and industrial complexes. Impacts to the stream systems will occur from increased impervious surfaces. This will raise the potential for water pollution, localized flooding, human impacts to streams and stream buffers, and reduced salmon production.
- Much of the watershed's agricultural and forest land is already under development pressure, including large areas where industrial development is planned by Marysville, Arlington, and The Tulalip Tribes. These agricultural and forest lands are very important in maintaining the stream system health because they provide areas to intercept and infiltrate water.

Climate

Climate is a driving force for runoff patterns and most of the erosion and sediment transport processes operating in the watershed. Air temperature, precipitation, and wind affect stream flow, stream temperature, and ground water. The intensity and amount of precipitation are key factors in determining the rates of sediment input into the stream channel. Knowledge of the watershed climate and causes of flooding helps in predicting the effects of various activities on peak flows. Changes in the peak flow affect bank stability, streambed material, and large woody debris; these channel features affect aquatic organisms as well.

SWM maintains a precipitation gauge in the Smokey Point area. The average annual precipitation in the watershed for the period December 1990 through April 1996 was 35.09 inches (figure 4). This compares with 36.51 inches for the 30 year period 1961 through 1990 at the Everett rain gage. Approximately 76 percent of this precipitation fell from October through April. During this wet season, rainfall was usually of light to moderate intensity and continuous over of time. November was the wettest month with an average annual rainfall of 6.21 inches, and September the driest with an average annual rainfall of 1.22 inches. According to the long term Everett gage, rainfall was the highest during December and lowest during July.

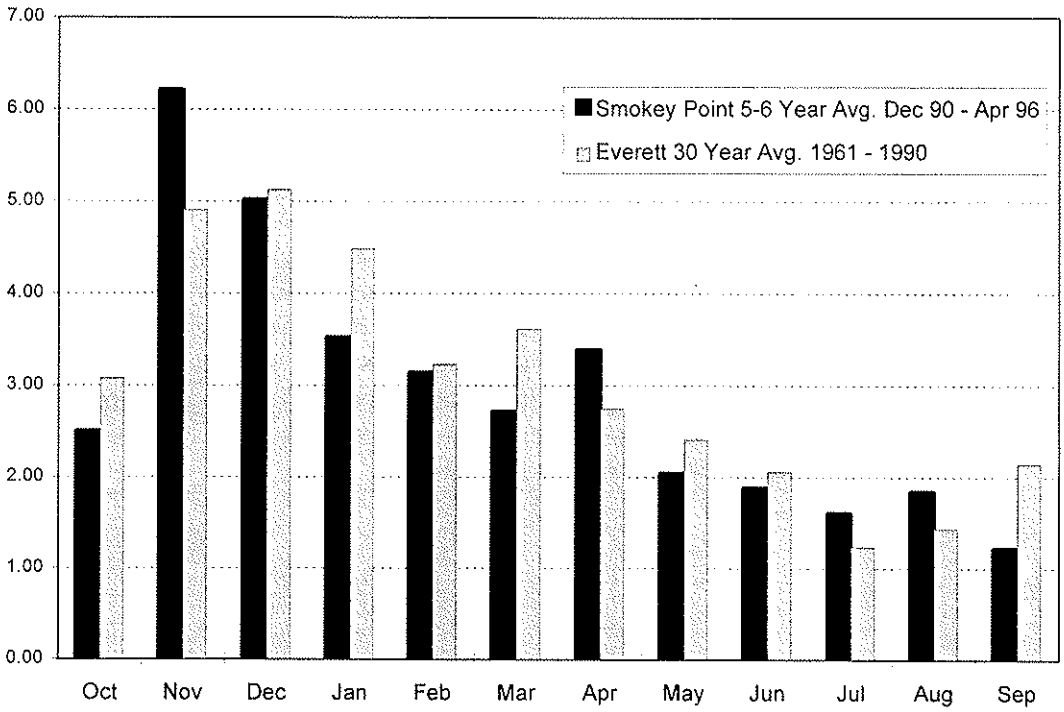

Figure 4. Average Annual Precipitation - Smokey Point - 1990-1996

Topography

The surface water flow in a watershed is determined by topography. The Quilceda/Allen watershed is characterized by a broad north-south trending valley (the Marysville trough) bordered by 400 to 500 foot plateaus to the east (Getchell plateau) and west (Tulalip plateau) (figure 5).

Approximately half the watershed lies along the Marysville trough. The trough extends from the Snohomish River to Arlington, gradually increasing in elevation from sea level at the southern end to about 120 feet at the northern end. Easterly and westerly, the trough gradually increases to about 100 feet within one half mile of the watershed boundary. There the land rises steeply out of the trough, approximately 500 feet in elevation, to the Tulalip plateau on the west and about 400 feet to the Getchell plateau on the east. The plateau margins are terraced formations gradually changing into fairly level terrain at the watershed's edges.

The steep sideslopes of the watershed play a major role in determining the rate at which water and sediments are delivered to stream channels. When streams drop steeply down hillslopes, they erode streambanks and carry instream wood downstream. Steep areas of the watershed will produce more sediment and produce it faster than the flat areas.

Quilceda/Allen Watershed Management Plan

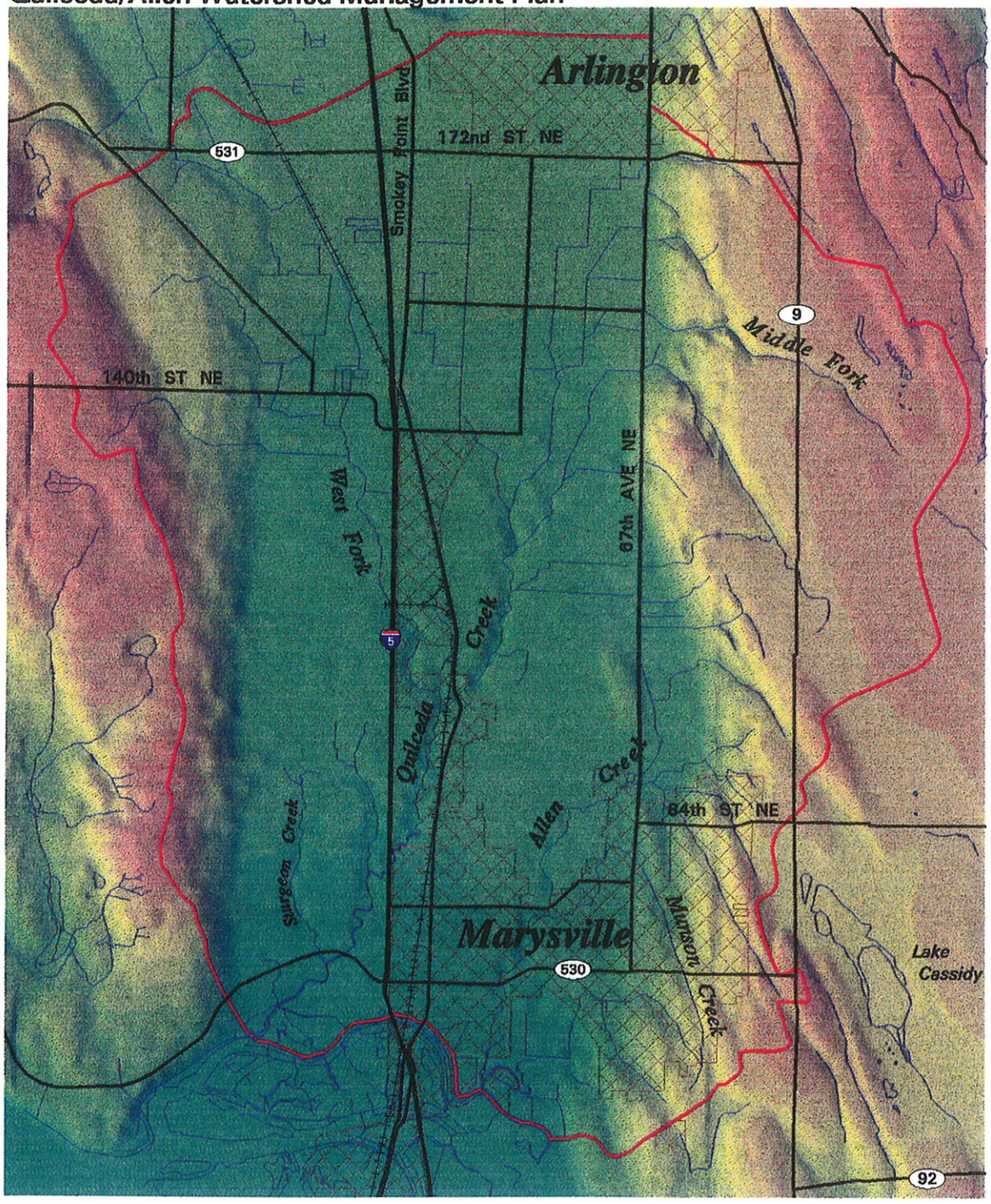

Figure 5. Shaded Relief Map

Miles
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Changes in Topography

The topography affects both surface and ground water flow direction and velocity. On the watershed's steep hillslopes, streams flow at a rapid rate. When these streams reach the valley floor, the flow of water slows significantly. Material, especially sediment, deposits and accumulates in these flat areas. Under natural conditions, much of the sediment would eventually be carried to the Snohomish River floodplain and washed into the river by tidal water. When human activities upstream cause unnaturally large amounts of sediment in the water, sediment released in the flat area causes silt accumulations in the stream channel. The silt then becomes a substrate in which vegetation can grow. Silt and vegetation can clog the stream and decrease the water holding capacity of the stream channel with resultant flooding.

In the lower Allen basin the Snohomish River floodplain has been diked, drained, and converted to farm land. Upstream construction activity releasing large amounts sediments into streams, together with the lack of tidal cleansing, makes the floodplain stream channels deposition areas for sediment. The result is that the floodplain floods--not from the tide, as it would naturally--but from large amounts of stormwater runoff in the streams spilling over the clogged stream channels.

Grading and filling for development and roads has changed runoff patterns and redirected the natural drainage. Pipes and ditches now direct more runoff to streams.

Geology

Geology is important in determining landforms, stream characteristics, and soil types. Runoff processes are characterized by the permeability, depth, and porosity of soil and bedrock. Soils and rock types affect erosion processes and the sediment delivery rate. Geologic features control stream gradient and channel morphology. Background nutrient and dissolved ion levels are also determined by bedrock type and soil depth.

Historical geologic events produced the regions landforms and hydrologic characteristics (figure 6). The soils and landforms of the Puget Sound area are the result of erosion and deposition of materials associated with the advance and withdrawal of glaciers. The Quilceda/Allen watershed lies in the Puget Sound Lowland Physiographic Province. The province contains the Puget Sound basin and all areas west of the Snohomish County foothills, including the larger river basins and river valleys extending into the foothills.

The Puget Sound lowland was formed by several glacial events that occurred over the last million years. Current surface features, landforms, and subsurface layers are related to the most recent of these glacial advances--the Fraser glaciation. During

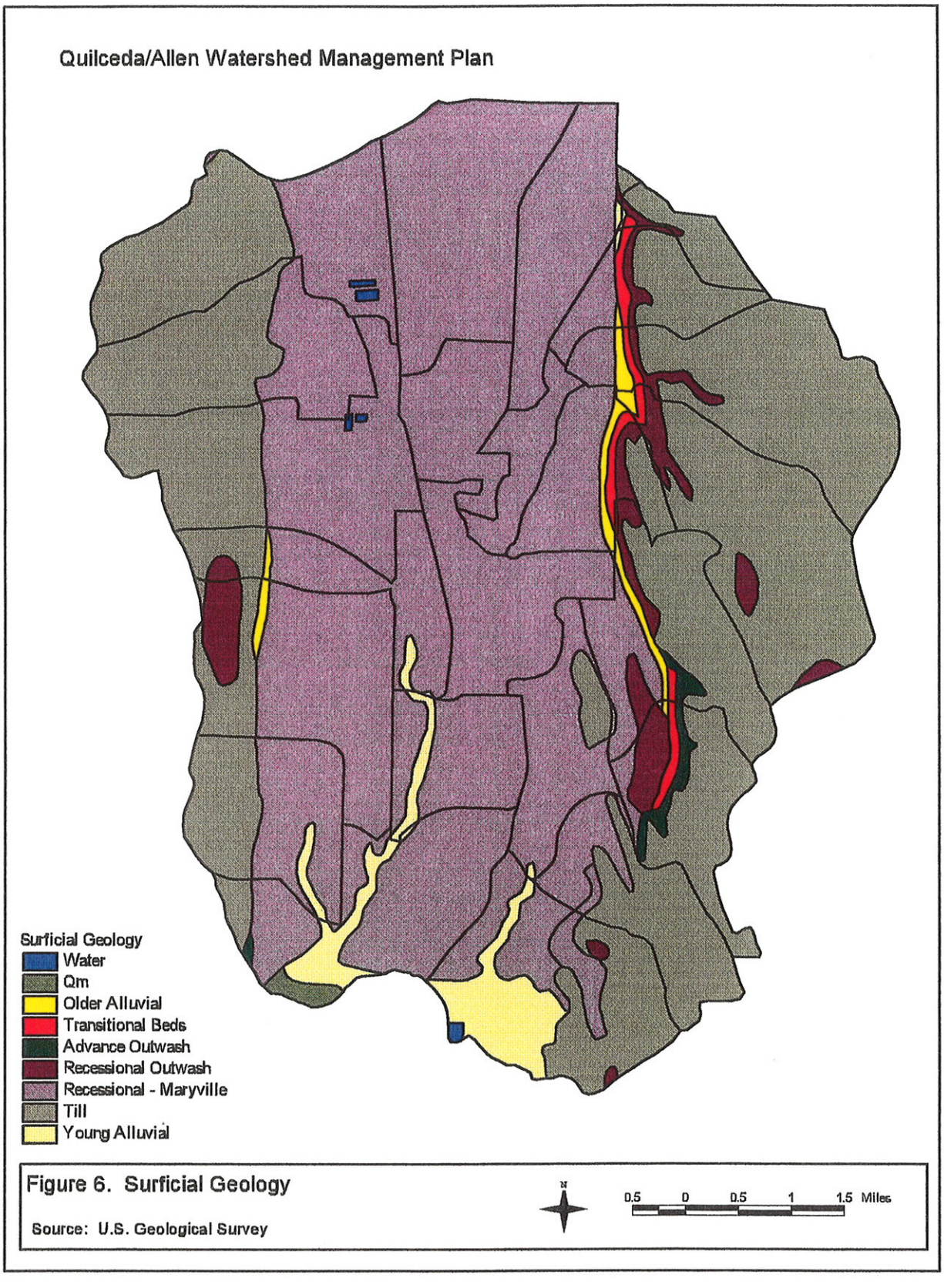

Figure 6. Surficial Geology

Source: U.S. Geological Survey

this glacial period there were two glacial advances and an intervening glacial retreat. The final advance, locally referred to as the Vashon Stade of the Fraser Glaciation, began approximately 20,000 years ago.

During the Vashon Stade, a large tongue of ice called the Puget Lobe advanced through the Puget Sound lowland. The meltwaters from the advancing glacier deposited sand and gravel, called Vashon advance outwash, directly on top of older glacial and nonglacial soils (transitional beds and tertiary sedimentary rocks). In the watershed the advance outwash material occurs on the Tulalip and Getchell plateaus in thicknesses of up to 350 feet.

As the ice sheet passed over the area, the sand and gravel materials consolidated with other materials that were directly deposited and overridden by the glacier. This consolidated material is referred to as Vashon till. The Vashon till was deposited on top of the advance outwash on hills and plateaus on both sides of the watershed. It also formed an underlying layer in the Marysville trough.

At some time during this glacial event, the Puget Lobe dammed the Stilliguamish River valley and glacial flow was deflected southward, eroding the Marysville trough valley. As the Puget Lobe receded out of the area, extensive deposits of recessional materials were laid down on the Vashon till. This recessional outwash, termed the Marysville sand member, became very thick and extensive throughout the Marysville trough.

Alluvial deposits are the most recent geologic deposits in the watershed. They are found at the eastern and western edges of the Marysville trough. These materials consist of sand and gravel carried by streams down the hillside and deposited in the valley.

Sensitive Geologic Areas

Geologic hazard areas have been defined by Snohomish County (Snohomish County Tomorrow 1991) (figure 7). Geologic hazard areas include areas prone to landslides and earthquakes. Landslide hazard areas are found along the slope of the Getchell plateau and along the banks of Quilceda, Allen, and Munson creeks. Steep slopes, soft soils, and ground water seepage make these areas prone to landslides.

Areas susceptible to earthquakes have been identified where soft or loose soils form valley floors and locally in upland areas (Snohomish County Tomorrow 1991). Moderate to high seismic hazard areas have been identified along Quilceda and Allen creeks and in the 100 year floodplain along Ebey Slough.

Geologic processes and human activities are responsible for slope instability and erosion prone areas. In the Quilceda/Allen watershed steep, unstable slopes occur along the streams and in ravines. Erosion from increased stream flows and human activity is observable along several reaches in both stream systems. More serious erosion problems can be expected as development increases surface water runoff.

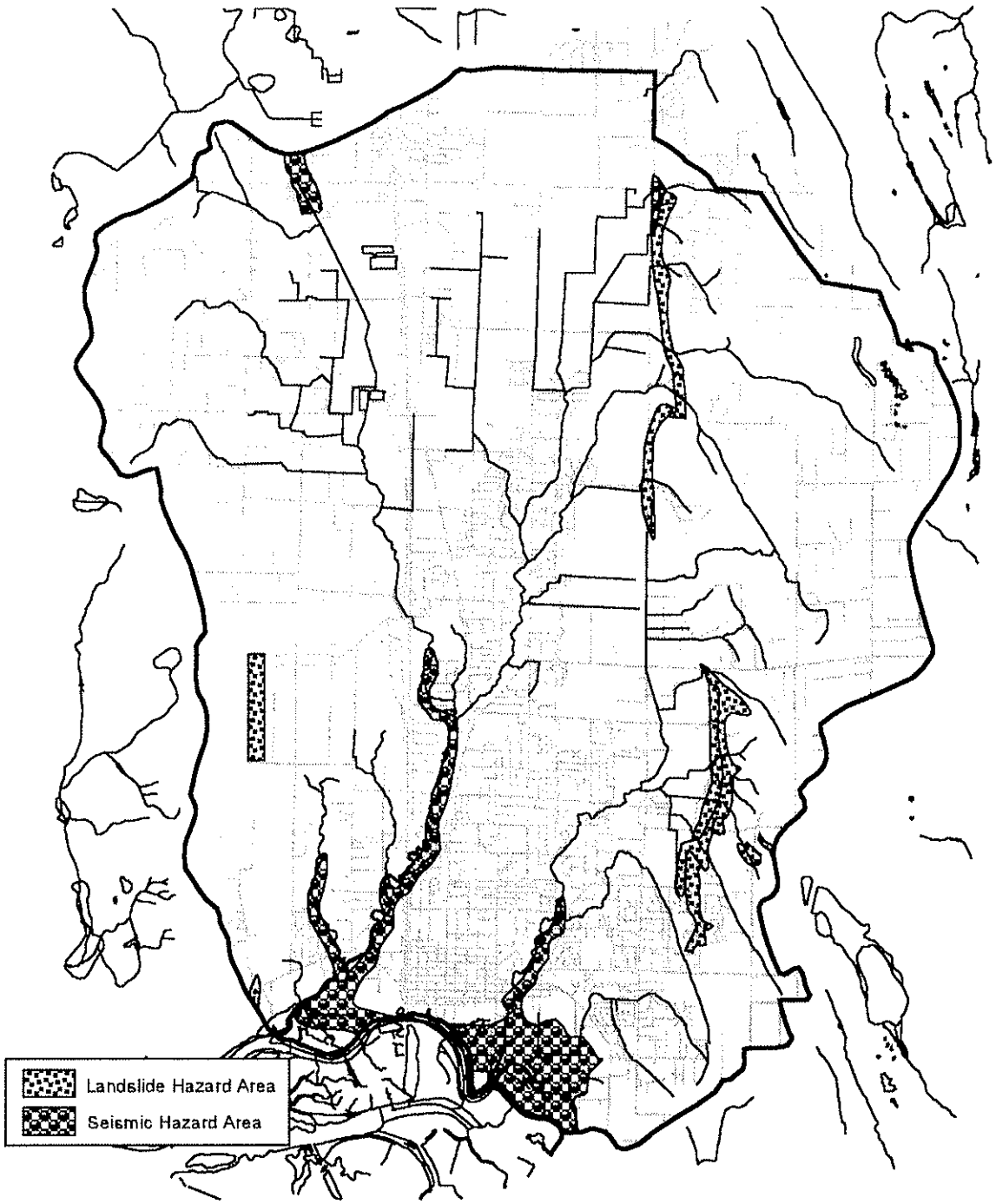

Figure 7. Geologic Hazard Areas

Source: Snohomish County Tomorrow (1991), Jones, pers. comm.

Soils

Soil type influences the water's ability to percolate through the ground, the growth of various vegetation types, and the development potential of an area. The soil texture, depth, and permeability also affects the types and amount of pollution that leach into the stream channel, especially during storm events. The extent of soil compaction and surface erosion is determined by soil texture. Soil permeability also influences hillside drainage. Major soils in the watershed include Norma, Custer, Alderwood, Ragnar, Tokul, Lynnwood, Puget, Kitsap, and Bellingham (figure 8). Other soils, including Everett, Indianola, McKenna, Mukilteo, Pastik, and Snohomish, each make up less than 1 percent of the watershed area.

Norma and Custer

Approximately one third of the watershed (10,776 acres) is made up of hydric soils, mainly Norma (15%) and Custer (12%). These coarse-textured sandy soils are dominant in the Marysville trough. Hydric soils are saturated, flooded, or ponded long enough during the growing season (at least one week) to develop anaerobic (low oxygen) conditions in the upper layer. Hydric soils are wetland soils and support wetland plants.

Alderwood and Tokul

Alderwood soil is the predominant till soil along the western edge of the watershed, underlying approximately 12 percent of the area and consisting of gravelly sandy loam. Tokul gravelly loam soil is found on the watershed's eastern side making up about 26 percent of the watershed area. Till soils are mixtures of silts, sands, and gravels derived from glacial till.

Ragnar

Ragnar soil is found in the lower and middle portions of the Marysville trough, comprising about 15 percent of the watershed area and consisting of sandy loam. Ragnar soil is a very deep, well drained soil found on outwash plains.

Lynnwood

Lynnwood soil constitutes about 7 percent of the watershed's land area and consists of loamy sand. It is found along the streams and in the northern portion of the Marysville trough. This soil is very deep, somewhat excessively drained.

Puget

Puget soil is either undrained or artificially drained wetland soil found in the flat Snohomish River floodplain areas at the mouths of both Quilceda and Allen creeks. It makes up about 3 percent of the soils and consists of silty clay loam. This soil is very deep and formed in alluvium.

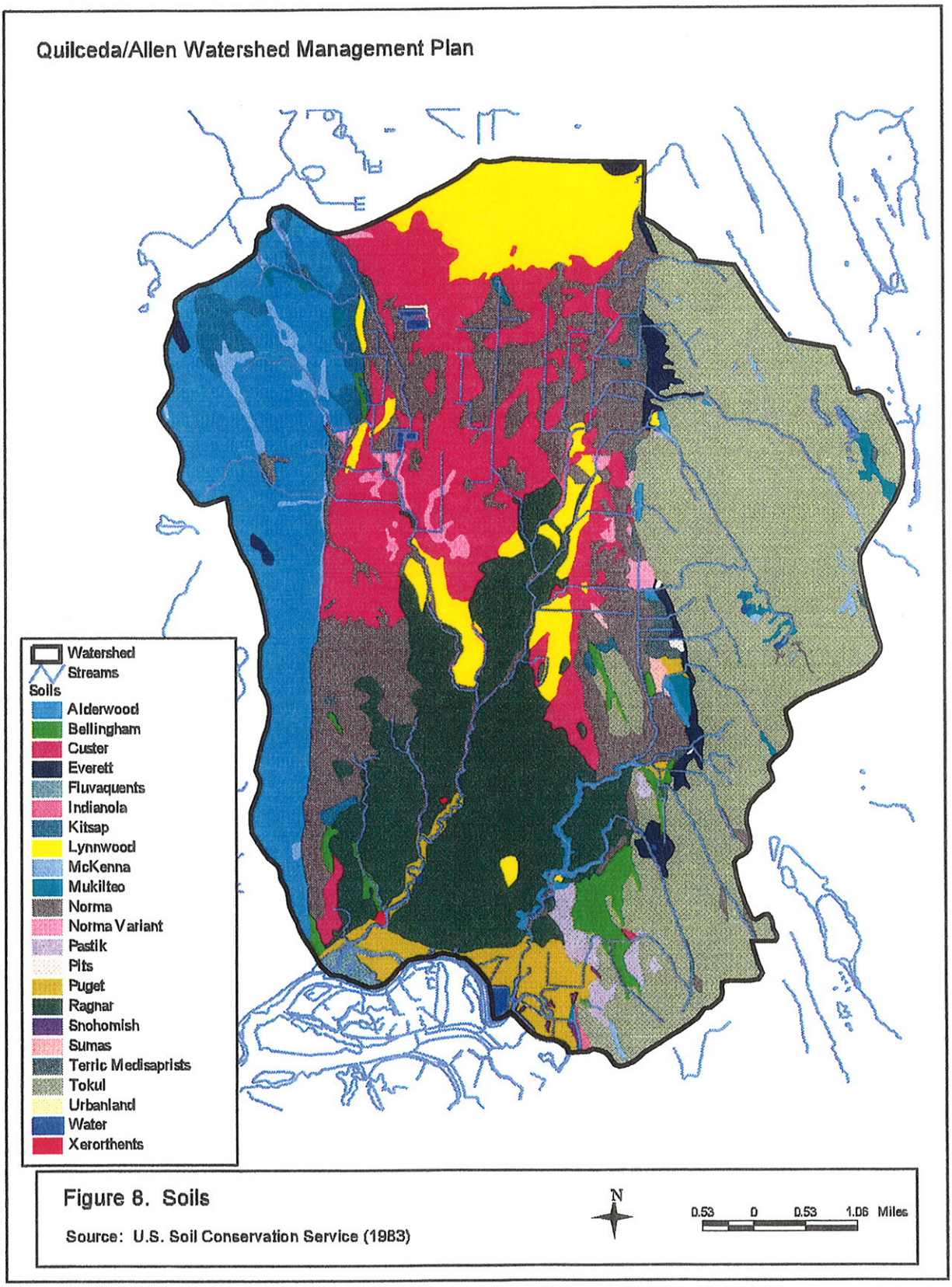

Figure 8. Soils

Source: U.S. Soil Conservation Service (1983)

Kitsap

Kitsap soil is found in flat areas mainly in the watershed's northwest portion. It makes up about 2 percent of the soils and consists of silt loam. This soil is very deep and moderately well drained.

Bellingham

Bellingham soil is a wetland soil found in depressions in the watershed's lower portion, mainly in the Allen basin. It makes up about 2 percent of the soils and consists of silty clay loam. It is deep and poorly drained.

Soil Sensitivity

Most of the watershed's soils are sandy. They are loose and easily eroded along streambanks and rapidly transmit surface water to ground water. The Tokul soils have fine silt particles that easily erode when disturbed. The sandy, coarse-textured soils have high permeability and little ability to capture and hold chemicals dissolved in water that can leach into the ground. Because the soils on the hillsides to the east and west are underlain by hardpan (a hardened or cemented soil layer), they pond water during the rainy season. Homes built on hydric soils and soils with perched water table often experience flooding. Ragnar, Alderwood, and Tokul are the watershed soils considered developable.

Key Findings:

- Thirty percent of the land base is in wetland soils or soils that constrain development.
- Sediment transported by hillside streams is deposited in flat areas.
- Geologic hazard areas are found along the toe of the slope of the Getchell Plateau, along the creeks, and in the floodplain.
- The sandy streambank soils and fine silty Tokul soils are easily eroded. Erosion will accelerate as runoff increases with new development, and as additional areas are cleared of vegetation.

Ground Water

Ground water is a limited and variable resource that plays an important role in the Quilceda/Allen watershed. Ground water discharge to streams supports year-round flow, and ground water provides drinking water to watershed residents. The infiltration, movement, and storage of ground water are controlled by the soils and geologic materials present below ground surface. How well the water infiltrates depends on the water's access to surface soil and soil permeability.

Aquifers are subsurface zones of earth, gravel, or porous stone yielding usable amounts of water. Three aquifers are found in the Quilceda/Allen watershed: the Marysville trough, the Getchell-Snohomish, and the Tulalip (figure 9). In Snohomish County three types of aquifer systems occur: shallow, intermediate, and deep. The Marysville trough aquifer is a shallow aquifer; the Getchell-Snohomish and Tulalip aquifers are intermediate. In the Quilceda/Allen watershed, ground water provides water for drinking, irrigation, and stock watering, as well as commercial and industrial, and fish propagation uses. The cities of Marysville and Arlington both have municipal wells in the watershed.

Marysville Trough Aquifer

The Quilceda/Allen watershed has a large unconfined or water table aquifer--the Marysville trough aquifer. This aquifer extends from Arlington and the Stilliguamish River in the north and to Marysville and the Snohomish River in the south. The aquifer is contained within the Marysville sand recessional outwash, extending from the surface to 150 feet below the surface. The ground water generally flows in a south to southwest direction, perpendicular to the water table contours. According to Larson and Marti (1996), ground water flow parallels the stream channel in the area south of 172nd Avenue NE, curving toward Quilceda Creek farther south where the creek is incised into the landscape. Because the aquifer underlying Quilceda Creek is very thick, deeper ground water probably continues southerly discharging to the Snohomish River.

Getchell-Snohomish Aquifer

The Getchell-Snohomish aquifer occurs in advance outwash deposits extending south from Arlington to Snohomish just east of the Marysville trough aquifer. The aquifer is from 50 to several hundred feet deep. Ground water flow from the Getchell-Snohomish aquifer is generally to the west in the watershed. This aquifer is considered confined even though ground water emerges where the Vashon advance outwash meets transitional beds, forming hillside springs and seeps and discharging into hillside headwater streams.

Tulalip Aquifer

The Tulalip aquifer occurs along the watershed's western boundary in advance outwash deposits extending from south of Stanwood throughout the Tulalip Reservation. This aquifer has been studied for designation as a sole source aquifer, but not designated. (A sole source aquifer is the only potential drinking water source for an area.) The aquifer is from 50 to several hundred feet thick. Similar to the Getchell-Snohomish, the Tulalip aquifer is confined, but discharges to the surface in several areas. Within the watershed, the Tulalip aquifer flows easterly and southerly.

Quilceda/Allen Watershed Management Plan

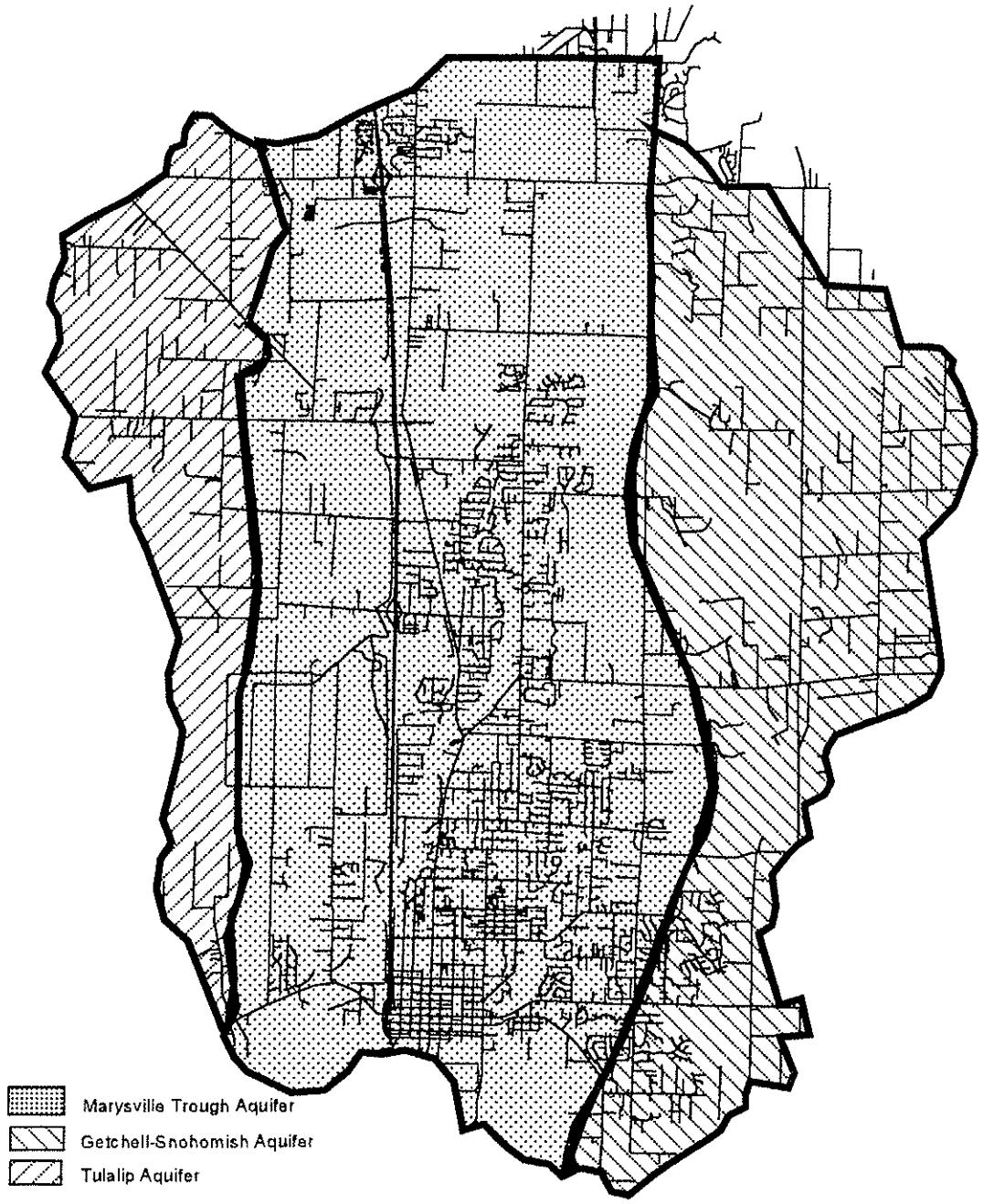

Figure 9. Aquifer Boundaries

Source: Snohomish County Planning Department

N

0.42 0 0.42 0.84 Miles

Ground Water Impacts

Impacts to ground water are long term and very difficult to correct with current technology. Because the ground water in the Marysville trough is so close to the surface, that aquifer is particularly sensitive to contamination from human activities. Threats to ground water quality include failing septic systems, leaking sewage pipes, phosphates and nitrates from animal waste and fertilizers, and accidental spills or intentional dumping of petroleum products and toxic chemicals. Ground water contamination has been documented in the watershed. According to Larson and Marti (1996), ground water is an important source of nitrate. Thus, an increase in nitrate in ground water will likely lead to a similar increase in stream water.

Maintaining ground water quantity depends on maintaining the balance between recharge, outflow, and withdrawal. Aquifer recharge potential is the water's ability to move into the aquifer from the surface or from other aquifer systems. Surface contributions depend on the capacity of the land surface to capture and infiltrate water and of the surface material to permit its percolation. The recharge potential of the Marysville trough aquifer is high because the aquifer is so near the ground surface, and the sand layer on the Marysville trough provides good infiltration material for precipitation. The recharge potential of the Tulalip and Getchell-Snohomish aquifers is considered low because of the aquifer depth and because till soils, like those on the Tulalip and Getchell plateaus, have a higher percentage of silt and clay. For this reason less water infiltrates, and infiltration is slower.

Without water to recharge the aquifer, ground water can be depleted. In the Quilceda/Allen watershed ground water depletion would not only affect the drinking water supply, but would decrease the amount of water to maintain summer streamflows. Ground water that discharges into streams does so at a much slower rate than surface water runoff and maintains baseflows during dry months. The results of the ground water study conducted in the upper Marysville trough by Larson and Marti (1996) indicated that ground water is an important source of streamflow in Quilceda Creek during nonstorm periods. Ground water continues to contribute to streamflow during storm events, but is not as important.

The ground water contribution to streamflow in the mainstem of Quilceda Creek ranged from 8 to 33 percent (Larson and Marti 1996). The mainstem has a relatively short length of channel within the study area (172nd Avenue NE south approximately 128th Street NE, east to 67th Avenue NE and west to Interstate 5), explaining the relatively small ground water contribution. In contrast, ground water contributes much greater amounts to the Middle Fork streamflow, with a longer stream section in the study area. Ground water comprised between 67 and 83 percent of streamflow. The combined flow of both the mainstem and the Middle Fork was between 46 and 60 percent contribution from ground water.

Flooding occurs as a result of the high water table in the Marysville trough area. Because the water from this aquifer rises rapidly to the surface in response to storm events, flooding of crawl spaces beneath residences is frequently reported. The flat expanses of land above the aquifer exacerbate these and other drainage problems.

Deep ditches have been dug throughout the Marysville trough in an effort to drain wetlands and lower the water table to maintain dry agricultural land.

Further watershed development will raise the potential for ground water contamination, particularly in the Marysville trough. The increased amount of impervious surface will diminish the amount of ground water recharge to the system. The role that ground water plays providing a local drinking water supply and in maintaining wetlands and streamflows could be substantially impaired.

Key Findings:

- Additional development over the aquifer could pose a high risk of contaminating the groundwater from metals and petroleum from accidental spills or dumping. Contamination of ground water in the northern area of the watershed may not show up in the stream for a considerable distance downstream.
- The major threats to ground water quality in the watershed are failing septic systems, petroleum, and toxic chemicals.
- Due to the large areas of sandy outwash soils, the Marysville trough is a primary recharge zone for underlying aquifers that supply drinking water and maintain stream flows in the summer.
- Any reduction in ground water recharge occurring in the northern portion of the watershed will probably reduce ground water discharge to the stream channel in the southern or lower portion of the watershed
- The high water table in the Marysville trough causes flooding and other drainage problems in the watershed.

Wetlands

In 1986 Snohomish County conducted a wetland inventory in the western portion of the county. A total of 181 wetlands were mapped in the Quilceda/Allen watershed; 122 in the Quilceda basin and 59 in the Allen basin. The total wetland area based on the inventory is approximately 1350 acres, with about 1000 acres in the Quilceda basin and 350 in the Allen basin. More than 100 acres of inventoried wetlands have been filled for development since 1986.

Because of the methodology used, the inventoried wetlands, represent only a portion of the watershed's wetlands. Figure 10 shows wetlands identified during the inventory and since the inventory. Hydric soils occur only in wetlands and their presence indicates the presence or former presence of wetlands. Therefore, it can be assumed that the 10,776 acres of the watershed mapped by the U.S. Soil Conservation Service (Debose and Klungland 1983) as hydric soils once were wetlands (figure 11).

The majority of inventoried wetlands (78%) are under 5 acres in area; 49 percent are 1 to 5 acres, and 29 percent are less than 1 acre. The preponderance of small

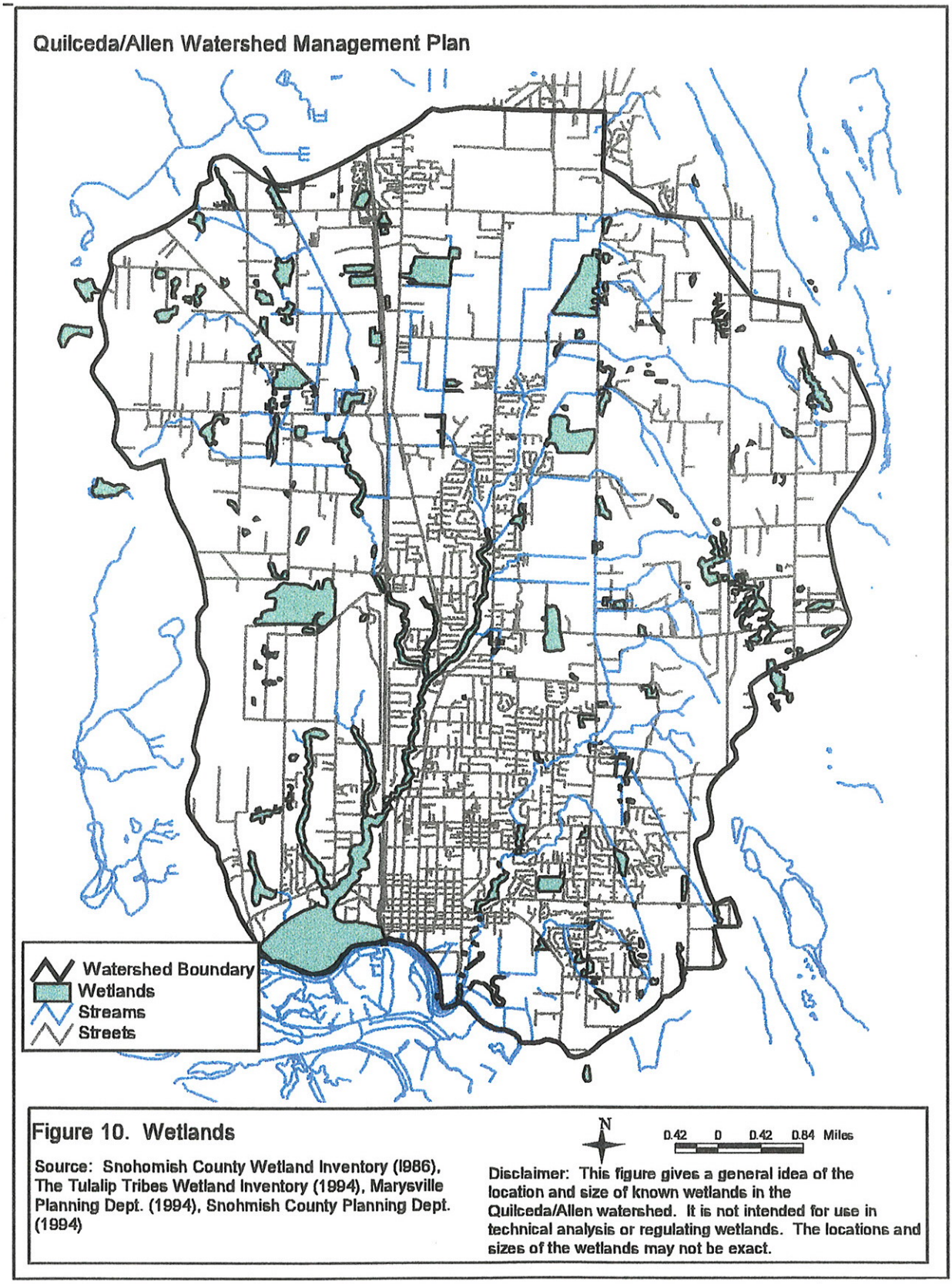

Figure 10. Wetlands

Source: Snohomish County Wetland Inventory (1986), The Tulalip Tribes Wetland Inventory (1994), Marysville Planning Dept. (1994), Snohmish County Planning Dept. (1994)

Disclaimer: This figure gives a general idea of the location and size of known wetlands in the Quilceda/Allen watershed. It is not intended for use in technical analysis or regulating wetlands. The locations and sizes of the wetlands may not be exact.

Quilceda/Allen Watershed Management Plan

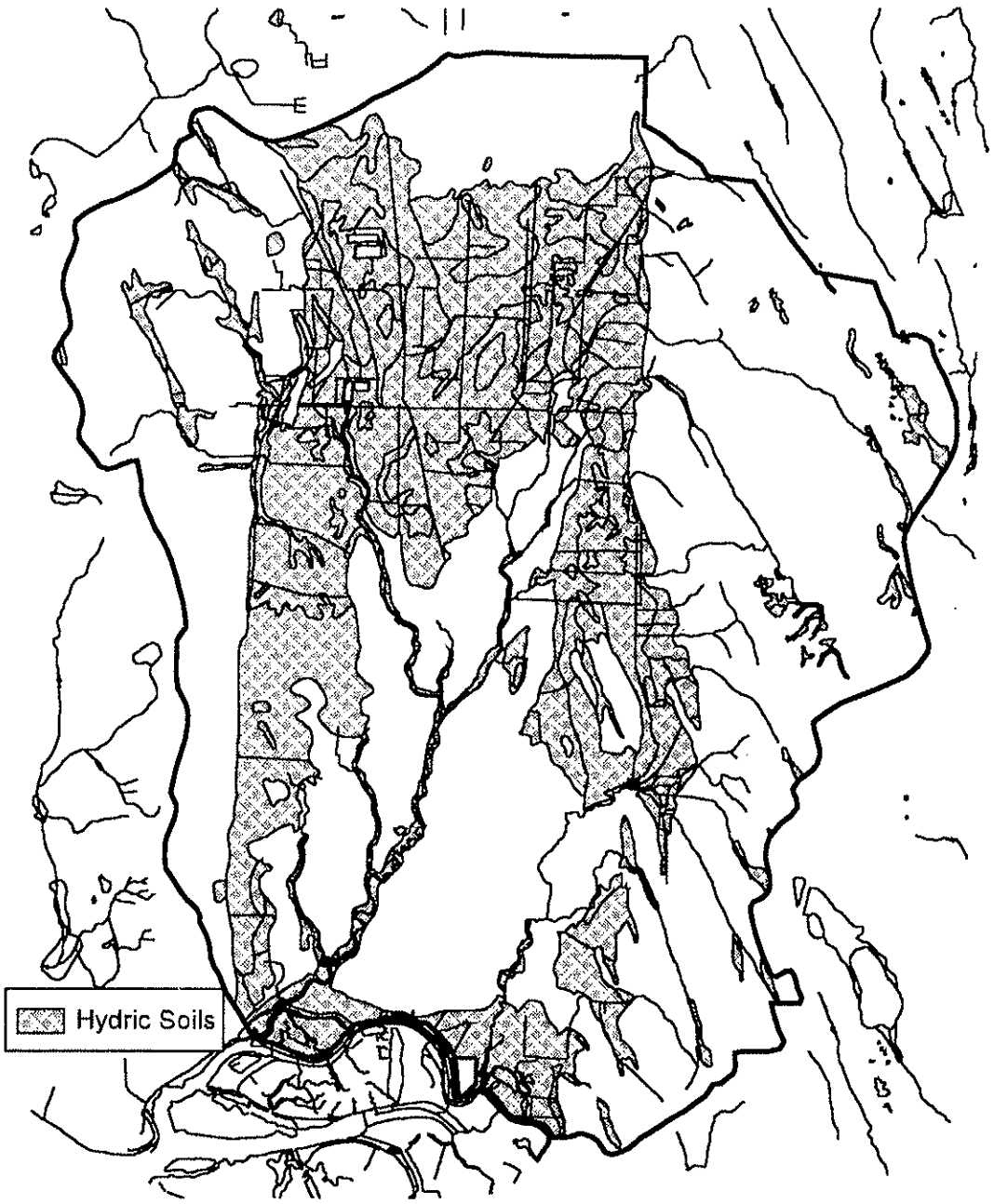

Figure 11. Hydric Soils

Source: U.S. Soil Conservation Service (1983)

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0.48 0 0.48 0.96 Miles

wetlands is probably a result of topography, fragmentation of larger wetlands, and eliminating wetlands through development. Only 2 percent of the wetlands are greater than 50 acres.

Many of the watershed's wetlands are within the ravines of Quilceda and Allen creeks and their tributaries. These wetlands and other off-channel wetlands are important rearing and overwintering habitat for juvenile salmon. The headwater streams often begin as wetlands fed by seeps, springs, and perched water tables, and these wetlands help maintain summer stream flows.

An outstanding example of an estuarine wetland occurs at the mouth of Quilceda Creek. This important wetland is over 350 acres in size and provides habitat for a rare plant species, the black lily. This wetland is one of the most pristine estuarine wetlands in Washington. Due to these attributes, the wetland is listed by the Washington Department of Natural Resources as a Natural Heritage site (Washington Department of Natural Resources 1993).

Functions and Values of Wetlands

Watershed wetlands can improve water quality through biofiltration of surface water, nutrient uptake by vegetation, binding by soils particles, and/or by providing a settling basin for the suspended solid deposition. Although natural wetlands play an important role in improving water quality, the use of these wetlands to treat stormwater runoff is no longer considered appropriate. The hydrology, vegetation, and aquatic habitat can be degraded by petroleum residues, heavy metals, and sediments absorbed by wetland vegetation (Taylor et al. 1995).

Due to their water holding capacity, wetland soils can extend stream flow and recharge over long time periods, and they can act as recharge areas for stream channels during dry periods. Upland soils or impervious surfaces contribute to stream flows during storm events. Because wetlands contribute water to perennial or seasonally intermittent salmonid bearing creeks, their stream flow discharge function is very important.

Watershed wetlands assist in reducing runoff quantity and force during storms. The wetland flood storage value varies with such factors as topography, soils, surrounding land uses, and association with other aquatic systems. Flood storage potential plays a critical role in tempering downstream flooding impacts within the watershed. The wetland flood storage value is also very important for preventing scouring of salmonid spawning beds in stream gravels. Additional wetland losses will increase downstream flooding impacts and reduce salmon production.

Quilceda and Allen creeks support a variety of anadromous and resident fish. The wetlands play a critical role in protecting this watershed's fish habitat. They provide a steady water source and reduce stream degradation from uncontrolled stormwater runoff. The estuarine wetland at the mouth of Quilceda Creek provides an important transition area for juvenile salmon moving into saltwater in Puget

Sound. This type of marsh allows young salmon to make a gradual physiological adjustment to saltwater.

Of the wildlife species occurring in western Washington, 75 percent use wetlands or riparian habitat during their life cycle (Brown 1985). Many wildlife species occur only in wetlands, while many more, like red-legged frogs, spend a portion of their life cycle in wetlands. Most of the watershed's wetlands are either freshwater forest, scrub/shrub, emergent wetlands, or combinations of those types, and some are exceptionally good areas for wildlife because of their high biological productivity.

Wetland Loss, Alteration, and Degradation

Based on the extent of the watershed's hydric soils, approximately 75 to 85 percent of the watershed's wetlands have been lost. Many of the remaining wetland acres have been altered to some degree by urbanization and agricultural activities (Snohomish County 1986). Almost all the watershed's urban wetlands have been degraded by humans through draining, filling, clearing, garbage dumping, and stormwater runoff. In the agricultural areas wetlands are used for pasture, and many have been drained. Algal blooms and excess vegetation growth occur in wetlands where runoff that includes fertilizer from surrounding residential and agricultural areas results in excessive nutrients. Logging in wetlands affects hydrology, habitat, and soil, and logging upland of a wetland can result in surface water acidification and release of copper, nutrients, and sediments into surface water (Mitsch and Gosselink 1986). Wetland alteration and destruction means wildlife habitat loss, and the introduction of undesirable of invasive plant species.

The degree of urbanization surrounding a wetland has a direct correlation with the amounts and types of disturbances affecting the wetland (Ecology 1992a). Increased watershed growth will continue to adversely affect wetland functions and water quality unless more effective protection measures are applied. Many wetland sites in urban areas become highly altered and show degraded water quality. Stormwater runoff is becoming increasingly more destructive as the hydrology of the wetlands are changed affecting the plant communities that grow there (Taylor et al. 1995). Even where vegetative buffers have been left to protect wetlands, their effectiveness is reduced as residents alter buffers by removing the vegetation.

Key Findings:

- About 75 to 85 percent of the watershed's wetlands have been filled and drained as a result of agricultural and urban land uses.
- The large estuarine wetland at the mouth of Quilceda Creek is a unique, high quality wetland.
- Watershed's wetlands perform important functions: water quality improvement, stream flow maintenance, water storage, and fish and wildlife habitat.
- The protection of the remaining wetlands in the watershed is very important to maintaining its overall ecological health.

Stream and Lake Fish Habitat

The condition of fish habitat in watershed streams is variable. Coho spawning and good rearing habitat are found toward the headwaters (figure 12); the heavily altered middle sections have significantly reduced habitat value, and the lower sections with their large ravines generally have good habitat value for an urban stream system. There are two lakes in the watershed, both constructed--Twin Lakes and Nina Lake. Largemouth bass are planted by the Washington Department of Wildlife in both lakes, and pumpkinseed and rainbow trout are found in Twin Lakes, probably also planted.

Approximately 24 percent of the salmon production in the Puget Sound region comes from the Snohomish River Basin, and the Quilceda/Allen system is still a major contributor to salmon production in this system. However, Washington Department of Wildlife Spawner data indicate that salmon productivity in Quilceda and Allen creeks has declined substantially (figures 13 and 14).

Coho and chum salmon and cutthroat trout are the predominant species that spawn in both Quilceda and Allen creeks and their tributaries. The chum salmon in the system appear to be dominated by straying hatchery fish from the Mission Creek hatchery on the Tulalip reservation (Paulson 1997). The streams are also used to a much lesser degree by chinook salmon, steelhead, and rainbow trout. Salmon have easy access to the Quilceda Creek system. However, a tidegate at the mouth of Allen Creek must be negotiated by salmon entering the Allen system.

Quilceda Creek System

Quilceda Creek and its tributaries provide good spawning and rearing habitat for salmonids, as well as supplying resident fish habitat. The mainstem Quilceda Creek provides about 1.5 miles of spawning habitat toward the headwaters. Very good salmon rearing habitat and resident fish habitat are found throughout the stream. A riparian buffer of from 100 to 200 feet in width and adjacent wetlands protect the creek along most of the length except as it passes through agricultural land. This buffer is largest below the confluence with the West Fork.

The West Fork Quilceda Creek has patchy spawning and good rearing habitat in the lower and middle sections. Coho and chum spawning habitat occurs just east of I-5. Coho and chum also spawn in some of the tributaries and channeled streams. Most of the stream sections that flow through agricultural lands have been highly modified, significantly reducing habitat values.

Fish spawning habitat occurs throughout the Middle Fork Quilceda Creek in both long stretches and patches. Chum spawning occurs north of the confluence of the Middle Fork with Quilceda Creek. A 75 to 100 foot riparian buffer exists along the

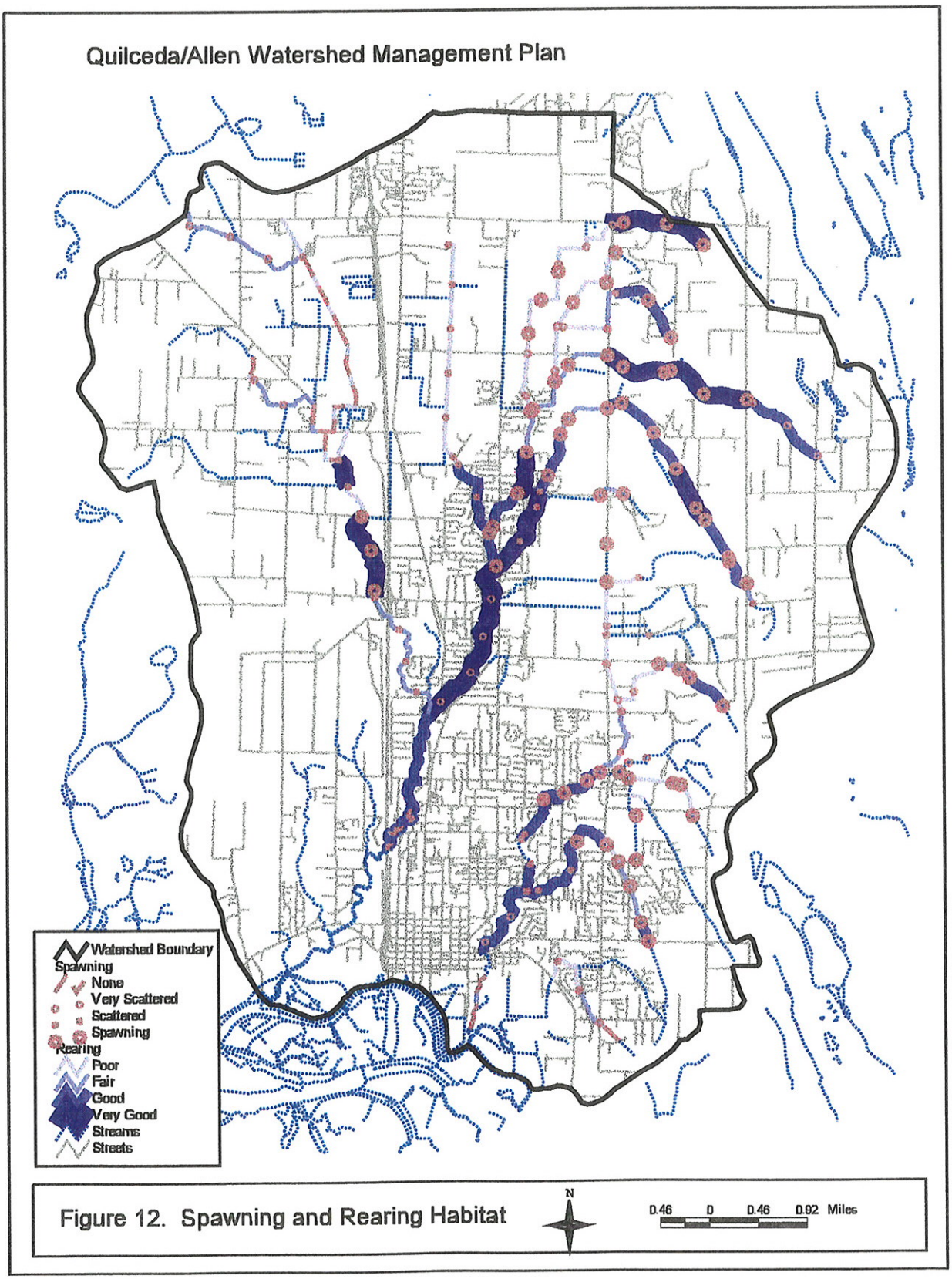


Figure 12. Spawning and Rearing Habitat

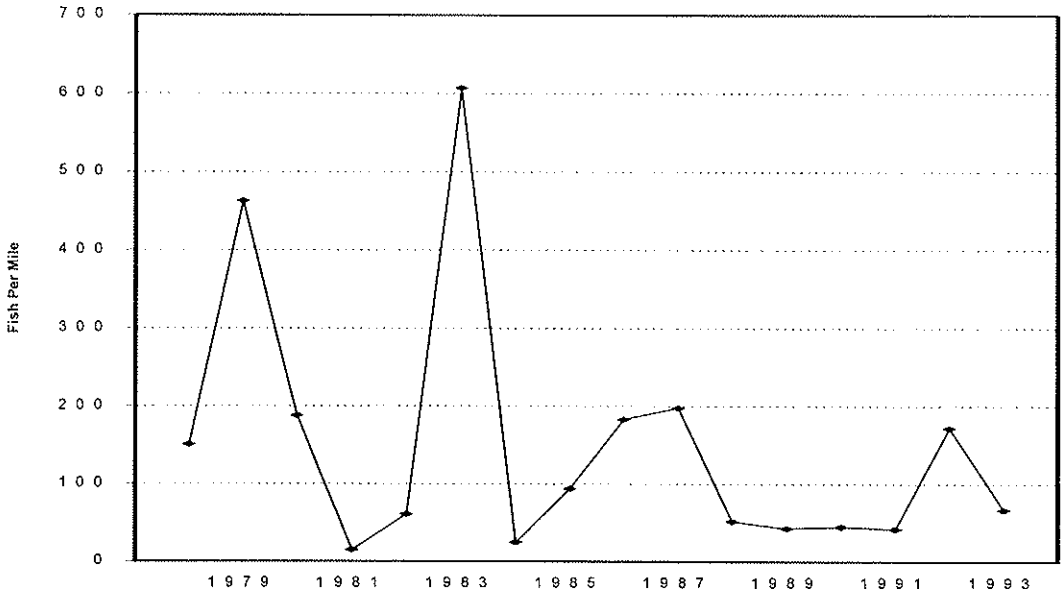


Figure 13. Coho Salmon Spawning Counts - Middle Fork Quilceda Creek (Nelson 1996)

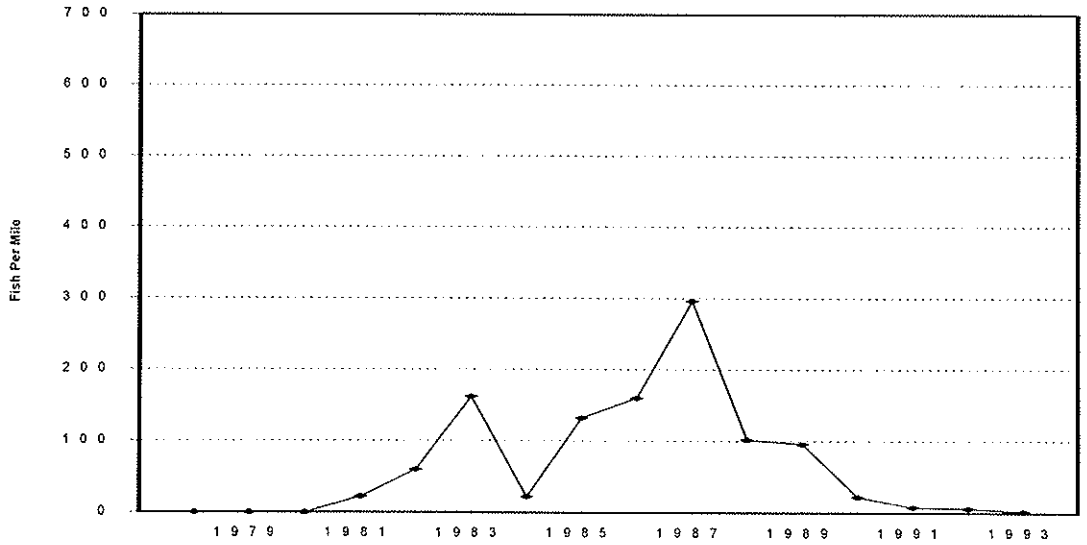


Figure 14. Coho Salmon Spawning Counts - Tributary to Allen Creek at 112th Street NE (Nelson 1996)

creek through portions of the residential development, but has been removed where the creek flows through farm fields.

The headwaters of Edgecomb Creek, a tributary to the Middle Fork, currently appear to be healthy, even though untreated road runoff is directed to the creek from 172nd Street NE. This stream's headwaters have good spawning habitat for coho salmon and resident cutthroat. The spawning habitat extends for about 1.5 miles and includes part of the creek in the agricultural land just west of 67th Avenue NE. Additional spawning habitat for chum salmon has been identified from the confluence with the Middle Fork Quilceda Creek for about 0.5 miles of stream. There is some riparian vegetation between 172nd Street NE and the north bank of the creek; a large forested tract borders the south bank. Vegetation is absent through the farm fields and sparse through the residential area.

Olaf Strad Creek, another Middle Fork tributary, is spring fed and provides good spawning habitat at its headwaters. Steelhead redds have been observed in this stream. The headwaters are protected with forested vegetation, but there is little overstory vegetation where the stream enters farmland.

Sturgeon Creek and the neighboring west bank tributary (WRIA 07-0048) to Quilceda Creek provide salmon and trout rearing habitat in the intertidal wetlands, as well as resident fish habitat. No salmon or trout spawning areas are found in these two streams. Salmon fry can be found in abundance in the lowland marshes associated with these creeks. Forest land or a forested buffer has been retained along the entire stream.

Allen Creek System

Salmon spawning habitat occurs toward the headwaters of Allen Creek east of 67th Avenue NE and along the stream south of 108th to 88th streets NE. The creek has good rearing habitat in many sections, including some of the east bank tributaries. Below its confluence with Munson Creek, the stream bottom is mud and silt, and spawning habitat is lacking. A small wooded buffer and wetland system protect the creek from Jennings Park south to Sunnyside Boulevard. North of Jennings Park the buffer is about 100 to 200 feet, but shrinks as it nears agricultural land and 67th Avenue, where little vegetation has been retained. Below Sunnyside Boulevard, Allen Creek flows through floodplain farmland. Here much of the channel is choked with sediment and Reed canarygrass.

Rearing habitat is available in the unnamed east bank tributary to Allen Creek (WRIA 07-0079) that has been channeled along 112th Street NE. There is some spawning habitat, but much of the stream has filled in with reed canarygrass. Habitat projects built in the stream channel no longer function properly.

Munson Creek has spawning and rearing habitat throughout, but draining and filling of about 100 acres of adjacent wetlands, sediment from construction activities, fish blockages, and human activities have severely degraded this stream. The entire stream will be surrounded by new development in the near future, and negative

impacts will only increase. Some of the vegetation along the creek has been retained, but where the creek flows through the golf course vegetation has been removed. In the agricultural areas, blackberries are found along the stream.

Impacts to Aquatic Habitat

Stream health in the Quilceda/Allen system is degraded. Aquatic habitat modifications have created streams with substantially reduced complexity. Cover created by downed logs, and other vegetation, and undercut banks are gone from long stretches of stream. Long stream sections have no riparian cover and pollution input into the streams is excessive.

Major impacts to aquatic habitat include the following:

- Removal of riparian vegetation in some areas in the lower stream reaches, in agricultural areas in the middle and upper reaches, and in logged areas in the headwater reaches.
- Streambank erosion from animal access to streams. Cows kept for commercial dairy and beef farming and horses, cows, and sheep from small farms all contribute to this problem.
- Water quality degradation from animal access to the streams and from runoff from pastures, feedlots, roads, parking lots, yards, roof drains, and commercial and industrial land uses.
- Channeling of streams along roads, railroad tracks, through subdivisions, and in agricultural areas.
- Erosion and bank failures caused by dirt biking and other human activities and increased runoff from new development, which affects unstable soils.
- Streamside grading or other construction activities that provide a sediment source and result in siltation.

While the issue of declining fish numbers is complex, of significant concern is the protection of rearing and spawning habitat in streams. The types of changes in the Quilceda/Allen stream system are typical of activities that have contributed to declines in fish numbers throughout the Pacific Northwest. Although the coho salmon numbers are depressed in the Quilceda/Allen system, it continues to contribute to the salmon and other fish production within the Snohomish River basin. This continued productivity may be due to several factors:

- Wide, deep, undevelopable ravines that provide a riparian buffer to sections of the streams.
- Substantial forested acreage remaining intact.
- Remaining wetlands along the streams, in the headwater areas, and elsewhere that improve water quality and help to maintain baseflows.
- Significant contribution of ground water to the system that cools stream water and maintains baseflows.

In the more heavily developed Allen basin, salmon and other fish productivity is substantially lower than the Quilceda system. House construction activities there

have added large amounts of sediment to the stream, and stream channels are clogged with vegetation. Moreover, many of the Allen system streams have been channeled along roads, and increased traffic has added road runoff pollutants to that stream system. Changes in stream flow are caused by the increase in impervious surfaces, and erosion resulting from increased peak flows has begun to occur. These recent impacts coupled with existing problems--livestock access, livestock waste, stream channeling, and wetland loss--make recovery of the Allen system a challenge and protection of the Quilceda system a priority.

Key Findings:

- The Quilceda/Allen stream system contributes to salmon production in the Snohomish River basin.
- Coho, chum, and chinook salmon, steelhead, cutthroat, and rainbow trout, have all been observed in the streams.
- Salmon and trout spawning gravel is found in the headwaters of both stream systems east of 67th Avenue NE and along the middle reaches of the West Fork and Middle Fork of Quilceda Creek. Some of the spawning gravel, particularly in the Allen system and the West Fork have a substantial sediment accumulation.
- Some streams in the system provide good rearing habitat for salmon and good general habitat for resident fish, particularly where there are adjacent and off-channel wetlands and large forested buffers.
- Salmon populations in both systems have been declining over the past several years as indicated by the number of adults returning to spawn. The Quilceda Creek system appears to be more productive than the Allen system.
- Watershed streams have had direct impacts from the following: livestock access, channeling, streamside vegetation removal, garbage dumping, increased pollution and stream scour from urban runoff, and human access.

Constructed Drainage System

The constructed stormwater drainage system in the Quilceda/Allen watershed consists of detention and retention ponds, biofiltration swales, infiltration systems, storm drains, catchbasins, ditches, and pipes that collect stormwater runoff from paved and unpaved areas and release the runoff into streams.

Direct discharges to streams, including ditches and stormwater pipes, were recorded during The Tulalip Tribes' water quality study (Halpin et al. 1991). At least 352 direct discharges into the streams from residential, commercial, industrial, and agricultural areas and from road runoff were observed. These discharges may be contributing to water quality degradation.

Loss of wetland flood storage capacity, construction on former wetland sites, ditch filling by homeowners, and drainage facility deterioration, combined with a high water table, contributes to isolated flooding problems. Flooding occurs along roadways, in backyards, and in the crawlspaces of homes throughout the watershed. Maintaining wetland systems and keeping development away from high water table areas would have prevented these problems at much less cost than trying to fix the resulting flooding and drainage problems. Because of the depth and width of the stream channels and ravines and limited amount of construction in the creek floodplain, flooding from high stream flows is relatively uncommon.

Generally only the newer watershed subdivisions have any form of water storage or water cleaning facilities. There are few biofiltration swales and few detention or retention facilities. Several dry wells have been installed in the watershed for infiltration. Dry wells are structures designed to provide areas for surface water to drain and infiltrate into the ground. Most of these systems are no longer functioning properly because they are clogged with sediment or were poorly designed. Unless modified to provide water quality treatment, dry wells are not recommended for use in infiltration. Other types of infiltration systems including infiltration basins and trenches are usually designed to prevent ground water contamination.

Drainage in the Marysville trough area is complicated because the ground water is very near the surface and the area is flat. Detention facilities constructed to slow surface water runoff can fill with ground water during storms, decreasing storage volume. Polluted runoff meeting ground water can contaminate the ground water. Impervious surfaces constructed over the aquifer interfere with ground water recharge and may ultimately cause lower stream flows in summer. Impervious surfaces also increase overland flow, potentially causing downstream flooding in winter if the water is not detained.

Under a proposed ordinance for stormwater management in Snohomish County (Title 24) and in draft stormwater management plans developed by the cities of Marysville and Arlington, detention ponds would be constructed at higher standards to ameliorate increased flows from runoff. Water quality would be protected through greater use of biofiltration swales, and erosion control standards would be strengthened. The standards proposed in these documents are similar to those recommended by Ecology in its Stormwater Management Manual for the Puget Sound Basin. Although these standards and water quality improvements will help modify problems associated with stormwater runoff, they will not eliminate those problems.

Key Findings:

- It is more cost effective to prevent drainage problems through maintaining wetlands and other natural drainage features rather than correcting problems through capital construction projects.

Key Findings Cont'd

- There are at least 352 direct discharges into the watershed streams from residential, commercial, industrial, and agricultural areas and road runoff.
- Loss of wetland flood storage capacity, construction on wetlands, ditch filling, and deterioration of drainage facilities, combined with a high water table and flat topography, contribute to watershed flooding problems.

Vegetation

Forests protect watersheds by stabilizing slopes, minimizing erosion, reducing sediment inputs to streams, maintaining the water quality and temperature, and maintaining the natural hydrologic patterns under which the streams and their inhabitants evolved. Forests help perform the vital function of maintaining stream flows. Much of the rain falling on the forest is intercepted by the canopy and evaporates back to the atmosphere. Some of the water that does reach the ground percolates through the soil and moves into streams. The root activity and decaying matter of the forest floor act as a sponge, holding and gradually releasing a large amount of water. The forest has a great effect on water movement from the atmosphere to the earth and back to the atmosphere.

Historically, the Quilceda/Allen watershed was a large forested area. The forest was composed of mature and old growth stands of western hemlock and Douglas fir on the drier areas and mixed coniferous-deciduous forests in wetter areas (Franklin and Dyrness 1973). Much of the watershed was logged around the turn of the century, and the land in the Marysville trough and floodplain was cleared and drained in the early 1900s for agricultural purposes.

The remaining forested areas are found along the eastern and western hillsides and consist of second and third growth forests. These forests are typically dominated by western red cedar, western hemlock, and Douglas fir or red alder and big leaf and vine maples. Within the drainages of Quilceda and Allen creeks, the vegetation is mainly red alder, vine maple, black cottonwood, and western red cedar.

Several thousands of acres of productive or fallow farm land occur in the flat lands north and east of the City of Marysville. Most of the farm land still in production is either pastureland or cropland, with hay as the major crop.

Vegetation removal and soil compaction, particularly in the developed areas, has changed the watershed's hydrology, increasing stormwater runoff. Landscaped areas are similar to impervious surfaces in their inability to infiltrate water.

Watershed vegetation continues to be removed as development increases. Logging occurs on the Tulalip Reservation and along Route 9. It is likely that much of the forested land will be replaced by development. Development of agricultural land will remove the infiltration potential of that area and decrease the amount of area

available to recharge the Marysville trough aquifer. Tree removal and replacement with lawns or parking lots will dramatically increase the amount of surface water flow while diminishing the amount of infiltration. If not mitigated, impacts to stream flow will be great.

Key Findings:

- Much of the watershed's forest vegetation has been removed; the remaining forested land is very important to maintaining watershed hydrology.

SECTION 3. PROTECTING BENEFICIAL USES, GOALS AND OJBECTIVES AND PRIORITIZING PROBLEMS

SECTION 3. PROTECTING BENEFICIAL USES, GOALS AND OBJECTIVES, AND PRIORITIZING PROBLEMS

Protecting Beneficial Uses

Quilceda and Allen creeks are natural resources to be managed and enjoyed by a variety of users in the watershed. Managing the watershed means not only protecting the environment, but protecting watershed residents, homes, and businesses as well.

The watershed's streams, wetlands, and streamside trees and shrubs provide habitat for fish and wildlife in and along Quilceda and Allen creeks. Chum and coho salmon and cutthroat trout spawn in these creeks and their tributaries. The pools and riffles in the creeks, forested ravines, and off-channel wetlands all play an important role in the life cycle of these fish. Salmon continue to be of great economic and cultural significance in the watershed. Other wildlife that depend on the watershed's stream and wetland habitats includes bald eagles, great blue herons, red-legged frogs, and Colombian black-tailed deer. These animals rely on healthy streams, streamside trees and shrubs, and forests for their existence.

Clean water is essential to outdoor recreation. Many children play in the water and ravines of Quilceda and Allen creeks and swim in local swimming holes. Children are attracted to streams as places to explore. Jennings Park, located along a scenic stream section in lower Allen Creek, is valued by children who swim, wade, and play in the park's creek and pond. Adults watch the ducks, geese, gulls, and great blue herons there. Kayakers and recreational boaters use the lower Quilceda estuary for bird and wildlife watching.

Finally, drinking water supplies draw on the watershed's water storage capacity. The Tulalip, Getchell-Snohomish, and Marysville Trough aquifers serve the watershed. Many residents, business owners, farmers, and the City of Arlington rely on the volume and quality of these ground water reserves. Forests, agricultural lands, and other natural open space insure adequate ground water for the watershed.

Goals, and Objectives

The goals and objectives developed by the WMC recognize the important uses of the water resources. They also illustrate the WMC's commitment to make the best possible effort to improve watershed conditions for future generations.

GOAL: Protect and Improve Water Quality in Quilceda and Allen Creeks and their Tributaries to Provide Clean Water and a Healthy Environment for Plants and Animals and for Public Enjoyment.

OBJECTIVES:

- Meet the water quality standards and guidelines for all water quality parameters.
- Reduce unnatural sediment input into streams to levels that can be transported out of the system by stream flow at all times of the year.
- Prevent dumping of petroleum and other waste into and along water conveyance systems.
- Follow up on the cleanup and inspection of hazardous waste sites and leaking underground storage tanks until the sites are cleaned up.
- Protect wetlands and riparian areas that provide water quality functions.
- Monitor best management practices to insure they are protecting water quality.
- Insure proper maintenance of facilities that provide water quality treatment.

GOAL: Prevent Contamination, Minimize Depletion, and Insure Recharge of Ground Water to Protect Drinking Water, Provide for Irrigation and Fish Propagation, and to Maintain Adequate Stream Flows.

OBJECTIVES:

- Support zoning, land uses, and policies to protect ground water quality and quantity.
- Identify sensitive ground water recharge areas and protect those areas.
- Identify and work with all sources of potential ground water contamination in the watershed to reduce the potential for contamination.
- Assure that the quantity of ground water is sufficient to maintain hydrologic baseflows to provide aquatic habitat and fish passage in streams and wildlife habitat on stream edges.
- Promote cost effective measures for restoring and maintaining ground water recharge.

GOAL: Preserve and Enhance Streams, Stream Corridors, and Other Water-Related Communities as Habitat for Fish and Wildlife to Maintain Species Diversity, to Increase Wild Salmonid Numbers, to Protect Rare Plants and Animals, and to Provide Recreational Opportunities.

OBJECTIVES:

- Protect and restore wetlands and streams that have important plant communities and provide fish and wildlife habitat.
- Protect riparian areas from degradation and restore native plant communities along streams.
- Prevent further degradation of instream habitat through maintaining natural systems and/or using regulatory or engineering methods.

GOAL: Inform and Educate Those Who Impact the Watershed on Stream Ecology, Water Quality, and Hydrology and on the Results of Their Impacts to Develop a Stewardship Ethic and to Encourage Participation in Decisions that Affect the Watershed.

OBJECTIVES:

- Develop programs that use watershed citizens to educate and train citizens.
- Target new members of the community, people with onsite septic, and streamside residents for watershed education.
- Provide, facilitate, and find opportunities for training on stream and wetland resources by using existing facilities, including parks and trails, existing groups, including organizations, clubs, and school classes, and existing businesses for water resource educational programs and dissemination of information.

GOAL: Protect Water-Related Sites of Cultural Significance to Maintain a Link between Water Resources and Watershed History and Culture.

OBJECTIVES:

- Educate watershed citizens about the history of the Quilceda/Allen stream systems through schools and community groups and encourage the distribution of information about stream history.
- Facilitate the use of natural systems located near schools as settings for watershed education.
- Identify public recreational areas in and along the stream system and establish community monitoring at these sites.

GOAL: Provide Incentives and Strategies for Developers, Landowners, and Land Users to Protect Streams, Wetlands, Ground Water, and Associated Habitat and Encourage Incorporation of the Natural System as an Element of Design and Livability, to Ensure Future Economic Viability.

OBJECTIVES:

- Recognize businesses, developers, and citizens who incorporate innovative water quality design features into new or existing developments or lots and who use the natural system as an element of design.

- Provide financial and/or other opportunities for farmers, residents, and businesses to develop innovative water quality practices or to correct water quality and water resource problems.
- Provide technical assistance to landusers to develop best management practices.

GOAL: Resolve Current Flooding Problems and Promote Changes in the Watershed that would Prevent Unnatural Alterations of In-Stream Habitat, Stream Velocity, and Flows to Protect Property, Life, and Aquatic Habitat.

OBJECTIVES:

- Prioritize and resolve flooding and drainage problems in the watershed.
- Support zoning and land use methods to retain and promote open space and forested habitat in the watershed to protect stream habitat and homeowners from drainage problems and flooding.
- Protect wetlands and forests in the watershed that provide water storage functions.
- Adopt water storage facility standards that protect stream habitat from degradation and streamside residents from flooding.
- Prioritize, repair, replace, and upgrade existing inadequate or degraded stormwater drainage facilities.
- Improve maintenance procedures to insure proper functioning of stormwater drainage facilities.

Identifying and Prioritizing Watershed Problems

Both the watershed characterization and the watershed studies helped the WMC identify and describe the major watershed problems. Public involvement activities were designed to elicit information about residents' concerns. In addition, watershed committee members, who all live and/or work in the watershed, were knowledgeable about certain problems from personal experience. The issues defined in the watershed plan reflect the problems identified from these sources.

All the watershed problems are serious. To clarify the type and severity of the problems, however, the WMC rated the problems under two categories of equal weight--water quality and quantity, and water resources. They then rated the specific problems from high to low as follows:

Water Quality and Quantity Problems (Rated Highest to Lowest)

1. Increased Stormwater Runoff

Rapid growth has occurred in the watershed, and the growth is expected to continue. Large areas of forest and wetlands have been replaced with residential areas, resulting in increased stormwater runoff. The runoff increases stream flows,

causing erosion and flooding. Houses built on wet areas experience crawlspace flooding in the spring and winter. These problems are expected to intensify as the watershed develops with increased residential, commercial, and industrial development.

2. Increased Instream Sediment

Much of the development has been occurring on steep sloped eastern areas of the watershed with Tokul gravelly loam soils, or on flat areas with sandy soils. These soils easily erode and deposit fine sediment in the stream channels, affecting salmon spawning and rearing habitat and causing flooding by reducing the channel capacity. Construction for development is currently the major sediment source in the watershed. Other sediment sources include streambank trampling by livestock, ditch maintenance, forestry activities, dirt biking, and erosion caused by increased stormwater runoff.

3. High Levels of Nutrients

Nutrients are contributed to streams from fertilizers and livestock, human, and pet waste. Nutrient levels are high in many watershed streams and also in ground water. High nutrient levels in streams encourage plant growth; plants deplete oxygen in the stream, causing low dissolved oxygen levels. Dissolved oxygen levels fall below state standards in Allen Creek. Fish and other aquatic organisms cannot exist in water without sufficient oxygen. In addition, high nutrient levels in ground water can cause human health problems such as blue baby syndrome.

4. High Bacteria Levels

Fecal coliform bacteria levels exceed state water quality standards in almost all watershed streams. Bacteria sources include failed septic systems and livestock and pet waste. High bacteria levels indicate that the streams are unsuitable for recreational uses, including swimming and wading; they also pollute shellfish beds.

5. Increased Pollutants in Urban Runoff

As the watershed develops, stormwater runoff rushing over paved and unpaved surfaces picks up pollutants on its way to the streams. These pollutants include petroleum, landscaping chemicals, detergents, and metals. As more roads are built and population and traffic increases these pollutants can be expected to increase in the streams. Detergents have been found in almost all water quality samples collected in the watershed, and metals exceed state standards in several streams.

6. Increased Direct Discharges to Streams

Homeowners and others living along the creek pipe or convey water from their property directly to the streams or ditches. There are hundreds of these direct discharges in the watershed. The water can contain contaminants such as detergents and metals.

7. Increased Use of Hazardous Wastes

Hazardous chemicals are used and eventually discarded by businesses and households and are transported through and to the watershed. While the numbers of accidental spills or chemical leaks has been limited, such incidents can have disastrous effects on aquatic organisms.

8. Dumping of Garbage In and Along Streams

Streams and streambanks have become dumping sites for all types of garbage. Some streamside residents pile yard waste and compost along the streams. Others dispose of unwanted car parts, appliances, tires, and other items along or in streams. Many streams are channeled along roads where garbage is tossed.

Water Resource Problems

1. Stream Habitat Degradation

Stream habitat has been compromised due to several factors, including erosion from removal of riparian vegetation, livestock access to streams, and increased stormwater runoff. Stream channeling, tree and shrub loss along streams, introduction of reed canary grass, and increased stream flows reduce instream diversity. Pollution degrades stream water; sediment has covered spawning gravel and degrades rearing habitat as well.

2. Wetland Loss and Degradation

The majority of watershed wetlands have been lost since watershed development began in the early 1900s. Wetland draining and filling for development of homes and roads and draining wetlands for agricultural purposes are the major causes. Wetlands are also adversely affected by livestock grazing and logging. In this watershed, wetland loss has reduced flood storage capacity and eliminated fish and wildlife habitat.

3. Ground Water Contamination and Depletion

Ground water in the Marysville trough is susceptible to contamination and depletion from proposed development over the aquifer. New impervious surfaces will reduce recharge. Failed septic systems, nutrients from livestock waste and fertilizers, accidental spills of petroleum or other toxic chemicals pose threats to ground water quality.

SECTION 4. WATERSHED MANAGEMENT RECOMMENDATIONS

SECTION 4. WATERSHED MANAGEMENT RECOMMENDATIONS

Introduction

The management recommendations that follow apply to the watershed as a whole. The choice and priority of the management recommendations were guided by the following principles:

- Encouraging the use of methods that are self-sustaining to achieve goals and objectives.
- Encouraging the implementation of management strategies that prevent problems.
- Promoting jurisdictional consistency in regulations throughout the watershed.
- Targeting the following nonpoint pollution problems: sediments, nutrients, bacteria, urban pollutants, hazardous waste, and garbage.
- Targeting the following issues: increased stormwater flows, stream habitat degradation, wetland loss and degradation, ground water quality and depletion, and cultural resources.
- Focusing activities on specific areas and specific sources where pollutants and water resource problems have been found to be most significant.

The recommendations include some new regulations and policies; proposed changes to existing regulations; best management practices; incentives; education; research, inventory, and monitoring; acquisition; and volunteer efforts. They are categorized by type of recommendation and appear in order of problem priority. For each type of problem there is an explanation of the problem being addressed, a discussion of the extent of the problem in the watershed, and a description of regulations and/or programs designed to address the problem.

Each management recommendation is printed in ***bold italics***; the text immediately following is clarification or commentary. High priority or priority recommendations--strategies that would be most effective and that are the most important to implement--are so noted. The remaining recommendations, while still important, are lower in priority.

Three sections, Stream Habitat Enhancement and Salmon Recovery, Wetland Acquisition and Enhancement, and Ground Water Protection, have target statements. These statements represent the plan's commitment to maintaining the functions of these resources at least at current levels.

Implementation of all management recommendations is contingent upon obtaining funding.

Control of Stormwater Runoff

The Quilceda/Allen watershed is an urbanizing watershed. Growth has been mainly through residential development, with additional industrial, commercial, and residential development planned. Replacing forests and open space with buildings and pavement means more runoff reaches streams and streams flow higher and faster than before. These changes affect peak stream flow velocity, volume, and timing. Only the watershed's newer developed sites have water storage facilities to reduce the impact of increased impervious surfaces. Most of those facilities are constructed to standards that do not maintain stream flow volumes at current levels.

Stormwater Runoff Problems

Because development in the watershed has been mainly in the Marysville trough, which has highly infiltrative soils, and because the lower watershed has deep, wide ravines, major impacts from increased stream flows have been limited. However, computer modeling indicates that future land use scenarios as developed through growth management planning could have significant impacts to salmon spawning streams and could also increase flooding. (See Beyerlein and Brascher 1995) in technical supplement.)

Hillside Sub-Basins

Computer modeling indicates that stream flows on the hillsides where most of the salmon spawning habitat is found would increase dramatically. Although the extent of the damage to habitat and property from increased stream flows will vary, these flows could cause substantial erosion and habitat disruption. The following three methods were used in the model to assess options to mitigate the future development impacts:

- Using detention standards recommended in Ecology's Stormwater Manual.
- Doubling Ecology's detention standards;
- Leaving half the trees to simulate a cluster or grouping scenario and using Ecology's detention standards.

With Ecology's detention standards in place, the stormwater discharge rates would be reduced significantly in the Munson, South Fork Allen, Upper Edgecomb, and Smokey Point sub-basins (table 1, figure 15). However, applying these standards would not be as effective in other sub-basins because of the till soils, large sub-basin

Quilceda/Allen Watershed Management Plan

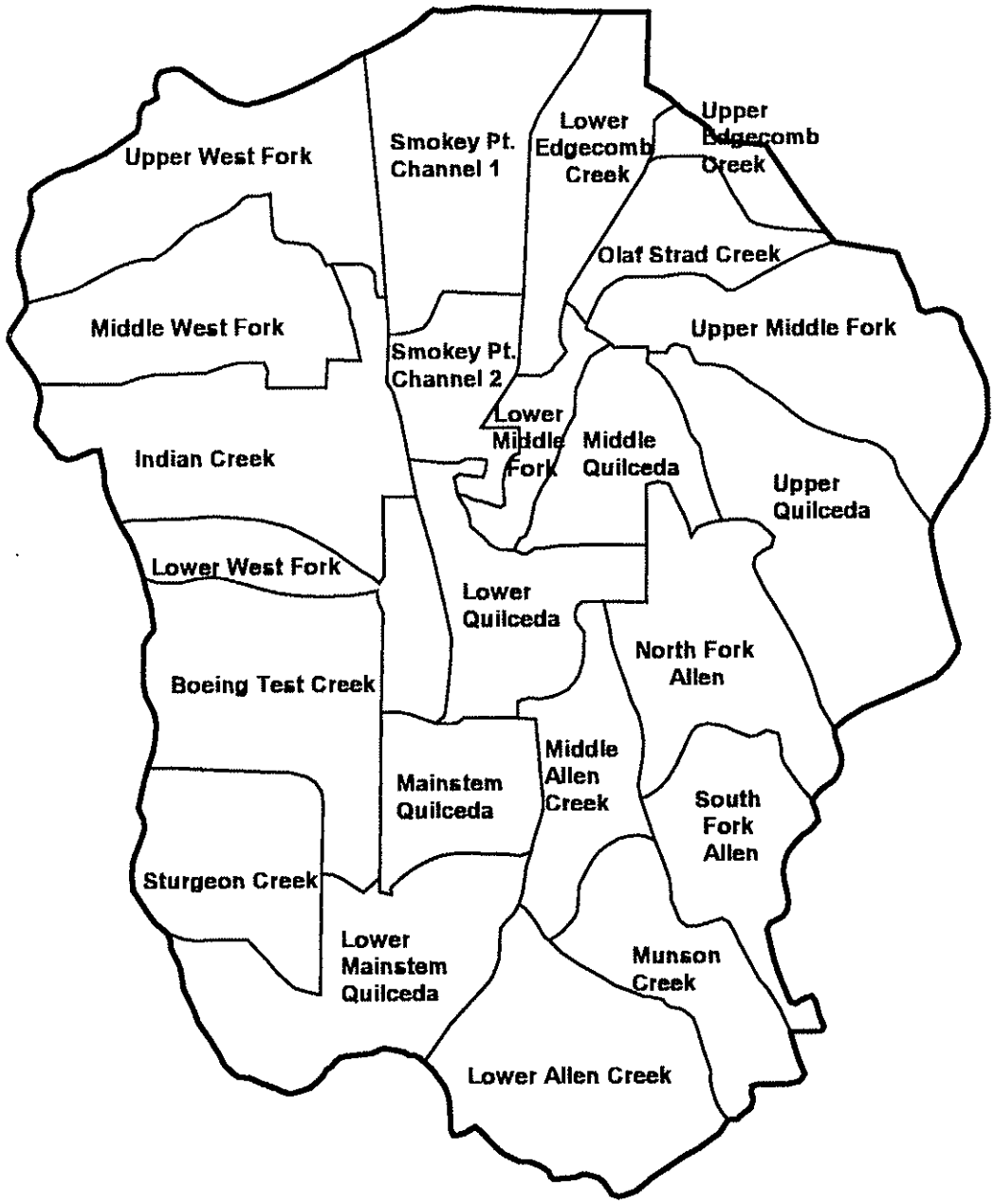
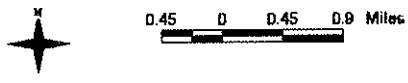


Figure 15. Sub-basin Boundaries



area, and steep slopes. Doubling the Ecology's detention standards helped in some sub-basins (Middle Allen, Lower Edgecomb, Indian Creek, Middle West Fork, and Upper West Fork). Using Ecology's detention standards while retaining half the trees was the only modeled scenario that substantially reduced stream flows in the Upper Quilceda and Upper Middle Fork sub-basins, although flows in those sub-basins still would be well above current levels.

Table 1.
Average Percent Increase In Future Stream Flow Volume Over Current Stream Flow Volume

Sub-basin	Unmitigated % Increase	Ecology's Detention Standards % Increase	Double Ecology's Detention Standards % Increase	Ecology's Standards And 50% Forest % Increase
Middle Allen	31	18	7	11
S. Fork Allen	25	3	-3	2
N. Fork Allen	37	27	13	15
Munson	39	4	-6	-7
Lower Mid Fork Quil	58	49	36	27
Upper Mid Fork Quil	64	38	28	18
Olaf Strad	31	26	20	16
Lower Edgecomb	18	13	8	8
Upper Edgecomb	60	-4	-13	-17
Lower Quilceda	46	35	27	19
Middle Quilceda	56	40	30	21
Upper Quilceda	82	53	40	26
Smokey Point	29	5	5	5
Lower W. Fork Quil	41	25	13	14
Indian Creek	33	20	8	11
Middle W. Fork Quil	33	11	-6	-3
Upper W. Fork Quil	46	16	5	6

Marysville Trough

Modeling shows that when water reaches the flat Marysville trough, stream flow velocities decrease because of the gradient change from steep to flat. In this area much of the water from precipitation is infiltrated through undeveloped farm land, and little runs off directly to the stream. However, the ground water rises to the surface during the rainy season and fills the stream channels and flooded farm fields are a result. With the predicted increased upstream flows, stream channels will overflow, and flooding in the surrounding area could be greater. The extent and locations of the flooding cannot be determined without further modeling, but more flooding of homes and farms along the streams is likely.

One assumption made in the computer model was that almost all the runoff from new development in the Marysville trough would be infiltrated into the ground. If water is infiltrated, peak flows in the lower stream section can be moderated. However, currently most of the new development in the Marysville trough does not use infiltration to handle the increased runoff. Instead, detention facilities are constructed. The detention facilities tend to fill up with ground water, reducing the facility's capacity to store stormwater runoff. Ground water can also

become contaminated from mixing with contaminated surface runoff. Where a three foot soil separation occurs between ground water and the infiltration facility bottom, the runoff will be cleaned. Where this condition exists infiltration is the preferred method for handling stormwater runoff. However, where there are Norma/Custer soils in the Marysville trough, the ground water is often just below or at the surface and traditional infiltration systems will not work and more innovative designs are needed. One option is to clean the water through an impervious biofiltration swale before it is directed to shallow recharge pond.

Regulating Stormwater Runoff

Until recently, the control of development related stormwater increases was regulated mostly at the local level. Standards that require new development to build flow control and drainage facilities were adopted by Snohomish County in 1979 as part of Snohomish County Drainage Code (Title 24). These regulations were an important step in controlling runoff related property damage and habitat degradation. However, facilities built to 1979 standards usually are not large enough to control increased runoff. In addition the standards do not address water quality.

In 1991 the Washington Department of Ecology (Ecology) established stormwater runoff standards through its Stormwater Management Manual for the Puget Sound Basin (Stormwater Manual) (WAC 173-275, WAC 400-20) to protect streams and wetlands. The county is required to adopt similar standards. As discussed above, Snohomish County has been working on revising its stormwater regulations (Title 24), as are the cities of Marysville and Arlington. All jurisdictions require the use of Ecology's stormwater standards in their proposed stormwater ordinances. These new local regulations represent an important step in addressing stream flow increases from new development.

In the meantime, the Washington Department of Fish and Wildlife (WDFW) is requiring Ecology's stormwater standards as a condition of Hydraulic Permits for all drainages to fishbearing streams. The Hydraulic Code addresses development and other activities that would degrade salmon habitat. Since most of the watershed streams are fishbearing, Ecology's standards are now being applied widely in the watershed. WDFW would prefer to have local jurisdictions regulate stormwater and would like to see Ecology's standards in place throughout the watershed.

Management Recommendations for Stormwater Runoff Control

Regulations and Policies

Q/A 1. Watershedwide Onsite Stormwater Standards (High Priority)

All watershed jurisdictions should consider adopting by ordinance the stormwater standards as described in Ecology's Stormwater Manual.

Onsite retention or detention standards will control to some extent downstream impacts of new development, including public and private streets and highways, if the facilities at a minimum meet the standards as described in the manual.

Q/A 2. Stream and Flood Protection Standards (High Priority)

Each jurisdiction should consider developing standards and stormwater management recommendations for each sub-basin. In order to determine what standards and recommendations would be appropriate, additional hydrologic modeling should be conducted by SWM to determine what methods would maintain stream flows at current levels to protect instream habitat and prevent downstream flooding in target sub-basins. The modeling should examine specific detention or retention standards, land use changes, regional detention, detention standards for individual lots, and combined lot detention.

Computer modeling in the watershed has predicted high stream flows at future developed conditions. Of the three mitigation scenarios described above, none was sufficient to mitigate predicted stream flow increases in the watershed's hillside sub-basins.

Q/A 3. Marysville Trough Stormwater Management Through Infiltration (High Priority)

Watershed jurisdictions should consider adopting a standard that requires infiltration of stormwater runoff in the Marysville trough, while maintaining water quality standards, if there is at least three feet of separation between the ground water and the infiltration facility bottom. When the infiltration facility is a pond, it should act as a recharge basin. Water quality standards must be maintained through treatment before infiltration, and water quality monitoring should be required as part of facility maintenance. Two examples of such treatment are as follows:

1) *Route stormwater through a shallow biofiltration swale lined with an aquatard to prevent infiltration before discharging into shallow infiltration basins. This type of system was designed for the Navy housing project to be constructed just west of the Navy support facility.*
2) *Line the bottom of an infiltration ditch with perforated pipe and/or gravel, cover the area with sphagnum peat, cover peat with sand, and plant with grass. This type of system was designed for the Top Foods parking lot at the corner of 172nd Street NE and Smokey Point Boulevard.*

Where there is less than three feet, other infiltration options should be considered, including using new technologies. Research into methods to infiltrate in the Marysville trough should be done by all jurisdictions. New methods should be tested and the results monitored to determine success.

Ground water provides as much as 80 percent of the stream water in the Marysville trough (Larson and Marti 1996). It also supplies drinking water. In order continue these uses, recharge to the Marysville trough aquifer must be maintained. This can

be achieved best through infiltration. Where new methods to infiltrate runoff are used, they should be monitored to determine effectiveness.

Q/A 4. Flood Prevention Analysis (High Priority)

Watershed jurisdictions should consider adopting a standard requiring hydraulic analysis downstream of proposed development sites. The analysis should extend for at least 1/4 mile. However, under the following circumstances additional stream reaches should be included in the analysis as follows:

- *When hillside development occurs, the analysis should include the entire downstream hillside length of the stream plus 1/4 mile into the Marysville trough.*
- *When local jurisdictions believe that downstream drainage facilities may have inadequate capacity to receive additional runoff from an upstream development project, hydraulic analysis should be conducted from the upstream project to the problem area.*

The developer should pay the cost of the analysis 1/4 mile downstream and then spilt the cost of the additional analysis with the jurisdiction. In all cases, if downstream flooding or erosion problems are found, no additional discharge should take place until the drainage systems are upgraded. Short plats could be exempt from this analysis.

Additionally, all jurisdictions are requested to set up a funding mechanism to conduct this type of analysis on a sub-basin level and through development of master drainage plans as recommended elsewhere in this plan.

Hydraulic analysis is important because runoff from new development may overwhelm undersized conveyance systems causing flooding.

Q/A 5. Clearing Ordinance (High Priority)

Watershed jurisdictions should consider adopting clearing ordinances that would include the following components, some of which are contained in a draft Landscaping and Tree Retention ordinance developed in 1992 by Snohomish County:

- *Maintain a minimum of 25 percent or the highest possible percent of the trees and shrubs on developed sites based on type and density of land use, including on single family sites. The trees and shrubs can be part of sensitive/critical areas tracts and should be incorporated into those areas where possible. Where there are no trees or the trees are deemed inappropriate, native trees and shrubs should be replanted.*
- *Minimize ground disturbance where and whenever possible.*
- *In formal subdivisions, establish a separate open space tract where trees, shrubs, and soils are left undisturbed. The tract should be dedicated to the homeowners association.*
- *Maintain all trees and shrubs on site in dedicated open space tracts.*

- *Maintain trees and shrubs in clusters or groupings.*
- *Phase tree removal of the site.*

Q/A 6. Research and Development of New Methods for Infiltration

SWM and the development community are requested to develop and monitor new and improved methods for infiltration in the Marysville trough area and to experiment with ways to improve water quality in these systems. Information should be shared with other jurisdictions and developers through workshops and mass mailings.

Infiltration of stormwater runoff is necessary to maintain ground and stream water levels. Infiltration is difficult in the Marysville trough area because of the high water table.

Q/A 7. Map Areas Where Infiltration Systems Will Function Properly

Each jurisdiction should identify and map areas where infiltration systems can be expected to function properly.

Infiltration is the preferred method of controlling stormwater runoff because it allows water drain into the ground as it would naturally instead draining directly to streams.

Projects

Q/A 8. Retrofitting or Building Stormwater Facilities (High Priority)

All jurisdictions should prioritize stormwater facilities for retrofitting to provide for water quality and water quantity functions. An inventory should be conducted to identify vacant land where new facilities could be constructed and old facilities upgraded.

Many of the old stormwater facilities were constructed without features that provide adequate flood, habitat, or water quality protection.

Q/A 9. Upgrading and Installing Stormwater Facilities on New Road Projects

Each jurisdiction should prioritize for potential inclusion in its approved capital project list upgrades or installation of stormwater facilities when new road projects at intersections or stream crossings allow for such facilities, and when there is evidence that such upgrades are needed.

SWM conducted a stormwater inventory recording evidence of pollution at outfalls to ditches or streams (figure 16). Areas where pollution or erosion was noted are priority areas for water facility construction along county roads. A similar inventory should be conducted in the city of Marysville and on the Tulalip Reservation.

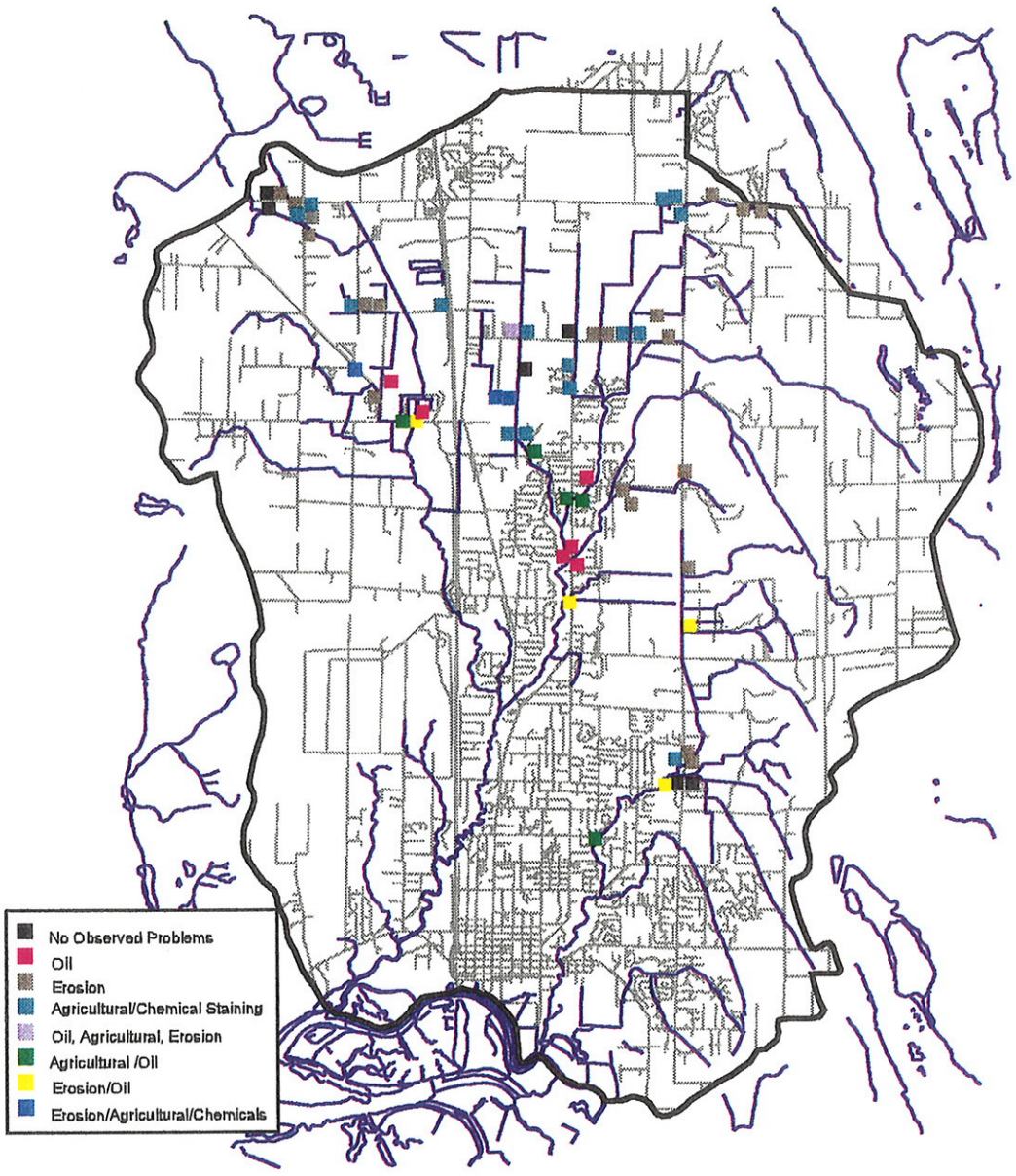


Figure 16. Observations of Pollutants and Problems at Storm Sewer Outfalls

Source: Leif (1994)

Other

Q/A 10. SWM as a Provider of Watershed Stormwater Management Services

Snohomish County should seek interlocal agreements with the city of Arlington and The Tulalip Tribes to provide stormwater management services to those jurisdictions. Those services could include planning, design, and construction of capital projects, response to drainage complaints, infrastructure and master drainage planning, water quality monitoring, and water resource planning.

The city Arlington will be increasing their land base within urban growth boundaries. The Tulalip Tribes will also be developing undeveloped reservation land within the watershed. These jurisdictions currently do not have the staff or equipment to provide stormwater services in these areas. SWM has staff and equipment in place to provide these services in a cost effective way. Note: The City of Marysville will provide their own stormwater management services.

Improved Stormwater Facility Maintenance

Drainage and stormwater facilities not properly inspected and maintained do not effectively reduce water pollution and peak stream flows. For example, retention or detention ponds and roadside drainage systems often fill with sediment that must be periodically removed. Vegetation in water quality facilities needs periodic cutting or replanting when it becomes contaminated with oil or other substances.

Stormwater Facility Maintenance

Maintenance responsibility for stormwater facilities varies. Snohomish County Roads Division and Marysville Road Department maintain county and city road-related drainage facilities. However, SWM and Marysville have the authority to maintain other facilities through easement provisions and, within budget constraints, to maintain detention facilities on a regular basis. Following development, it is usually the responsibility of the property owner or homeowners' association to maintain private facilities. Some do not properly maintain their drainage systems, either because they are not aware of their maintenance responsibilities, they lack motivation, or they do not set aside maintenance funds. Inadequate maintenance is a problem throughout the watershed.

Sediment also settles in detention or retention ponds constructed to control stormwater quantity. These ponds are often filled and clogged with sediment during construction, are not cleaned after construction has been completed, and do not work properly from the start. In areas where sediment loads are high, stormwater facility maintenance is needed as often as twice yearly. Due to staffing constraints, Snohomish County provides maintenance to facilities about once every two years, and private landowners probably provide maintenance even less frequently.

Regulating Stormwater and Drainage Facility Maintenance

In 1987 Snohomish County adopted Title 25 of the county code that authorizes service charges for surface water services within areas called Watershed Management Areas (WMAs). The county entered into an interlocal agreement with the city of Marysville to form a joint watershed management area for some of the Quilceda/Allen drainages (figure 17). Since 1991 the county has been collecting WMA fees in the entire watershed management area and disbursing the portion collected within city limits to Marysville. In 1995 the Quilceda/Allen WMA generated approximately $247,000 in Snohomish County and $305,000 in Marysville.

Title 25 authorizes the collection of funds to be used by SWM for watershed management, capital projects, water quality programs, and maintenance of stormwater and drainage facilities. Marysville also uses the WMA fees for facility maintenance. The fees are not sufficient to cover the rising costs of these programs.

Management Recommendations for Stormwater Facility Maintenance

Regulations and Policies

Q/A 11. Access to Stormwater Facilities

Through amendments to stormwater ordinances, watershed jurisdictions should consider securing easements to access all facilities serving more than one lot and all commercial and industrial sites. The easements would be dedicated or granted to each jurisdiction so that the jurisdiction can enter and maintain the facility for emergencies if necessary.

This access is often needed when poor facility maintenance creates public health and safety problems.

Q/A 12. Placing Stormwater Facilities in Tracts

Each jurisdiction should consider amending stormwater ordinances or platting regulations to provide maintenance of private stormwater detention or infiltration facilities serving residential areas to insure that routine maintenance is done. Until such time as each jurisdiction maintains these facilities, the facilities should be put in separate tracts owned by the group or property owners the facility serves, or by the homeowners association.

Stormwater facilities that serve residential lots or access roads are often placed close to homes. Many homeowners do not like having these facilities near their home and may want to fill or modify them if it is on an individual's lot. Group ownership places control in more hands, and allows for sharing the maintenance costs.

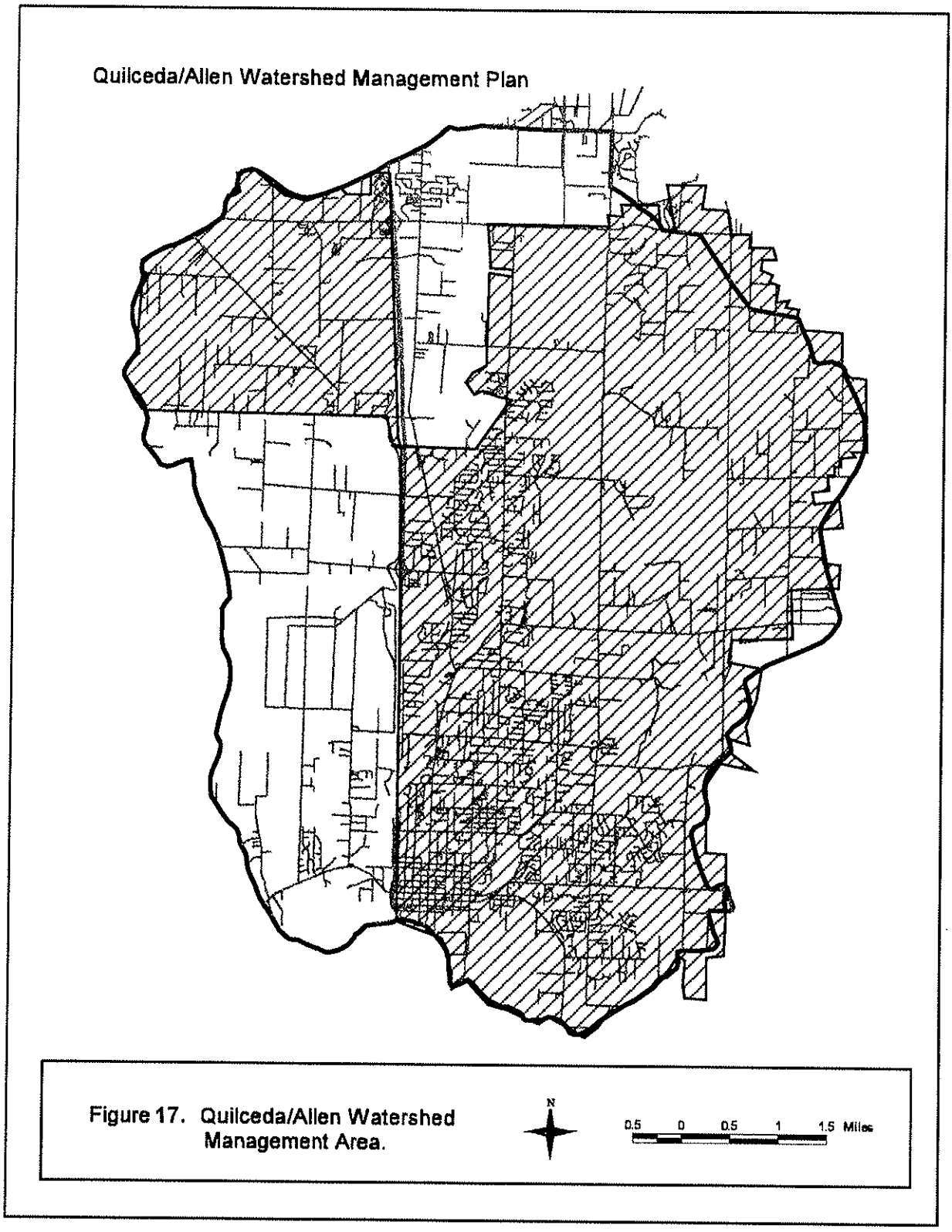


Figure 17. Quilceda/Allen Watershed Management Area.

Maintenance

Q/A 13. Improved Stormwater Facility Maintenance (High Priority)

All jurisdictions should inventory public and private stormwater facilities and conveyance systems to determine their condition and prioritize facilities for repair or replacement if needed. A maintenance schedule should be developed for each facility and reminder notices sent annually to those that are privately maintained.

Funding

Q/A 14. Development of Funding Sources for Facility Maintenance and Infrastructure Improvements (Priority)

Watershed management area fees are not sufficient to adequately respond to the increasing surface water management problems, including facility maintenance. SWM and the city of Marysville should work toward developing adequate funding through increased WMA fees. All jurisdictions should continue to develop other funding sources to design and construct infrastructure improvements. These funding sources could include grants and private/public partnerships.

Incentives

Q/A 15. Maintenance Incentives for Private Stormwater Facilities (Priority)

Until such time as each jurisdiction maintains private stormwater facilities, a program should be developed to provide incentives for private property owners and homeowners associations to routinely maintain stormwater facilities through offers of technical assistance, removal of materials, and providing equipment. Reminder notices and informational brochures should be sent out. Technical assistance should be provided to show methods to enhance these facilities so that they blend in with the landscape. For those landowners who do regularly maintain their facilities, incentives should be explored to recognize their efforts.

Monitoring

Q/A 16. Inspection of New Stormwater Facilities

Each jurisdiction should make provisions for routine inspection of newly constructed stormwater facilities as part of the permit process.

These inspections are rarely done because of insufficient staff. Inspections are needed to determine if facilities were correctly constructed and function properly.

Nonpoint Source Pollution Reduction

Land Clearing and Grading

Sediment from land clearing and grading is one of the watershed's major pollutants. Approximately 85 Forest Practice applications were submitted to the Washington Department of Natural Resources (DNR) from January 1990 to February 1994. Of those, 55 were issued Class IV General Permits involving conversion of about 730 acres of forest land to commercial, residential, or industrial uses.

Periods of intensive construction can create many water quality problems. These problems are usually associated with land clearing and site preparation activities. Areas that have been denuded of vegetation are more prone to erosion and can contribute large amounts of sediment to nearby streams and wetlands. Although soil erosion is the most visible source of construction related nonpoint pollution, other pollutants can also be generated by building activities. These include pesticides, fertilizers, petroleum products, cleaning solvents, and paints.

Land Clearing, Grading, and Erosion Problems

Land clearing and grading for development in the Allen basin has resulted in large sediment amounts in local streams. Sediment from the steep hillsides is carried downstream because of the high stream gradients. When the stream gradient changes in the flat areas, the stream can no longer carry the excess sediment loads, and the sediment settles in the streambed and stream floodplain. Sediment clogs culverts, pipes, and detention facilities, and transports other pollutants downstream. When it accumulates in stream channels, it also reduces the amount of water that the channel can hold, causing streams to flood streamside properties.

The upper stream reaches, including the Middle Fork Quilceda and upper mainstem Quilceda, carry gravelly sediment that has been deposited and accumulated over the years. At the toe of the slope, these two streams are channeled through culverts under 67th Avenue NE. Because the sediment naturally settles in flat gradient reaches, the culverts clog, and the area floods. A pond that functions as a sediment trap has been constructed along the Middle Fork to resolve this problem.

Channels within sandy or silty soils and steep slopes are extremely susceptible to erosion. Erosion has resulted from streamside vegetation removal and streambank filling, particularly in residential areas of the Marysville trough.

Regulating Land Clearing and Grading

Grading is regulated in Snohomish County through SCC 17 and in Marysville, Arlington, and Snohomish County through the Uniform Building Code. The regulations are the same for Snohomish County and Marysville. A grading permit is required for movement of more than 50 cubic yards of earth for all development types. When over 500 cubic yards of earth are to be moved or when there are under

50 cubic yards of earth to be moved that could impact wetlands and streams, an environmental review under the State Environmental Policy Act (SEPA) is triggered. The city of Marysville's Sensitive Areas Ordinance regulates grading in those areas. The city of Arlington requires a grading permit for movement of over 50 cubic yards of earth, but all larger developments must go through SEPA review. There is no specific amount of earth moving that triggers the SEPA process. Arlington requires a SEPA checklist of all grading in sensitive areas.

Grading related erosion and sedimentation problems can be controlled somewhat by construction best management practices (BMPs) required as a condition of grading permits. Unfortunately BMPs are not always applied, or they often do not work due to site conditions.

Land clearing activities of areas smaller than two acres are not regulated. Land clearing of over two acres, or any clearing within 200 feet of Shorelines of the State as designated by the Shoreline Management Act, within forest Riparian Management Zones, or within the ordinary high water mark of a stream require a state Forest Practices Permit. Clearing on small acreages is a major problem because much of the stream sediment comes from land clearing.

Management Recommendations for Land Clearing, Grading, and Erosion Control

Regulations and Policies

Q/A 17. Erosion Control Ordinance (High Priority)

To handle erosion from construction activities most effectively, each jurisdiction should consider adopting an ordinance to:

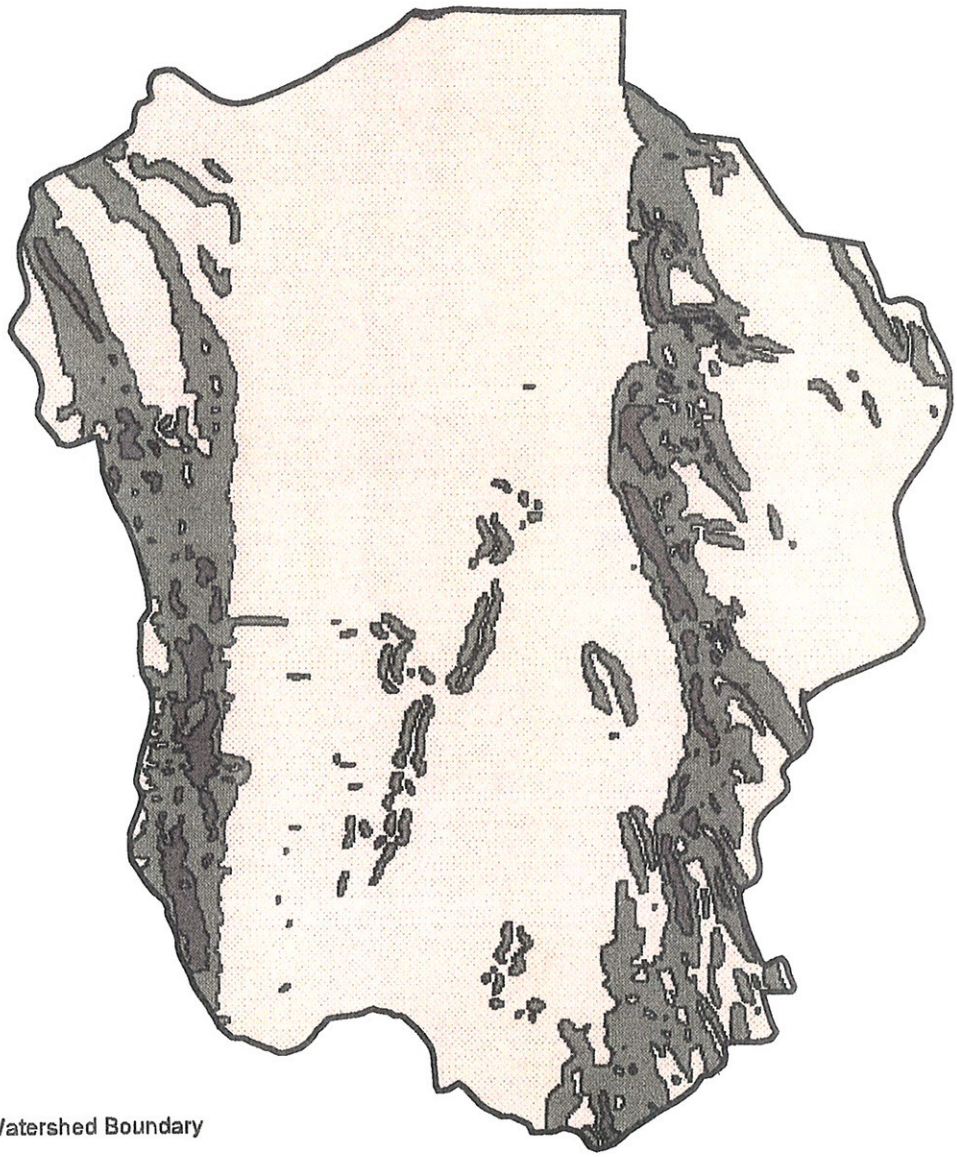
- *Establish erosion control standards that meet the minimum requirements of Ecology's Stormwater Manual.*
- *Establish a procedure for approving erosion control plans in the permit process prior to the beginning of grading, and require full plan implementation at each site development stage.*

Q/A 18. Timing Restrictions for Clearing and Grading on the Getchell and Tulalip Hillsides (High Priority)

A system similar to the city of Everett (appendix A) that would apply timing restrictions for grading during the rainy season should be developed. This system should be based on the amount of earth moved, land cleared, and slope steepness and should be considered for adoption by all the jurisdictions.

On the steep Getchell and Tulalip hillsides (figure 18), there are virtually no erosion control measures that can prevent soil erosion from cleared and graded areas

Quilceda/Allen Watershed Management Plan



Watershed Boundary

Slope

0 to 4.9%

5.0 to 14.9%

> 15.0%

Figure 18. Slope

Source: U.S.G.S. Digital Elevation Model

0.53 0 0.53 1.06 Miles

during the rainy season. The only method to control erosion from these areas is to restrict earth moving and land clearing during that time, which in the watershed is usually from October 1 through April 30.

Research and Monitoring

Q/A 19. Streambank and Sediment Monitoring (High Priority)

Stream channel and sediment transport monitoring should be conducted by watershed staff.

Because the watershed's streambanks are highly susceptible to erosion and deposition, the extent of these problems should be determined and tracked over time. Areas that will be affected by new development should receive priority for monitoring.

Q/A 20. Innovative Methods for Erosion Control (Priority)

Funding should be sought by SWM to support development of more innovative erosion control techniques. The county, cities, and tribe are requested to support development and implementation of more effective and innovative methods of erosion control and to approve them for use.

Often erosion control measures do not work for a site, but because they are the standard methods, they continue to be used. In some cases the contractor may not know about new methods. In other cases a jurisdiction's process of developing erosion control plans may not be flexible enough to incorporate more innovative methods.

Education

Q/A 21. Guidelines for New Grading Codes

Snohomish County Planning and Development Services and the city of Marysville will be adopting new grading codes. They should develop grading guidelines and distribute copies of the guidelines to developers and individual builders as part of the permit application process.

See also: Q/A 5 - Clearing Ordinance; Q/A 49 - Interdisciplinary Team to Assist with and Monitor BMPs

Forest Practices

Logging can degrade water quality in many ways. Clearing of trees along the water's edge can increase water temperature. Logging affects the amount of

nitrogen in the stream by introducing organic material and sediment. Fertilizer application to replanted areas is also a nutrient source.

Pesticides and herbicides are used to control undesired plants and animals. These chemicals can be applied directly or by aerial spraying, and may be transported from the area to streams during storms or from overspraying, or by drift in the case of aerial spraying. Sediment input and turbidity (cloudiness) can be caused by road building, road maintenance, and logging activities. The amount of sediment contributed to streams depends upon the extent of the logging activities, the intensity of the disturbance, the proximity of the logging activity to the stream, and the amount of precipitation occurring during logging.

Forest Practices Problems

Forest is the dominant land cover on the Tulalip and Getchell hills and plateaus. Approximately 30 Forest Practice applications were submitted to the Washington Department of Natural Resources (DNR) from January 1990 to February 1994, involving about 800 acres to be logged and replanted.

The Getchell plateau has some of the most sensitive stream reaches in the watershed. Approximately 275 acres of forest land were or will be logged along the upper mainstem of Quilceda Creek and 110 acres in the upper Middle Fork. About 100 acres are currently being logged on the Tulalip hillside west of Sturgeon Creek. Erosion and sedimentation are particularly severe when logging occurs on steep slopes such as those on the Tulalip hillside.

Recent logging activities have occurred along upper reaches of the Middle Fork Quilceda Creek. Logging activities there have increased the amount of debris and sediment in the stream, and logging within the Riparian Management Zone has caused some streambank degradation.

During the summer of 1993, stream temperatures in the Quilceda and Allen stream system were measured at between 11 and 17 degrees C. Ground water input and amount of streamside vegetation along much of the stream system are probably responsible for maintaining the low summer stream temperatures in the lower watershed reaches. It does not appear that logging is having an impact on stream temperatures.

According to the Washington Department of Natural Resources (DNR) fertilizers are used infrequently in western Washington, although herbicides are used regularly to control unwanted vegetation.

Regulating Forest Practices

Logging is regulated through the Washington Forest Practices Rules and Regulations (WAC 222), administered by the DNR. Most watershed logging and replanting activities are either Class II or Class III. Forest management activities under Class II permits "have less than ordinary potential to damage public

resources." Under Class III permits the activities would impact streams and wetlands or would involve aerial application of pesticides, herbicides, and fertilizers.

The riparian management zone requirements of the Forest Practice Rules and Regulations are designed to provide protection for water quality and fish and wildlife habitat through ensuring present and future supplies of large organic debris for streams, snags, canopy cover, and a multi storied diverse forest adjacent to Type 1, 2 and 3 waters.

A specified minimum number of trees that meet certain structural criteria are left within riparian management zones to provide wildlife and fish habitat. These trees provide shade, streambank integrity, and habitat for fish and wildlife. The number, size, species and ratio of leave trees, deciduous to conifer, varies depending on stream type and size, channel characteristics and desired outcome.

Forest Practice rules require specific buffers to protect streams and wetlands, depending on the type of pesticide application (hand, ground based power equipment, or aerial) and water or wetland type.

Forest practices rules address the sediment problem resulting from road building by requiring seeding or other erosion control measures and by placing timing restrictions on road building activities. Erosion control measures are also required as part of road maintenance activities.

Management Recommendations for Forest Practices

Monitoring

Q/A 22. Monitoring Logging Operations

The Washington Department of Natural Resources (DNR), with the assistance of watershed citizens and watershed staff, should monitor logging operations in the upper Mainstem Quilceda and upper Middle Fork Quilceda creek areas to make sure that riparian areas are protected to the standards of Forest Practices Rules (WAC 222).

The DNR is responsible for enforcing Forest Practice Rules with respect to logging operations. In the riparian zone, forest practice rules are designed to provide protection for water quality and fish and wildlife habitat through ensuring present and future supplies of large organic debris for streams, snags, canopy cover, and a multistoried diverse forest adjacent to Type 1, 2, and 3 waters.

See also WF6 - Logging Operation Monitoring

Ditch Maintenance

Roadside ditch drainage systems are maintained by the city, county, or state. These ditches often fill with sediment and vegetation that must be periodically removed. Some maintenance practices are harmful to water quality. The Washington Department of Transportation (WSDOT) cleans drainage ditches as needed using a backhoe or drought (big backhoe). Snohomish County uses a backhoe or ditchmaster. Dredging the ditches during the rainy season can cause sediment to enter streams. Dredging can also kill fish in ditched streams.

Management Recommendations for Ditch Maintenance

Regulations and Policies

Q/A 23. Road Ditching Standards (Priority)

A handbook describing ditch maintenance standards should be produced by SWM, the cities, and the county Maintenance and Operations Division. The handbook should be used by all jurisdictions to guide ditch maintenance practices.

All jurisdictions maintain roadside drainage ditches to insure proper stormwater runoff flow. Because these ditch maintenance activities can degrade water quality and because ditches can also provide beneficial effects for water quality, procedures should be established to deal with both aspects of ditch maintenance. The ditch maintenance standards should include the following:

- Timing of ditch maintenance.
- Replanting ditches.
- A plan to find and correct the causes of sedimentation problems in ditches.
- A plan for maintenance of salmon-bearing streams that have been ditched (figure 19).

Agricultural Practices

Nonpoint pollution from agricultural activities is caused by improper waste management, livestock access to streams and wetlands, wetland grazing, and improper pasture management. Pollutants associated with these activities include bacteria and other pathogens from livestock waste; nutrients, including nitrates, phosphates, and potassium from livestock waste and fertilizers; sediments from animals trampling streambanks; and pesticides and herbicides that are toxic to aquatic organisms.

Farm livestock, especially on dairy farms, produces large amounts of waste. When the manure is applied to land and pastures that receive large amounts of precipitation and/or are continuously saturated with water, pollutants are carried to

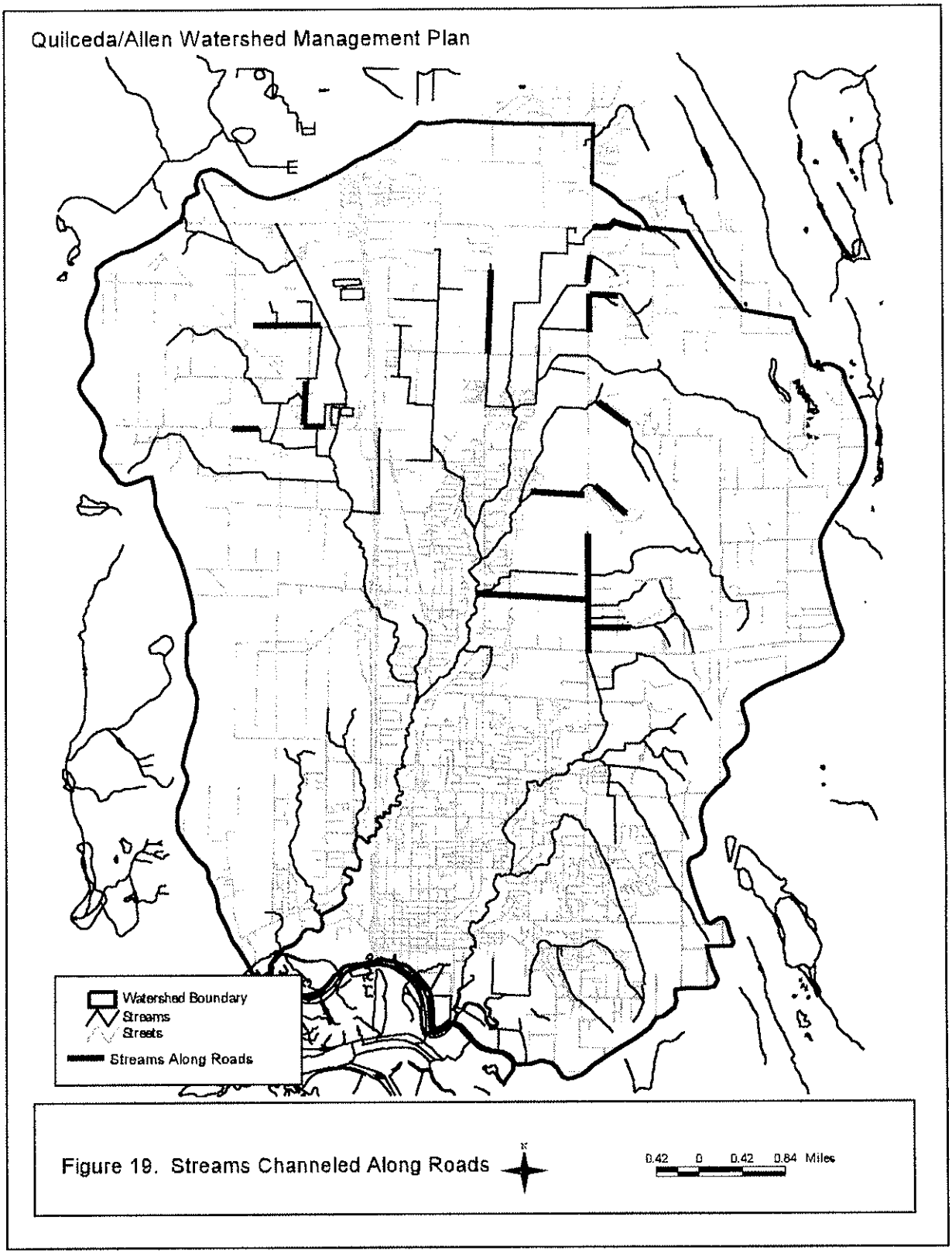


Figure 19. Streams Channeled Along Roads

the streams. Improper spreading and poor timing in manure application, excessive amounts of manure applied to fields in proportion to land area, and direct livestock access to streams are ways that bacteria and nutrients get into stream water.

Agricultural Pollution

Approximately 2800 acres of the watershed are devoted to agricultural use, including both large and small commercial and noncommercial farms (figure 20). The majority of the commercial farms (59%) raise cows for beef production, 22 percent are dairies, 32 percent raise horses, and 28 percent raise sheep or goats. Most of the noncommercial farms raise horses or beef cows (Bachert 1993).

Water quality standards have been established by law for all state waters to protect water uses. Fecal coliform bacteria standards have been exceeded at almost every watershed water quality monitoring station by as much as 1000 times the acceptable level. Nutrient levels are consistently high in both stream systems. These pollutants are contributed in part by livestock waste. Dissolved oxygen levels are below the standards in some streams, generally correlated with increased nutrient levels.

According to Ecology, over the past 20 years there have been more fish kills in the Quilceda and Allen stream systems than in any other watershed in Snohomish County (Halpin et al. 1991). From 1970 to 1987 over 70,000 fish died as a result of water pollution in these streams. Some of these kills were attributed to the discharge of large quantities of livestock waste into streams.

Nutrients are also potential ground water pollutants. High nitrate and phosphate levels are found in ground water in agricultural areas. High nitrate levels in ground water have been recorded in watershed wells by the Snohomish Health District, the U.S. Geological Survey (1994), and Larson and Marti 1996).

According to an assessment of agricultural impacts to water quality (Bachert 1993), dairy livestock are being raised on six percent of the 258 farms in the watershed, but produce 79.5 million pounds of waste annually, while the rest of the animals produce a total of 23.84 million pounds annually. Livestock waste in the watershed includes approximately 591,500 pounds of nitrogen, 103,900 pounds of phosphates, and 351,000 pounds of potassium per year.

As part of the agricultural survey, a rating system was developed to prioritize farms based on potential water quality impacts (Bachert 1993). The factors that influenced ranking included seriousness and number of problems affecting water quality, number and types of animals, pasture size and condition, proximity to wetlands and surface water, and topography. The impact types evaluated included waste management, pasture management, access to wetlands and surface water, wetland grazing, and soil erosion. Over 60 percent of the farms have been ranked with a high or moderate potential for impacting water quality. Only 11 percent of the farms had a low rating.

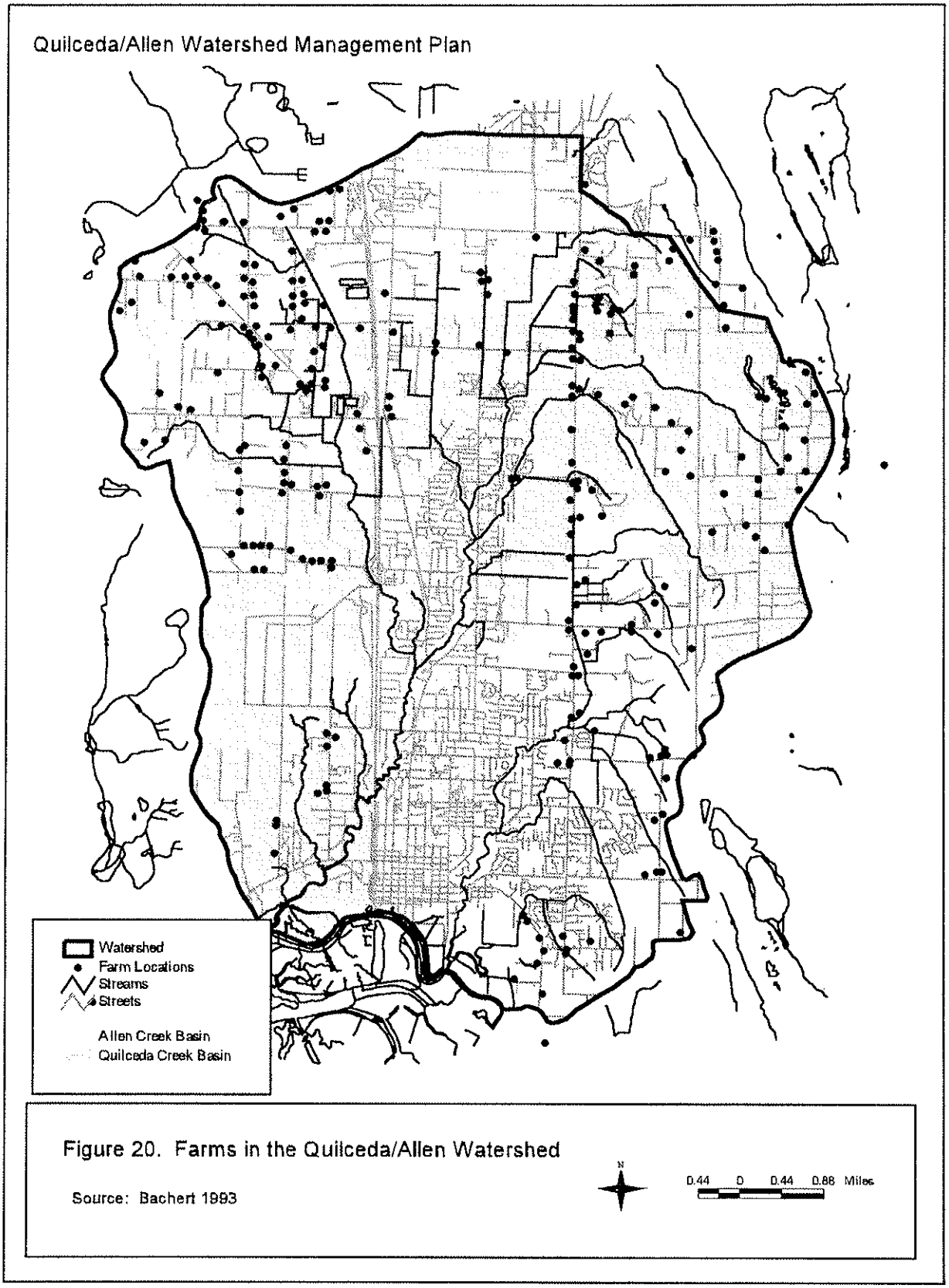


Figure 20. Farms in the Quilceda/Allen Watershed

Source: Bachert 1993

The following table lists the number of farms with moderate to high potential to have impacts on water quality.

Table 2
Farms with Moderate to High Impacts on Water Quality

Impact Source	Number of Farms	Percent of Farms
Pasture Management	91	59
Waste Management	75	49
Access to Wetland/Surface Water	45	29
Wetland Grazing	13	8
Erosion	14	9

Pasture management is a primary concern in the watershed; over half the farms have overgrazed pastures. Over half the farms have inadequate waste management, with waste stored in uncovered piles. A large percentage do not properly dispose of or apply waste. Runoff problems from livestock confinement areas or poorly managed pasture paddocks occur on many farms.

Livestock have direct access to wetlands and streams adding bacteria and nutrients to the streams. Livestock also trample streambanks causing erosion that produces sediment in the streams and degrades fish habitat. Wetland grazing occurs on many farms; 13 were identified as having wetland grazing as a significant water quality concern. Wetland grazing is a problem during the wet months when the soggy soil cannot support the animal's weight and when nutrients from animal waste are not used by growing vegetation.

Regulations and Programs For Controlling Agricultural Pollution

A statewide dairy waste discharge permit program became effective in September 1994, and is administered by Ecology under provisions of the State Water Pollution Control Act and Federal Clean Water Act. The permit addresses nonpoint pollution from dairy farms. A dairy farmer is required to get a permit if a complaint is filed for polluting streams or rivers and if the complaint is validated through water quality testing and other evidence. There is no reporting required as a result of the permit issuance, nor are there any compliance dates. Control of other nonpoint pollution from agricultural activities is also currently carried out under the Clean Water Act. Ecology responds to water quality complaints and can cite a farmer for polluting stream water if there is sufficient evidence. Any farm found to pollute waterways is referred to the Conservation District, which will assist the farmer in developing farms plans to resolve the water quality problems.

SCD, Washington State University (WSU) Cooperative Extension, Washington Department of Fish and Wildlife (WDFW), and The Tulalip Tribes all have programs or projects in the watershed to reduce nonpoint pollution from agricultural activities. SCD provides technical assistance to farmers for developing farm management plans to improve pasture and grazing management, find ways to decrease waste and sediment runoff in animal confinement areas, use fencing to exclude livestock from streams and wetlands, and assist with the development of a complete waste management system. Few watershed farmers are currently taking

advantage of the SCD programs; and even when plans are developed, very often they are not implemented or only partially implemented. One watershed farm that has completed and implemented a farm plan is the dairy operated by the DeJongs.

WDFW has made available free fencing materials, plants, and labor to farmers in the Quilceda/Allen watershed to place fencing to prevent cows from accessing streams, as well as to stabilize banks, provide shade, and provide wildlife habitat by revegetating streambanks. SCD has worked with WDFW and Watershed Management Committee to identify landowners to participate in this project. Three dairy farmers along a half mile of Quilceda Creek and one farmer along Allen Creek have agreed to fence. A few small farmers also have expressed interest. The Tulalip Tribes has fenced and replanted a stream section on a farm along the West Fork.

The Solid Waste Management Division has implemented an on-farm training program that will provide 100 farmers a one day training in onsite composting of farm waste. Ten of these farms will receive additional assistance in waste composting from the county's consultant.

Management Recommendations for Agricultural Practices

Best Management Practices

Q/A 24. Development and Implementation of Farm Plans (High Priority)

Snohomish Conservation District should attempt to get more farmers to participate in the farm plan program and follow through with plan implementation, particularly in the area of waste and pasture management and livestock access to streams and wetlands. Yearly goals should be set to ultimately have farm plans developed for all large farms.

Priority areas for farm management plans should be where water quality problems are greatest as identified in the water quality study conducted by SWM (figure 21) (Thornburgh 1994).

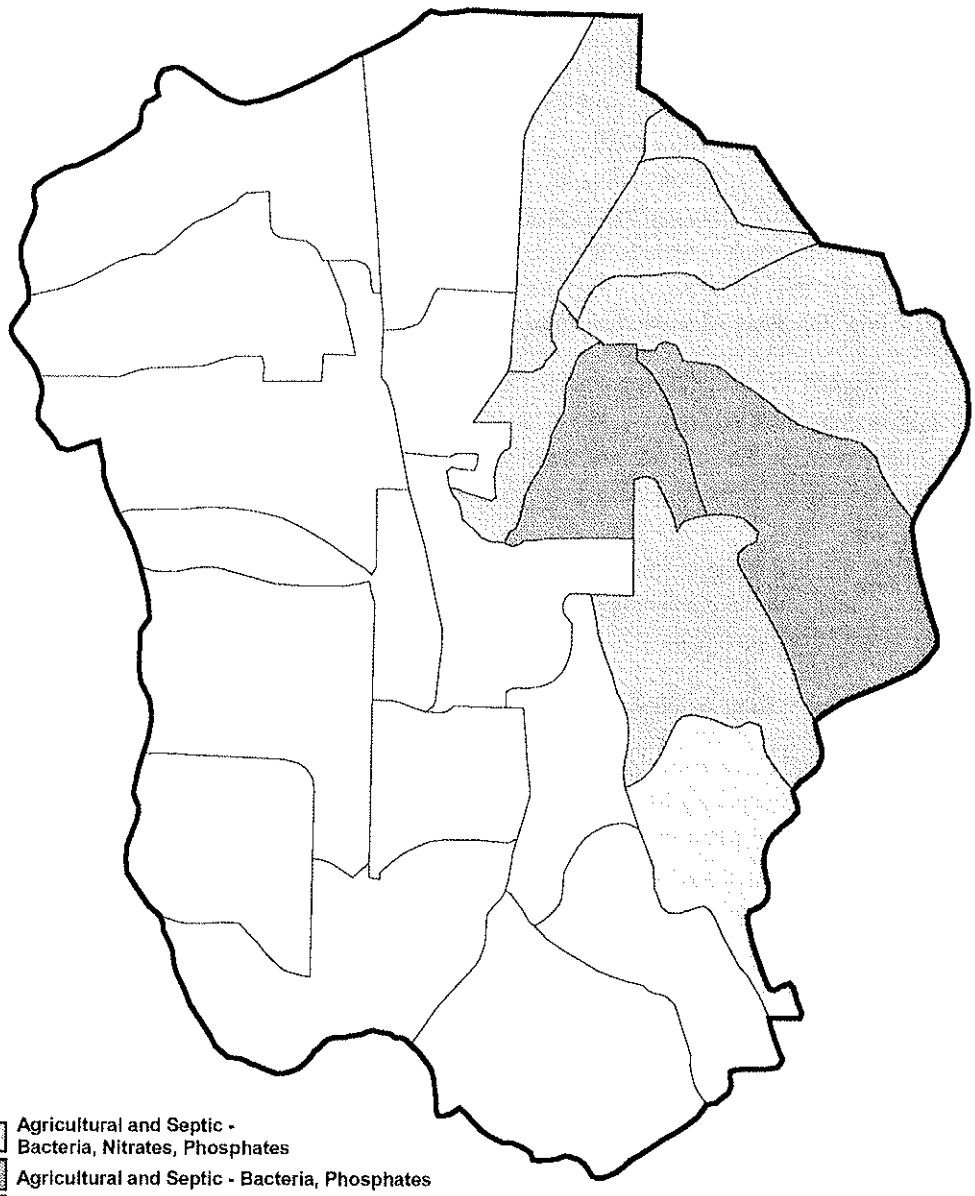
Q/A 25. Preventing Livestock Damage to Streams and Wetlands (High Priority)

Snohomish Conservation District and WSU Cooperative Extension should work with farmers to prevent or restrict livestock access to streams and wetlands.

Surveys by SWM and The Tulalip Tribes indicated several areas where livestock has free access to streams. SCD, WSU Cooperative Extension, 4-H Club, and Future Farmers of America (FFA) should work with farmers to prevent or restrict access to these sensitive areas using the following and other appropriate methods:

- Fence streams and use nosepumps or water tanks to provide drinking water.
- Fence and provide a small area of livestock access to stream for drinking. The access should be protected from erosion by grading, placing cobbles, or paving.
- Draw livestock away from streams and wetlands by providing salt blocks, supplemental feeding, and shade away from aquatic resources. Control the time of grazing to keep livestock away from sensitive streambanks when they are most vulnerable to damage.

Quilceda/Allen Watershed Management Plan



Agricultural and Septic - Bacteria, Nitrates, Phosphates

Agricultural and Septic - Bacteria, Phosphates

Septic - Bacteria

Figure 21. Priority Areas for Farm Plans and Septic Surveys

N

0.5 0 0.5 1 Miles

Source: Thornburgh (1994)

Q/A 26. BMPs Specific to Small Farms (High Priority)

Snohomish Conservation District and WSU Cooperation Extension should provide small farm owners with information on the BMP types that address overgrazed pastures, waste runoff, and livestock access to streams.

Agricultural practices are changing in the watershed. More and more agricultural and rural land is being converted to small farms raising mainly cows, horses, and sheep. The problems associated with livestock on small farms include overgrazing pastures from too many animals in a small area, waste runoff, and lack of space to fence livestock from streams.

Incentives

Q/A 27. Loan Program to Support Use of Agricultural BMPs (Priority)

A low interest loan program, such as use of the state revolving fund loan, should be developed by Snohomish Conservation District, or federal, state, or other private organizations, to assist farmers in making pollution control improvements and using BMPs. Snohomish Conservation District should also facilitate the use of federal cost share funds for implementing BMPs and maximize cost sharing funds by using local and private matches.

Some BMPs used in addressing water quality problems in agricultural areas are costly, and farmers are reluctant to finance water quality improvement measures.

Q/A 28. Incentives for Use of Agricultural BMPs (Priority)

Financial incentives like property tax reduction, monetary or equipment awards, supplying labor and materials, and public recognition, including at the Evergreen State Fair, should be developed and implemented by Snohomish Conservation District and WSU Cooperative Extension to reward farmers who use BMPs to control livestock waste and reduce pasture erosion.

Voluntary use of BMPs is one of the only ways of improving water quality in agricultural areas. Farms that use BMPs should be rewarded.

Monitoring

Q/A 29. Private Ditching Practices

Snohomish County SWM and SCD should work cooperatively to make sure the agricultural community is aware of ditch maintenance standards (see Q/A 23). Technical support should be provided to insure that sediment input is reduced during ditch maintenance activities or when new ditches are dug.

Dredging ditches produces sediment. Ditching in the watershed's agricultural areas has been done to drain wet areas and wetlands and to lower the ground water table

so the land can be used as pasture or for crops. Some ditches are regularly maintained by farmers to keep their land dry.

Education

Q/A 30. Waste Management Seminars

Snohomish Conservation District and WSU should host waste and pasture management seminars for commercial dairy farmers.

Q/A 31. Water Quality Workshops for Noncommercial Farmers

Snohomish Conservation District and WSU Cooperative Extension should offer water quality workshops for noncommercial farmers focusing on the use of BMPs, including proper grazing techniques, managing livestock waste, roof runoff systems, proper use of or alternatives to fertilizers and pesticides, riparian management, fencing, and off-stream watering.

Small farms can have serious impacts to water quality. Management practices that minimize those impacts differ somewhat from those used on large farms.

Q/A 32. Model Fencing Project

Snohomish Conservation District should use the existing model fencing site in Marysville to demonstrate the benefits of restricting access to water bodies and of off-stream watering to owners of cattle and horses.

Farmers are often reluctant to fence streams running through their farm fields. The model fencing project is intended to show farmers how to reduce impacts from livestock access through fencing and replanting and by providing an alternate livestock watering method.

Q/A 33. Involve FFA and 4-H in Agricultural Water Quality Programs

WSU Cooperative Extension and Snohomish Conservation District should organize stream enhancement projects in the watershed's agricultural areas with Lakewood and Marysville-Pilchuck high schools' FFA and 4-H youth groups. Additionally, FFA classes should work with WSU and SCD to identify a watershed farm willing to work with the students to develop and implement a water quality management plan. Evergreen State Fair and WSU should offer awards at the county fair to 4-H and FFA participants for stream or wetland enhancement projects.

Other

Q/A 34. Livestock Waste Composting and Recycling (High Priority)

Compost facilities should be established (or expanded) in Snohomish County to process excess organic waste, including livestock waste. Smaller livestock waste

composting facilities should be located close to the waste source, and may make use of other compostable materials. Snohomish County Solid Waste Management Division will encourage private companies and farms to build and manage mixed organics composting facilities, and will encourage facilities to expand materials handled to include livestock wastes.

Tons of livestock waste and chicken manure are produced in the watershed each year, more than can be efficiently used on farms. Manure recycling and composting strategies that would process livestock and other organic waste into fertilizer, soil, electricity, or other products would benefit the watershed. The compost from these facilities could then be used in the local area for soil enhancement.

See also Q/A 79 -Agricultural Impacts to Wetlands

Onsite Septic Systems

Septic systems provide initial wastewater treatment and settling of solids before purification and disposal of the effluent occurs in the soil. Septic system problems generally result from improper siting, sizing the system too small, improper construction, insufficient maintenance, excessive water use, chemical use in the system, and aging systems. According to the Snohomish Health District (SHD), the most common problems in the Quilceda/Allen watershed are old, undersized systems and lack of maintenance, i.e. pumping. Septic systems built prior to 1970 were designed primarily for disposal and did not emphasize the treatment standards required of today's systems.

The ability to treat and absorb sewage effluent depends on the soil depth and type in the drainfield. The Washington Department of Health and Social Services has determined that a minimum of three feet of unsaturated soil is needed to insure adequate effluent treatment and to protect ground water aquifers. Because of the seasonally high water table in portions of the watershed, many older septic systems lack water quality treatment and can contaminate ground water. New septic systems constructed in areas where the soils are highly permeable and wet must meet current regulations by using enhanced treatment systems such as sand filters or mounds.

Septic system failure can result when the wastewater volume exceeds the soils' capacity to absorb the waste causing a backup in the plumbing system, releasing waste effluent to the ground surface, or seepage of effluent containing bacteria into the ground water. Lush vegetation growth over the drainfield, wet or swampy areas adjacent to or in the drainfield area, and/or profuse wetland plant growth over the drainfield are all indicators of septic failure.

Septic System Pollution

The Puget Sound area has an average septic system failure rate of 3 to 5 percent (PSWQA 1989). There has been no field survey conducted in the Quilceda/Allen watershed to determine the failure rate there, but it probably can be assumed that the failure rate within the watershed is similar or greater. Septic problems are usually reported by neighbors who call to complain about bad odors or visual indications of septic problems. Less frequently homeowners will call about their own septic problems. During The Tulalip Tribes' synoptic water quality study (Halpin et al. 1991), physical evidence of possible septic system failure was noted in stream water at nine areas. Those problem areas were reported to SHD.

Less than one third of the watershed has public sewer service (figure 22). Areas of high risk for septic system failure include all unsewered areas in the Marysville trough where the water table is high. Areas of lower risk for septic system failure include the unsewered, low density hillside areas. The soils on these hillsides are Alderwood series soils, which are not as wet and have good water holding capacity.

Regulations and Programs for Controlling Pollution from Failed Septic Systems

Under the federal Clean Water Act, it is illegal to allow organic material such as septic system effluent that could cause pollution to seep into streams and wetlands. SHD regulates the installation and operation of all onsite septic systems with capacities under 3,500 gallons per day. New development using onsite disposal must get a permit from SHD. The Washington State Department of Health regulates systems with capacities over 3,500 gallons per day and under 14,500. Large septic systems (14,500+ capacity) and industrial onsite systems are regulated by Ecology. These administrative responsibilities have been assigned in On-Site Sewage System Regulations (WAC 246-272).

In January 1995, SHD adopted revised State Board of Health onsite sewage system regulations. These new regulations emphasize high standards for treatment and professional and personal responsibilities in the siting, design, installation, inspection, operation, and maintenance of onsite systems. The new regulations require local health departments to develop and implement plans for periodic monitoring of onsite sewage systems and dissemination of operation and maintenance information to homeowners by January 1, 2000.

SHD has several programs in place to reduce nonpoint pollution from onsite septic systems. SHD licenses septic pumpers to make sure they are using proper pumping techniques. It also has public education programs. Educational brochures are available to help the public locate their septic systems and show proper septic tank and drainfield maintenance. Staff are available to speak to community groups about onsite sewage maintenance. In addition, a video has been prepared that talks about septic systems and proper maintenance for use by citizens.

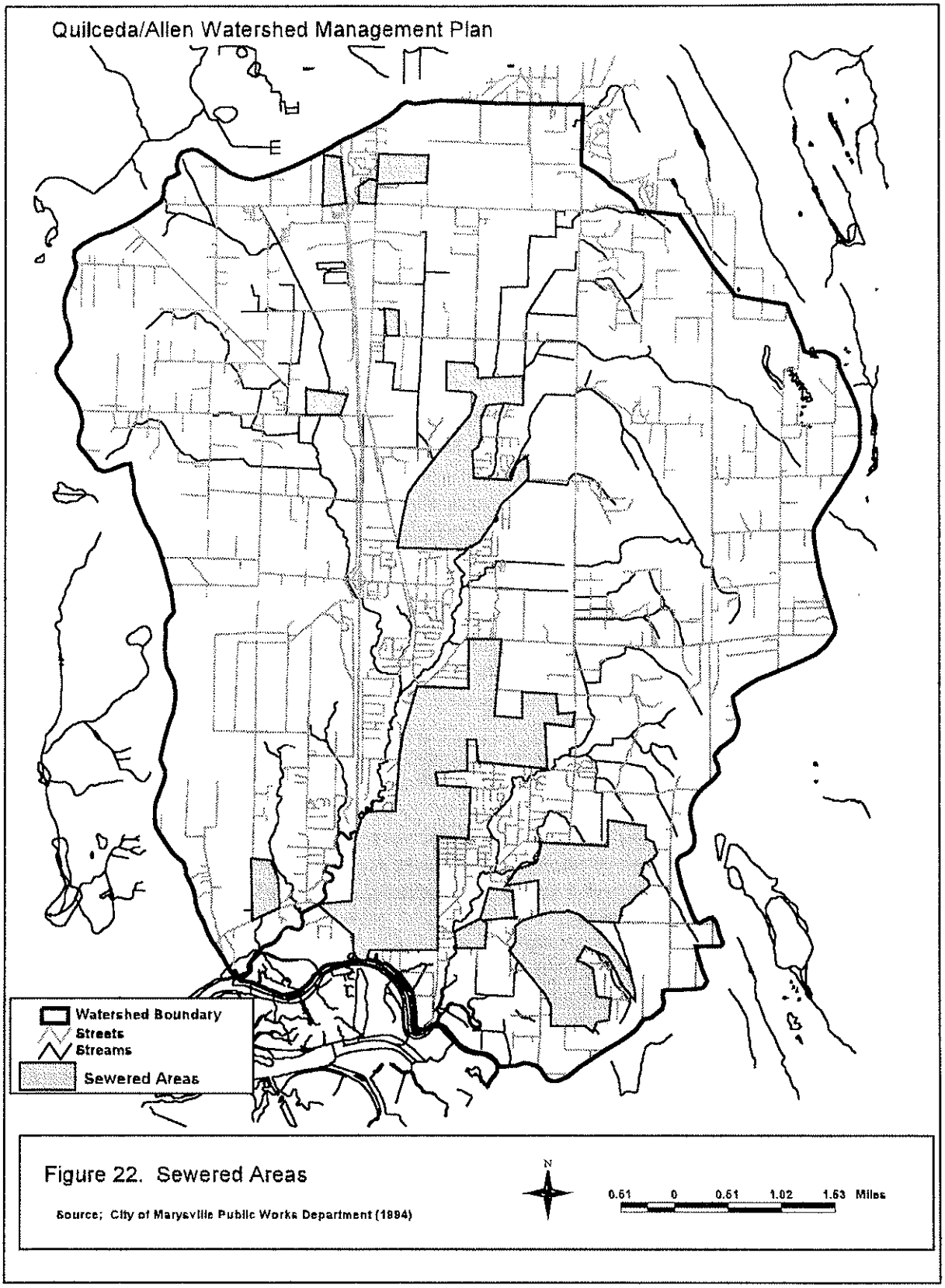


Figure 22. Sewered Areas

Source; City of Marysville Public Works Department (1994)

Management Recommendations for Septic Systems

Incentives

Q/A 35. Subsidy for Replacing Failed Septic Systems (High Priority)

Areas that are not designated for future sewer service and that have failing septic systems should be targeted under the low interest loan program currently being developed by Ecology/Snohomish County SWM/Snohomish Health District for replacement of failed septic systems.

This program is currently not being funded and therefore cannot be implemented at this time.

Q/A 36. Septic Maintenance Reminder Data Base (High Priority)

A database of new septic systems should be established by SHD. This database should be used to send notices to homeowners to have their septic systems checked for maintenance every three years. Included with the notices should be an informational brochure explaining the importance of regular maintenance.

This recommendation included a program to involve pumping businesses in providing discounts or other incentives to maintain septics. SHD does not believe it is feasible to implement this type of program.

Education

Q/A 37. Information on Septic Operation and Maintenance

SHD should continue to distribute septic system operation and maintenance brochures and videos to Snohomish County residents. SHD should also be available to present septic system operation and maintenance information to homeowners' associations.

Pet Waste

Pet waste is another source of harmful bacteria, viruses, and nutrients in streams. This waste enters streams when residents deposit it along streambanks and when animals defecate in backyards or along a stream corridor, and the waste material washes into the stream.

Pet waste is a major contributor of bacteria in residential areas. A recent water quality study in Snohomish County's North and Swamp Creek watersheds found that there was a trend toward higher bacteria levels in residential areas as opposed to areas with hobby farms. The residential sites are served by municipal sewer systems so pet waste was the likely contributor of bacteria (Thornburgh 1994).

Through ribosomal tracking researchers were able to identify bacterial sources in Piper Creek, an urban stream in Seattle (Herrera Environmental Consultants, Inc. 1993). They concluded that feces of dogs, cats, and ducks were the primary source of the stream's fecal contamination.

Pet Waste Pollution

Approximately 16 miles of streams flow through residential watershed areas. Pet waste has been observed along streambanks. As more people move into the watershed with their pets, this problem will increase.

Regulating Pet Waste

The most common way to regulate pet waste is through laws that require pet owners to pick up and dispose of their pet's waste. The city of Marysville has adopted such a law (MMC Title 10, Section 21) that requires removal of pet fecal matter deposited on someone else's property or on public property. Snohomish County Solid Waste Division distributes brochures that discuss the proper pet waste disposal. The Snohomish Health District responds to complaints concerning pet waste and provides information to concerned citizens. No other watershed regulations or programs address pet waste.

Management Recommendations for Pet Waste

Regulations

Q/A 38. Pet Waste Ordinance

Snohomish County, The Tulalip Tribes, and the city of Arlington should consider adopting an ordinance that would require pet owners to pick up pet waste.

Education

Q/A 39. Information on Pet Waste Disposal

Snohomish County Solid Waste Division should continue to publish and distribute a brochure that includes information on how to properly dispose of pet waste.

Hazardous Waste

Hazardous waste can contaminate drinking water and kill fish and other aquatic organisms. There are several sources of hazardous waste problems in the Quilceda/Allen watershed, including sites that have been found to have toxic substances in the soils, ground, and/or surface water.

Underground storage tanks are potential nonpoint pollution sources. These tanks are used to store petroleum and other regulated substances. Single walled, bare steel tanks without corrosion protections that are over 15 years old are vulnerable to leakage that can contaminate ground water. The Environmental Protection Agency estimated that as many as 25 percent of all underground storage tanks may be leaking nationwide (USEPA 1988). Tank leakage may be caused by tank deterioration, improper installation, pipe failures, and/or spills and overfills.

Businesses can also be hazardous waste sources. Accidental chemical spills can occur at businesses like auto service and repair shops, print shops, dry cleaners, beauty salons, medical facilities, and school shops that are potential small quantity hazardous waste generators. Fertilizer use for lawns, golf courses, turf farms, and nurseries adds nutrients to runoff. Household products such as paints, solvents, and cleaning fluids and auto related products, such as oil and antifreeze, often end up in surface water or are dumped down storm drains.

Hazardous Waste Problems

Hazardous Substance Sites

Several sites were identified by Ecology (1994b) as hazardous waste sites including the Sisco Landfill, Mann Equipment, the Bowers Property, and Offset Web Sales. These sites are required to clean up their property on their own or with assistance from the state.

Leaking Underground Storage Tanks

Ecology (1995) has identified 5 sites with leaking underground storage tanks in the watershed. Three of the sites are gas stations, and all are located in the upper watershed, where ground water contamination is a major concern. All sites are either in the process of being cleaned up or are being monitored.

Leaking underground storage tanks could present a severe threat to watershed ground water, as well as a significant threat to surface water because of the interconnection between these resources, particularly in the Marysville trough. Water contamination will remain a threat until all storage tank locations are identified and all storage tanks known to be leaking are replaced.

Moderate Risk Waste

As of 1992, the county's 177,500 households and 2,000 minor and major commercial generators produce about 11.1 million pounds of moderate risk waste annually (Snohomish County 1993a). Currently the number of small quantity waste generators in the Quilceda/Allen watershed is unknown. However, there are a number of businesses that use chemicals creating a potential for spills or stormwater contamination in storm drains. Many households also use pesticides, fungicides,

and herbicides in landscaping. These chemicals wash off lawns into storm drains and streams. Approximately 40,000 residents live in the watershed and that number is expected to increase by about 50 percent in the next 20 years, intensifying the household hazardous waste problem.

Regulations and Programs for Addressing Hazardous Waste Problems

Hazardous waste is regulated under the Model Toxics Control Act (RCW 70.105D.010). In general the act is designed to insure that sites identified as potentially dangerous to the state's citizens or environment will be cleaned up.

Ecology has enforcement authority over all hazardous substances identified from major contributors of dangerous hazardous waste, including underground storage tanks. SHD enforces most of the regulations with respect to hazardous and moderate risk waste.

Hazardous Substances

The Model Toxics Control Act defines how contaminated sites are cleaned up once they have been identified. Hazardous substance sites are listed not only to categorize the various types of sites and their impacts, but also to provide information to individuals interested in purchasing land. The landowner is responsible for the clean up cost of any hazardous sites on the land no matter who caused the problem. The state has established cleanup standards that identify acceptable levels for particular hazardous substances and where cleanup must occur.

Leaking Underground Storage Tanks

Ecology currently enforces federal and state underground storage tank regulations and deadlines. The regulations require all tanks to be registered before they can be legally filled. To receive a permit, underground storage tanks must comply with state rules and owners must pay annual tank fees. Additionally, all tanks installed prior to December 22, 1988, must be upgraded to include leak detection devices (WAC 173-360). The deadline for upgrading existing tanks is based on the tank age with an ultimate deadline of 1998 for leak detection system installation. Ecology is implementing a program to identify and register unregistered underground storage tanks, and to enforce construction upgrades and monitoring systems.

There is no registration, regulation, or tracking required for underground homeowner fuel tanks that may leak or spill pollutants into surface and ground water.

Moderate Risk Waste

Moderate risk waste is defined by RCW Chapter 70.105.010(17) as hazardous waste generated in smaller quantities than those regulated under the state's dangerous

waste regulations (2.2 pounds of extremely hazardous material per month or less than 220 pounds of dangerous waste per month and/or household-generated hazardous waste such as paints, solvents, thinners, pesticides, herbicides, battery acids, cleaners, polishes, auto maintenance products, cosmetics, and pharmaceuticals).

The Snohomish Health District is mandated to enforce Chapters 3.1 and 3.5 of the Sanitary Code. These include Solid Waste and Moderate Risk Waste. In December of 1994, Snohomish Health District adopted "Regulations Covering Moderate Risk Waste Handling." These regulations cover handling, storage, and disposal requirements for both households and small businesses. They also cover permitting requirements for moderate risk waste collection facilities.

Local governments are responsible for creating their own plans to deal with hazardous waste. With input from the SHD, Snohomish County Solid Waste Management Division has developed a Moderate Risk Waste Management Plan. The plan recommends and prioritizes programs that address these waste disposal problems and has been adopted by all watershed jurisdictions except The Tulalip Tribes.

The county will provide year-round collection of household hazardous waste through the following programs:

- Moderate Risk Waste Facility in Everett
- In-store program for collection of paint related materials
- Automotive waste drop-off programs at transfer stations and cooperating automotive related businesses.

Some programs are already in place in Snohomish County Solid Waste Management Division to reduce nonpoint pollution from household generated hazardous waste. Household hazardous materials roundups are conducted April through November in various cities in Snohomish County to provide safe disposal of various types of products. County residents can bring materials such as paint thinners, glues, sealants, oil based paints, herbicides, pesticides, household cleaners, and bleach.

Education and training programs on hazardous waste include an educational booth at the roundups that provides information on alternative products. The county also sponsors free training on hazardous waste through their Master Recycler Composters training sessions held each year.

The program developed by Snohomish County to handle small quantity hazardous waste generators focuses on education and technical assistance. Programs are in place that provide education to households concerning hazardous chemicals used in the home and by businesses patronized by homeowners; provide education concerning waste and pollution prevention alternatives, provide education and technical assistance to businesses concerning financial and environmental liabilities associated with the use of hazardous materials in the workplace; and provide education and incentives for businesses to reduce costs and liabilities through

pollution prevention. The primary goal is to reduce the chemical use, and a secondary goal is to make sure the chemicals are handled and disposed of properly.

The EnviroStars recognition program as envisioned by the Small Quantity Generator panel, showcases businesses that are implementing waste prevention and helps to inform the community and other businesses about ways to prevent pollution.

Management Recommendations for Hazardous Waste

BMPs

Q/A 40. Require the Use of BMPs for Businesses that Use Toxic Chemicals (Priority)

All jurisdictions should consider conditioning permits to businesses that use toxic chemicals to require the best available water quality best management practices to reduce the risk of contamination to stream and ground water.

Under the new land use plans for the watershed, more industrial and commercial businesses will be established. The land set aside for these types of uses are in areas where a high water table and salmon bearing streams are present.

Incentives

Q/A 41. Pumping of Household Heating Oil Tanks

A program to pump and dispose of heating oil and underground oil tanks should be established to protect ground and surface water by SWM. A successful program has been undertaken in King County through grant funding.

The use of oil to heat homes was formerly common, and the oil was usually stored in underground tanks. With conversion of home heating to electricity or natural gas, heating oil is rarely used, and the oil tanks remain in the ground with leakage potential.

Education

Q/A 42. Workshops and Distribution of Fact Sheets on Independent Cleanup Process

Ecology should provide fact sheets on the independent cleanup process for distribution at city and county planning and permit offices. Workshops for consultants and property owners should be available through the Ecology's Hazardous Waste Independent Remedial Action Program.

Monitoring

Q/A 43. Water Quality Site Monitoring for Toxic Chemicals

SWM and The Tulalip Tribes should develop a water quality site monitoring program for activities and businesses that could be contributing toxic chemicals to stream systems.

Other

Q/A 44. Underground Storage Tank Survey

An underground storage tank survey in the Marysville trough area to identify the location and condition of tanks should be conducted. If additional leaking tanks are found, Ecology should work with landowners to make sure the tanks are repaired or removed as quickly as possible because of the sensitivity of the Marysville trough aquifer to contamination.

There is currently no agency identified to implement this recommendation.

Q/A 45. Emergency Spill Response Plan

The Snohomish County Department of Emergency Management should review the emergency spill response plan for the watershed and make any changes deemed necessary to improve the plan.

Interstate 5 runs the entire watershed length, and hazardous waste is carried in trucks along that route and to various watershed destinations.

Other Urban Pollutants

Stormwater is water that washes off developed land into streams and lakes, and eventually into Puget Sound. On its way to the streams, stormwater picks up particles, oils, metals, and other toxic chemicals. In urban areas runoff from development and hard impervious surfaces such as streets, parking lots, buildings, and construction sites carries metals, organics, oils, and other pollutants.

Everyday activities are responsible for the degraded stormwater runoff quality. Cars drip or rain washes petroleum, hydrocarbons, and metals such as arsenic, cadmium, chromium, copper, lead, and zinc off cars onto streets and from there the runoff goes into streams. Use of detergents for car washing and other types of washing are pollutant sources.

Urban Pollution

Watershed population and traffic are increasing rapidly causing more water quality problems. Interstate 5 crosses Quilceda Creek at 4th Street/Tulalip Road and 116th Street NE, and construction of a third intersection at 88th Street NE has just been

completed. Many other roads and streets throughout the watershed cross streams. Stream sections are channeled along the road in several areas (see figure 19, page 71). Untreated runoff from all these roads carries metals and other pollutants to nearby streams. In the Quilceda/Allen watershed, lead and copper exceed state standards in most water quality samples.

There are a number of automotive related businesses in the watershed that use high strength detergents for washing, including three car dealerships and a bus barn. Residential discharge of laundry water in unsewered areas and car washing water also goes into stormwater systems. The METRO Water Pollution Control Department conducted a study of detergent and soap toxicity. They found that dilution ratios of from 15:1 to 60:1 were needed to make detergents and soap safe for discharge into storm drains (Waddell 1992). Detergents are routinely found in all watershed water quality samples taken.

Transportation related businesses are also metal and petroleum sources in streams. An auto wrecking yard is located adjacent to the West Fork of Quilceda Creek, and auto related businesses including automobile painting and repair shops are found along Smokey Point Boulevard and elsewhere in the watershed. Industries using plastics like Northwest Composite and Bayside Marine are also potential metal sources. The Sisco landfill contributes metals, and metals also come from residences that use copper drain pipes and tubing and buildings with galvanized roofs. Metal road culverts are also a continuous metal source.

There are one golf course, two turf farms, and several nurseries in the watershed. Fertilizer use for these types of businesses, in addition to its use on farms and lawns, contributes nutrients to the stream system. Water quality monitoring indicates a greater nutrient input from the upper watershed where there are one turf farm, one large nursery, and several commercial livestock farms in addition to unsewered areas. The golf course discharges water into Munson Creek and an unnamed tributary to Allen Creek (no WRIA number). Excessive plant and algal growth are apparent in both streams during the summer months.

Pesticides, herbicides, and fungicides can be a source of metals and toxic chemicals. These chemicals are used extensively in agricultural areas, by turf farms and nurseries, and in forest management. They are also used to control roadside vegetation along state and city roadways.

Regulations and Programs for Controlling Urban Pollutants

Direct or point source discharges to surface water are required to be covered by National Pollution Elimination System (NPDES) permits under the Federal Clean Water Act. Ecology has been delegated responsibility for issuing NPDES permits in Washington. State discharge permits, also issued by Ecology, are required for discharges to the ground or to publicly owned treatment plants. General permits are issued to entire groups of similar dischargers, such as sand and gravel operation, boat yards, and ship yards. In addition, certain categories of industries considered likely to cause polluted storm water runoff are required to obtain a Baseline Storm

Water Permit. The storm water permit requires development and implementation of storm water pollution prevention plans specifying BMPs intended to minimize the risk of storm water pollution. Construction projects affecting five acres or more must also be covered by a storm water permit requiring planning and implementation of construction site BMPs.

Snohomish County is required to identify and correct existing stormwater pollution problems and to establish preventive stormwater programs for the county stormwater drainage system. Snohomish County is monitoring water quality in its storm drainage system and will be working with businesses and industries to resolve water quality problems.

The Washington Department of Transportation (WSDOT) is required to develop a similar program for highway runoff. WSDOT plans to incorporate methods for controlling water quantity and improving water quality in all new highway construction. WSDOT is also developing a vegetation management program that addresses integrated pest management, pesticide use, and protection of water quality. State highways will be ranked by WSDOT based on water quality concerns to determine where appropriate stormwater BMPs should be installed first. All roads are required to have BMPs by December 31, 2015. In addition, WSDOT is developing a list of priority projects for corrective measures. Several projects in the Quilceda/Allen watershed have been identified by SWM for inclusion in this program.

Management Recommendations for Urban Pollutants

Regulations and Policies

Q/A 46. Water Quality Ordinance (Priority)

Because of the evidence of widespread nonpoint pollution problems, a water quality ordinance should be developed by SWM and adopted and enforced by the county.

Snohomish County is required under the NPDES permit to develop a water quality ordinance.

Q/A 47. Detergent Reduction

All jurisdictions should consider amending their codes to require designated car washing areas in large apartment complexes as is done in the city of Everett. If possible, older apartment complexes should be retrofitted for car washing facilities. In addition businesses like automobile dealerships and bus barns, as well as charity car washes that use detergents for washing, should be identified and if they are discharging wash water into the storm drainage system, that practice should be stopped and technical assistance provided to help reduce detergent use and to find alternate disposal methods.

Best Management Practices

Q/A 48. Herbicide Spray Away From Streams and Wetlands (Priority)

WSDOT and other road maintenance entities should minimize herbicide use for roadside ditches. Herbicides should not be used within 200 feet of any stream or wetland.

Herbicides are currently used by the WSDOT and the cities of Arlington and Marysville to control vegetation along roadways.

Q/A 49. Interdisciplinary Team to Assist with and Monitor BMPs

An interdisciplinary team with members from all jurisdictions should be established to assist with review of stormwater, erosion control, and water quality BMPs, development of maintenance for BMPs, monitoring the effectiveness of BMPs, and making recommendations for changes to BMPs for businesses and contractors.

Incentives

Q/A 50. Model Business Program

SWM should develop a program to use businesses that have been successful in applying innovative and economically efficient ways to reduce water pollution as models for other similar businesses.

Many businesses, such as Smith Gardens, have found it cost effective to reduce the toxic chemical use.

Q/A 51. EnviroStars Recognition Program

The Solid Waste Management Division's EnviroStars Recognition program should continue to provide pollution prevention technical assistance, incentives, and recognition to businesses in the watershed.

This program will help to showcase these businesses and inform the community and other businesses of ways to implement and support pollution prevention.

Education

Q/A 52. Workshops on the Use of Toxic Chemicals in Gardening

Master Gardeners should continue to use the Jennings Park demonstration garden to educate watershed residents on the water quality problems associated with pesticide, herbicide, and fungicide use in gardening and inform them of nontoxic alternatives.

Q/A 53. Information on Pesticides and Herbicides for Distribution at Local Businesses

Master Gardeners should distribute information about landscaping chemicals to local nurseries, department stores, and hardware stores in the watershed to educate residents about the water quality problems associated with these products and present alternative options.

Q/A 54. Development and Distribution of Water Quality Material to New Homeowners

The Quilceda/Allen Watershed Management Committee should develop information on water quality to provide to all new home buyers in the Quilceda/Allen watershed. This information should be distributed through direct mail, community groups, Realtors, and businesses. Materials could include a video, a calendar, refrigerator magnet, printed brochures, and other useful items.

Q/A 55. NPDES Business Assistance Program

SWM's Water Quality Program will provide technical assistance to businesses and individuals that discharge pollution to surface waters, including assistance with implementing stormwater pollution prevention measures.

Q/A 56. Storm Drain Stenciling

SWM Education Program will advertise and distribute storm drain stenciling kits and materials to student and youth groups in the watershed for biannual stenciling campaigns to be coordinated by the schools or the sponsoring organizations.

Direct Discharges Into the Quilceda/Allen Stream System

A potentially difficult problem in the Quilceda/Allen watershed is the large number of pipes and other drainage devices that discharge effluent directly into the stream or on the streambank. Pollutants from direct discharges are similar to those that occur in urban stormwater--fertilizers, pesticides, herbicides, fungicides, and detergents. Piped and ditched flows also cause erosion near their outlets.

Direct Discharge Problem

Within the Quilceda/Allen watershed, 352 direct discharge sources were located; 112 locations along Allen Creek, 240 along Quilceda Creek (Halpin et al. 1991). The types of direct discharges recorded during the study were storm drains, agricultural and other drainage ditches, and drainage pipes. Drainage pipes accounted for 105 points of direct discharge along the stream systems, with 51 pipes draining residential gutters, driveways, depressions in the yard, and for illegal sewage disposal. Open ditches draining into the creeks were identified at 216 locations.

In the Quilceda system, points of direct discharge were observed along portions of the West Fork, Middle Fork, and mainstem. Agricultural ditches were noted along the Middle Fork between 143rd and 172nd Streets NE. Storm drains and residential drainages were concentrated along roads and residential areas of the Middle Fork at 143rd Street NE, in the mainstem and Middle Fork between 108th and 132nd Streets NE, and on the West Fork along 116th Street NE.

Visible pollution was commonly seen in ditches; sediment from erosion and animal waste were the most conspicuous. Types of pollution normally associated with residential drainage including fertilizers, pesticides, and other soluble substances are not readily visible.

Regulating Direct Discharges

Direct discharges into streams are regulated by the National Pollution Discharge Elimination System and other sections of the Clean Water Act. The act requires discharges from gutters, driveways, lots, agricultural ditches, some types of commercial discharges, and city roads to be mitigated through BMP use.

Management Recommendations for Direct Discharges

Inventory

Q/A 57. Inventory of Illicit Discharges (Priority)

An inventory of all commercial, industrial, and agricultural sites should be conducted by SWM as required by the NPDES program to locate illicit hookups to storm drains and illegal discharges into streams. Jurisdictions should consider adopting ordinances requiring businesses that generate waste runoff to connect to the sanitary sewer system where possible or to develop and implement pretreatment programs. Ecology should conduct an inventory of direct discharges on private property.

Many pipes and ditches discharge polluted water into the storm sewer system and the Quilceda and Allen stream systems. Some are legal, some illegal.

Education

Q/A 58. Development of Brochure on Direct Discharges

SWM's Water Quality Program should develop a brochure providing information on stormwater discharges to citizens and construction contractors. These brochures could be distributed by Realtors and through the permit process.

Dumping and Stream Garbage

Stream garbage, including organic material such as yard clippings and inorganic material such as tires, bottles and cans, appliances, cars, and car parts, is a common problem in both urban and rural watershed areas. Illegal dumping is affected by many factors, including disposal prices, location and convenience of disposal options, public advertising and education, access to and visibility of a site, community pride, and personal responsibility. Streams routed along roads are frequently the receptacles for garbage tossed out of cars. Forested streamside buffers often provide out of the way places to put unwanted material.

Dumping and Stream Garbage Problems

Solid waste and garbage along the stream were recorded by The Tulalip Tribes (Halpin et al. 1991). Litter occurred most frequently in the urbanized areas along Quilceda Creek and adjacent to roads along Allen Creek. Isolated dump sites were identified along Quilceda Creek at 61 sites. An additional 5 percent of the stream and riparian corridor was affected by dumping. In Allen Creek 21 dump sites were observed, and longer stretches were littered, constituting 15 percent of the stream surveyed. A substantial portion of the litter was found along 67th Avenue NE. The majority of the refuse recorded in both stream systems consisted of yard clippings and compost piles, garbage, metal, and car parts. Small dump sites are often associated with littered areas along Quilceda Creek.

Neighborhood groups have gotten together to do stream cleanups, but the amount of garbage collected from the stream can be very large and garbage disposal at a landfill can be expensive. It is hard to persuade people to do stream cleanups if they have to pay for disposing of other people's garbage.

Regulations and Programs to Address Illegal Dumping and Garbage

Most waste disposal is regulated through the state General Sanitation Code (WAC 246-203). Dump sites on private property become illegal only when they contain hazardous materials like lead acid batteries. When these materials are identified, Snohomish Health District (SHD) will investigate and get the materials removed in an acceptable manner. Household waste dumping on public property is illegal. Once removed, SHD will try to determine ownership.

The cost to the homeowner of yard waste disposal and other garbage is high, and many people do not realize that there are ways to cut costs. For example, by pooling all yard waste in a neighborhood and taking it in one truck to a disposal site, individuals can save money.

There is a cost to the homeowner of yard waste disposal. The Solid Waste Management Division, through a number of programs, helps to insure the availability of techniques for homeowners to reduce or reuse their yard debris instead of paying for disposal. Master Recycler Composters assist in the training of homeowners in composting methods through demonstration sites and workshops.

Mulching lawnmowers and compost bins have been made available to homeowners at reduced prices.

Metal appliances such as stoves, washing machines, and dryers (white goods) can be recycled for free at Snohomish County transfer stations. These white goods are still frequently illegally dumped throughout the county.

Other items that can be recycled for free by households include car batteries, aluminum cans, glass bottles, and other recyclables that are often dumped in streams and open spaces. These program are good examples of public/private partnerships between the county and businesses willing to handle recycled materials.

Management Recommendations for Dumping and Garbage

Education

Q/A 59. Distribute Information on Disposal Alternatives

Snohomish County Solid Waste Management Division (SWMD) should continue to develop and distribute brochures and provide training on waste and pollution prevention through the Master Recyclers Composters program, Envirostars, school programs, at on farm composting training, and at Moderate Risk Waste Facilities. SWMD should continue to distribute reduced cost home composting bins and mulching lawnmowers.. SWM should distribute brochures to local Stream Teams and through the Watershed Steward program. The cities of Marysville and Arlington and The Tulalip Tribes should distribute information on alternative waste disposal options for items such as auto batteries, metals, and tires through fire districts and permit offices.

Q/A 60. Stream Cleanup Activities

SWM's Watershed Steward Program should coordinate efforts to conduct stream cleanups.

Stream Teams should be formed in various neighborhoods throughout the watershed (see Q/A 72) and Watershed Keepers (see Q/A 67) should be supported and encouraged in their efforts to keep streams clean.

Q/A 61. Grant Program for Disposal of Stream Waste

Snohomish County Solid Waste Management Division should continue to implement a fee grant program to reduce disposal costs of waste collected through volunteer stream cleanups. Corporate or business sponsorship for remaining costs should be sought and their efforts rewarded.

Grants are available by applying to the Solid Waste Division and are limited to trash collection from illegal dump sites on public lands and public access lands. Grants will offset disposal fees by reducing costs from $89/ton to $25/ton. SWM's Watershed Steward Program will assist with cleanup projects and grant applications. SWM's Watershed Steward and DRI programs can assist Stream Teams and others in seeking corporate or business sponsorship for remaining waste disposal costs. Certificates should be presented to participating businesses.

Stream Habitat Enhancement and Salmon Recovery

Target: No Net Change In Flow Regime and No Net Loss of Habitat

There are approximately 60 to 70 stream miles in the Quilceda/Allen watershed. Almost all stream sections provide habitat or influence habitat for anadromous salmon and trout or resident trout. The Quilceda and Allen stream system was formerly one of the most productive stream systems in the Snohomish River basin. Today, the salmon numbers in this stream system have declined dramatically. Chinook salmon have not been recently observed in the streams. Coho salmon are considered to be at depressed levels because of a short term, severe decline (Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes 1992). Restoration can help reverse this trend. Recent habitat improvement projects on a tributary to the Middle Fork Quilceda have provided some additional habitat for chum salmon. Their numbers were high in 1993; approximately 700 spawning chum and some coho were counted in a one quarter mile reach north of 136th Avenue NE.

Stream Degradation

With increased watershed development, the fish habitat destruction (i.e. scouring and pool filling) associated with high winter peak flows and high sediment levels will increase. Increased flows during smaller, more frequent storms cause the greatest instream habitat degradation. In addition, low summer flows cannot be maintained if precipitation cannot infiltrate to ground water supplies. Water levels could drop to the extent that some streams can no longer sustain fish populations.

Other major impacts to aquatic habitat include the following:

- Riparian vegetation removal in some areas in the lower stream reaches, agricultural areas in the middle and upper reaches, and in logged areas in the headwater reaches.
- Streambank erosion from animal access to streams. Commercial dairy and beef farming and horses, cows, and sheep from small farms all contribute to this problem.
- Water quality degradation from animal waste entering streams and from runoff from roads, parking lots, yards, roof drains, and commercial and industrial land use.

- Stream channelization along roads, railroad tracks, through subdivisions, and agricultural areas.
- Erosion and bank failures caused by dirt biking and other human activities; increased stormwater runoff from new development that affects unstable soils.
- Hillside and streamside grading or other construction activities that provide a sediment source and result in siltation.

Regulations and Programs Protecting Streams and Stream Habitat

Regulations

Significant regulatory programs at the state level for protecting streams include hydraulic permit approvals (HPAs) issued under the 1949 Hydraulic Code, the Puget Sound Water Quality Plan, SEPA, and Shoreline Management Master Programs. Local comprehensive plans also have policies that protect streams.

HPAs protect fish habitat through requirements placed on construction and other activities within the stream channels or activities that would affect the stream channels. The Washington Department of Fish and Wildlife (WDFW) establishes these requirements on a project-by-project basis for individual development proposals. While most larger streams are protected by this permit process, small intermittent and ephemeral streams can sometimes still be moved and channeled or piped for development. A recent example is the housing development adjacent to Jennings Park where a tributary to Allen Creek has been filled and piped to allow for one additional new house.

The Puget Sound Water Quality Authority spearheaded implementation of the Puget Sound Water Quality Plan and its implementing regulations (WAC 400-12). State and local jurisdictions must evaluate and incorporate applicable plan provisions into their own regulatory framework and policies. The plan encourages all jurisdictions to coordinate their regulations and programs so that a net gain of aquatic and riparian habitat is ultimately achieved. Specific strategies include long range educational programs, habitat enhancement programs, public forums to discuss the hydraulic permit standards, and research.

Activities in and near waterbodies designated as shorelines of the state are regulated under the 1971 state Shoreline Management Act (RCW 90.58). The act was established under the provisions of the federal Coastal Zone Management Act. Shoreline Management Master Programs (SMMPs) implement the Shoreline Management Act by limiting stream alterations and identifying acceptable uses within 200 feet of major waterbodies. In the Quilceda/Allen watershed about twelve stream miles are designated as shorelines of the state and protected under the Snohomish County and Marysville Shoreline Management Master Programs. The SMMPs designate the lower Quilceda Creek ravines and some estuarine wetlands in the lower Quilceda system as conservancy shorelines where resource uses such as agriculture and forestry are allowed. Above the ravine, the Quilceda shoreline is designated for suburban residential uses.

Environmental reviews are used by all watershed jurisdictions to attempt to reduce harmful effects on local water resources. Most reviews are conducted under the State Environmental Policy Act (SEPA) and the local ordinances that describe county and city roles in administering SEPA requirements (SCC Title 23 and MMC Title 18). Under SEPA, development project proponents are required to disclose the possible negative effects of their projects on streams and propose ways to reduce those effects. Local governments usually have the authority to conduct these reviews and insure that negative effects are avoided or reduced. The county's Critical Areas Regulation (CAR) precludes use of SEPA review for resources regulated under CAR.

The effectiveness of the SEPA review process is bolstered when local governments adopt comprehensive plans or ordinances establishing specific development standards for surface water protection. The city of Marysville has adopted such standards as part of the Sensitive Areas Ordinance that requires vegetated buffers along streams. Snohomish County's CAR establishes streamside buffers as well. The buffers in the county and city are similar. Most streams in the watershed would have 100 foot buffers. Buffers on some streams on Tulalip Reservation could be as much as 200 feet.

The county and the cities have established general stream protection policies through comprehensive plans. All jurisdictions have recently revised their comprehensive plans, and The Tulalip Tribes have adopted their own comprehensive plan. Comprehensive plans are implemented through individual rezone actions and other land use decisions subject to SEPA review. The policies themselves protect streams in only a limited way. The county's is developing new subarea plans that would supersede the community plans developed in the 1970s and 1980s.

Nonregulatory Programs

Programs that offer reductions in property taxes on sensitive lands are incentives available through local governments. The county open space taxation program (Title 4) allows property owners to pay reduced taxes on lands maintained in open space, agriculture, or forest for at least seven years. Property owners can also reduce property taxes by selling or donating conservation easements authorized under WAC 458-16-290 to local governments or private land trusts.

SWM has a number of educational projects that involve Quilceda/Allen watershed citizens. Watershed Keepers participate in educational, monitoring, and rehabilitation projects with county schools and within county watersheds. The Adopt-A-Stream Foundation presents assemblies in county schools on water quality and water resource issues. The Tulalip Tribes has an ongoing education program for watershed schools as well.

Management Recommendations for Streams and Stream Habitat

Plan

Q/A 62. Coho Recovery Plan (High Priority)

SWM should work with WMC agency representatives to develop a recovery plan for coho salmon with a goal of maintaining or improving salmon productivity. The plan should protect good habitat, prioritize enhancement projects and riparian areas for revegetation, and identify areas with high potential for restoration (see AC4, page 136, QC7, page 149, SC2, page 164). The plan should also identify further research that needs to be conducted.

Due in part to habitat degradation, coho salmon numbers have declined over the past several years. Salmon habitat studies conducted in the watershed provide a basis on which to develop a local recovery plan for the Quilceda and Allen creek coho runs.

Volunteers

Q/A 63. Watershed Restoration and Enhancement Work Force (High Priority)

SWM and other watershed staff should establish a volunteer network to carry out projects such as revegetation, habitat enhancement, monitoring, stream cleanup, and bioengineering work along streambanks identified by the coho recovery plan, as well as other recommendations in this plan. The volunteers should be supervised by watershed staff working on the projects. The network should also include a boating team to regularly monitor the lower section of Quilceda Creek, the most pristine area of the watershed, to look for pollution, garbage, illegal filling, and buffer alteration. Team participants will work with local jurisdictions and enforcement personnel as needed.

Volunteers are a great asset to watershed restoration. Volunteers have already worked on watershed bank stabilization and planting projects.

Projects

Q/A 64. Relocation of Streams Away from Roads

Whenever possible, all jurisdictions should move streams away from the roads when widening roads or intersections adjacent to streams.

Many watershed streams that provide salmon habitat have been transformed into roadside ditches (see figure 19, page 71). These streams receive contaminated road runoff and garbage.

Q/A 65. Identification and Repair of Fish Blockages

Watershed staff should regularly inventory all culverts and other constructed instream structures to determine if there are fish blockages, and any blockages found should be prioritized for repair.

Q/A 66. Hydraulic Permit Follow-up

Watershed staff assistance should be provided to work with WDFW to follow up on HPA permits to make sure conditions are met. Standard procedures should be developed for evaluation purposes. Enforcement actions will be the responsibility of WDFW.

HPA requirements are one of the most important regulatory tools in protecting watershed streams. Follow-up monitoring to make sure the permit conditions are fulfilled is often not done because of lack of WDFW staff time.

Education

Q/A 67. Watershed Training

SWM's Education Program should continue to offer training to watershed teachers and citizens as part of countywide Watershed Keeper program.

Resources should continue to be committed to advertise and recruit in the Quilceda/Allen watershed, and topics relevant to Quilceda/Allen should be included in the programs. Watershed Keeper training for teachers and citizens countywide will be offered annually, alternating general education programs with specific programs on topics such as stream monitoring and ground water.

Q/A 68. Puppet Show and School Programs

The county Parks Department Ranger staff should present "Watershed Willy" (a watershed puppet show) and Importance of Water Quality in the Puget Sound Region programs to schools in the Marysville and Lakewood districts.

Both programs should discuss issues specific to the Quilceda/Allen watershed. Direct mail should be used to advertise program availability.

Q/A 69. Watershed Field Trips for Schools

The Adopt-a-Stream Foundation should coordinate field trips for Marysville and Lakewood district schools.

The following are two types of field trips conducted by Adopt-A-Stream : (1) Watershed Field Trips--Work with teachers to organize a student field trip of the Quilceda/Allen watershed. Students will learn about where the water in the streams originates, where it goes, and what happens to it along the way. (2) Stream

Monitoring Field Trips--Work with teachers to organize student monitoring field trips to assess the physical, biological, and chemical character of watershed streams.

Q/A 70. Watershed Management Area Fee Credits for Schools

The SWM Education Program should establish a more specific program to meet the Watershed Management Area fee credit requirements for schools. This program should include teacher participation in the Watershed Keepers training and support for teachers who wish to implement water quality and water resource curricula.

SWM collects Watershed Management Area (WMA) fees from watershed residents and businesses. The county currently grants WMA fee "credits" to schools in exchange for conducting water quality education or stewardship programs.

Q/A 71. "Streamside Savvy" Booklet Distribution

SWM and the cities of Marysville and Arlington should distribute Snohomish County's "Streamside Savvy" booklet and other water resource publications to watershed residents at public distribution locations and through direct mail.

Q/A 72. Stream Team Program

The SWM Watershed Steward Program should continue the watershed Stream Team program to involve streamside and watershed residents in stream and wetland enhancement and cleanup projects.

Stream Teams are residents who take responsibility for stream projects in their neighborhood. Stream Team efforts should be concentrated on priority stream reaches near 129th Place NE, 143rd Place NE, and south of 132nd Place NE along Quilceda Creek and the Middle Fork tributaries, as well as wetlands that provide fish and wildlife habitat.

Q/A 73. Adopt-A-Stream Workshops for Teachers

The Adopt-a-Stream Foundation should provide workshops for teachers interested in coordinating Adopt-a-Stream programs in the watershed.

Adopt-a-Stream works with teachers to organize student Streamkeeper projects that help protect or restore their adopted stream. Adopt-a-Stream should consult with SWM to identify important stream reaches and focus on these areas.

Q/A 74. Watershed Interpretive Signs along Centennial Trail

SWM should work with Snohomish County Parks and Recreation to include information on the Quilceda/Allen watershed through interpretive signs placed on the Centennial Trail within the watershed.

Q/A 75. Placement of Signs along Streams, Stream Buffers, Wetlands and Wetland Buffers, and at Watershed Boundaries and Project Sites

SWM should develop a countywide "family" of signs to post along streams and stream buffers, wetlands and wetland buffers, at watershed boundaries, and at capital, enhancement, and volunteer projects. All jurisdictions should provide signs for sensitive areas and enhancement projects.

Wetland Aquisition and Enhancement

Target: No net loss of function and values of wetlands.

A total of 166 wetlands were mapped by Snohomish County in 1986 in the Quilceda/Allen watershed. The total wetland area based on the inventory is approximately 1350 acres; about 1000 acres in Quilceda basin and 350 acres in Allen.

Because of the methodology used for the inventory and exclusion of some agricultural land from the survey, many wetlands were not mapped and some were mapped incorrectly. The inventoried wetlands, therefore, represent only a portion of the watershed's wetlands. Since hydric soils are now considered wetland indicator soils, it appears that about 10,000 watershed acres (30%) mapped by the U.S. Soil Conservation Service as hydric soils were once wetlands (see figure 11, page 33).

Watershed wetlands range in size from less than an acre to over 600 acres. Of the mapped wetlands with acreage estimations, 77 are less than 5 acres in area; 16 are between 5 and 10 acres; and 18 are over 10 acres. Size does not always correspond to importance; small wetlands can be of high value. In some cases, many small wetlands together can provide the same or greater benefits than a large one.

Wetlands provide a wide variety of vitally important ecological and cultural benefits referred to as wetland functions and values. Wetland functions reflect the biological, chemical, and physical attributes of a wetland system and its role as part of a watershed or larger ecosystem. Wetland values reflect the attributes of a system perceived by humans as valuable to our society.

The various functions and values wetlands provide are influenced by a combination of factors, including the following: type, size, condition, watershed location, proximity to other wetlands, dominant vegetation, surrounding topography, and land uses in the wetland basin.

Wetland Loss and Impacts

Information in this analysis was taken from Sheldon & Associates (1994), Bachert (1994), Snohomish County (1986), Tulalip Tribes (1994), and field forms from the 1993 salmon habitat survey conducted by SWM that documents wetlands adjacent to streams.

Approximately 75 to 85 percent of the watershed wetlands have been lost since development began in the early 1900s. Watershed landuse activities that have had or continue to have an adverse effect on wetlands include agricultural practices, residential development, and logging.

Ditch excavation and drain tile installation for agriculture and residential development drain wetlands. Draining leads to wetland habitat elimination; the hydrology becomes so altered it will not support wetland species. Draining wetlands is a reversible process--drain tiles can be removed, or drainage ditches can be filled. Wetland hydrology and wetland vegetation communities will recover to some extent. However, the new vegetation community will often be less diverse and complex than the original one and contain invasive species.

Livestock grazing on many watershed wetlands results in trampling and damaging of vegetation and soil structure, wildlife habitat elimination, and contribution of fecal material. Grazed wetlands usually support invasive plant species such as soft rush, creeping buttercup, and Reed canarygrass. The SCD agricultural survey conducted for the Quilceda/Allen watershed identified 54 farms that had moderate to high grazing and/or animal access impacts to wetlands.

Throughout the Quilceda/Allen watershed, wetlands have been permanently lost as a result of converting the landscape to accommodate residential development. This is particularly true in the southeast portion. Since wetlands store water, one of the consequences is that the surface water runoff rate and volume increases, resulting in increased flooding and siltation in streams and wetlands, and subsequent decreases in water quality. In addition a more direct impact occurs from conversion of fish and wildlife habitat to other land uses.

Logging in and around watershed wetlands occurs. Logging can result in habitat loss and changes in the hydroperiod. Significant tree cover loss alters the rate and volume of water entering a wetland. Exposed soils may also erode. In logged areas, due to the lack of vegetated cover and disruption of the soil integrity, surface water runoff can cause erosion. This erosion can lead to problems such as increased sedimentation in downstream wetlands and streams, blockage of downstream conveyance culverts, and slope failure. Debris piles left from logging activities in wetlands can create dams that alter the water's natural movement through the wetland.

Most of the watershed wetlands serve important water quality functions, but many have low value as wildlife habitat because that lack either vegetation that is valuable as food or cover for wildlife or the habitat has been degraded. Many wetlands maintain summer stream flows, but fewer have high values for water storage.

Regulations Protecting Wetlands

At the federal level, one of the most significant regulatory programs is administered by the U.S. Army Corps of Engineers under section 404 of the federal Clean Water

Act. This program requires that developers obtain a permit for dredging or the placing dredge or fill material in U.S. waters. Section 404 permits, which could be required for many watershed construction projects, were developed to protect water quality and reduce damage to rivers, streams, and wetlands. In the watershed, Section 404 permits are most commonly used to regulate wetlands. While the regulations do prevent wetland filling, mitigation is allowed for almost all wetland loss. The regulations do not prevent wetland draining unless there is a water quality impact.

Wetland filling is also regulated through the county and city grading codes, through Shoreline Master Management Plans (SMMPs), and through sensitive areas ordinances. The county's SMMP protects wetlands within 200 feet of shorelines of the state through restrictions on wetland filling and mitigation requirements for most permitted wetland filling. The Marysville SMMP, which is being revised, does not specifically address wetlands.

Logging and other forest practice activities affecting wetlands are regulated through the Forest Practices Act administered by the Washington Department of Natural Resources. Forested wetlands can be logged using systems that have low impact to the soil. Wetland management zones (WMZs) are required around the edge of nonforested wetlands. The width and the number of trees to be left standing within the WMZ depends on the wetland size and type.

Environmental reviews are used by all watershed jurisdictions to reduce harmful effects on wetlands. Most of these reviews are conducted under the State Environmental Policy Act (SEPA) and local ordinances that describe county and city roles in administering SEPA requirements (SCC Title 23 and MMC Title 18). Under SEPA, development project proponents are required to disclose the possible negative environmental effects of their projects and propose ways to reduce those effects. Local governments in the watershed usually have the authority to conduct these reviews and insure that adverse effects are avoided or reduced.

The city of Marysville and Snohomish County have adopted sensitive/critical area regulations requiring vegetated wetland buffers and providing for mitigation standards to reduce wetland function and value loss. The county and cities have established general wetland protection policies through comprehensive plans.

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) manages the Wetland Reserve Program. The program acquires easements for agricultural wetlands that often have negotiated restrictions on the uses of these lands. No uses that would have negative impacts to the wetlands, such as development, grazing, and haying, are allowed. The owner of the floodplain farmland in the lower Allen basin has applied to the Wetland Reserve Program. The federal government has included within the Farm bill, incentives to discourage the conversion of wetlands to farmland.

Management Recommendation for Wetland Acquisition and Enhancement

Inventory

Q/A 76. Wetland Inventory and Function and Value Assessment (High Priority)

Funding should be sought by SWM to complete the wetland inventory and function and value assessment.

For all the watershed's jurisdictions and landowners to do effective land use planning, identification of wetland locations is needed. Snohomish County conducted a wetland inventory in 1986. However, this inventory was not complete and many additional wetlands exist in the watershed. A function and value assessment was conducted of a sample of watershed wetlands for this plan. Both studies should focus funding opportunities in areas where future zoning indicates that the greatest amount of development will take place and where the seeps and springs expanding out from the toe of the Getchell and Tulalip slopes recharge the Marysville trough aquifer.

Acquisition

Q/A 77. Wetland Acquisition for Preservation (High Priority)

Important wetlands and surrounding buffer areas as identified by Sheldon & Associates (1994) should be preserved through acquisition by the appropriate jurisdiction, or if the wetland is of regional significance by all jurisdictions.

A function and value assessment of some of the watershed wetlands was conducted by Sheldon & Associates. That study identified a number of wetlands with high value for water quality, flood storage, habitat, and baseflow support functions. Acquisition is the most certain way to protect these functions. The list of acquisition sites may be expanded through future studies (see Q/A 76). Acquisition priorities will be based on funding opportunities and landowner willingness.

Projects

Q/A 78. Wetland Enhancement (High Priority)

Through the Coho Recovery Plan (Q/A 62) wetlands identified in the Sheldon & Associates study should be prioritized for enhancement and cleanup based on landowner willingness and potential benefits to the watershed.

The Sheldon & Associates study found that almost all wetlands would benefit from cleanup work and could be enhanced for various functions.

Best Management Practices

Q/A 79. Agricultural Impacts to Wetlands

Snohomish Conservation District should work with farm owners identified in the agricultural survey to reduce harmful effects on wetlands.

Agricultural practices are degrading watershed wetlands, mainly from grazing activities.

Q/A 80. Technical Assistance to Wetland Landowners

Qualified watershed staff should offer technical assistance to wetland landowners to improve their wetlands for various functions and to improve aesthetics.

Many landowners are interested in improving their wetlands for wildlife habitat and other benefits, including aesthetics. The availability of programs to provide this type of assistance should be publicized.

Monitoring

Q/A 81. Five Year Wetland Assessment

An assessment should be conducted every five years to determine how well the "no net loss of function and value" aspect of the plan is working.

Q/A 82. Wetland Database Update

The wetland database updated by Snohomish County SWM should continue to be updated and shared with Snohomish County Planning and Development Services, The Tulalip Tribes, and the cities.

As part of the wetland planning process, a wetland database was created by Sheldon & Associates and SWM. The database contains wetland data from the 1986 Snohomish County wetland survey, The Tulalip Tribes wetland survey, and wetlands added from the Marysville and Snohomish County development proposals.

Q/A 83. Wetland Delineation in the Marysville Trough

Because of the difficulty in delineating wetlands in the Marysville trough, all jurisdictions should use and consider requiring developers to use the following wet season well monitoring methodology:

1. *Use pisometers to a depth of 2 to 3 feet.*
2. *Monitor for three months during the early growing season - February, March, and April.*
3. *Take weekly or more frequent readings as deemed necessary.*

Q/A 84. Determining Hydrologic Connectivity between Wetlands and Streams in the Upper Quilceda and Allen Basins.

Many wetlands in the upper Quilceda and Allen basins are connected to streams and provide baseflow support, but that relationship is often not readily apparent. A study should be conducted to determine hydrologic connectivity between the streams and wetlands in this area.

Education

Q/A 85. Wetlands as Field Classrooms

All jurisdictions should attempt to purchase, or gain permission to manage, wetlands to be used as "field classrooms" for wetland education at local schools.

Ground Water Protection

Target: No Net Loss of Ground Water Elevation

Ground water is a limited and variable resource that plays an important role in the Quilceda/Allen watershed. Groundwater discharge to streams supports year-round flow, and ground water provides drinking water to many watershed residents. Ground water also provides water for irrigation, stock watering, and commercial, industrial, and fish propagation uses. The cities of Marysville and Arlington both have municipal wells in the watershed; the Marysville wells are backup wells.

Ground water contamination is a serious problem and one that cannot readily be reversed. Threats to watershed ground water quality include failing septic systems, leaking sewage pipes, phosphates and nitrates from livestock waste and fertilizers, and accidental spills or intentional dumping of petroleum products and toxic chemicals.

Aquifers are a subsurface zone of earth, gravel, or porous stone that yields usable amounts of water. Three aquifers are found in the Quilceda/Allen watershed: the Marysville trough, the Getchell-Snohomish, and the Tulalip. The Marysville trough aquifer is a large, shallow, unconfined or water table aquifer extending from Arlington and the Stilliguamish River on the north to Marysville and the Snohomish River to the south. Water levels measured by the U.S. Geological Survey in March 1992 in the Marysville trough area ranged from 1.61 feet to 15.5 feet below the ground surface, averaging 7.19 feet. In July water levels ranged from 10.4 to 60.4 feet below the ground surface, averaging 28.5 feet. The Getchell-Snohomish and Tulalip are intermediate in depth. Water level depths on the Getchell-Snohomish side of the watershed ranged from an average of 54.6 at lower elevations to 93.1 at higher elevations. On the Tulalip side the depths averaged 46.7 feet at lower elevations to 125 feet at higher elevations.

Maintaining ground water quantity depends on keeping the balance between recharge, outflow, and withdrawal. The surface recharge (infiltration of precipitation) potential of the Marysville trough aquifer is high because the aquifer is so near the ground surface and the sand layer on the Marysville trough provides good infiltration material. The surface recharge potential of the Tulalip and Getchell-Snohomish aquifers is considered low because of the aquifer depth and because the overlying soils have a higher percentage of silt and clay, making infiltration slower.

Ground Water Quality and Quantity Problems

Ground Water Quality

There has been no watershedwide monitoring of ground water quality. However, two ground water studies have been conducted in the watershed by the U.S. Geological Survey (USGS) and Ecology. The USGS conducted a ground water study in Snohomish County in 1993, including a water quality analysis of 19 drinking water wells in the Quilceda/Allen watershed. High nitrate levels were found in water wells near Smokey Point Boulevard and 172nd Street NE and along lower Sturgeon Creek, and naturally occurring high arsenic levels were found in many areas throughout the watershed.

Ecology conducted a water quality study in the upper Marysville trough in 1994/1995 (Larson and Marti 1996). The findings of the study with respect to water quality are as follows:

- Ground water temperatures probably moderate the higher extremes of surface water temperatures.
- Nitrate concentrations in half the ground water wells tested consistently exceeded 1.0 mg/L, a value often used as a transition point between natural concentrations and man-caused contamination. Greatest concentrations of nitrates were found in the tributary draining agricultural lands in the upper Marysville trough.
- Phosphorus concentrations in ground water were relatively low compared to stream concentrations.
- Eleven ground water wells had iron concentrations that exceeded the 300 ug/L secondary drinking water standard. Ground water is responsible for increased iron in Quilceda Creek.
- Thirteen wells had manganese concentrations that exceeded the 540 ug/L secondary drinking water standard. Ground water is responsible for increased manganese in Quilceda Creek.
- The pesticides atrazine and terbacil were detected at very low levels in two wells.
- Increases of concentrations of either nitrate or chloride in ground water will likely lead to a similar increase in their respective concentrations of stream water.

Because the ground water in the Marysville trough is so close to the surface, that aquifer is particularly sensitive to contamination from human activities. The following impacts to ground water have been documented:

- In 1991 vapors from an oil spill in the upper Marysville trough were detected in ground water test wells located a mile farther down within hours of the spill (D. Smith pers. comm.).
- Drinking water in a well downslope from the Sisco landfill was contaminated. The source of the contamination was believed to have been toxic leachate from the landfill.
- SHD has noted high nitrate levels in the upper watershed and high arsenic levels at various sites.
- The USGS found high nitrate levels in two wells; one in the upper watershed and one along Sturgeon Creek.
- Ecology noted high nitrate levels is eleven wells in the upper watershed.

A number of hazardous waste sites have been identified that indicate the occurrence of or potential for ground water contamination (see the Hazardous Waste section)

Ground Water Quantity

Without water to recharge an aquifer, ground water can be depleted. In the Quilceda/Allen watershed ground water depletion would not only affect the drinking water supply, but also the amount of water available to maintain summer stream flows.

The Marysville trough aquifer is highly productive with transmissivity and hydraulic conductivity of 10,000 to 500,000 gallons per day/ft and 50 to 200 ft/day, respectively (Larson and Marti 1996). Individual wells may yield up to 300 gallons per minute. Ground water inflow from other aquifers may also occur along the eastern and western boundaries of the aquifer where the advance outwash deposits of the surrounding plateaus rise in elevation above the plain of the Marysville trough.

Ground water that discharges into streams does so at a much slower rate than surface water runoff and can maintain stream baseflows during dry months. In the summer ground water may be the only water source for some of the watershed streams. Due to recharge loss or direct lowering of the water table through ditching, summer stream flows may become inadequate to provide aquatic habitat and fish passage (Larson and Marti 1996).

A substantial portion of the land over the lower Marysville trough aquifer has already been developed. The land use that is being proposed for the remaining agricultural areas by the cities of Marysville and Arlington over the Marysville trough aquifer includes residential, commercial, industrial, and business park uses. These areas are prime candidates for this type of development because the land is flat, fairly inexpensive, and close to Interstate 5. As more of the surface area is covered with impervious surface, however, less water will reach the aquifers. With

greater and more concentrated human activities over the aquifer, the potential for petroleum and chemical spills and other pollution to enter the ground water and be transported to surface water increases.

Flooding occurs as a result of the high water table in the Marysville trough area. Because the water from this aquifer rises rapidly to the surface in response to storm events, crawl space flooding is frequently reported. The flat expanses of land above the aquifer exacerbate these and other drainage problems. Deep ditches have been dug throughout the Marysville trough in an effort to drain wetlands and lower the water table to maintain dry agricultural land. Some of the streams in the upper watershed dry up in the summer in part because these ditches have lowered the water table.

Ground water from the Getchell-Snohomish aquifer emerges where the Vashon advance outwash meets transitional beds, forming hillside springs and seeps that discharge into hillside headwater streams, including Edgecomb Creek, Olaf Strad Creek, and other Quilceda and Allen Creek tributaries. These seeps and springs are a critical source of water for streams during the summer. These areas are prone to landslides and have standing water most of the year.

Regulating Ground Water

Ground water is protected through water quality standards established by the state and by the federal Environmental Protection Agency (USEPA). The state standards address health issues; USEPA standards address hazardous substances and carcinogens. Snohomish Heath District is the agency that administers the rules protecting drinking water, investigates potential contamination sites, and facilitates drinking water quality tests.

Washington Water Law requires prospective ground water users to obtain a water right permit from Ecology before constructing a well. Exempt from obtaining the permit are those wells that withdraw under 5,000 gallons of water per day.

Most ground water regulations in force today address water withdrawal and protection of drinking water in wells. The county is participating in the state Ground Water Management Program administered by Ecology. Under this program, the county has received grants to conduct a data gathering effort with respect to ground water characteristics and quality and to develop a plan to identify policies and management strategies to protect ground water.

As part of the Ground Water Management Plan, the county has adopted an interim ground water ordinance. This ordinance requires that studies be done for certain types of activities that could affect ground water quality. If the studies indicate potentially significant impacts to important ground water resources, alternatives to address those impacts must be presented and conditions placed on the activity to prevent or mitigate those impacts.

The Snohomish County Council has also adopted a County Policy for Protection of Groundwater Resources (Motion No. 90-249). The motion recognizes ground water as a valuable and vulnerable resource and adopts policies meant to protect ground water supply and quality. None of the other watershed jurisdictions addresses the ground water issue through policies or regulation.

Management Recommendations for Ground Water Protection

Regulations and Policies

Q/A 86. Maintaining Recharge to Marysville Trough Aquifer (High Priority)

Jurisdictions should consider adopting interim guidelines for ground water protection to maintain recharge to the Marysville trough aquifer as follows:

1. *Much of the land over the Marysville trough aquifer is or was formerly in agriculture and is currently undeveloped. These agricultural fields provide large areas of uncovered surface for recharge to the Marysville trough aquifer. Larson and Marti (1996) found that stream water flow in the Quilceda system within the Marysville trough is highly dependent upon ground water. The study also found that lowering the water table through ditching or through the creation of impervious surfaces in the upper Marysville trough could decrease the amount of ground water discharging to downstream reaches, and that upstream reaches could be affected by development in close proximity to streams. In order to maintain base flows in the stream to support salmon runs, those areas designated as urban reserve or other urban uses should be changed to rural residential 10.*

2. *For any development that does occur over the Marysville trough aquifer under existing zoning, Planned Residential Development or Rural Cluster should be required. The undeveloped area should be left for infiltration and should be planted with trees and shrubs to enhance the water's ability to filter through the soil.*

3. *For any development that does occur over the Marysville trough aquifer under existing zoning, site designs should be required that would limit the amount of impervious surface, including the following elements:*

    - *Using less surface parking through shared parking areas, reducing parking stall size, or construction of multi-storied parking structures.*
    - *Promoting alternative travel modes like buses, carpools, biking, and walking.*
    - *Using landscaping techniques that enhance infiltration in open spaces like parks and courtyards.*
    - *Draining rooftops and parking areas to lawns or filter strips*
    - *Using alternative pavement for low use areas such as sidewalks, driveways, overflow parking, and fire lanes.*

4. *In the upper Marysville trough, Larson and Marti (1996) found that the source of most of the stream water in the upper stream reaches is ground water located within close proximity to the streams. (In addition to receiving water from streamside areas, the lower sections of stream receives a substantial amount of ground water from the upper watershed.) The area along the streams where water infiltrates readily and discharges directly into the stream is called the zone of influence. As part of the permit process, the zone of influence should be determined and any actions that would prevent water from infiltrating into the ground, such as construction of buildings, roads, sidewalks, or any other type of impervious surface would not be allowed.*

Ground water in the Marysville trough is a major contributor to streamflow to Quilceda Creek, accounting for 46 to 60 percent of the streamflow when it is not raining. Any development that decreases ground water recharge or storage capacity of the aquifer will decrease the flow in Quilceda Creek and its tributaries, especially during periods of no rainfall and lowest flows (Larson and Marti 1996). The WMC realizes that the comprehensive plans of the various jurisdictions developed under the Growth Management Act are designed to concentrate development within the urban growth boundary. However, the WMC would like to see these land use recommendations evaluated based on recent findings of ground water studies.

Q/A 87. Critical Aquifer Recharge Area (High Priority)

The Marysville trough should be considered for designation as a critical aquifer recharge area, and policies established to protect recharge. The following should be included as part of the designation:

1. *Jurisdictions should provide a method of assessing proposed development actions against adopted performance standards. Project level review and the performance based standards should consider but not be limited to the following:*

    - *Avoiding disruption of natural soil drainage channels to the maximum extent feasible.*
    - *Landscaping that employs the natural contours and surfaces to promote infiltration.*
    - *Diversion and spreading of runoff from rooftops, patios, and other clean impervious surfaces onto preserved pervious surfaces.*
    - *Terracing and other means of detaining runoff on site to promote infiltration over as large an area as possible.*
    - *The use of subsurface drains and infiltration systems when appropriately designed and maintained.*

2. *Specific considerations of development effects on infiltration and recharge quantities should be applied to project review under the SEPA process. When development regulations are based on the recharge goals and objectives*

established under comprehensive plans, SEPA review at the project level then becomes the final evaluation of the plan implementation.

3. *Mitigation that provides for a range of options such as the infiltration and retention and slowing of runoff, the redirection of clean storm water to remaining pervious surfaces, and artificial recharge.*

4. *Options for small parcels, including actions taken at the individual single homesite level. These often provide the best opportunities for maintaining effective recharge.*

Snohomish County is developing a ground water management plan. During the phase 2 planning process, the county will look at designating critical aquifer recharge areas where ground water is important for drinking water and has a significant connection to stream water.

Q/A 88. Landscaping Requirements to Promote Infiltration

Local jurisdictions should consider adopt landscaping requirements over the Marysville trough aquifer that would promote infiltration to increase recharge, including recommendations for single homesites.

These requirements would include the use of native plants, especially trees and shrubs, planted in groupings to provide areas for water to filter into the ground. Local jurisdictions require landscaping plans for all development types. These plans usually designate the plant number and types that can be used in landscaping.

Q/A 89. Additional Landslide Hazard Ordinance Sites

Landslide hazard area maps developed by the city of Marysville for sensitive areas regulations should include areas along steep slopes where ground water seeps to the surface (where advance outwash meets Transitional beds). (See figure 7, page 24)

Research and Monitoring

Q/A 90. Baseline Ground Water Study and Monitoring (High Priority)

Because of increased watershed development a ground water monitoring study should be developed to determine if ground water quality and quantity is being maintained.

The study in the upper Marysville trough being conducted by Ecology has established ground water quality baseline data for that area. In addition, the USGS has conducted water quality monitoring of watershed wells. The USGS has found ground water quality currently to be good, but few wells were monitored.

Education

Q/A 91. Ground Water Celebration and Annual Water Festival

A ground water celebration and annual water festival for watershed residents should be developed to increase knowledge about ground water and other watershed issues.

The ground water celebration will be the kick-off theme of an annual festival to celebrate the Quilceda/Allen watershed. The annual festival will educate watershed residents about water resources and opportunities for involvement.

Q/A 92. Ground Water Model in Schools and at Jennings Park

The Tulalip Tribes should continue to use their ground water model during school and public presentations to illustrate the role of ground water in the water cycle and the susceptibility of ground water to contamination. Marysville Parks and Recreation will house Marysville-Pilchuck High School's ground water model in Jennings Park for public display during the summer.

Q/A 93. Ground Water Education in Workshops

Adopt-a-Stream, SWM Watershed Keepers, and The Tulalip Tribes should include ground water education in all workshops for citizens, teachers, and students.

Q/A 94. Information on Maintaining Recharge for Developers

SWM Watershed Steward Program should work with the cities of Marysville and Arlington to develop an informational brochure on maintaining recharge for distribution to building industry professionals. Master Builders and SWM should sponsor workshops or other informational forums for developers and builders on BMPs for construction and stormwater requirements to include strategies for maintaining ground water recharge. Businesses working in the Quilceda/Allen watershed will be targeted for participation.

Q/A 95. Brochure on Increasing Recharge at Individual Home Sites

SWM Watershed Steward Program should work with the cities of Marysville and Arlington to develop a brochure explaining how to increase recharge at single homesites and the importance of ground water protection in the watershed.

Brochures will be distributed through the city planning offices and via watershed homeowners' associations.

Stream and Wetland Riparian Corridors and Forest Retention

Forests protect watersheds by stabilizing slopes, minimizing erosion, reducing sediment input to streams, maintaining the quality and temperature of the water, and maintaining the natural hydrologic patterns under which the streams and their inhabitants evolved. Forests help perform the vital function of maintaining stream flows. Rain falling on the forest is intercepted by the canopy and evaporates back to the atmosphere. Some of the water that does reach the ground percolates through the soil and moves into streams. The root activity and decaying matter of the forest floor act as a sponge, holding and gradually releasing large quantities of water. The forest has a great effect on water movement from the atmosphere to the earth and back to the atmosphere. Under natural forested condition in the Puget Sound region, much of the rainfall is intercepted or evaporates before it reaches streams.

The vegetated uplands adjacent to wetlands and streams provide a number of protective functions. Wetlands are often located in low areas where they collect sediment from upland areas. Vegetated wetland buffers filter sediment and remove many pollutants from stormwater runoff. The vegetation reduces erosion within the buffer and maintains streambank stability. Trees provide shade, reducing water temperature in the summer. Vegetation impedes the flow of stormwater, allowing it to filter into the ground. Vegetation also creates a barrier that limits human disturbance to wetlands and streams.

Of the wildlife species that occur in western Washington, 75 percent use wetlands or streamside habitat during some portion of their life cycle (Brown 1985). These areas are used as travel corridors, feeding sites, and for cover, nesting and rearing of young. The vegetation along Quilceda and Allen creeks and surrounding wetlands provides some limited habitat in the developed area for animals, including raccoon, Virginia opossum, coyote, bald eagle, winter wren, Swainson's thrush, Stellar's jay, western garter snake, and Pacific treefrog. These habitats add to the diversity of the watershed's wildlife species.

Almost all of the watershed's streams provide spawning and rearing habitat for salmon. Buffers along streams provide shade to cool the stream water. Large woody debris consisting of dead trees and large limbs that fall from the buffer into the stream creates pools and eddies for fish in which to rest and hide. Small debris such as leaves and twigs provide food for aquatic organisms and add nutrients to the stream. Insects falling into the stream from vegetation above also provide food for salmon and other aquatic animals.

Impacts to Watershed Forests and Riparian Areas

Forests

In 1993, more than 5,000 acres of both deciduous and coniferous forests remained in the watershed along the eastern and western hillsides. Watershed forests continue to be removed as development increases. Although logging occurs on the Tulalip Reservation and along the Getchell plateau, much of the land in forestry will be

replaced by development. Along the forested eastern hillside, the development pressure increases yearly. The comprehensive plan for The Tulalip Tribes would change most of the forest land on the reservation within the watershed to other high density land uses.

The vegetation removal and soil compaction, particularly in the developed areas, has changed and will continue to change watershed hydrology, increasing stormwater runoff. Landscaped areas with compacted soils are similar to impervious surfaces in their inability to infiltrate water. Tree removal and replacement by lawns or parking lots will dramatically increase the amount of surface water flow while decreasing the infiltration amount.

Riparian Areas

Streams and wetlands are subject to disturbances from the uses of upland adjacent land that result in changes in the biological, chemical, and physical makeup of these aquatic resources. In addition they change the way these systems serve to ameliorate pollutant loading and stormwater runoff. Vegetated areas surrounding a wetland or along the stream serve to buffer these impacts. In addition to water quality, water quantity, and habitat benefits, the vegetation provides an opportunity to mitigate for the increased watershed density. Under Growth Management planning, watershed residents are expected to accommodate more and more people, houses, businesses, and industry. Providing substantial riparian corridors along streams and wetlands will give residents a respite from this urban density. These corridors could serve as areas for small parks and trails where people could enjoy the stream and wetlands.

The degree to which a riparian corridor protects wetlands and streams depends on the width, type and vegetation density, and surrounding land use. In general, the largest, most densely vegetated widths are the most effective at limiting impacts to wetlands and streams and provide the greatest benefits. Many watershed wetlands and streams have degraded riparian zones and some contain no vegetation at all. Of the wetlands assessed by Sheldon & Associates (1994), management recommendations for most included buffer restoration. The stream survey found that riparian vegetation was absent or less than 30 feet in width mainly in the watershed's agricultural areas, but that streamside vegetation removal was also a significant problem in residential areas.

When buffers established by regulation are part of the property of an adjacent landowner, the landowner often does not realize the importance of maintaining the trees and shrubs and wants to incorporate the buffer into the yard landscaping. This regularly results in removal of the native vegetation and replacement by lawns.

Regulating Forest Conversion and Stream and Wetland Buffers

Stream and wetland buffers are regulated through SEPA or the sensitive/critical areas regulations or local comprehensive plans. The Tulalip Tribes has adopted buffer widths through their comprehensive plan.

In the Snohomish County Critical Areas Regulations (CAR) streams are classified based on water typing. The Marysville Sensitive Areas Ordinance (SAO) and the Tulalip Comprehensive Plan classify streams differently. Most of the watershed's streams are Type 3 (county), Class II (Marysville), or Class 1 (Tulalip). In unincorporated Snohomish County the buffer width for Type 3 streams with anadromous fish would be 100 feet; 100 foot buffer widths would be applied to most streams under the jurisdiction of Marysville, and 200 foot buffers could be applied on the Tulalip Reservation. Stream buffer widths are shown in table 3.

Table 3
Stream Buffer Widths

Snohomish County			City of Marysville		
Type	**Land Use**	**Width**	**Class**	**Width**	**Description**
1	Urban	100	I	100	Streams inventoried as "shorelines of the state
1	Rural	100			
2	Urban	100	II	100	Streams with anadromous fish smaller than Class I with year round flow
2	Rural	100			
3	Urban	100 with anadromous fish	II	50	Stream not used by anadromous fish smaller than Class I with year round flow
3	Urban	50 w/o anadromous fish			
3	Rural	100			
4	Urban	25	III	25	Streams that do not flow year round and are not used by anadromous fish
4	Rural	50			
5	Urban	10	IV	0	Streams that are naturally occurring intermittent swales
5	Rural	25			

Tulalip Tribes		
Class	**Width**	**Description**
1	200'	All streams the flow year round or are used by salmonids
2	50'	All streams that are intermittent or ephemeral and are not used by salmonids

Under the Snohomish County CAR and Marysville SAO, wetlands are classified by category. A majority of the watershed wetlands would have 25 foot (county), 40 foot (city) buffers, or 100 foot (tribes) buffers. Buffers widths are shown in tables 4-6.

Table 4
Snohomish County Critical Areas Regulation Wetland Buffer Widths

Category	**Land Use**	**Width**	**Description**
1	Urban	75'	Wetlands that are estuarine, bogs 1+ acre, mature forests 10+ acres,
1	Rural	100'	have priority species, wetlands 10 acres with 3 wetland types including open water
2	Urban	50'	Bogs less than 1 acre, mature forests less than 10 acres, wetland 5-
2	Rural	75'	10 acres with 3 wetlands types including open water
3	Urban	25'	Wetlands that are not 1, 2, or 4
3	Rural	50'	
4	Urban	25'	Wetland not along streams, less than 1 acre with 1 type mainly
4	Rural	25'	dominated by exotic plants

Table 5
City of Marysville Sensitive Areas Ordinance Wetland Buffer Widths

Category	Buffer Width	Description
I	100'	Wetlands that provide habitat for federal/state listed species,
I	100'	are natural heritage wetlands, have high quality rare species, 5+ acres with 3+ types including open water
II	60'	Provide habitat for listed or candidate, sensitive, or priority species, have functions & values that cannot readily be duplicated
III	40'	Wetland that are not 1, 2, or 4
IV	25'	Wetlands hydrologically isolated, less than 1 acre & dominated by exotic plants

Table 6
Tulalip Tribes Watershed Management Plan Wetland Buffer Widths

Category	Buffer Width	Description
I	200'	Presence of species listed by Tribe or other agencies as threatened or endangered, or their critical habitat; regionally rare and unique wetland communities; wetland having direct impact on Tribal Fisheries enhancement projects; wetland having cultural or spiritual significance, irreplaceable wetlands, wetlands with exceptional habitat value and diversity
II	100'	Wetlands with habitat for sensitive or priority plant, animal, or fish species; wetlands with functions that cannot be adequately replicated; all riparian wetlands not in Category I
III	50'	Wetlands of minimal habitat value suitable for restoration or enhancement efforts and not in Categories I and II

Snohomish County has an open tax incentive program for landowners who would like to maintain areas like forests, wetlands and stream corridors in their natural condition. The program substantially reduces the property tax for these areas if the property owner agrees to keep the area in open space for at least seven years. Another similar program gives a Timberland designation to forested areas over 20 acres and provides similar tax reductions. Penalties are incurred if the land is converted to other uses before the required time period. While these tax reductions do provide incentives to maintain land in open space, developers do not find it an economic hardship to pay the penalties and back taxes to landowners who want to sell their land and remove it from the open space designation before the required time period.

Management Recommendations for Retention of Stream and Wetland Riparian Corridors and Forests

Regulations and Policies

Q/A 96. Recommendations for Stream and Wetland Riparian Corridors (High Priority)

To adequately protect the aquatic resources from the substantial amount of development proposed in the watershed and to provide habitat, all jurisdictions should consider methods to increase riparian widths as recommended below. The methods to consider include both regulatory and voluntary. Some incentives and sources of funding to acquire additional habitat are suggested.

Stream Riparian Corridors

The Washington Department of Fish and Wildlife (Knudson & Naef 1997) has studied the size of stream buffers in relation to their benefits to fish and wildlife. Table 7 shows the recommended riparian corridor for the watershed in undeveloped areas or areas of new development. (The stream types are based on the DNR stream typing system.) Most of the streams would have 200 foot riparian corridors (figure 23).

Table 7
Recommended Stream Riparian Corridor

Stream Type	Restriction	Corridor Width
1		250 feet
2		250 feet
3	Stream over 5 feet in width	200 feet
3	Stream under 5 feet in width	150 feet
4,5		150 feet

Wetland Corridors

Because wetlands and wetland corridors are very important in mitigating some development impacts, this plan recommends the wetland corridor widths as described in the Model Wetland Protection Ordinance developed by Ecology (appendix B). These widths are based on the functions that vegetation performs and the intensity of surrounding landuse. Most watershed wetland corridors qualify as Category III with 100 foot corridor widths in urban areas and 50 foot in rural areas. The corridor widths recommended by this plan are shown in Table 8.

Table 8
Recommended Wetland Corridors

Category	Land Use	Corridor Width	Description
I	Urban	300'	Habitat for federal or state listed species, high quality native wetland, regionally rare, wetlands with local significance
I	Rural	200'	
II	Urban	200'	Provide habitat for listed or candidate, sensitive, or priority species, rare communities, functions that cannot be readily replicated, significant habitat value, use by fish & wildlifecontiguous with salmon bearing streams
II	Rural	100'	
III	Urban	100'	Do not contain features of I, II, and IV
III	Rural	50'	
IV	Urban	50'	Isolated wetlands of one acre or less, one wetland class, 1 dominant plant species, isolated wetlands of 1 acre, 1 wetland class & dominated by exotic species
IV	Rural	25'	

Economic Incentives for Stream and Wetland Riparian Corridors

The following are proposed as ways to provide financial incentives for landowners who preserve riparian areas or wetland corridors:

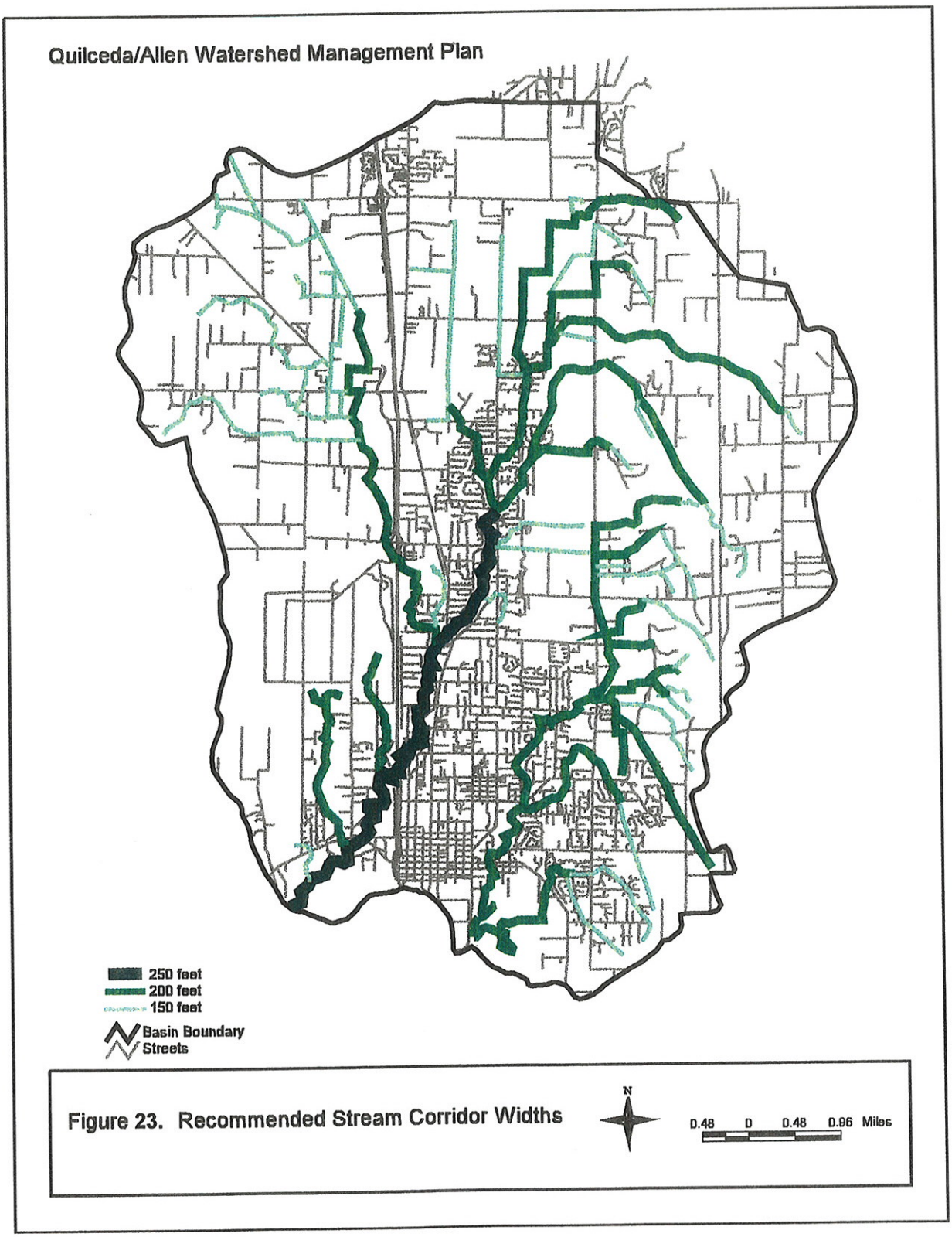


Figure 23. Recommended Stream Corridor Widths

- *Density Transfers. Higher density development (primarily residential) would be allowed to compensate for the loss of potential lots within the corridor.*
- *Property or Sales Tax Increase. A slight increase in property or sales tax could generate funds for the exclusive purpose of purchasing development rights to corridors.*
- *Fish and Wildlife Corridor Bond. A specific bond would be financed for purchase of buffers or development rights.*
- *Tax Exemption. Property taxes would not be assessed or would be reduced for corridors.*

The watershed plan's goals are to improve water quality and protect water resources and, therefore, wider riparian and wetland corridors are recommended. A major deterrent for establishing wider riparian corridors comes from that fact that they prevent the landowners from developing property to the maximum extent possible allowed by zoning and, therefore, receiving lesser economic returns.

Q/A 97. Stream Buffers, Wetlands and Wetland Buffers, and Native Growth Protection Areas in Separate Tracts (High Priority)

Jurisdictions should consider placing regulated buffers in separate tracts dedicated to the local jurisdiction. Signs should be placed to identify the tracts as public property, and the tracts should be regularly monitored by each jurisdiction to make sure they are left intact.

There are a number of ways that ownership of wetlands, their buffers, and stream buffers are designated by various jurisdictions. They can be part of the lot ownership, they can be placed in tracts deeded to a homeowners association, or placed in tracts and dedicated to the jurisdiction. The last option is recommended in this plan. If buffers are put in separate tracts assigned to the jurisdiction, they are more likely to be protected. Tree and shrub removal and filling, which degrade the buffers, would be minimized to some extent.

Q/A 98. Lot Clustering

Watershed jurisdictions should consider amending lot clustering ordinances to allow for lot clustering without density bonuses in the Quilceda/Allen watershed. Lot clustering should be allowed only when the retention of riparian lands, wetlands, and forest lands is maximized.

Lot clustering is a method to attempt to reduce intrusion into streams, wetlands and their buffers, reduce runoff, and promote aquifer recharge while allowing the developer to use the land. This is accomplished by allowing for increased home or building densities in exchange for providing for open space. In most cases, the developer can construct as many homes as initially planned on the property, but on somewhat smaller lots. Homeowners benefit from the aesthetics of retained trees and other vegetation, the developer does not lose economically, and the watershed benefits from tree and shrub retention that reduce runoff, allow infiltration, provide water quality benefits, and enhance fish and wildlife habitat. There are some

circumstances where lot clustering degrades sensitive areas, and should not be used. Careful examination of individual cases is needed to determine if lot clustering will actually benefit sensitive areas.

Incentives

Q/A 99. Forest Stewardship Programs

(a) Information about the DNR Service Forest Stewardship Program should be provided to forest landowners by watershed staff or volunteers. The Forest Stewardship Program provides free technical guidance, educational programs and materials, and cost sharing to forest landowners to help them effectively manage their forests.

(b) Information about the Natural Resource Conservation Service Forest Stewardship Incentive Program should be provided to forest landowners. The Stewardship Incentive Program provides financial incentives to maintain forest and woodlands in an environmentally sensitive manner.

Promoting forest land ownership and encouraging watershed sensitive forest land management is important to the watershed.

Q/A 100. Open Space and Tax Incentives to Maintain Forest

Each jurisdiction should promote the use of open space incentives and tax breaks to maintain forest, including developing an information packet that describes the various programs.

The greatest watershed benefits come from the retention of forest and other natural areas. In terms of stormwater runoff, maintaining forested areas is particularly important.

Q/A 101. Providing Plants and Technical Assistance for Revegetation Projects

Hundreds of areas in the watershed should be replanted, including along streams, in wetlands, and in wetland buffers. SWM Watershed Stewards, Snohomish Conservation District, The Tulalip Tribes, and WSU Cooperative Extension all have staff who can provide technical assistance on planting projects.

SWM has established a native plant rescue program. Through this program plants are "rescued" from areas where development is taking place and moved to a nursery area. The plants are then used for revegetation projects. Landowners and landusers can use these free plants to revegetate areas, and will receive technical expertise in developing a planting plan. In addition, volunteers are usually available to do the planting.

See also QC3, page 147

Regulatory Enforcement

Due to human activities, streams and wetlands have changed substantially in recent times. Wetlands are dredged, filled, or drained; streams are piped or channeled. Sediment from poorly managed construction sites fills stream channels. Many of the activities that cause these adverse impacts continue unchecked, despite numerous local, state, and federal laws aimed at controlling them. The major enforcement of water quality and water resource regulations is conducted by Ecology, Snohomish County grading inspectors, and city code enforcement staff. Ecology has one staff person who serves six counties, including Snohomish, for water quality violations related to agriculture and one for other types of water quality violations. Snohomish County has two grading inspectors; one to handle the area north of State Route 2 and one to handle the south. Both agencies are overwhelmed by complaints received and cannot respond to all.

Enforcement Problems

Because of staffing deficiencies, the jurisdictions in the Quilceda/Allen watershed and other watersheds in Snohomish County are unable to enforce existing regulations to protect aquatic resources. This is a very serious problem. Wetlands and streambanks are being filled, grading is done without permits or erosion control, erosion control treatments are not maintained, toxic materials are being dumped into the creek, and disturbance to riparian buffers is destabilizing streambanks causing erosion.

Many illegal or unacceptable practices by landowners continue unrestricted because there is insufficient staff to enforce the regulations. Some of these activities occur in agricultural areas, such as draining wetlands, dredging stream channels, and stockpiling chicken and livestock manure next to streams or other areas that easily run off into streams. In residential areas illegal grading is done to create larger backyards by filling in the streambank. In some areas where the stream has been channeled through residential areas, the stream channel has become so small from filling that the channel lacks the capacity to convey the water and the area floods. Wetland draining is also commonly practiced when a landowner wishes to sell the land, but does not want to be restricted by wetlands. Trees and shrubs in riparian and buffer areas designated for protection are often cut and replaced by lawns. Often individuals who do act responsibly are discouraged when they observe others who do not and who get off with no penalty.

Enforcement Management Recommendation

Q/A 102. Add to Enforcement Staffing (High Priority)

Stronger enforcement and more enforcement staffing are needed by all jurisdictions for handling all water quality, stream filling, and grading violations. It is recommended that a program be developed for periodic meetings of all watershed enforcement staff to discuss successes, failures, technical issues, and enforcement

problems. Citizen education and training should be developed so that citizens can recognize violations and know where and to whom to report complaints and problems.

Watershed Steward Program

Implementation of watershed plans is most successful when staff is assigned specifically for that task. Many aspects of the watershed plan require special types of expertise. To this end, SWM has established a watershed steward program to assist with the watershed plan implementation. The watershed steward typically has training in such areas as erosion control, bioengineering, stormwater management, and stream and wetland ecology. The watershed steward has a continual watershed presence spending much of the time there addressing water quality and water resource problems. The steward is readily available to watershed residents and jurisdictions for various forms of guidance and assistance.

Watershed Steward Management Recommendation

Q/A 103. Quilceda/Allen Watershed Steward

A watershed steward should be hired for the Quilceda/Allen watershed with an office located in the watershed and funding the responsibility of all the jurisdictions.

The major watershed steward tasks would be to:

- Educate watershed residents about how their actions affect water quality and wetland and stream resources.
- Facilitate the design, construction, and implementation of stream and wetland improvements.
- Work with resident volunteers on monitoring and planting efforts.
- Work on all forest and wetland acquisitions.
- Coordinate watershed studies.
- Conduct monitoring associated with best management practices, forest practices, and HPA conditions.
- Provide technical assistance to landowners to enhance water resources.
- Communicate residents' reports of code violations to appropriate enforcement officials.

The city of Marysville feels that their current staff is adequate to conduct the activities of the watershed steward and does not at this time want to participate in this action.

SECTION 5. PLANNING AREA RECOMMENDATIONS

SECTION 5. PLANNING AREA RECOMMENDATIONS

Introduction

This section gives a detailed description of problems in each of four planning areas--Allen Creek, Mainstem Quilceda, West Fork Quilceda, and Sturgeon Creek (figure 24). The management recommendations in the previous sections address the major problems in the entire watershed. This section outlines recommendations that apply to problems specific to the planning area and further defines recommendations made in the watershedwide management recommendation section. Implementation of all management recommendations is contingent upon obtaining funding.

Allen Creek Planning Area

Description

The Allen Creek planning area covers 13 square miles. It rises in elevation from sea level to about 300 to 400 feet on the Getchell plateau. Approximately one third is under 100 feet in elevation. In the flat Marysville trough, outwash soils predominate; on the hillsides and plateau, till soils predominate. Allen Creek and most of its tributaries originate on hillside slopes.

Much of the urbanized portion of the planning area is in the city of Marysville, while most of the agricultural areas, rural hillsides, and plateau are in unincorporated Snohomish County. The planning area is experiencing rapid conversion from forest and agriculture to suburban development. The city of Marysville has annexed a considerable area in recent years and growth management boundaries will extend the urban area to the north (see figure 3, page 17). Recent high density, single family development has occurred most extensively in the Munson Creek area. New subdivisions have replaced forests and wetlands, and large amounts of impervious surface have been created.

Agricultural areas lie to the north and east, and in the Snohomish River floodplain. Under new city and county land use plans, all of the land has been taken out of agriculture. The farms in the Snohomish River floodplain near the mouth of Allen Creek, and adjacent upland areas, have recently been annexed by the city of Marysville.

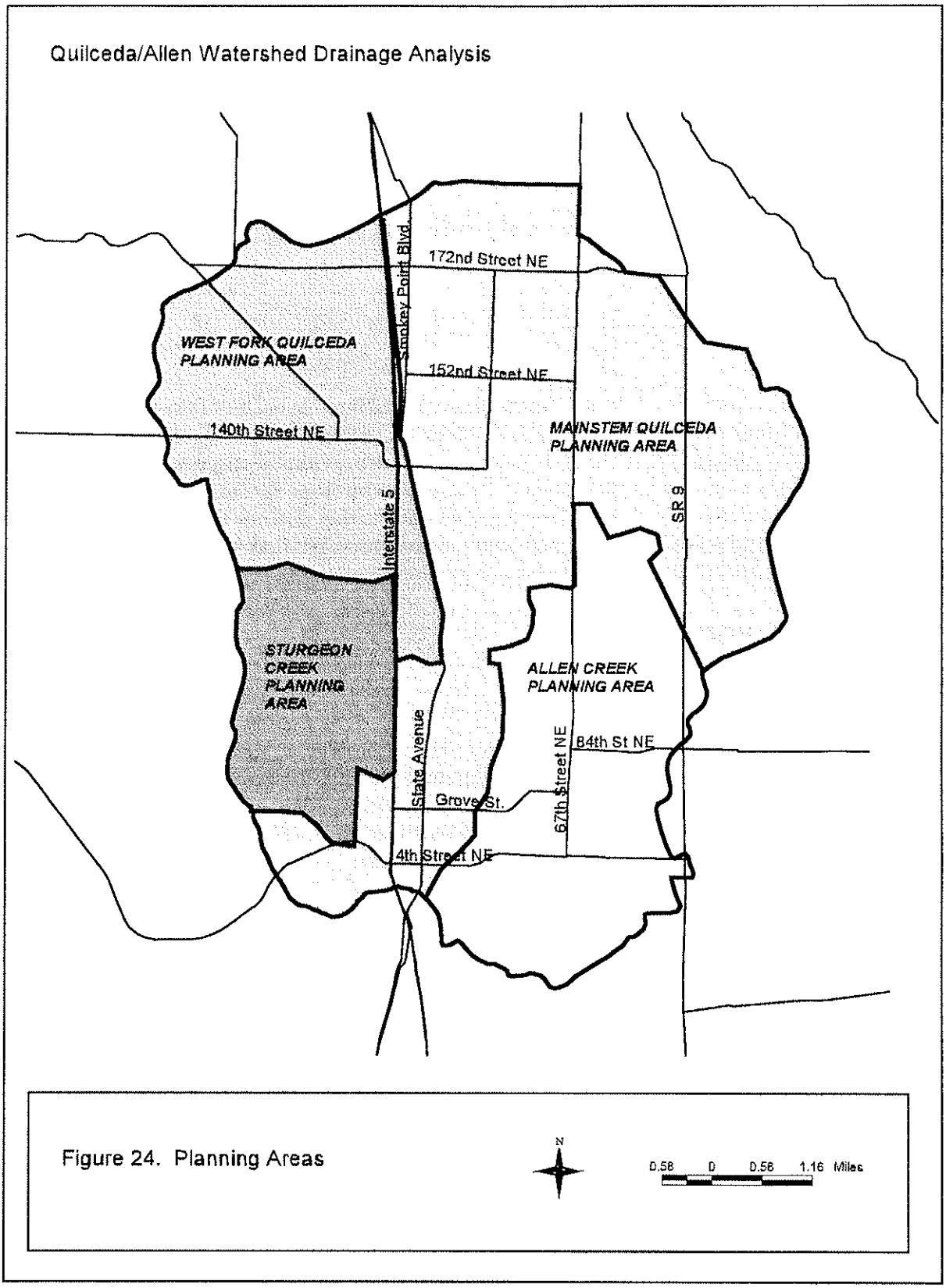


Figure 24. Planning Areas

Water Quality Issues

The predominant water quality problems in this planning area are heavy sediment loads and high bacteria and nutrient concentrations in stream water. These problems were identified through water quality studies conducted by The Tulalip Tribes (Halpin et al. 1991) and SWM (Thornburgh 1994) (figure 25) and a 1993 stream habitat survey conducted by SWM (Snohomish County 1993b, Nelson 1994). With continued urbanization, pollutants related to residential development can be expected to increase.

Sediment

Land clearing and grading have resulted in a large sediment contribution to the streams. Other sediment sources include overgrazed pastures, livestock access to streams, ditch maintenance, and erosion from removal of streamside vegetation in residential areas and from increased stormwater runoff. Stream habitat studies indicated that most of the planning area has sediment levels detrimental to salmonid spawning and rearing habitat (figure 26).

The greatest sediment source is sediment from construction activities. Turbidity measured in the South Fork Allen Creek sub-basin was significantly higher than at all other watershed sites (Thornburgh 1994). During the study, new homes were being constructed on the hillside drained by the south fork of Allen Creek.

Other sub-basins in the Allen Creek planning area have also experienced hillside development over the past several years. During the 1993 stream survey, instream sedimentation was observed near the confluence of Munson Creek with Allen Creek and upstream and downstream in the lower mainstem Allen Creek. Increased sediment deposition was also observed in Jennings Park and in the lower mainstem Allen Creek channel. Lower Allen Creek floods, due in part to the sediment and plant clogged channel. Soils on the steep hillsides readily erode, and sediment from construction will be a continuous problem.

Livestock access to the streams causes erosion and sedimentation. Potential pasture management and livestock access problems were noted on 15 farms in this planning area (Bachert 1993). Erosion is also apparent in Marysville trough residential areas where humans have access to sensitive sandy streambank soils and streambanks are destabilized from streamside vegetation removal (Halpin et al. 1991, SWM 1993). Erosion was also noted at stormwater outfalls along 67th Avenue NE and 88th Street NE (Leif 1994) (see figure 16, page 59).

Nutrients and Bacteria

The highest nutrient levels, with respect to both nitrates and phosphates, in the entire watershed were found in the North Fork Allen Creek sub-basin (Thornburgh 1994). Sixty percent of the stream water samples taken at the north fork sampling

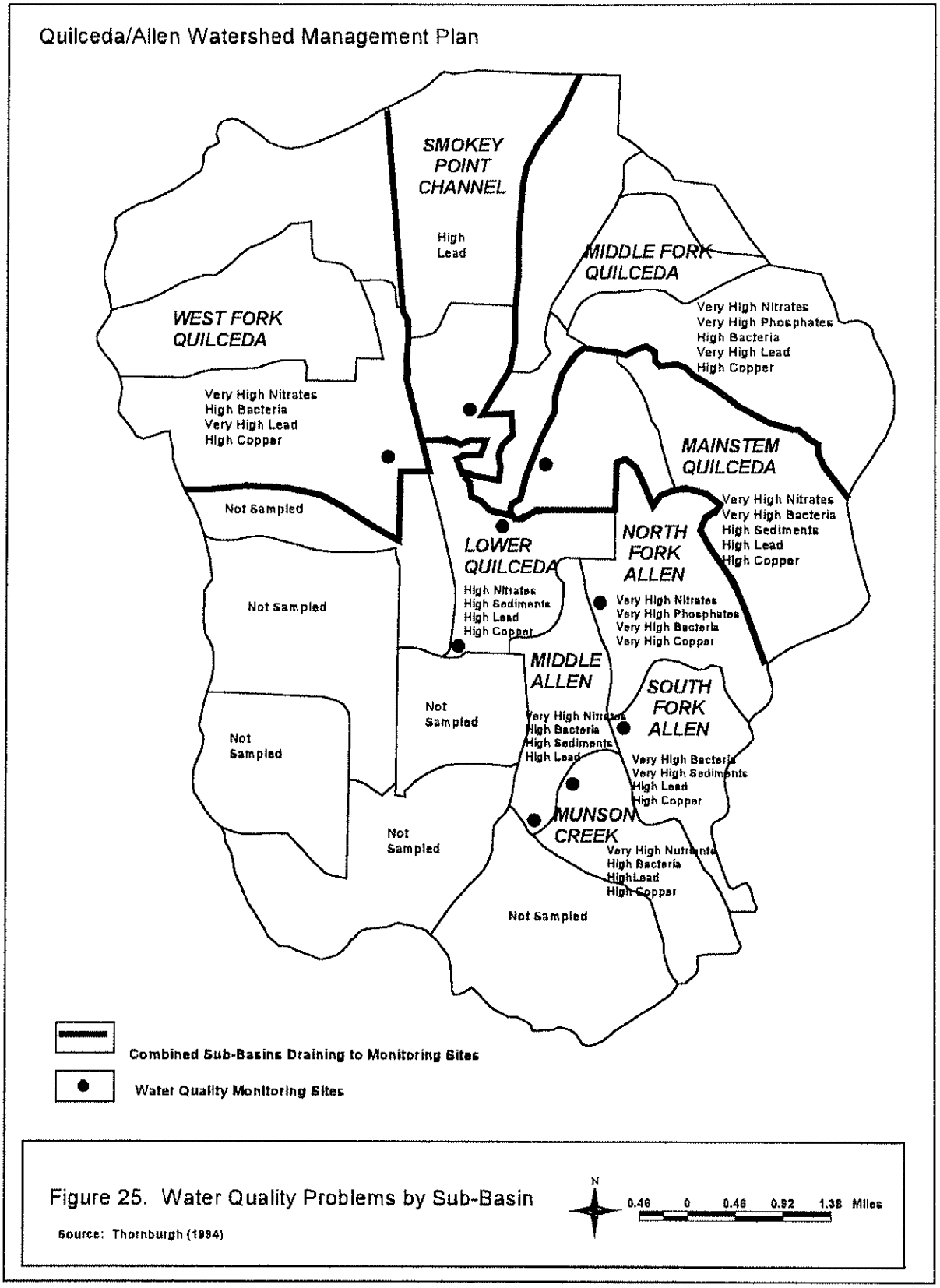


Figure 25. Water Quality Problems by Sub-Basin

Source: Thornburgh (1994)

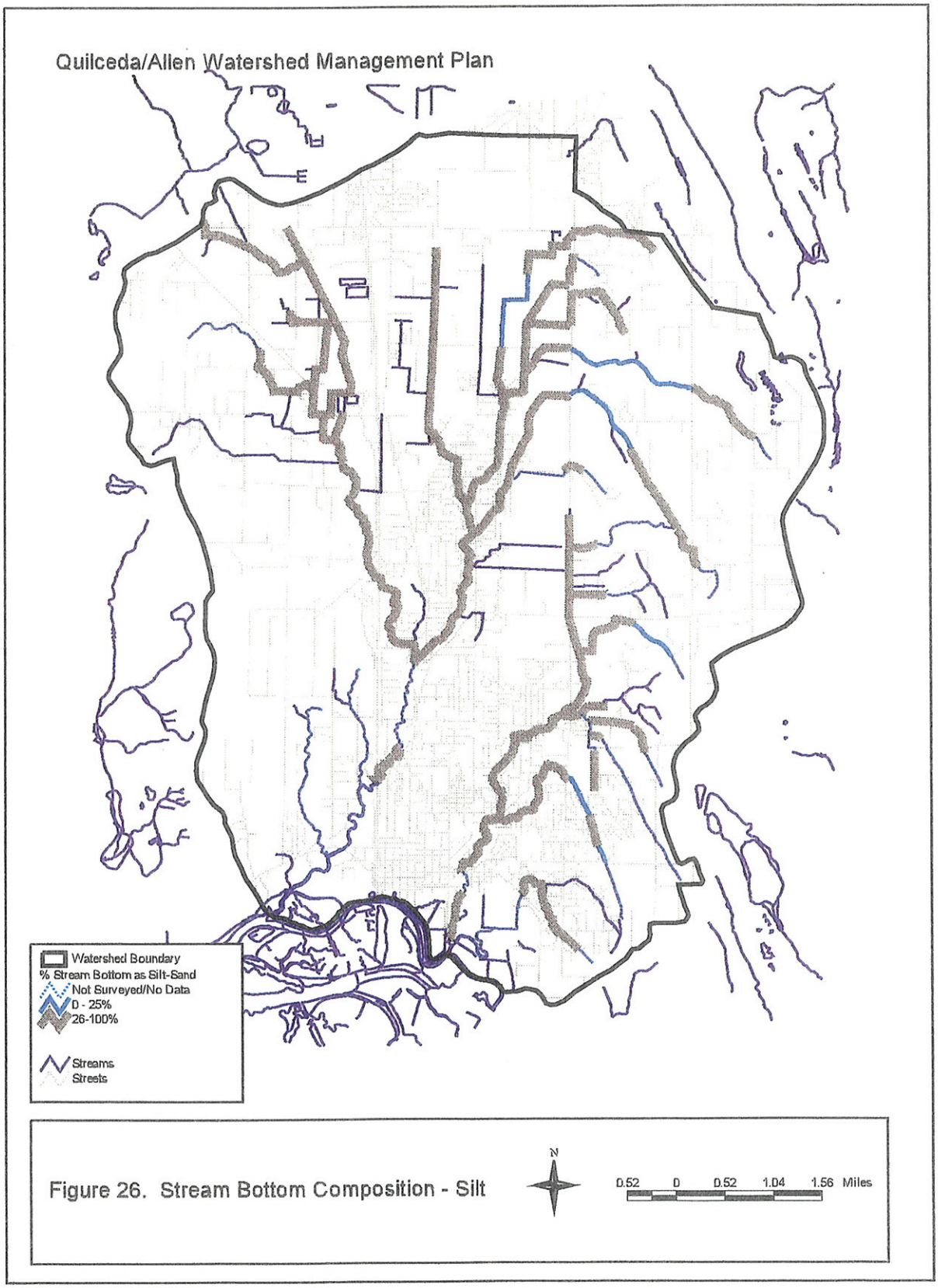


Figure 26. Stream Bottom Composition - Silt

site during the SWM water quality study violated state standards for dissolved oxygen, and all violated bacteria standards and nutrient guidelines. This sub-basin has many farm animals, as well as a fairly high density of animals per acre, and almost half the farms were noted as potentially having severe water quality impacts (Bachert 1993). Piling of chicken manure along Allen Creek is common in this area. Another source of high nutrient levels may be failed septic systems. Almost all of the North Fork sub-basin is on septic systems, and some of these are old and may be failing.

The south fork of Allen Creek has moderately high nutrient levels. There are few farms in the South Fork sub-basin, but about 65 percent of the area has onsite septic systems. In addition, part of the Cedarcrest Golf Course drains to the south fork, potentially contributing nutrients from fertilizer use.

The Munson Creek sub-basin has high nitrate concentrations and moderate bacteria levels. This area has few farms and has recently been connected to the sanitary sewer system. The nitrates and bacteria may be coming from soil disturbance and leaching in areas of new construction, as well as from fertilizers used in the newly developed residential areas and the Cedarcrest Golf Course, a portion of which drains into Munson Creek.

Pollutants in Urban Runoff

Much of this planning area is developed or will be within the next few years. Increases in nutrients from fertilizers, toxic chemicals such as pesticides and herbicides, detergents from car washing, and other pollutants contained in water from runoff or being discharged into the stream will occur. Along Allen Creek, 112 direct discharge sources were observed (Halpin et al. 1991).

Approximately two stream miles, including a portion of mainstem Allen Creek, are channeled along roads. Roads cross streams at 30 sites in this planning area. Highway runoff contains heavy metals, such as arsenic, cadmium, chromium, copper, lead, and zinc, which can concentrate in stream sediments. Untreated runoff from roads ends up in nearby streams. Lead levels consistently violate state standards in water quality samples in all Allen Creek sub-basins, and copper levels were in violation in all but Munson Creek.

Hazardous Waste

Ecology's Affected Media and Contaminants Report of hazardous sites listed the Bowers Property along lower Allen Creek for petroleum spills from storage drums resulting in soil contamination; solvents and metals were also suspected at the site (Ecology 1994b). The property is located almost at the tide gates at the mouth of Allen Creek and appears to be an equipment storage area. Ground and surface water contamination from this site goes directly into Ebey Slough.

Solid Waste and Garbage

Solid waste and garbage along streams were recorded by The Tulalip Tribes (Halpin et al. 1991). In the planning area, litter occurred most frequently in streams adjacent to roads, especially along 67th Avenue NE. Dump sites were observed at 21 places along the stream. Most refuse consisted of yard clippings, compost piles, garbage, metal, and car parts.

Water Resource Issues

Streams in the planning area were found to provide spawning and rearing habitat for salmon, although habitat quality is not as good as the Quilceda basin (see figure 12, page 37). Coho salmon numbers have decreased over time. Ground water contributes a substantial amount of water to the stream year round and helps to maintain summer baseflows. Wetlands also perform important functions to the hydrology of this planning area. However, substantial amounts of wetland habitat have been filled for development, and overall the wetlands have become degraded.

Stream Habitat

The streams have been damaged by pollution, increased stormwater runoff, and channelizing. Streamside vegetation has been removed in residential and agricultural areas, and regulatory buffers protect limited areas. Wetland loss throughout the planning area has eliminated or degraded fish and wildlife habitat. The discussion below represents an analysis of stream habitat information collected by SWM (1993) and evaluated by Nelson (1994). Nelson rated the rearing habitat in individual streams as "very good, good, fair, and poor," compared to other streams in the Quilceda/Allen system.

Mainstem Allen Creek

In mainstem Allen Creek about 14 percent of the stream length has suitable salmon spawning conditions (see figure 12). Spawning occurs just east and west of 67th Avenue NE for about 1.25 miles. Spawning conditions occur elsewhere as well, but in scattered stretches. Below its confluence with Munson Creek, the stream bottom is mud and silt in its natural condition, and spawning habitat is lacking.

Rearing habitat of variable quality can be found throughout Allen Creek. Only 43 percent of the stream length has good rearing habitat, with 37 percent considered poor. No high quality of the rearing habitat occurs in Allen Creek. Pool habitat dominates much of Allen Creek.

Mainstem Allen Creek has been channeled along 67th Avenue NE and through agricultural lands. Livestock have access to the stream in many areas. From just above the confluence with Munson Creek to the mouth, extensive sediment has been accreting in the stream channel. The channel has filled in from above Jennings Park

to Sunnyside Boulevard, where some of the sediment becomes trapped in wetland vegetation.

Where it enters the Snohomish River floodplain, Allen Creek is choked with Reed canarygrass, and the water barely flows. Very low dissolved oxygen levels were recorded in stream water near the Sunnyside Boulevard. The lower one and a half mile of stream probably provides a challenge for salmon moving to upstream spawning habitat and young salmon moving out of the system.

Allen Creek Tributaries

Spawning and rearing habitat occurs in the Allen Creek tributaries (see figure 12). About 64 percent of these tributaries contained spawning habitat. Munson Creek contained more gravel substrate and a smaller percentage of fine silt over a greater distance than other streams in the Allen Creek planning area. However, this stream does not appear to be used by coho salmon; only cutthroat trout have been observed.

The unnamed 112th Street NE tributary to Allen Creek (WRIA 07-0079) has some spawning habitat, but much of the stream has filled in with Reed canarygrass. Habitat projects built in the stream channel are no longer functioning properly. Other unnamed tributaries (WRIA 07-0074, 0075, 0076, 0077) that originate between 84th Street NE and 100th Street NE also contain spawning habitat.

Varied quality rearing habitat occurs throughout these tributaries. Much of the rearing habitat is poor due to low stream habitat diversity, poor riparian buffer conditions, and few fish. Pools dominated the instream habitat in 55 percent of the streams and riffles in 45 percent.

Stream Flow

Stormwater runoff in this planning area has had less impact to stream channels than in other urban areas. Much of the development has taken place in flat areas with soils that allow for water to infiltrate into the ground. Some runoff from impervious surfaces does go to the stream, but it is received by some wide stream channels protected by deep, wooded ravines.

The hillside channels and stream reaches at the toe of the slope in the North and South Fork Allen Creek sub-basins contain the best spawning habitat in the planning area. Substantial development has occurred in other hillside sub-basins, and as more of these areas become developed, impacts could be greater unless measures are taken to reduce future stream flows. These are the areas where forest removal and wetland filling will take their greatest toll. The increased volume and velocity could cause erosion and hillside stream channel downcutting, degrading salmon habitat, particularly in the North Fork sub-basin where hydrologic modeling indicates a need for increased detention and/or forest retention.

Increases in upstream flows are already causing downstream flooding problems. These problems will likely intensify if measures are not taken to reduce future stream flows. Both lower Allen Creek and the left bank tributary to Allen Creek in the floodplain, sometimes called Woods Creek, overtop their banks, in part because of greater upstream flows.

Riparian Habitat

Riparian areas are important, especially in urbanized areas, for fish and wildlife habitat. Beavers live in the developed portion of the planning area, and an occasional deer is observed. Christmas Bird Counts have been conducted in this area for many years. Bird numbers on these counts have declined and continue to decline each year because of habitat loss (Carroll pers obs.). Species diversity has also decreased. Forested stream ravines provide the only habitat for nonurban species like winter wrens, Swainson's thrush, and pileated woodpeckers. Riparian vegetation provides shading, bank stability, nutrients, and a source of woody material for streams that benefit fish.

In mainstem Allen Creek riparian areas greater than 30 feet were observed along 3.5 stream miles beginning just less than one mile from the mouth (Nelson 1994) (figure 27). Streambank vegetation in most of the riparian areas was dominated by grasses and shrubs, including blackberries. Few trees were observed, and most were deciduous. There are several areas where vegetation has been removed completely. These include most streams in agricultural areas and those flowing through the golf course and Jennings Park.

Along the Allen Creek tributaries, riparian buffers improve in the upstream direction except the streams north of 84th Street NE. Lower stream reaches generally have no buffer or very small buffer widths. Bank vegetation along the tributaries was dominated by grass and blackberries.

Ground Water

The high ground water from the Marysville trough aquifer contributes substantial amounts of water to the streams. Because of the well-drained Ragnar soils in the lower portion of this planning area, water reaching pervious surfaces there quickly infiltrates into the ground. However, where Norma/Custer soils predominate the water table is very close to the surface, and flooding occurs during the rainy season. Much of the land over the lower Marysville trough has already been developed, except the agricultural areas where infiltration to ground water provides stream baseflow support.

Ground water in the form of seeps and springs from the Getchell-Snohomish aquifer occurs at the toe of the slopes in this planning area. These discharge points are landslide hazard areas and backyard flooding occurs where houses have been constructed.

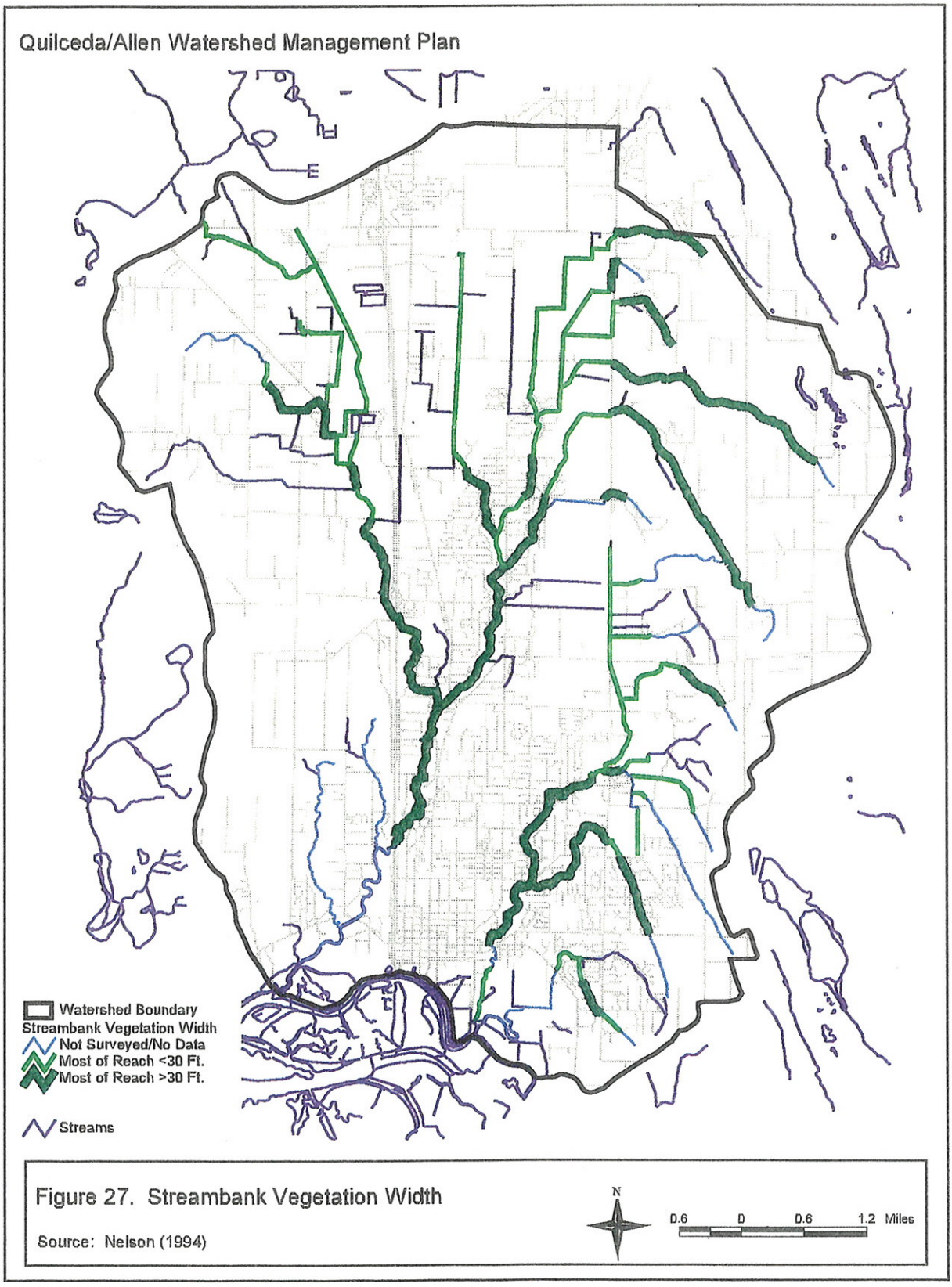


Figure 27. Streambank Vegetation Width

Source: Nelson (1994)

Wetlands

Wetlands in the Allen Creek planning area provide water quality and stream baseflow support functions. They also store water and provide islands of fish and wildlife habitat in this urbanizing area. Many wetlands in the Allen Creek planning area have been filled and drained, particularly in the middle and lower portions. One third of the inventoried wetlands has been filled within the past several years.

Impacts to wetlands from farming activities often are severe (Bachert 1993). Grazing and mowing on five farms have caused moderate to high levels of damage to wetlands. Native plant communities appear to be at risk on these farms (Sheldon & Associates 1994). Throughout the Allen Creek planning area many wetlands have greater than 50 percent cover by nonnative invasive species, including soft rush and Reed canarygrass.

Based on an analysis of both old and new data in the Allen Creek planning area, few wetlands provide what is considered high value flood storage functions. This is mainly because the mid-basin area where flood storage is most important is small, and there are few large wetlands remaining. Most inventoried wetlands in the planning area appear to provide good to excellent water quality functions. Many wetlands have a high vegetation density, improving their ability to filter pollutants.

Flooding and Drainage

The Allen Creek planning area conveyance system consists of open ditches and pipes (Kerwin 1994). There is limited stormwater storage, either in wetlands or detention ponds.

In the flat Marysville trough, ditches must be very deep to make the water flow. The drainage channels in this area often are undersized and run through homeowners' backyards; flooding has resulted. Many watershed residents were unaware of the high water table problems when they purchased their homes and are now dealing with the consequences.

Hillside portions of the planning area have greater topographical differences, providing easier conveyance. However, many of the conveyance systems are in need of repair, replacement, or upgrading due to the area's growth, age of the systems, and water acidity and fluctuations, which tend to cause drainage pipes to rust. Increased flows from development upstream of Allen and Woods creeks have caused flooding downstream.

Management Recommendations for the Allen Creek Planning Area

Acquisition and Enhancement (figure 28)

AC 1. Wetlands for Restoration and Education

Wetlands held by the city of Marysville and located near the Cedarcrest Middle School and Allen Creek Elementary School could benefit from restoration and should be used as outdoor laboratories for the schools.

AC 2. Garbage Clean-up Along 67th Avenue NE

The city of Marysville should coordinate a regular garbage cleanup for Allen Creek along 67th Avenue NE with the Adopt-A-Street program.

AC 3. Acquisition of Floodplain Land at the Mouth of Allen Creek

The floodplain farmland at the mouth of Allen Creek is currently for sale. Purchase of this land for eventual conversion to estuarine wetland by agencies and/or jurisdictions is recommended.

Estuarine wetlands are transition areas for salmon smolts returning to the sea from upstream spawning and rearing areas.

AC 4. Potential Stream Rehabilitation and Enhancement Projects to be Evaluated in the Coho Recovery Plan (see Q/A 62)

The following projects should be evaluated and prioritized in the coho recovery plan:

a) Removing Cedarcrest Golf Course dam; revegetating and stabilizing streambanks.
b) Analyzing productivity in Munson Creek where there is good spawning habitat, but few fish.
c) Reconstructing Allen Creek away from the 67th Avenue NE.
d) Rehabilitating fish enhancement facilities on 112th Street NE.
e) Assessing the stream channel and potential flooding problems at Jennings Park and downstream.

Projects (see figure 28)

AC 5. Correct Erosion Problems at Outfalls Along 67th Avenue NE at 88th Street NE

SWM should consider prioritizing correction of erosion problems at stormwater outfalls along 67th Avenue NE at 88th Street NE for inclusion in the capital project list.

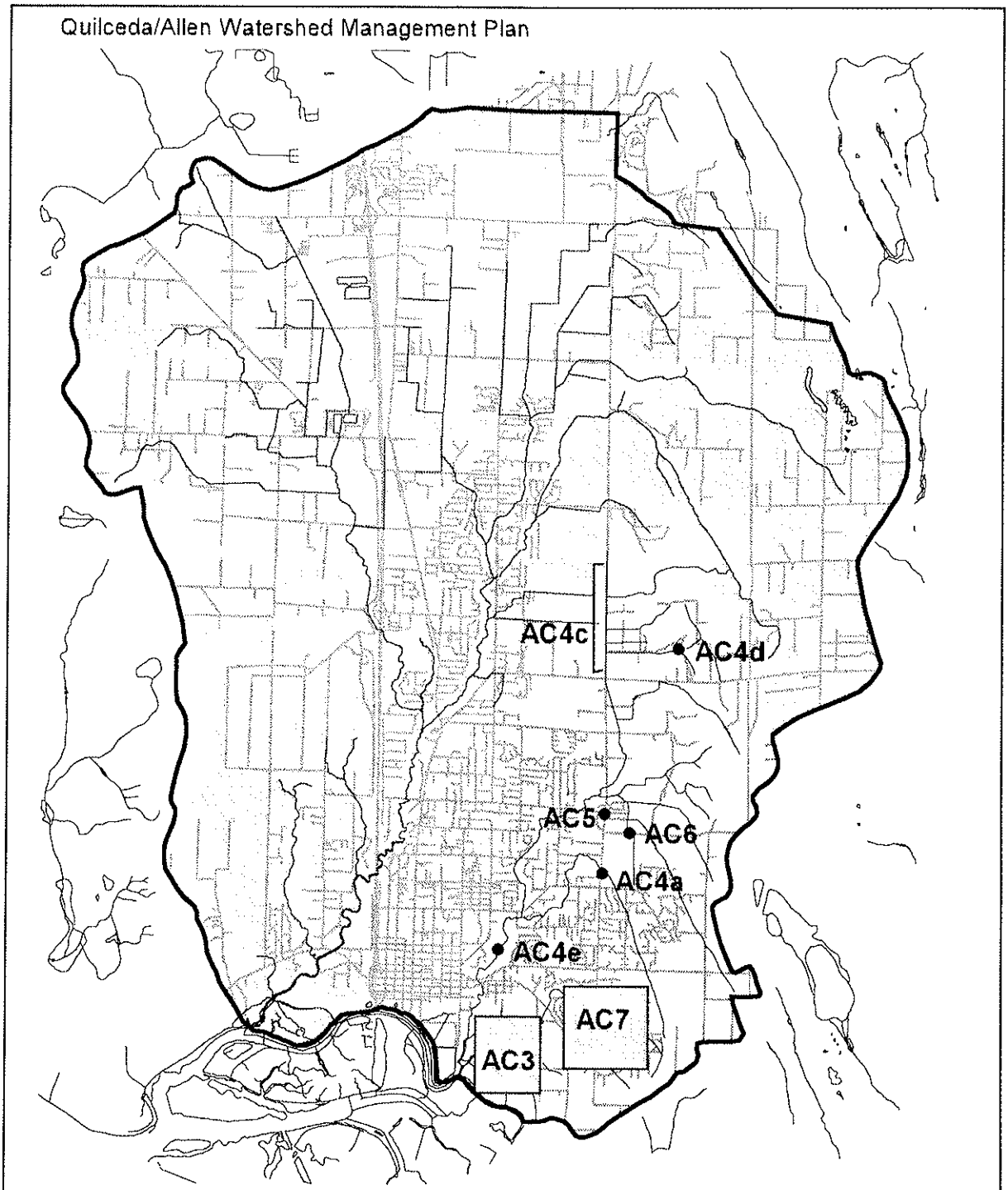


Figure 29. Allen Creek Planning Area Projects

AC 6. Culvert Replacement under 84th Street NE

The drainage system under 84th Street NE near the Cedarcrest Golf Course should be evaluated and the situation corrected by the city of Marysville.

The culvert under 84th Street NE drains the Cedarcrest golf course. The culvert is generally full; when it backs up road flooding occurs.

AC 7. Development of Master Drainage Plan for the Sunnyside Area in Marysville

A master drainage plan should be developed by the city of Marysville Public Works Department to address the drainage problems in the Sunnyside area.

Stormwater conveyance is a problem in the Sunnyside area because of the infringement on the system by adjacent landowners. There is a long history of drainage complaints in the area.

Mainstem Quilceda Planning Area

Description

The Mainstem Quilceda planning area encompasses about 20 square miles and resembles a larger, less developed version of the Allen Creek planning area. The area lies in the northeast and central portions of the watershed.

The upper portion of the planning area east of 67th Avenue NE climbs steeply to an elevation of about 400 feet and flattens into a large plateau. The lower portion is in the Marysville trough and has very little elevation change from north to south. Soils in the upper planning area are till, in the Marysville trough they are outwash dominated by Lynnwood above 172nd Street NE, Norma/Custer in the center, and Ragnar in the southern portion.

The headwaters of Quilceda Creek, Middle Fork Quilceda, Olaf Strad, Edgecomb, and two unnamed tributaries (WRIA 07-0064, 0066) originate on the hillsides and are supported by large wetland systems, seeps, and springs. These streams descend to the Marysville trough, where they flow from straightened channels into large ravines as they move south toward Ebey Slough. Where the tributaries meet the mainstem, the channel widens and deepens, and Quilceda Creek becomes tidally influenced. The lower mainstem has a wide floodplain lined with intertidal wetlands. One stream, a tributary to the Middle Fork, originates in the Marysville trough.

Land use on the hillside consists of low to moderate density rural residential, some noncommercial agriculture along Route 9, and about 3000 forest acres. Much of the upper Marysville trough has been ditched and drained for agriculture. Commercial development concentrated along Smokey Point Boulevard close to Interstate 5 (I-5), and industrial areas, including the Arlington Airport, are located in the upper Marysville trough. This area is mainly in unincorporated Snohomish County, but is within the urban growth boundary and annexation into Marysville and Arlington is proposed. The lower Marysville trough is dominated by commercial and residential land use. Snohomish County zoning in the lower section of Quilceda Creek near Ebey Slough is commercial, which is not compatible with the conservancy shoreline designation.

The hillside is likely to remain in a rural zoning designation for the time being. Forestry will probably not continue to remain a viable option because of the proximity to urban development. The area is not designated as a natural resource area under growth management planning. There is pressure to begin commercial and residential development along Route 9.

In the upper Marysville trough some of the agricultural land is fallow. Much of the watershed's agricultural land has recently been changed to either urban, urban reserve, or rural residential-10 zoning (one dwelling unit per 10 acres). Wetland impacts and drainage problems have thwarted development in this area for a number of years.

Water Quality Issues

Predominant water quality problems in this planning area are high sediment levels in streams and high nutrient levels in both stream and ground water. Bacteria levels exceed the state standards in almost all streams. Road runoff from I-5, Route 9, and many other roads contribute metals, petroleum, and other pollutants to the streams.

Sediment

High sediment levels in Quilceda Creek are a cause for concern (Nelson 1994). The highest sediment concentrations in Quilceda Creek were measured in the Lower and Upper Quilceda sub-basins. The lower portions of the creek are deposition areas for upstream sediment. Most sediment input to the creeks occurred during the wet season, and peak loads were recorded after a storm in mid-December 1993 and after a period of heavy rain in mid-February 1994. The highest sediment loads in the watershed were found at the water quality monitoring site that drains both the Upper Quilceda and combined Middle Fork sub-basins (Thornburgh 1994).

Logging, land clearing, and grading all produce sediment. Approximately 270 acres of forest land have been or will be logged along the upper Quilceda Creek and 110 acres in the upper Middle Fork Quilceda. Recent logging activities along the upper Middle Fork have increased the amount of debris and sediment in the stream, and logging within the Riparian Management Zone has caused streambank degradation.

Construction activities in the Marysville trough have also added to stream sediment; most of the development occurs along the streams. Erosion control measures taken at most construction sites have failed to prevent sediment input to the streams. Approximately 215 hillside acres has been or will be converted to development in the next few years. Sediment from hillside land clearing and grading can be expected to accumulate in downstream channels where the stream gradient flattens, stream flow slows, and sediment cannot be transported out of the system.

Erosion has been observed at several culvert outfalls in the planning area. A new culvert draining a large area of impervious surface and a portion of the Glen Eagle development is routed under 172nd Street NE. The culvert discharges water at the top of the ravine above Edgecomb Creek and has eroded a large channel to the stream. Erosion was noted at other culvert outfalls along 172nd Street east, west of 67th Avenue NE, and along the tributary to Quilceda Creek that runs along 132nd Street NE (Leif 1994). Severe erosion is also occurring at an outlet near 108th Street NE and Shoultes Road (Kerwin 1994).

Erosion from livestock and human access to the streams is also a problem in this planning area. In addition removal of riparian vegetation along streams has destabilized the streambanks in many areas. Another activity occurring in the upper planning area during the water quality study was mining at the Sisco gravel mine.

Sediment from the mining operation and trucks carrying gravel could have added fine sediment to the streams.

Nutrients and Bacteria

Nutrient and bacteria problems are severe in this planning area's streams. The Upper Quilceda sub-basin has the highest mean bacteria concentrations in the watershed. The highest bacteria loads were measured from the Upper and Middle Quilceda sub-basins and combined Upper and Middle Quilceda and Middle Fork sites. Moderately high nitrate and phosphate levels were also found in Upper Quilceda. All water quality monitoring sites, except for the Smokey Point channel site, violated state standards for bacteria. Because the Marysville trough area is flat and the stream gradient low, stream water in this area is slow moving and tends to concentrate pollutants.

There are 23 small farms that have high impacts to water resources in the hillside portion of the planning area, and most of that area is on septic systems. In the Marysville trough, there are over 400 farm animals, and 25 percent of the farms were identified as potentially having severe water quality impacts (Bachert 1993). Use of chicken manure is fairly extensive in this planning area. Only half of the Marysville trough portion of the planning area is served by onsite septic systems.

Turf farms and nurseries typically contribute nutrients from fertilizers and other chemicals to both stream and ground water. Water quality samples taken at Smith Gardens, a nursery where use of chemicals is limited and water recycled was found to have low nutrient levels. Water quality samples have not been taken at other such businesses.

Urban Runoff

The lower portion of the planning area contains residential and commercial land uses. Increases in nutrient contributions from fertilizers, toxic chemicals such as pesticides and herbicides, detergents from car washing, and other pollutants contained in runoff are being discharged into the streams. Detergents were noted in most samples at water quality sampling sites. Within the Quilceda system, 149 direct discharge sources were located along the streams (Halpin et al. 1991). The types of direct discharges were storm drains, agricultural and other drainage ditches, and drainage pipes.

In this planning area, roads cross streams in at least 16 places. Highway runoff contains heavy metals and untreated runoff ends up in nearby streams. Lead levels consistently exceeded state standards in the streams in this planning area, and copper was in violation in the Lower Quilceda, Middle Fork, and Upper Quilceda sub-basins. The mainstem Quilceda Creek passes beneath I-5, and oils and grease were found there even with no runoff occurring (Halpin et al. 1991). In the Snohomish County portion of the planning area, oil was observed at several stormwater drainage outfalls along 51st Avenue NE, 116th Street NE, 132nd Street NE, and the Smokey Point channel (Leif 1994).

Hazardous Waste

The Sisco landfill is identified as a hazardous site in the Affected Media and Contaminants Report of hazardous sites prepared by Ecology. Litigation has resulted, and no action has yet been taken to address the toxic substances leaching from this landfill. Other hazardous sites in this planning area include Mann Equipment along Smokey Point Boulevard. All five of the watershed's leaking underground storage tanks are found in this planning area; most are being cleaned up or monitored (Ecology 1995).

Solid Waste and Garbage

In this planning area, litter occurs most frequently in streams in residential areas; 51 dump sites were observed along Quilceda Creek, and litter was observed along five percent of the stream. Most refuse consisted of yard clippings and compost piles, garbage, metals, and car parts (Halpin et al. 1991).

Water Resource Issues

Quilceda Creek and its tributaries provide good spawning and rearing habitat for coho and chum salmon and resident cutthroat trout. Ground water provides substantial inputs of water to the stream system and provides baseflow support. The estuarine wetland at the mouth of Quilceda Creek and associated intertidal wetlands in lower Quilceda along with the headwaters and other forested wetlands in the upper portion of the planning area, provide the best fish and wildlife habitat in the watershed.

Stream Habitat

Coho salmon spawn in the upper stream reaches; chum salmon spawn in mainstem and Middle Fork tributaries in the middle of the planning area. Chinook salmon spawning was documented in the mainstem Quilceda in 1986, but not since then. Rearing habitat exists throughout this planning area, with variable quality (see figure 12, page 37). Rating of the rearing habitat in the following discussion was done by Nelson (1994) comparing streams in the Quilceda/Allen watershed with each other.

Mainstem Quilceda Creek

Mainstem Quilceda Creek has about three miles of spawning habitat from just west of 67th Avenue NE up the hillside (Nelson 1994). Suitable spawning conditions occur further downstream but in scattered stretches. Eighty-nine percent of the rearing habitat throughout Quilceda Creek is rated as either good or very good; the area east of Route 9 is rated fair. Pools are the dominant habitat because of the low gradient in the Marysville trough and the number of beaver ponds in the stream's upper reaches. Riparian areas along portions of the upper reaches of Quilceda Creek

and through residential and agricultural areas in the middle reaches have been degraded. The stream channel has been modified along Wade Road and in a short section of stream in agricultural land.

Middle Fork Quilceda Creek

The Middle Fork Quilceda Creek has a large drainage area consisting of almost 20 miles of stream. Fish spawning habitat occurs throughout the Middle Fork in both long stretches and patches. Rearing habitat was rated as good or very good for 71 percent of the stream. Major impacts to the stream are riparian vegetation removal and sediment input from logging and construction activities, livestock access, and erosion caused by removal of riparian vegetation in residential areas.

Middle Fork Quilceda Tributaries

Olaf Strad Creek, a Middle Fork tributary, is spring fed and provides good spawning habitat for about one mile from 67th Avenue NE east to its source, with scattered spawning habitat elsewhere in the stream. Fish habitat structures have been constructed in this stream, and they appear to be working well. The headwaters are protected with forested vegetation. Rearing habitat was rated as good east of 67th Avenue NE, but poor or fair where the stream is channeled along 67th and through a field. Vegetation along the stream has been cleared in one area, and road runoff and livestock access both affect the stream. Spawning habitat occurs throughout the unnamed tributary to Olaf Strad Creek (WRIA 07-0064). Rearing habitat was rated as poor throughout this stream because of lack of vegetative cover and limited pool habitat.

The habitat in the upper reaches of Edgecomb Creek, a tributary of the Middle Fork, currently appears to be healthy. The headwaters of this stream provide excellent spawning habitat for coho and resident cutthroat east of 67th Avenue NE. Rearing habitat in that section is rated as very good. West of 67th Avenue NE, the stream is severely degraded, and the rearing habitat is poor. A project to reconstruct the intersection of 172nd and 67th is underway. A portion of the stream will be rechanneled west of 67th and drainage facilities constructed to slow and clean runoff. Impacts to this stream include increases in upstream flows that could potentially degrade salmon habitat, and livestock access and lack of riparian vegetation in the agricultural areas.

Several stream sections along the Middle Fork and the mainstem have received residential impacts, including stream channel filling and removal of streamside vegetation. Erosion is a severe problem in residential areas of the Marysville trough; the problem is exacerbated by humans trampling the sandy streambank soils.

Stream Flows

Even though much of the upper planning area is zoned low density rural, when the area is built to its zoning capacity, peak stream flows are expected to increase

dramatically because of the steep slopes and till soils that do not readily store and infiltrate water (Beyerlein and Brascher 1994). There could also be areas where flows are reduced and streams dry up. These stream flow changes would have negative impacts to salmon habitat and could also cause additional flooding in the Marysville trough. The water's increased volume and velocity will probably cause erosion and downcutting of the hillside stream channels. Maintaining the large wetlands at the headwaters of both Quilceda and the Middle Fork is very important to the streams since these wetlands store tremendous volumes of water. Loss of these wetlands would cause greater increases in stream flows during the winter and loss of stream water in the summer.

Because stream flows are expected to increase on the hillsides and subsequently downstream, although not as dramatically, streamside flooding will probably increase in the Marysville trough. Currently much of the potentially impacted land is agricultural. Increased flooding there would decrease the use of the land. If the land is developed, the flooding will be exacerbated and buildings constructed near the stream could be damaged.

Riparian Habitat

Streamside vegetation in this planning area provides important wildlife habitat. Much of the forested corridor is located in deep wide ravines protected somewhat from development encroachment. These riparian ravine corridors add to species diversity in the developed areas of the watershed. Riparian areas also add to the value of the stream as rearing habitat.

Riparian conditions are good along much of Quilceda Creek, except for the reach along 152nd Street NE (see figure 27, page 134). A portion of this unvegetated stream section has recently been fenced and planted, and plans are being made to fence and revegetate the remaining section as well. Once this is completed, an unbroken corridor will exist. Riparian vegetation consists of a combination of shrubs, grasses, and trees. Trees are the dominant vegetation in the upper forested portion of Quilceda Creek.

Riparian conditions along the Middle Fork vary considerably, especially with respect to buffer size. Trees dominate bank vegetation type in six out of eight reaches along the Middle Fork, except in the agricultural areas, where buffers are largely absent. Riparian habitat along the Middle Fork tributaries is essentially good east of 67th Avenue NE, but poor in the farmland west of 67th. An active bald eagle nest is found in a large cottonwood tree along the Middle Fork.

Several residential areas have degraded riparian conditions along the streams in this planning area from filling the stream channels and removing riparian vegetation. Streambank instability and erosion have resulted.

Ground Water

Ground water in the form of seeps and springs from the Getchell-Snohomish aquifer is the source of Edgecomb and Olaf Strad creeks. These and other areas where ground water comes to the surface are also landslide hazard areas.

The high ground water of the Marysville trough aquifer contributes substantial volumes of water to streams flowing through or originating in this area. From 45 to 80 percent of the water in the streams in the upper Marysville trough comes from ground water (Larson and Marti 1996). In this area, the water table is very close to the ground surface most of the year. In the summer, the water table maintains base flow. In the winter the high water table causes flooding. The high ground water has slowed development in this area.

Almost all of the land over the lower Marysville trough aquifer has already been developed, and there is pressure from development over much of the rest of the aquifer. As more of the watershed's surface area, especially the upper watershed, is covered with impervious surface, less water will reach the aquifer. With greater and more concentrated human activities occurring over the aquifer, it is increasingly likely that petroleum and chemical spills and other pollution will enter the ground water. The ground water in the upper Marysville trough already has high nitrate levels, but water quality in general is good (Larson and Marti 1996, USGS 1995).

Wetlands

Sixty wetlands were identified in this planning area during the Snohomish County inventory. Forty-five were on the hillside and plateau where there are highly saturated and inundated soils, especially near the headwaters of Quilceda and Middle Fork Quilceda creeks (Sheldon & Assoc. 1994). Closer to 67th Avenue NE, the wetlands are primarily on agricultural land.

The major impact to wetlands on the hillsides and plateau is from logging. Several large forested wetlands have recently been clearcut. Impacts to individual wetlands in this area include road construction, ditching, garbage dumping, clearing, and filling of the wetland and wetland buffer. Livestock grazing of wetlands was observed on ten farms (Bachert 1993).

Major impacts to wetlands in the Marysville trough are from draining and livestock grazing. Thirteen farms allow livestock to graze wetland habitat (Bachert 1993). Much of the upper portion of the Marysville trough was once wetland that was ditched and drained for agricultural purposes. Many of the ditches are filling in and the water table is rising. A considerable number of wetlands in the developed portion of the planning have been lost.

The estuarine wetland at the mouth of Quilceda Creek has received substantial impacts and even more will result when a new road is constructed on the southeastern portion of the wetland. A junk yard, drain pipes, garbage, and stormwater runoff were noted along this wetland (Halpin et al. 1991).

Based on an analysis of both old and new data (Sheldon & Associates 1994) in the planning area, most wetlands provide moderate value for flood storage functions. Wetlands providing the highest storage functions were located on the hillsides and plateau. Many of the inventoried wetlands throughout the planning area appear to function well for water quality and provide baseflow support. Wetlands provide the source of the mainstem Quilceda, Middle Fork, and other smaller streams and are critical to maintaining these stream systems. Small adjacent wetlands occur along Olaf Strad and Edgecomb creeks. The forested swamps provide excellent wildlife habitat. Species like red-legged frogs, beavers, and pileated woodpeckers have been observed in these wetlands (SWM 1993).

Wetlands in the Marysville trough provide water quality, baseflow support, and habitat functions. The few forested wetlands provide habitat islands in this area, and the estuarine and intertidal wetlands at the mouth of Quilceda Creek are very important to fish and wildlife in the Snohomish River delta.

Flooding and Drainage

Drainage problems in this planning area are due to the lack of a conveyance system in the lower portion of the Marysville trough and the high water table, lack of slope, and long conveyance systems that run through back yards in the upper Marysville trough. The less developed hillside areas have fewer problems.

The upper portion of the Marysville trough has many drainage problems related to the difficulty in obtaining stormwater detention and infiltration in an area with a high water table and lack of slope to convey runoff into the creek or ground. This area has several infiltration systems, many of which have failed and are causing flooding at individual residences. Infiltration is successful in areas close to the creek where the ground water drops to the creek ravine, but in other areas the high ground water and siltation cause system failure. Flooding was less of a problem in the past when drainage ditches dug to lower the water table to drain farmland were maintained, and the area was less developed. Many farm fields are now fallow, and drainage ditches are no longer maintained. As a consequence, the water table and associated wetlands are being restored.

The lower portion of the Marysville trough has few conveyance systems. Here the water either soaks into the ground or into areas where fill has replaced the sandy soils, or stands on the road, in roadside ditches, or yards.

The hillsides are steep and many downhill roadside ditches are eroding. After the runoff rushes down these steep slopes to the flat areas near 67th Avenue NE, it has nowhere to go, causing flooding and siltation. The ditches along 67th Avenue NE are deep with steep side slopes. These ditches were constructed to drain farmland and protect the road, and they now present safety problems.

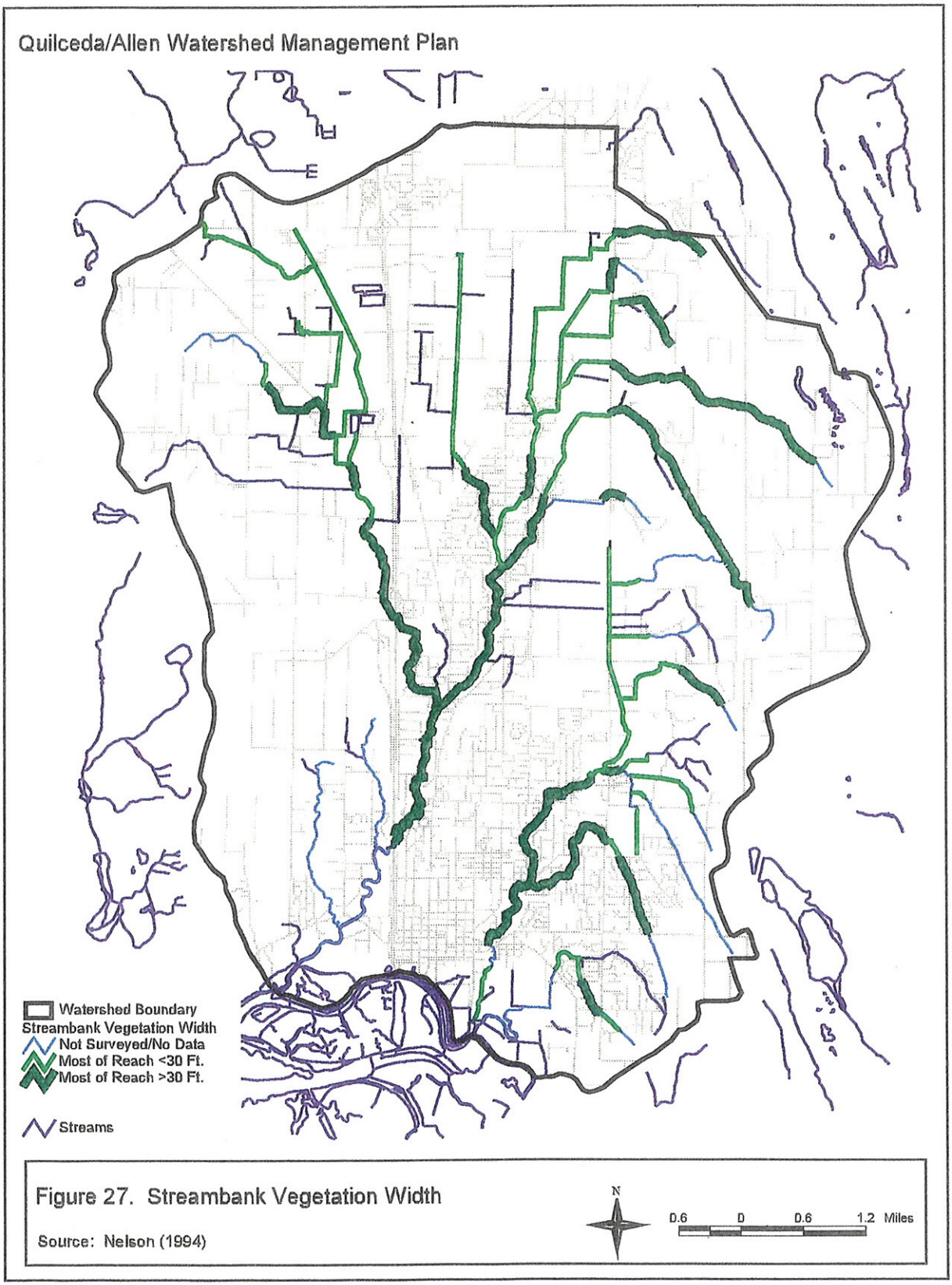


Figure 27. Streambank Vegetation Width

Source: Nelson (1994)

Management Recommendations for the Mainstem Quilceda Planning Area

Policies and Regulations

QC 1. Changes in Incompatible Shoreline/Zoning Designations

In lower Quilceda Creek, shoreline and zoning designations conflict. Snohomish County Planning and Development Services should consider revision the shoreline plan and zoning ordinance to resolve the problems caused by these conflicts.

QC 2. Encourage Hazardous Waste Free Businesses to Locate in Areas Over the Marysville Trough.

Businesses that do not pose a contamination threat to surface or ground water should be encouraged in the areas zoned for industrial and commercial development over the Marysville trough.

Acquisition and Enhancement (figure 29)

QC 3. Acquisition or Permanent Protection of Quilceda Headwater Forest and Wetlands (High Priority)

Jurisdictions should consider measures to protect forests surrounding and wetlands near the headwaters of Quilceda and Middle Fork Quilceda. Measures to be considered should include acquisition for use as a park, for timber management, or other uses that would provide permanent protection.

One of the most important issue in the Quilceda watershed is the retention of trees and wetlands. Currently there are approximately 3000 acres of forest land in the upper Quilceda and Middle Fork Quilceda sub-basins. Wetlands in these upper sub-basins are the source of Quilceda Creek and many of its tributaries. Wetlands in these upper areas are also some of the most pristine wetlands in the watershed, and they store tremendous volumes of water.

QC 4. Wetlands to Receive Permanent Protection

Several wetlands in this planning area are recommended for permanent protection. Watershed staff should work with the landowners to determine whether they are willing to sell the wetlands either independently or as part of the recommendation specified in QC 3.

MQ-3 is a forested wetland located in the upper Marysville trough. It is owned, at least in part, by the Washington Department of Wildlife. It is one of the larger wetlands in that area and has a diversity of habitat types, which provide important wildlife habitat and significant water quality improvements.

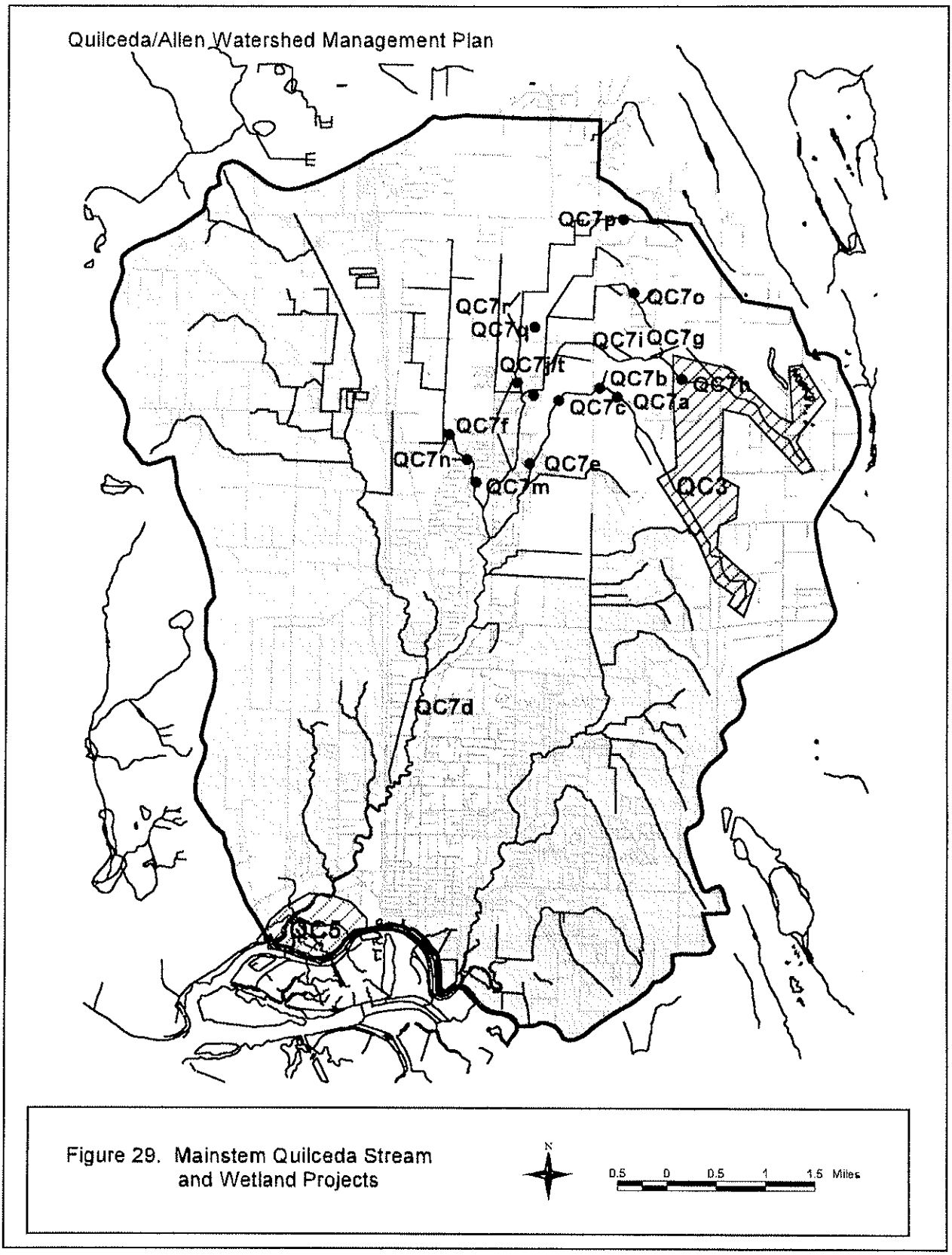


Figure 29. Mainstem Quilceda Stream and Wetland Projects

MQ-13 is the estuarine wetland at the mouth of Quilceda Creek and associated intertidal wetlands along the creek. This wetland is large; it supports a rare plant species, has a diversity of habitat types, contributes to the protection of an important wildlife corridor along Quilceda Creek, and performs baseflow support and water quality functions for the creek. This wetland needs to be cleaned of garbage and a strategy developed to keep the buffer intact and to minimize the impacts of the planned new road. Despite the impacts, this wetland is one of the finest estuarine wetlands along the entire West Coast (see QC 5).

UQ-14 and UQ-27, 28 and 29 are all wetlands near the headwaters of Quilceda or Middle Fork Quilceda creeks. UQ-14 is a large, fairly pristine wetland with diverse habitat types occurring near the Middle Fork headwaters. UQ-27 and 28 are small and UQ-29 large, but all have high values as wildlife habitat and for providing floodwater abatement and baseflow support. Other wetlands in this planning area that should be considered for permanent protection include UQ-34 and UQ-45, both are large wetlands also near the Quilceda Creek headwaters.

QC 5. Establishment of Tribal Wildlife Refuge

The Tulalip Tribes should establish a tribal wildlife refuge to protect and increase public awareness of the value of the estuarine wetland at the mouth of Quilceda Creek for fish and wildlife habitat and for cultural and recreational use.

The estuarine wetland at the mouth of Quilceda Creek provides some of the best fish and wildlife habitat in the Snohomish River basin. The wetland is a popular hunting and fishing area, and also has particular value for tribal members.

QC 6. Wetland Buffer Enhancement

SWM Watershed Steward should work with landowners to protect and where needed, enhance wetland buffers in the upper planning area. Wetlands for enhancement should be prioritized through the Coho Recovery Plan.

By protecting and enhancing the wetlands in the upper planning area, habitat could be improved.

QC 7. Potential Stream Projects to be Evaluated in Coho Recovery Plan (see Q/A 62)

The following projects should be evaluated and prioritized in the coho recovery plan:

Mainstem Quilceda

a) Determining whether creating structural diversity in the stream would benefit the channeled area just east of 67th Avenue NE along Wade Road.
b) Replanting the left bank just to the east of 67th Avenue NE.
c) Completing fencing and replanting the stream in the agricultural area just west of 67th Avenue NE.

d) Improving rearing habitat from RM 2.25 to RM 4.35 by adding structural diversity.
e) Replanting and clearing garbage along streams in residential areas north of 132nd Street NE.
f) Analysis of beaver dam obstruction from RM 0.9 to 1.37.

Middle Fork Quilceda

g) Replanting streambanks in logged areas.
h) Modifying the culvert near 81st Avenue NE.
i) Improving spawning habitat in upstream reaches between RM 2.93 and 3.8.
j) Replanting and clearing garbage along stream in residential areas near 143rd Street NE. (A stream team has been formed in this area.)
k) Experimenting with creating structural diversity in channeled sections of stream throughout agricultural areas to improve fish habitat.
l) Revegetation of streams in agricultural area.
m) Evaluation of streambank erosion north of 23rd Street NE.
n) Augmenting riparian plantings along the two new habitat enhancement projects at 47th Place NE and 136th Street NE.

Olaf Strad Creek

o) Replanting sections of stream where riparian vegetation is absent.

Edgecomb Creek

p) Continued analysis of the culvert under 172nd Street NE that discharges water from 172nd and of a portion of the Glen Eagle development at the top of the ravine to determine whether erosion problem has been corrected.
q) Unplugging the culvert under the railroad tracks north of 152nd Street NE.
r) Assessing the advisability of dredging the channel from the railroad tracks to 152nd Street NE.
s) Replanting streams in agricultural areas.
t) Replanting and clearing garbage along stream in residential areas near 143rd Street NE. (A stream team has been formed in this area.)

Drainage System Projects (figure 30)

QC 8. 108th Street NE and Shoultes Road Culvert Replacement

The discharge at the 108th and Shoultes Road outfall is causing severe erosion of the streambank down to the stream itself, causing sediment input to the stream and streambank destabilization. This culvert needs to be replaced by SWM and the streambank rehabilitated. This project should be considered for prioritization on the capital improvement project list. In addition, other outfalls in this particularly sensitive area should be checked to determine if the same problem exists and if other culverts need replacement.

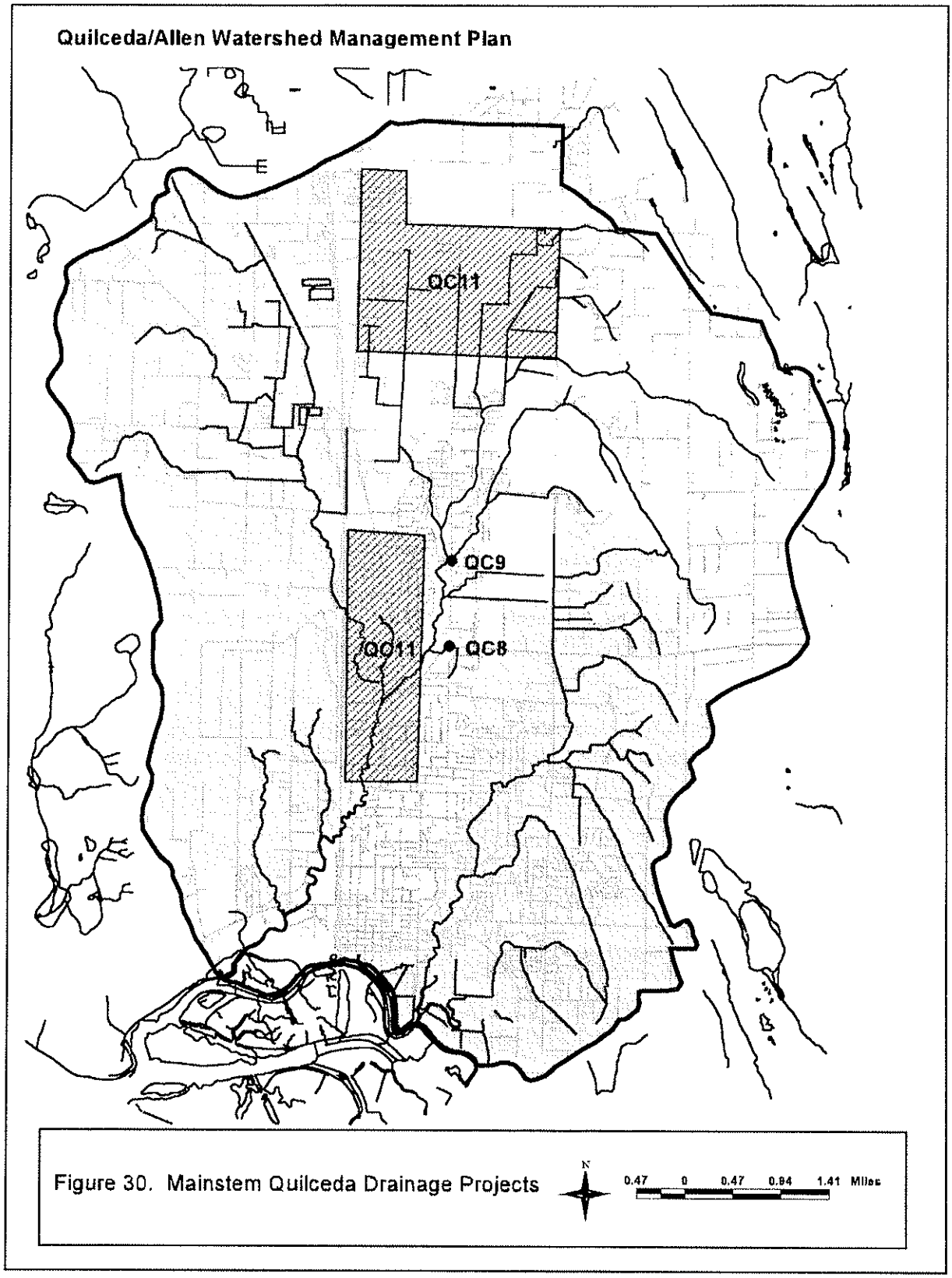


Figure 30. Mainstem Quilceda Drainage Projects

QC 9. Shoultes Road at 122nd Street NE Street Culvert Replacement

The culverts under 51st street NE are beginning to fail and need to be replaced by SWM. This project should be considered for prioritization on the capital improvement project list.

QC 10. Correction of Erosion Problems at Outfalls

A number of erosion problems associated with outfalls were noted during the outfall inventory conducted by SWM (see figure 16, page 59). These erosion problems should be evaluated and prioritized for correction.

QC 11. Development of Master Drainage Plans

Appropriate jurisdictions and landowners should consider developing master drainage plans to deal with stormwater conveyance. This is often a problem in the flat portions of this planning area because of high ground water, potential for flooding, and sensitive streams and wetlands.

The plans should propose infiltration facilities, identify methods for cleaning the water before infiltration, and establish ways to protect wetlands and stream habitat. The plans should include alternative proposals that would maintain areas of forest or open space. The following areas need planning:

- The area north of 172nd Street NE to 188th Street NE; east of Interstate 5 (I-5); and west to 43rd Avenue NE, and the area south of 172nd Street NE to 136th Street NE and from I-5 to 67th Avenue NE, including the Smokey Point and Edgecomb Creek areas. A portion is currently zoned industrial; other land use changes are anticipated.

- The area between 123rd Street NE south to 76th from I-5 to east to 51st Avenue NE has an inadequate drainage system that causes flooding.

QC 12. Jubie Addition Drainage Upgrade

Correction of street flooding problems resulting from inadequate stormwater drainage should be considered and prioritized on the capital improvement project list.

Jubie Addition conveyance system near 95th Street NE has insufficient capacity and slope to accommodate the stormwater runoff, and detention facilities do not function because of high ground water. As a result flooding occurs at the intersection of 95th Street NE and 67th Avenue NE.

West Fork Quilceda Planning Area

Description

The West Fork Quilceda planning area is approximately 11 square miles occupying the northwest portion of the watershed. The sub-basin includes both reservation and nonreservation lands. The western portion of the planning area is characterized by steep slopes, while the central and eastern portions contain moderate slopes or flat topography. The area soils are till on the slopes and outwash, mainly Norma/Custer, in the flat Marysville trough.

The West Fork Quilceda and several tributaries to the West Fork headwater in this planning area. Unlike other portions of the watershed, few stream segments are protected by steep ravines.

Land use consists of low to moderate density rural residential, agricultural, and a small forested area. Future densities in this planning area are under discussion, but it is likely that a portion of the land will remain low density, while areas closer to Interstate 5 (I-5) may have increased residential densities, as well as commercial development.

Water Quality Issues

Water quality problems are not as severe in this sub-basin as compared to other areas. Bacteria concentrations were found to be moderately high and dissolved oxygen levels low (Thornburgh 1994). Nutrients and sediment levels in the West Fork sub-basin were significantly lower than at other sites. Urban runoff will be a problem as this area develops. Already there are a number of direct discharges to streams. There were no known hazardous sites or leaking underground storage tanks in this planning area.

Sediment

Sediment levels measured in the West Fork Quilceda Creek were low compared to other sub-basins (Thornburgh 1994). However, fine sediment in the West Fork was noted as a cause for concern because of its affect on instream salmon habitat (Nelson 1994). Stream water in the West Fork is noted for its milky appearance. The source may be fine clay sediment leaching into stream water from ground water sources.

Approximately 155 acres have been or will be converted from forest in the West Fork planning area. Development has occurred on the Tulalip hillside, resulting in the removal of much of the forest there. However, development is slow compared to other portions of the watershed due to the high water table and lack of infrastructure. Sediment input to the streams in this area comes from development activities as well as livestock access, ditching, and dirt biking. Farmers in the upper planning area continue to dig new ditches to lower the water table. This ditching

activity, along with maintenance activities in ditches, may be a major sediment source.

Erosion has been noted at several outfalls discharging into the West Fork along the major streets from 172nd Street to 140th Street NE, and along the tributary to the West Fork at the intersection of Forty-Five Road and 23rd Avenue NE (see figure 16, page 59) (Leif 1994). Scouring of the streambank and stream channel also occurs at the culvert under 116th Street NE at the Interstate 5 intersection. These sources of erosion also produce sediment.

Nutrients and Bacteria

Nutrients in the West Fork sub-basin were significantly lower than at other sites during the dry season and lower than most of the other sites during the wet season. Dissolved oxygen levels were low in 15 percent of the samples taken from this sub-basin. Bacteria levels were rated as moderate as compared to other sub-basins (Thornburgh 1994). Although both the Tulalip and SWM stream surveys found serious livestock waste problems in this area, there is a large land base in comparison to the number of livestock. There are four dairy farms with over 600 animals and about 100 smaller farms. Three of the dairy farms potentially have severe impacts to water quality and the fourth has moderate impacts; approximately one quarter of the smaller farms in this planning area potentially had impacts to water quality. Most of these impacts come from poor livestock waste management practices (Bachert 1993).

This planning area is mainly served by onsite septic systems. Septic problems can be expected, particularly in the Marysville trough section, because of old systems and a high ground water table.

Urban Runoff

The West Fork planning area has not yet urbanized, although a few large subdivisions have been constructed and more are planned. Impacts to streams similar to those of the mainstem Quilceda planning area can be expected as higher house densities are built along the streams. Problems such as stream channel filling, increased pollutants in runoff, and yard waste and garbage dumping may be more serious in this planning area because many streams are not buffered by ravines or vegetation.

Within the West Fork Quilceda system, 84 direct discharge were located along the streams during the water quality study conducted by The Tulalip Tribes (Halpin et al. 1991). The types of direct discharge recorded were storm drains, agricultural and other drainage ditches, and drainage pipes.

In this planning area, roads cross streams in at least 14 sites including I-5. Lead levels consistently violate state standards in the streams, and copper levels were in violation in 10 percent of the water quality samples (Thornburgh 1994). Oil was

observed at several stormwater drainage outfalls along 140th Street NE and 23rd Avenue NE (see figure 16, page 59) (Leif 1994).

Water Resource Issues

Streams in the West Fork planning area provide important habitat for coho and chum salmon and resident cutthroat trout, and riparian areas provide vital wildlife habitat, especially where associated with forests and wetlands. The watershed's eastern portion lies over the Marysville trough aquifer, which helps to maintain summer stream baseflows. There are a number of forested wetlands, as well as a unique Labrador tea bog in this area.

Stream Habitat

Both coho and chum salmon spawn in the West Fork and its tributaries (see figure 12, page 37). SWM surveyed about seven miles of the West Fork stream habitat and just over three miles of West Fork tributaries. About 90 percent of the spawning habitat in the West Fork occurs downstream of 140th Street NE (Fire Trail Road). Spawning habitat occurs over a one mile reach in the West Fork downstream and upstream of I-5; scattered spawning occurs elsewhere.

Stream survey results indicated high sand and silt levels in the spawning habitat (see figure 26, page 129). These heavy sediment loads were the result of dirt bike activity in the lower West Fork and channel dredging in the upper West Fork. Dirt bike trails go along the West Fork and cross the stream in several places. The streambanks are unstable because of sandy soil and ground water seepage into the banks. The dirt bikes have demolished the streambanks at the crossings.

Pools were the dominant habitat type in this stream system, resulting from low stream gradients and ditching. Rearing habitat exists throughout this planning area with variable quality. When compared with other streams in the watershed, only 13 percent of the stream was given a rating of good or very good by Nelson (1994); 42 percent was rated poor. Low to moderate habitat diversity, low fish abundance, and poor riparian buffer conditions were found in stream reaches rated poor.

A number of tributaries to the West Fork were not surveyed in this planning area. Some are considered to have salmon and trout rearing habitat, including Indian Creek, the left bank tributary just east of I-5 (WRIA 07-0050), and an unnamed right bank tributary just above 128th Street NE (no WRIA number). Cutthroat trout have been observed in these streams, and chum salmon fry have been seen in the tributary above 128th. Beaver dams occur along the West Fork north of 116th Street NE. These dams benefit the stream by ponding water, collecting sediments, and providing salmon resting areas.

Stream Flows

Stream flows in this planning area are expected to increase in the future, but somewhat less than in other Quilceda and Allen creek sub-basins. Many of the slopes are not as steep as other sub-basins and at least a portion of each sub-basin is in outwash soils. These factors help to mitigate increases in runoff by slowing and infiltrating the water. The greatest increase in flows are predicted to occur in the Upper and Lower West Fork sub-basins.

Riparian Habitat

Riparian habitat along the West Fork is limited to areas where forest patches or forested wetlands occur along the stream (see figure 27, page 134). The riparian habitat could be improved substantially to increase its value as fish and wildlife habitat. Trees dominate streambank vegetation downstream of 140th Street NE along the West Fork; above that area, grasses and blackberries prevail. The size of the buffer was also greater below 140th Street. Streams above 140th flow through agricultural land. These streams have little habitat diversity because of the lack of a riparian corridor and straightened channels.

Ground Water

Two aquifers are found in this planning area--the Tulalip and the Marysville trough. As in other areas of the Marysville trough, the water table is very close to the ground surface at almost all times of the year and very likely maintain summer base flows in streams. In winter, the water table rises during wet periods often causing flooding. This high water table causes development constraints.

Wetlands

Forty-four wetlands were identified in this planning area during the Snohomish County inventory. Most of the known wetlands are in the lower portion, with only one identified on the hillside (Sheldon & Associates 1994). Most wetlands were from one to five acres in area. The hillside wetland is surrounded by rural residential, forest, and agricultural areas. Most of the wetlands in the middle portion of the planning area are in rural residential areas, and in the lower portion of the planning area wetlands are bordered by forest, rural residential, or suburban land uses.

Based on an analysis of both old and new data (Sheldon & Associated 1994) in the planning area three wetlands had high values for flood storage; most other wetlands had moderate flood storage value. Most wetlands in the planning area also provide important water quality functions.

Wetlands also provide baseflow support and wildlife habitat. Several forested wetlands are located along the West Fork and its tributaries, and a substantial wetland system occurs along the lower reaches of the West Fork near its confluence with Quilceda Creek. Most of the West Fork is lined with adjacent wetlands.

Major impacts to wetlands are from agricultural practices and wetland draining. Eighteen farms allow livestock grazing or livestock access to wetlands.

Flooding and Drainage

Fewer drainage problems have been reported in this planning area because of the limited amount of development. Streams in the planning area have been channeled, and channels have been dug to drain farmland in areas where the water table is high. In recent years some of the channels have not been maintained because farming is declining, and flooding generally results. Because the planning area has little slope and a high water table, water during storm events tends to spread out over the land. Serious roadside flooding occurs along 23rd Avenue NE.

Development on the hillside to the west in the planning area may result in flooding downstream as stream flow volumes increase with development. Attempts to continue to construct large housing developments on areas with a high water table could result in additional flooding of crawl spaces and yards.

Management Recommendations for the West Fork Planning Area

Policies and Regulations

WF 1. Tulalip Reservation Watershed Management Area

A surface water utility similar to the county's and Marysville's Watershed Management Area should be established on the Tulalip Reservation to provide funding for comprehensive management of flooding and drainage problems, detention pond maintenance and inspection, and water quality. This utility would extend from 140th Street NE into the Sturgeon Creek Planning Area to Ebey Slough and west along the Quilceda/Allen watershed boundary.

There are currently no funds available to address stormwater problems on the Tulalip Reservation. As a result, Snohomish County Surface Water Management handles few drainage problems on the reservation. At the present time, stormwater problems are minimal because of limited development. However, future plans for the area include major development.

Acquisition and Enhancement (figure 31)

WF 2. West Fork Quilceda Enhancement and Flood Reduction Project

A SWM project to reduce road flooding and improve water quality, while protecting and enhancing aquatic habitat, should be considered for prioritization on the capital improvement list along the West Fork Quilceda Creek south of 140th Street NE.

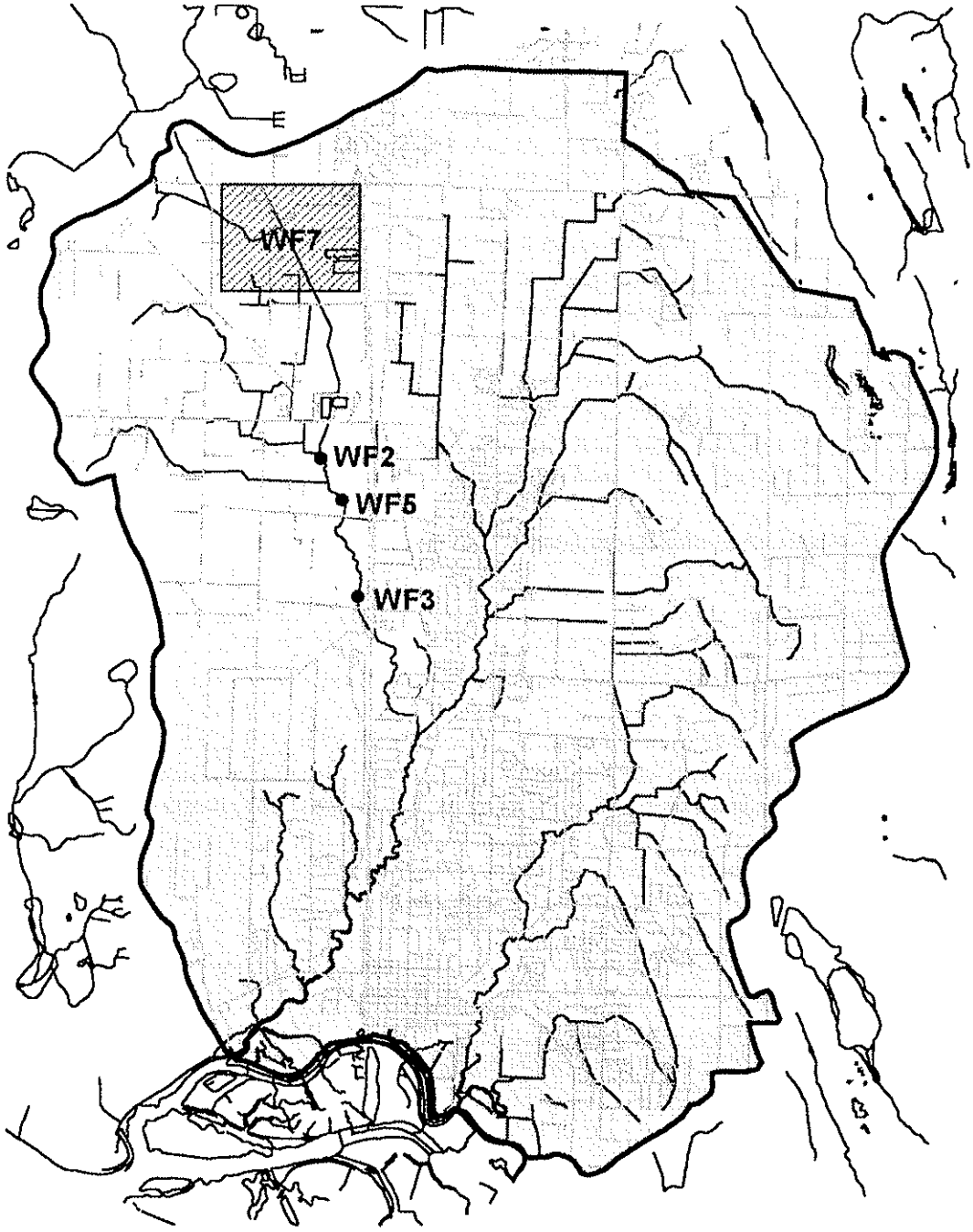


Figure 31. West Fork Quilceda Projects

Because the stream is clogged with vegetation and has a number of beaver dams, the creek channel not only floods the fallow farm fields, but also backs water up throughout the system and floods over 23rd Avenue NE.

WF 3. Discontinuance of Dirt Biking Along the West Fork Quilceda Creek

The Tulalip Tribes is requested to work with the property owners to prevent dirt biking along the West Fork Quilceda Creek.

Many individuals ride dirt bikes on land owned by tribal members along and across the West Fork Quilceda Creek near 116th Street NE. Dirt bikes erode streambanks and stir up sand, which settles in salmon spawning areas.

WF 4. Wetlands Identified for Acquisition and Preservation

Two wetlands in this planning area have been identified for acquisition and preservation. These wetlands are owned by private parties, and watershed staff should work with these landowners to determine their willingness to sell or otherwise preserve these wetlands.

The bog wetland (WF-20) and a large forested wetland located along a tributary to the West Fork (WF-36) are recommended for permanent protection (Sheldon & Associates 1994). A large wetland with a bog component is located in the middle of the planning area. The wetland has been ditched, and the bog habitat is beginning to dry. The hydrology could readily be restored to this wetland. This wetland is close to the Lakewood High School and could be used as an educational resource, providing a valuable restoration experience for students.

The forested wetland is recommended for protection for its large size, dense diversity of native plant species, importance for wildlife habitat, and high value for flood storage.

WF 5. 128th Street NE/West Fork Enhancement

The work of The Tulalip Tribes to enhance the section of the West Fork north of 128th Street NE should be completed.

Livestock have access to the stream, and riparian vegetation is needed to shade out Reed canarygrass north of 128th Street. The Tulalip Tribes is already working with landowners to fence the stream and restore the riparian area.

Monitoring

WF 6. Logging Operation Monitoring

The Tulalip Tribes with the assistance of watershed citizens and watershed staff should monitor logging operations along the West Fork and its tributaries to make sure that logging operations are not negatively affecting streams and wetlands.

Logging operations can often cause sediment input to streams and destabilize streambanks.

Drainage System Projects (see figure 31)

WF 7. Development of a Master Drainage Plan for the Twin Lakes and Upper West Fork Areas

Development of a master drainage plan for the Twin Lakes and Upper West Fork areas should be considered to address stormwater problems before development creates additional problems.

Stormwater conveyance is already a problem in this area because of the high ground water, flat topography, flooding, and sensitive streams. This is an area designated for increased density. The drainage plans for this area should propose infiltration facilities, identify methods for cleaning the water before infiltration, and establish ways to protect wetlands and stream habitat.

Sturgeon Creek Planning Area

Description

The Sturgeon Creek planning area is approximately 6 square miles and occupies the southwest portion of the watershed. The entire planning area is on the Tulalip Indian Reservation; the western portion contains steep slopes, while the eastern portion is flat. Soils in this area are till on the slopes and outwash, mainly Norma/Custer, in the flat Marysville trough.

Sturgeon Creek, an unnamed tributary to Quilceda Creek (WRIA 07-0048), and an unnamed, unnumbered creek occur in this planning area with their source being in the Marysville trough. The unnumbered creek is a very short, lower Quilceda tributary located near the mouth. The other two streams are enveloped by deep wide ravines with intertidal wetlands lining the channels for a substantial portion of their lengths.

Land use consists of high density residential along lower Sturgeon, and industrial land use and forestry in the upper portion of the planning area. Medium density residential development is expected to occur along the unnamed creek, and development close to I-5 is expanding rapidly. Development proposals include plans for a business park in the vicinity of the Boeing Test Site property just south of 116th Street SE and a new casino with associated service facilities north of the 88th Street NE interchange. This area represents the major urban corridor supporting business and economic growth for The Tulalip Tribes. The watershed's most drastic and rapid changes in land use will occur in this planning area.

Water Quality Issues

Water quality problems are not as severe in this relatively undeveloped planning area compared to other planning areas. There are few farms to contribute bacteria, but problems from old, unmaintained septic systems are likely. Construction of residential housing along lower Sturgeon is already occurring and is expected to move to the unnamed creek as well. As development accelerates related pollutants such as sediment and bacteria will increase. The Tulalip Tribes simulated water quality and quantity problems using hydrologic modeling on the unnamed tributary (Taylor 1993).

Sediment

Approximately 50 acres along Sturgeon Creek will be converted from forest to residential development. Logging has occurred extensively in the planning area, adding sediment to the streams. Sedimentation clogs fish gills and covers bottom habitat. Sediment may build up in the low gradient stream channel.

Nutrients and Bacteria

Monitoring identified high nitrate and phosphate levels in the unnumbered creek, which is downstream of the Marysville West residential development and three small farms (Halpin et al. 1991). Elsewhere, bacteria and nutrient levels were low. Only twelve small farms are in this planning area, most with one to three horses. Two of these farms, one with 20 horses on eleven acres, were rated as having impacts to water quality associated with the unnumbered creek from stockpiling animal waste and poor pasture management (Bachert 1993). This area is served by onsite septic systems. Septic problems can be expected due to some older systems and the high ground water table. Evidence of septic failure was noted at two locations on lower Sturgeon Creek (Halpin et al. 1991).

Urban Runoff

The Sturgeon Creek planning area has not yet urbanized, although residential development is expanding along Sturgeon and the unnamed creek (WRIA 07-0048), and business park and industrial development will occur along the I-5 corridor. Water quality modeling of the unnamed stream found that pollutant loading would increase dramatically during urbanization (Taylor 1993). Potential increases in metals, sediment, and phosphates would be most significant. Other problems such as stream channel filling, increased pollutants in runoff, and yard waste and garbage dumping may become more severe as more homes and businesses are built along the stream.

Within the Sturgeon Creek system, at least 13 direct discharge sources were found along the streams (Halpin et al. 1991). Most of the discharges were along the Boeing Test Facility where petroleum was noted in the stream water.

In this planning area, roads cross streams in only a few places. The new 88th Street NE intersection of I-5 crosses over the unnamed tributary. Water quality facilities are being incorporated into the construction design of this intersection.

Hazardous Waste

The Boeing Test Site facility was listed in the Affected Media and Contaminants Report of hazardous sites prepared by Ecology. The site is a fuel storage area and could be a leachate contamination source. Petroleum spills have occurred at this facility in the past.

Solid Waste and Garbage

The lower reaches of Sturgeon Creek contain a substantial amount of solid waste and garbage.

Water Resource Issues

The streams in the Sturgeon Creek planning area provide important rearing habitat for salmon and trout, and the wide forested riparian areas along the streams provide wildlife habitat. The planning area's eastern portion lies over the Marysville trough aquifer, which helps to maintain stream baseflows. There are a number of forested and intertidal wetlands in this planning area.

Stream Habitat

Although the streams in this planning area do not provide spawning habitat, they do have important rearing habitat for salmonids. Intertidal wetlands occur along the length of both Sturgeon Creek and the unnamed tributary to Quilceda Creek. These streams were not surveyed by SWM, but should be examined in the future for their values for fish.

Stream Flows

Stream flows are expected to increase with future development. Hydrologic modeling of the unnamed tributary in this planning area, found that peak runoff rates and volumes will increase dramatically in the future (Taylor 1993). Streamflows were predicted to be more forceful and sporadic, potentially causing channel scour and downstream sediment deposition problems.

Riparian Habitat

The riparian corridor along Sturgeon Creek currently has some of the best habitat in the watershed, mainly because a substantial amount of forested land remains in the stream's upper sections.

Ground Water

Two aquifers are found in this planning area, the Tulalip aquifer on the hillside and the Marysville trough in the central plain. As in other areas of the Marysville trough, the water table is very close to the ground surface at almost all times of the year and provide baseflow to streams. In the winter, the water table rises causing flooding. Under current Tulalip land use planning, about 50 percent of the upper planning area in the Marysville trough will become impervious surface. Recharge to the aquifer will be limited and will probably affect water quantity in the streams.

Wetlands

Some of the largest and most pristine watershed wetlands are found in this planning area. However, many wetlands have been filled or are being degraded or eliminated due to logging, agriculture, and residential development. Eighteen wetlands were identified in this planning area during the Snohomish County inventory; several additional wetlands were mapped by The Tulalip Tribes. All the

wetlands were in the flat Marysville trough and surrounded at least partly by forest (Sheldon & Associates 1994).

Most wetlands in this planning area provide what is considered moderate value for flood storage functions, but are important for water quality functions because of their size and the vegetation density. Wetlands provide baseflow support, especially the extensive wetland systems along both Sturgeon Creek and the unnamed tributary.

Flooding and Drainage

Few drainage problems have been reported in this planning area because of the limited amount of development. The infrastructure along in the lower portion of the area is old and requires continuous maintenance.

Management Recommendations for the Sturgeon Creek Planning Area

Acquisition and Enhancement

SC 1. Wetland Recommended for Acquisition and Preservation

The wetland adjacent to Sturgeon Creek is recommended for permanent protection.

This wetland is large and supports a diversity of habitat types, with high values for water quality, flood storage, habitat, and baseflow support functions.

SC 2. Potential Stream Projects for Consideration in the Coho Recovery Plan (see Q/A 62, page 99) (figure 32)

The following projects should be evaluated and prioritized in the coho recovery plan:

- Cleaning up the stream along lower Quilceda and Sturgeon creeks.
- Monitoring the riparian vegetation along the two tributaries of Quilceda Creek to make sure it remains intact.
- Conducting a habitat study of Sturgeon and the unnamed tributary to Quilceda Creek (WRIA 07-0048).

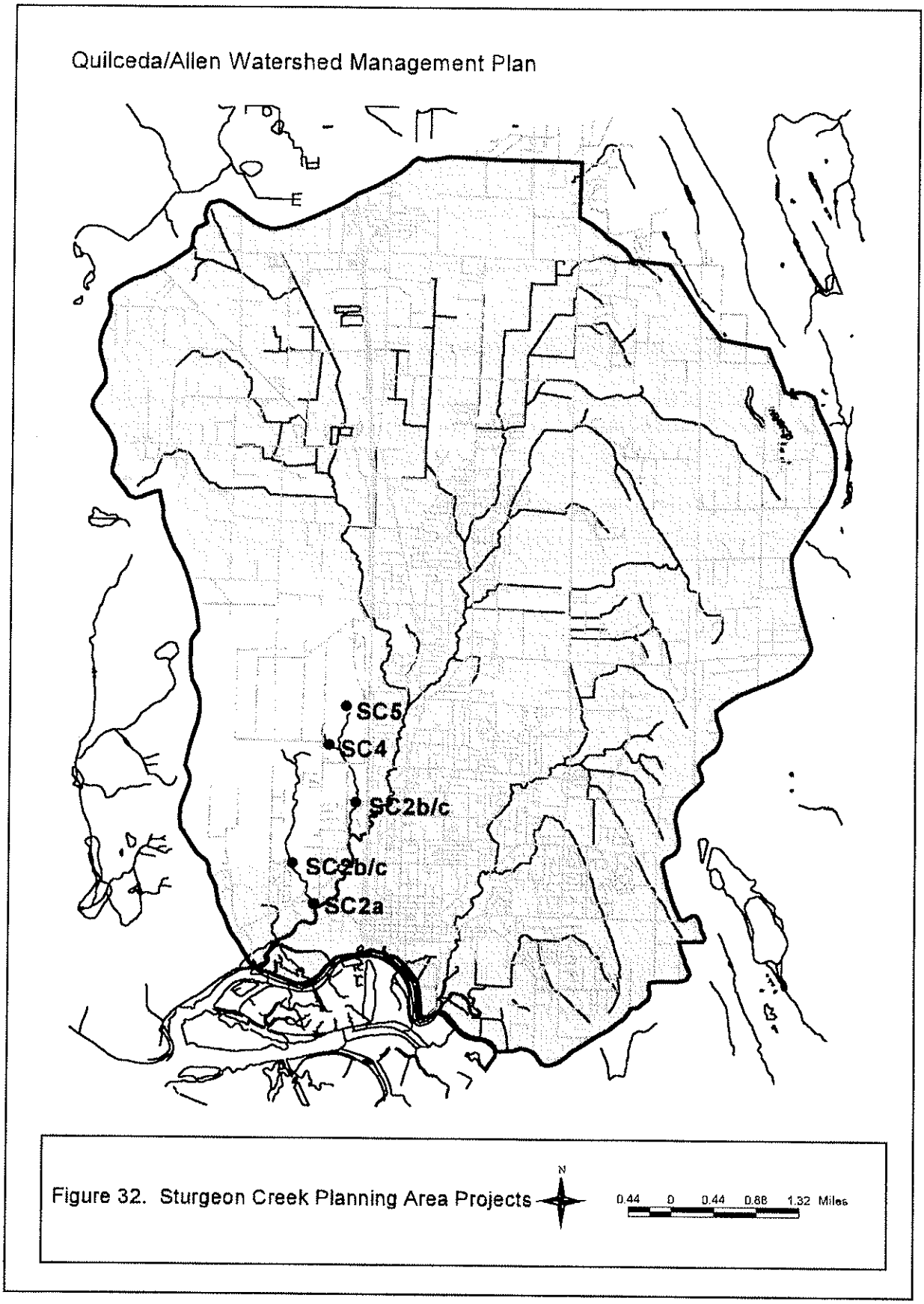


Figure 32. Sturgeon Creek Planning Area Projects

Monitoring

SC 3. Logging Operation Monitoring

The Tulalip Tribes with the assistance of watershed citizens and watershed staff should monitor logging operations in the upper Sturgeon Creek area to make sure that logging operations do not harm streams and wetlands.

Logging operations often cause sediment input to streams and destabilize streambanks.

SC 4. Monitoring of Boeing Test Facility Stormwater Plan

Water quality monitoring by The Tulalip Tribes should continue on the unnamed tributary (WRIA 07-48) that drains the site to insure that best management practices (BMPs) are in place and working to prevent petroleum spills at this site.

The area has a high water table; contamination of the ground and stream water could occur, immediately affecting lower Quilceda Creek and Ebey Slough.

SECTION 6. IMPLEMENTATION

SECTION 6. IMPLEMENTATION

Introduction

This plan recommends 133 actions to address nonpoint pollution, water resource issues, and flooding and drainage problems in the Quilceda/Allen watershed. Several management recommendations have already been completed; some are currently underway. Most will be implemented over the next several years. The following are included in the implementation strategy:

- Management strategies to be implemented by each entity.
- Implementation schedule.
- Cost of management programs.
- Funding sources.
- Provision for public involvement.
- Time frame for achieving plan objectives.
- Method for evaluating overall effectiveness of the plan.
- Process for annual review.

Plan implementation will include improved cost estimates on all actions and final decisions on funding options. Progress on the plan will be tracked and evaluated, and the plan revised when needed. These issues are discussed in more detail in the following sections.

Preliminary costs for planned one time management actions are about $21,500,000. Approximately $19,500,000 represents acquisition costs. Preliminary costs for annual actions range from about $750,000 to $1 million. These projected costs currently exceed the revenue sources that local jurisdictions now dedicate to these types of problems in the watershed, and funding opportunities will be sought to finance the plan recommendations. Implementation of all management recommendations is contingent upon obtaining funding.

Implementation Strategy

Implementation Entities and Schedule

Snohomish County Surface Water Management Division (SWM) will be the lead agency responsible for coordinating implementation of 103 watershedwide and 30 planning area actions. Other key agencies involved include the cities of Marysville

and Arlington, The Tulalip Tribes, Snohomish Health District, Snohomish Conservation District, and Snohomish County Planning and Development Services. In all, 15 different agencies, local governments, tribes, and interest groups are identified as having some part in implementing the plan recommendations. Table 9 lists the recommended actions for key implementing agencies, with a proposed schedule for project initiation during the five year period 1996 through 2001.

Implementation Costs

Cost estimates are included as a planning tool to assist in budgeting. Costs are one-time or annual costs; many have both. One-time costs are typically associated with specific construction projects but may also be associated with new programs. Such actions can be prioritized and phased into the corresponding jurisdiction's capital improvement or planning program over a period of years. An example of a one-time cost would be stream restoration, land acquisition, or culvert replacement projects. Annual costs reflect operating costs including additional staff, maintenance, public involvement and education programs, storm system maintenance, and new programs. Table 10 identifies estimated costs for actions included in the plan.

Potential Sources of Revenue

Implementation of plan actions are contingent on available funding and the ability of the individual implementing entities to incorporate and prioritize the actions into their existing programs and budgets. The total projected costs for plan implementation exceed the revenue sources of the major implementing entities. Possible revenue sources are listed below to help fund implementation of the Quilceda/Allen Watershed Management Plan.

Watershed Management Areas

The county began collecting WMA fees for that part of the Quilceda/Allen watershed outside the Tulalip Reservation in 1990 (see figure 17, page 62). The county collects WMA fees for the city of Marysville and pays the city their proportional share. The WMA fee is $30 for residential homes; commercial and industrial property is assessed on a sliding scale depending on the percentage of impervious surfaces on the property. The WMA program is administered by SWM.

In 1995, the Quilceda/Allen WMA generated approximately $247,000 in the county portion of the WMA. County WMA revenues can be expected to decrease significantly since much of the WMA is within the urban growth boundary and will eventually be annexed by the cities of Marysville or Arlington. Current WMA fees generated from the Quilceda/Allen watershed are dedicated to existing SWM

Table 9. Implementation Schedule

ID Number	Project Initiation	Management Recommendations	Implementing Entity
High Priority Management Recommendations			
Ongoing			
Q/A 24	Ongoing	Development and Implementation of Farm Plans	SCD
Q/A 25	Ongoing	Preventing Livestock Damage to Streams and Wetlands	SCD
Q/A 26	Ongoing	BMPs Specific to Small Farms	SCD
1998			
Q/A 1	1998	Watershedwide Onsite Stormwater Standards	All Jurisdictions
Q/A 3	1998	Marysville Trough Stormwater Management Through Infiltration	All Jurisdictions
Q/A 17	1998	Erosion Control Ordinance	All Jurisdictions
Q/A 34	1998	Livestock Waste Composting and Recycling	Snohomish Co. Solid Waste
1999			
Q/A 2	1999	Stream and Flood Protection Standards	All Jurisdictions
Q/A 4	1999	Flood Prevention Standards	All Jurisdictions
Q/A 13	1999	Improving Stormwater Facility Maintenance	All Jurisdictions
Q/A 19	1999	Sediment Monitoring	Snohomish Co. SWM
Q/A 35	1999	Subsidy for Replacing Failed Septic Systems	SWM
Q/A 36	1999	Septic Maintenance Reminder Data Base	SHD
Q/A 63	1999	Watershed Restoration and Enhancement Work Force	All Jurisdictions
Q/A 76	1999	Wetland Inventory and Function and Value Assessment	Watershed Staff
Q/A 86	1999	Maintaining Recharge to Marysville Trough Aquifer	All Jurisdictions
2000			
Q/A 5	2000	Clearing Ordinance	All Jurisdictions
Q/A 8	2000	Retrofitting or Building Stormwater Facilities	All Jurisdictions
Q/A 18	2000	Timing Restrictions for Clearing and Grading on Getchell and Tulalip Hillsides	Snohomish Co. PDS, Marysville, Tulalip
Q/A 77	2000	Wetland Acquisition for Preservation	Watershed Staff
Q/A 87	2000	Critical Aquifer Recharge Designation	Snohomish Co. PDS
Q/A 96	2000	Recommendations for Stream and Wetland Corridors/Economic Incentives	All Jurisdictions
Q/A 97	2000	Buffers in Separate Tracts	All Jurisdictions
Q/A 102	2000	Add to Enforcement Staffing	Ecology/All Jurisdictions
2001			
Q/A 40	2001	Requiring Use of BMPs for Business that Use Toxic Chemicals	All Jurisdictions
Q/A 62	2001	Coho Recovery Plan	Snohomish Co. SWM
Q/A 78	2001	Wetland Enhancement (See Q/A 61)	Watershed Staff
Q/A 90	2001	Baseline Ground Water Study and Monitoring	SWM
Priority Management Recommendations			
Completed			
Q/A 46	Completed	Water Quality Ordinance	Snohomish Co. SWM

Table 9. Implementation Schedule

ID Number	Project Initiation	Management Recommendations	Implementing Entity
Ongoing			
Q/A 28	Ongoing	Incentives for Use of Agricultural BMPs	SCD
Q/A 57	Ongoing	Inventory of Illicit Discharges	Snohomish Co. SWM
1999			
Q/A 20	1999	Innovative Methods for Erosion Control	All Jurisdictions
Q/A 48	1999	Herbicide Spray Away from Streams and Wetlands	WSDOT/Cities
2000			
Q/A 14	2000	Developing Funding Sources for Facility Maintenance and Infrastructure Improvements	All Jurisdictions
Q/A 15	2000	Maintenance Incentives for Private Stormwater Facilities	All Jurisdictions
Q/A 23	2000	Road Ditching Standards	Snohomish Co. SWM/Rd. Maintenance
2001			
Q/A 27	2001	Loan Program to Support Use of Agricultural BMPs	SCD
Other Management Recommendations			
Completed			
Q/A 32	Completed	Model Fencing Project	SCD
QC 8	Completed	108th Street NE & Shoultes Road Culvert Replacement	Snohomish Co. SWM
QC 9	Completed	Shoultes Road at 122nd Street NE Culvert Replacement	Snohomish Co. SWM
QC 12	Completed	Jubie Addition Drainage Upgrade	Snohomish Co. SWM
WF 5	Completed	128th Street NE/West Fork Enhancement	Tulalip Tribes
Ongoing			
Q/A 9	Ongoing	Upgrading and Installing Stormwater Facilities on New Road Projects	Snohomish Co./WSDOT
Q/A 30	Ongoing	Farm Waste Management Seminars	SCD/WSU Cooperative Ext.
Q/A 31	Ongoing	Water Quality Workshops for Noncommercial Farmers	SCD/WSU Cooperative Ext.
Q/A 33	Ongoing	Involving FFA and 4-H in Agricultural Water Quality Programs	SCD/WSU Cooperative Ext.
Q/A 37	Ongoing	Information on Septic Operation and Maintenance	SHD
Q/A 39	Ongoing	Information on Pet Waste Disposal	Snohomish Co. Solid Waste
Q/A 51	Ongoing	Envirostars Recognition Program	Snohomish Co. Solid Waste
Q/A 52	Ongoing	Workshops on the Use of Toxic Chemicals in Gardening	Master Gardeners
Q/A 53	Ongoing	Information on Pesticides and Herbicides for Distribution to Local Businesses	Master Gardeners
Q/A 55	Ongoing	NPDES Business Assistance Program	Snohomish Co. SWM
Q/A 57	Ongoing	Information Distribution on Disposal Alternatives	All Jurisdictions
Q/A 61	Ongoing	Grant Program for Disposal of Stream Waste	Snohomish Co. Solid Waste
Q/A 65	Ongoing	Identification and Repair of Fish Blockages	All Jurisdictions
Q/A 67	Ongoing	Watershed Training	Snohomish Co. SWM
Q/A 68	Ongoing	Puppet Show and School Programs	Snohomish Co. Parks
Q/A 75	Ongoing	Placement of Signs along Stream, Stream Buffers, Wetlands, and Wetland Buffers, etc.	All Jurisdictions
Q/A 85	Ongoing	Wetlands as Field Classrooms	Watershed Staff/Steward

Table 9. Implementation Schedule

ID Number	Project Initiation	Management Recommendations	Implementing Entity
Q/A 92	Ongoing	Ground Water Model in Schools and at Jennings Park	Tulalip Tribes, Marysville Parks
Q/A 93	Ongoing	Ground Water Education in Workshops	Tulalip Tribes/SWM/ Adopt-A-Stream
Q/A 101	Ongoing	Providing Plants and Technical Assistance for Revegetation Projects	Snohomish Co. SWM/SCD
AC 3	Ongoing	Acquisition of Floodplain Land at Mouth of Allen Creek	Marysville/Tribes/SCD
WF 2	Ongoing	West Fork Quilceda Enhancement and Flood Reduction Project	Snohomish Co. SWM
WF 3	Ongoing	Discontinuance of Dirt Biking Along West Fork	Tulalip Tribes
SC 4	Ongoing	Monitoring of Boeing Test Facility Stormwater	Tulalip Tribes
1999			
Q/A 6	1999	Research and Development of New Infiltration Methods	Snohomish Co. PDS/SWM
Q/A 7	1999	Map Areas Where Infiltration Systems will Function Properly	All Jurisdictions
Q/A 22	1999	Monitoring Logging Operations	DNR
Q/A 45	1999	Emergency Spill Response Plan	Snohomish Co. Emergency Mgt.
Q/A 54	1999	Development and Distribution of Water Quality Material to New Homeowners	WMC
Q/A 60	1999	Stream Cleanup Activities	Snohomish Co. SWM
Q/A 64	1999	Relocation of Streams Away from Roads	Snohomish Co. Public Works
Q/A 71	1999	"Streamside Savvy" Booklet Distribution	Snohomish Co. SWM
Q/A 83	1999	Wetland Delineation in the Marysville Trough and Upper Quilceda/Upper Middle Fork Sub-basins	Snohomish Co. PDS/Marysville/Arlington
Q/A 73	1999	Watershed Interpretive Signs Along Centennial Trail	SWM/Snohomish Co. Parks
Q/A 79	1999	Agricultural Impacts to Wetlands	SCD
Q/A 80	1999	Technical Assistance to Wetland Landowners	Snohomish Co. SWM/SCD
Q/A 82	1999	Wetland Data Base Update	Snohomish Co. SWM
Q/A 99	1999	Forest Stewardship Programs	Watershed Staff/DNR
AC 2	1999	Garbage Clean-Up Along 67th Avenue NE	Marysville
AC 6	1999	Culvert Replacement Under 84th Street NE	Marysville Public Works
QC 1	1999	Changes in Incompatible Shoreline/Zoning Designations	Snohomish Co. PDS
QC 2	1999	Encourage Hazardous Waste Free Businesses to Locate in Areas Over Marysville Trough	All Jurisdictions
Q/A 89	1999	Additional Landslide Hazard Ordinance Sites	Marysville
Q/A 16	1999	Inspection of New Stormwater Facilities	All Jurisdictions
Q/A 103	1999	Hiring of Watershed Steward	All Jurisdictions
Q/A 66	1999	Hydraulic Permit Follow-up	Watershed Staff
Q/A 100	1999	Open Space and Tax Incentives to Maintain Forest	Snohomish Co. PDS
2000			
Q/A 10	2000	SWM as Provider of Stormwater Services	Snohomish Co. SWM
Q/A 11	2000	Accessing Stormwater Facilities	All Jurisdictions
Q/A 12	2000	Placing Stormwater Facilities in Tracts	All Jurisdictions
Q/A 21	2000	Guidelines for Grading Codes	All Jurisdictions
Q/A 29	2000	Private Ditching Practices	Snohomish Co. SWM/SCD

Table 9. Implementation Schedule

ID Number	Project Initiation	Management Recommendations	Implementing Entity
Q/A 41	2000	Pumping of Household Heating Oil Tanks	Watershed Staff
Q/A 42	2000	Workshops and Distribution of Fact Sheets on Independent Cleanup Process	Ecology
Q/A 43	2000	Water Quality Site Monitoring for Toxic Chemicals	Snohomish Co. SWM
Q/A 44	2000	Underground Storage Tank Survey	Ecology
Q/A 50	2000	Model Business Program	Snohomish Co. SWM
Q/A 56	2000	Storm Drain Stenciling	Snohomish Co. SWM
Q/A 70	2000	Watershed Management Area Fee Credits for Schools	Snohomish Co. SWM
Q/A 81	2000	Five Year Wetland Assessment	Watershed Staff
Q/A 88	2000	Landscaping Requirement to Promote Infiltration	All Jurisdictions
Q/A 94	2000	Information on Maintaining Recharge for Developers	Snohomish Co. SWM
Q/A 95	2000	Brochure on Increasing Recharge at Individual Home Sites	Snohomish Co. SWM
Q/A 98	2000	Lot Clustering	All Jurisdictions
AC 1	2000	Allen Creek Planning Area Wetland Restoration and Enhancement	Marysville
AC 7	2000	Development of Master Drainage Plan for Sunnyside Area	Marysville Public Works
QC 3	2000	Acquisition or Permanent Protection of Quilceda Headwater Forest and Wetlands	Snohomish Co. SWM
QC 4	2000	Wetlands to Receive Permanent Protection - Upper Quilceda (See Q/A 75)	Watershed Staff
QC 5	2000	Establishment of Tribal Wildlife Refuge	Tulalip Tribes
QC 6	2000	Wetland Buffer Enhancement	Watershed Staff
QC 11	2000	Development of Master Drainage Plans for Smokey Point and Edgecomb Creek	SWM/Marysville/Arlington
WF 1	2000	Tulalip Reservation Watershed Management Area	Tulalip Tribes
WF 4	2000	Wetlands Identified for Acquisition and Preservation - West Fork (See Q/A 75)	Watershed Staff
WF 6	2000	Logging Operation Monitoring - West Fork	Tulalip Tribes
WF 7	2000	Development of Master Drainage Plan for Twin Lakes and Upper West Fork	SWM/Marysville/Arlington
SC 1	2000	Wetlands to Receive Permanent Protection - Sturgeon (See Q/A 77)	Watershed Staff
SC 3	2000	Logging Operation Monitoring - Sturgeon	Tulalip Tribes
2001			
Q/A 8	2001	Retrofitting or Building Stormwater Facilities	All Jurisdictions/DOT
Q/A 38	2001	Pet Waste Ordinance	Snohomish Co./Arlington/Tulalip
Q/A 47	2001	Detergent Reduction Program	All Jurisdictions
Q/A 49	2001	Interdisciplinary Team to Assist with and Monitor BMPs	All Jurisdictions
Q/A 58	2001	Development of Brochure on Direct Discharges	Snohomish Co. SWM
Q/A 69	2001	Watershed Field Trips for Schools	Adopt-A-Stream
Q/A 72	2001	Stream Team Program	Snohomish Co. SWM
Q/A 73	2001	Adopt-A-Stream Workshop for Teachers	Adopt-A-Stream
Q/A 84	2001	Determining Hydrologic Connectivity between Wetlands and Streams in Upper Basins	Snohomish Co. D101SWM
Q/A 91	2001	Ground Water Celebration and Annual Water Festival	Snohomish Co. SWM
AC 4	2001	Potential Stream Projects (See Q/A 62)	Watershed Staff

Table 9. Implementation Schedule

ID Number	Project Initiation	Management Recommendations	Implementing Entity
AC 5	2001	Correct Erosion Problems at Outfalls Along 67th Avenue NE at 88th St. NE	Snohomish Co. SWM
QC 7	2001	Potential Stream Projects (See Q/A 62+C32)	Watershed Staff
QC 10	2001	Correction of Erosion Problems at Outfalls	Snohomish Co.SWM
SC 2	2001	Potential Stream Projects (See Q/A 62)	Tulalip Tribes

Table 10. Plan Implementation Costs

ID No.	MANAGEMENT STRATEGY	IMPLEMENTING ENTITY	ONE TIME COSTS	ONGOING COSTS/YR	FTE
	CONTROLLING STORMWATER RUNOFF				
Q/A 1	Watershedwide Onsite Stormwater Standards	All Jurisdictions	$0	$10,000	0.15
Q/A 2	Stream and Flood Protection Standards	All Jurisdictions	$40,000	Covered Under Q/A 1	
Q/A 3	Marysville Trough Stormwater Management Through Infiltration	All Jurisdictions	0	Covered Under Q/A 1	
Q/A 4	Flood Prevention Analysis	All Jurisdictions	$2,500-$5,000	Covered Under Q/A 1	.05-.1
Q/A 5	Clearing Ordinance	All Jurisdictions	$15,000	Covered Under Q/A 1	0.25
Q/A 6	Research and Development of New infiltration Methods	Snohomish Co. PDS/SWM	$0	$5,000	0.08
Q/A 7	Map Areas Where Infiltration System Will Function Properly	All Jurisdictions	$1,000	$0	0.01
Q/A 8	Retrofitting or Building Stormwater Facilities	All Jurisdictions	$10,000-$50,000	0	
Q/A 9	Upgrading and Installing Stormwater Facilities on New Road Projects	Snohomish Co. SWM/WSDOT	$10,000-$50,000	0	
	IMPROVEMENT OF STORMWATER FACILITY MAINTENANCE				
Q/A 10	SWM as Provider of Watershed Stormwater Services	Snohomish Co. SWM	$5,000	0	0.1
Q/A 11	Accessing Stormwater Facilities	All Jurisdictions	0	Covered Under Q/A 1	
Q/A 12	Placing Stormwater Facilities in Tracts	All Jurisdictions	0	Covered Under Q/A 1	
Q/A 13	Improving Stormwater Facility Maintenance	All Jurisdictions	$10,000	$0	0.15
Q/A 14	Developing Funding Sources for Facility Maintenance and Infrastructure Improvements	All Jurisdictions	$0	$1,000	0.01
Q/A 15	Maintenance Incentives for Private Stormwater Facilities	All Jurisdictions	0	$500	
Q/A 16	Inspection of New Stormwater Facilities	All Jurisdictions	0	$6,500	0.1
	NONPOINT POLLUTION REDUCTION AND PREVENTION				
	· Land Clearing and Grading				
Q/A 17	Erosion Control Ordinances	All Jurisdictions	0	Covered Under Q/A 1	
Q/A 18	Timing Restrictions for Clearing and Grading on Getchell and Tulalip Hillsides	Snohomish Co.PDS, Marysville, Tulalip	$6,500	Covered Under Q/A 1	0.1
Q/A 19	Streambank and Sediment Monitoring	Snohomish Co. SWM	0	$5,000	0.1
Q/A 20	Innovative Methods for Erosion Control	All Jurisdictions	0	$15,000	0.16
Q/A 21	Guidelines for New Grading Codes	All Jurisdictions	$1,000	$100	0.1
	· Forest Practices				
Q/A 22	Monitoring Logging Operations	DNR	0	$500	
	· Ditch Maintenance				
Q/A 23	Road Ditching Standards	Snohomish Co. SWM/Rd. Maintenance	$5,000	$15,000	0.3
	· Agricultural Practices				
Q/A 24	Development and Implementation of Farm Plans	SCD	0	$15-30,000	.25-.5
Q/A 25	Preventing Livestock Damage to Streams and Wetlands	SCD	Covered Under Q/A 61		
Q/A 26	BMPs Specific to Small Farms	SCD	$3,000	$8,000	0.18
Q/A 27	Loan Program to Support Use of Agricultural BMPs	SCD	$3,000	$5,000	0.1
Q/A 28	Incentives for Use of Agricultural BMPs	SCD	$3,000	$3,000	0.1
Q/A 29	Private Ditching Practices	SCD/Snohomish Co. SWM	Covered under Q/A 25	$5,000	0.08
Q/A 30	Farm Waste Management Seminars	SCD/WSU		$5,000	0.08
Q/A 31	Water Quality Workshops for Noncommercial Farmers	SCD/WSU		$10,000	0.1
Q/A 32	Model Fencing Project	SCD		$2,000	0.03

Table 10. Plan Implementation Costs

ID No.	MANAGEMENT STRATEGY	IMPLEMENTING ENTITY	ONE TIME COSTS	ONGOING COSTS/YR	FTE
Q/A 33	Involving FFA and 4-H in Agricultural Water Quality Programs	SCD/WSU		$10,000	0.1
Q/A 34	Livestock Waste Composting and Recycling	Snohomish Co. Solid Waste		$5,000	0.01
	· Onsite Septic Systems				
Q/A 35	Subsidy for Replacing Failed Septic Systems	SHD		$0	
Q/A 36	Septics Maintenance Reminder Data Base	SHD	$3,000	$500	0.05
Q/A 37	Information on Septic Operation and Maintenance	SHD		$20,000	0.3
	· Pet Waste				
Q/A38	Pet Waste Ordinance	Snohomish Co. PDS, Arlington, Tulalip	$6,000	$500	0.1
Q/A 39	Information on Pet Waste Disposal	Snohomish Co. Solid Waste		$200	
	· Hazardous Waste				
Q/A 40	Requiring Use of BMPs for Business that Use Toxic Chemicals	All Jurisdictions	$6,500		0.1
Q/A 41	Pumping Heating Oil Tanks	Watershed Staff		$20,000	
Q/A 42	Workshops and Distribution of Fact Sheets on Independent Cleanup Process	Ecology		$6,000	0.1
Q/A 43	Water Quality Site Monitoring for Toxic Chemicals	Snohomish Co. SWM		$6,500	0.1
Q/A 44	Underground Storage Tank Survey	Ecology	$1,400		0.02
Q/A 45	Emergency Spill Response Plan	Snohomish Co. Emergency Mgt.	$1,000		0.01
	· Other Urban Pollutants				
Q/A 46	Water Quality Ordinance	Snohomish Co. SWM	$12,500		0.2
Q/A 47	Detergent Reduction Program	All Jurisdictions	$5,000	$1,500	0.1
Q/A 48	Herbicide Spray Away From Streams and Wetlands	WSDOT/Cities	$650		0.01
Q/A 49	Interdisciplinary Team to Assist with and Monitor BMPs	All Jurisdictions		$8,000	0.1
Q/A 50	Model Business Program	Snohomish Co. SWM		$625	0.01
Q/A 51	EnviroStars Recognition Program	Snohomish County Solid Waste		$80,000	0.5
Q/A 52	Workshops on the Use of Toxic Chemicals in Gardening	Master Gardeners		$600	
Q/A 53	Information on Pesticides and Herbicides for Distribution at Local Businesses	Master Gardeners		$200	
Q/A 54	Developing and Distributing Water Quality Material to New Homeowners	WMC		$25,000	
Q/A 55	NPDES Business Assistance Program	Snohomish Co. SWM		$625	0.01
Q/A 56	Storm Drain Stenciling	Snohomish Co. SWM	Covered Under Q/A 66		
	· Direct Discharges Into Streams				
Q/A 57	Inventory of Illicit Discharges	Snohomish Co. SWM/Ecology	120,000		
Q/A 58	Developing Brochure on Direct Discharges	Snohomish Co. SWM	$400	$200	,01
	· Solid Waste and Garbage				
Q/A 59	Distribution of Information on Disposal Alternatives	All Jurisdictions		$200	
Q/A 60	Stream Cleanup Activities	Snohomish Co. SWM		$5,000	0.08
Q/A 61	Grant Program for Disposal of Stream Waste	Snohomish Co. Solid Waste		$3,000	0.05
	STREAM HABITAT ENHANCEMENT AND SALMON RECOVERY				
Q/A 62	Coho Recovery Plan	Snohomish Co. SWM	30,000		0.5
Q/A 63	Watershed Restoration and Enhancement Work Force	Snohomish Co. SWM		$6,000	0.1
Q/A 64	Relocation of Streams Away from Roads	All Jurisdictions		$185,000	

Table 10. Plan Implementation Costs

ID No.	MANAGEMENT STRATEGY	IMPLEMENTING ENTITY	ONE TIME COSTS	ONGOING COSTS/YR	FTE
Q/A 65	Identification and Repair of Fish Blockages	All Jurisdictions		$1,000	0.01
Q/A 66	Hydraulic Permit Follow-up	Watershed Staff/Dept. of Fish and Wildlife		$1,200	0.01
Q/A 67	Watershed Training	Snohomish Co. SWM		$1,500	0.025
Q/A 68	Puppet Show and School Programs	Snohomish Co. Parks		$200	0.01
Q/A 69	Watershed Field Trips for Schools	Adopt-A-Stream		$500	0.01
Q/A70	Watershed Management Area Fee Credits for Schools	Snohomish Co. SWM	$2,000		0.03
Q/A 71	"Streamside Savvy" Booklet Distribution	Snohomish Co. SWM		$600	
Q/A 72	Stream Team Program	Snohomish Co. SWM		$1,500	0.02
Q/A 73	Adopt-A-Stream Workshops for Teachers	Adopt-A-Stream		$10,000	0.16
Q/A 74	Watershed Interpretive Signs along Centennial Trail	Snohomish Co. Parks		$16,000	0.01
Q/A 75	Placement of Signs along Sensitive Areas	All Jurisdictions		$40-100	0.01
	WETLAND ACQUISITION AND ENHANCEMENT				
Q/A 76	Wetland Inventory and Function and Value Assessment	Snohomish Co. SWM	$100,000		
Q/A 77	Wetland Acquisition for Preservation	Watershed Staff	$2,000		0.01
Q/A 78	Wetland Enhancement	Watershed Staff	$750		0.01
Q/A 79	Agricultural Impacts to Wetlands	SCD	$750		0.01
Q/A 80	Technical Assistance to Wetland Landowners	Snohomish Co. SWM/SCD		$1,000	0.01
Q/A 81	Five Year Wetland Assessment	Watershed Staff	$1,000		0.01
Q/A 82	Wetland Database Update	Snohomish Co. SWM		$5,000	
Q/A 83	Wetland Delineation in the Marysville Trough	All Jurisdictions		$0	
Q/A 84	Determination of Hydrologic Connectivity between Wetlands & Streams	Snohomish Co. SWM	$30,000		
Q/A 85	Wetlands as Field Classrooms	Watershed Staff		$6,000	0.1
	GROUNDWATER PROTECTION				
Q/A 86	Maintaining Recharge to Marysville Trough Aquifer	All Jurisdictions	$12,000		0.2
Q/A 87	Critical Aquifer Recharge Designation	Snohomish Co. PDS	$2,000		0.01
Q/A 88	Landscaping Requirement to Promote Infiltration	All Jurisdictions	$6,500		0.1
Q/A 89	Additional Landslide Hazard Ordinance Sites	Marysville	$1,000		0.01
Q/A 90	Baseline Ground Water Study and Monitoring	Tulalip Tribes	$10,000	$5,000	0.1
Q/A 91	Ground Water Celebration and Annual Water Festival	Tulalip Tribes	$55,000	$55,000	0.5
Q/A 92	Ground Water Model in Schools and at Jennings Park	Tulalip Tribes/Marysville Pks		$1,000	0.01
Q/A 93	Ground Water Education in Workshops	Tulalip Tribes/SWM/Adopt-A-Stream	Covered Under Q/A 82		
Q/A 94	Information on Maintaining Recharge for Developers	All Jurisdictions	$200	$200	
Q/A 95	Brochure on Increasing Recharge at Individual Home Sites		$200	$200	
	STREAM AND WETLAND BUFFER AND FOREST RETENTION				
Q/A 96	Recommendations on Stream and Wetland Corridors	All Jurisdictions	$12,000		0.25
Q/A 97	Buffers in Separate Tracts	All Jurisdictions	$1,200		0.02
Q/A 98	Lot Clustering	All Jurisdictions	$2,500		0.04
Q/A 99	Forest Stewardship Program	DNR/Watershed Staff		$1,000	0.01
Q/A 100	Open Space and Tax Incentives to Maintain Forest	Snohomish Co. PDS	$2,000		0.03

Table 10. Plan Implementation Costs

Q/A 101	Providing Plants and Technical Assistance for Revegetation Projects	Snohomish Co. SWM		$2,500	0.04
	ENFORCEMENT				
Q/A 102	Add to Enforcement Staffing	Ecology/All Jurisdictions		$300,000	3
	WATERSHED STEWARD PROGRAM				
Q/A 103	Hiring of Watershed Steward	All Jurisdictions		$50,000	1
ID No.	**MANAGEMENT STRATEGY**	**IMPLEMENTING ENTITY**	**ONE TIME COSTS**	**ONGOING COSTS/YR**	**FTE**
	ALLEN CREEK PLANNING AREA				
AC 1	Wetlands for Restoration and Education	SWM/Marysville/Arlington	Covered Under Q/A 61		
AC 2	Garbage Cleanup Along 67th Avenue NE	Marysville		$500	
AC 3	Acquisition of Floodplain Land at Mouth of Allen Creek	Snohomish Co.SWM/Marysville/Tribes	$3,515,000	$55,000	
AC 4	Project For Evaluation in Coho Recovery Plan	Snohomish Co. SWM	Covered Under Q/A 61		
AC 5	Correction of Erosion Problems at Outfalls Along 67th Avenue NE at 88th Street NE	Snohomish Co. SWM	$5,000-20,000		
AC 6	Culvert Replacement under 84th Street NE	Marysville Public Works	$30,000		
AC 7	Development of Master Drainage Plan for Sunnyside Area	Marysville Public Works	$125,000		
	MAINSTEM QUILCEDA PLANNING AREA				
QC 1	Changes in Incompatible Shoreline/Zoning Designations	Snohomish Co. PDS	$1,500		0.02
QC 2	Encourage Hazardous Waste Free Businesses Over the Marysville Trough	All Jurisdictions		$5,000	0.1
QC 3	Acquisition or Permanent Protection of Quilceda Headwater Forest and Wetlands	Snohomish Co. SWM	$8,000,000	$55,000	
QC 4	Wetlands to Receive Permanent Protection	Watershed Staff	Covered Under Q/A 61		
QC 5	Establishment of Tribal Wildlife Refuge	Tulalip Tribes	$8,000		0.13
QC 6	Wetland Buffer Enhancement	Watershed Staff	Covered Under Q/A 61		
QC 7	Projects For Evaluation in Coho Recovery Plan	Snohomish Co. SWM	Covered Under Q/A 61		
QC 8	108th Street NE and Shoultes Road Culvert Replacement	Snohomish Co. SWM	$12,000		
QC 9	Shoultes Road at 122nd Street NE Culvert Replacement	Snohomish Co. SWM	$35,000		
QC 10	Correction of Erosion Problems at Outfalls	Snohomish Co. SWM	$5,000-20,000		
QC 11	Development of Master Drainage Plans	Snohomish Co. SWM/Marysville/Arlington	$350,000		
QC 12	Jubie Addition Drainage Upgrade	Snohomish Co. SWM	$50,000		
	WEST FORK PLANNING AREA				
WF 1	Tulalip Reservation Watershed Management Area	Tulalip Tribes	46,875		0.75
WF 2	West Fork Quilceda Enhancement and Flood Reduction Project	Snohomish Co. SWM	150,000		
WF 3	Discontinuance of Dirt Biking Along West Fork	Tulalip Tribes	$3,000		0.01
WF 4	Wetlands Identified for Acquisition and Preservation	Watershed Staff	Covered Under Q/A 61		
WF 5	128th Street NE/West Fork Enhancement	Tulalip Tribes	$44,000		
WF 6	Logging Operation Monitoring	Watershed Staff		$1,200	
WF 7	Development of Master Drainage Plan for Twin Lakes and Upper West Fork	Snohomish Co. SWM/Marysville/Arlington	$100,000		
	STURGEON CREEK PLANNING AREA				
SC 1	Wetlands Recommended for Acquisition and Preservation	Watershed Staff	Covered Under Q/A 61		
SC 2	Projects for Evaluation in the Coho Recovery Plan	Snohomish Co. SWM	Covered Under Q/A 61		
SC 3	Logging Operation Monitoring	Tulalip Tribes		$1,200	0.02
SC 4	Monitoring of Boeing Test Facility Stormwater Plan	Tulalip Tribes		$1,500	0.02

programs and projects occurring within the WMA. As a result, there are limited WMA funds available to implement the actions in the watershed plan.

The city of Marysville received approximately $305,000 in WMA fees in 1995. City WMA revenue has been increasing as a result of annexations and development. Neither the city of Arlington, nor The Tulalip Tribes have this type of fee to pay for surface water management, although proposals for such fees for The Tulalip Reservation are included in this plan, and Arlington is working on this type of funding source.

Grants and State Loan Programs

Federal and state grant programs can be utilized to help fund implementation of selected watershed actions. The most obvious state grant source is the Centennial Clean Water Fund administered by Ecology. Centennial grants will fund up to 75 percent of the total costs of some water quality projects. Centennial grants require a minimum of a 25 percent match from local funds.
The State Revolving Loan Program, also administered by the Department of Ecology, could be used to help implement selected plan actions as well.

Many of the programs currently implemented by the Snohomish Health District and Snohomish County Solid Waste Management Division are supported in part by Coordinated Prevention Grants that are administered by Ecology.

Intergovernmental Cost Sharing

Implementation of the Quilceda/Allen Watershed Management Plan will require cooperation between Snohomish County and other jurisdictions, both in terms of funding and responsibility. Snohomish County, Marysville, Arlington, The Tulalip Tribes, Snohomish Health District, and Snohomish Conservation District should explore interlocal agreements as a way to help fund selected plan actions.

Summary of Funding Alternatives

The Quilceda/Allen Watershed Management Committee recognizes that funding for implementation of the watershed plan is limited. A variety of alternatives should be explored to help fund plan implementation, including:

- Aggressively pursuing Centennial Grants, State Revolving Loans, and other funding programs to fund planning, design, and construction of water quality-related facilities in the watershed.
- Seeking additional county general funds, grant funding, or interlocal agreements with the county and cities, Snohomish Health District and Snohomish Conservation District to fund activities in the watershed.
- Seeking private donations and volunteer assistance to implement selected actions.
- Raising WMA rates in the watershed.
- Delaying implementation of some actions for an extended period of time.

Provision for Public Involvement

Public involvement in implementation of the plan will evolve through several processes. Incorporation of the plan's goals, policies, and control measures into comprehensive plans will require public hearings before appropriate councils and commissions. As ordinances are amended or proposed, public hearings will be held. Through the volunteer Watershed Enhancement Task Force watershed residents will participate in projects and monitor various types of pollution problems. The plan has provided for many educational programs that will be ongoing in the watershed. Annual meetings will be held as discussed below to assess and evaluate plan progress and public input will be sought at that time.

Implementation Review and Evaluation

As the lead agency for overall coordination and implementation of the plan, SWM will work with all implementing agencies to evaluate the effectiveness of the proposed actions in controlling nonpoint pollution and water resource and flooding problems in the watershed. To assess the effectiveness of the plan, SWM will hold an annual plan evaluation meeting on implementation of the Quilceda/Allen Watershed Management Plan. The purpose of this meeting will be twofold:

- For implementing agencies to present progress on plan implementation.
- For the public and agencies to comment on ongoing and proposed implementation activities.

The annual evaluation meetings will provide a forum to encourage implementing agencies to continue work on the plan and to track progress on the plan. The first plan evaluation meeting will be within one year after final approval of the Quilceda/Allen Watershed Management Plan by Ecology.

On the basis of agency and public comments received at the evaluation meeting, SWM will prepare an annual report on the effectiveness of plan implementation. This report will be submitted to Ecology within 2 months of the scheduled evaluation meeting.

To assist implementing agencies with plan implementation, SWM will convene a Watershed Implementation Committee (WIC) within six months after approval of the plan by Ecology. The committee will:

- Assist implementing agencies in securing funding to implement plan actions
- Provide a forum for the county and cities to resolve multi-jurisdictional water quality and water quantity problems.

The committee will be open to citizens and organizations with an interest in protecting water quality and water resources, and reducing flooding problems in the watershed.

After five years, the WIC will review plan objectives to determine whether they are being met and what additional steps need to be taken, changes made, or additional management recommendations needed to meet the objectives.

Revisions to the Plan

Watershed plans such as the Quilceda/Allen plan are meant to be adaptive as new information or methods to control nonpoint pollution and address water resource issues and flooding and drainage problems become available. There are three actions that can trigger revisions to the plan. All efforts to revise the plan will incorporate public involvement and education.

- Five Year Update. To accommodate changes over time, the Quilceda/Allen Watershed Management Plan is scheduled to be revised in five years from the date of approval by Ecology. At that time, the Watershed Management Committee will convene to revise the plan.
- Annual Evaluation. If the annual evaluation meeting or annual report identifies a need to revise the plan, then SWM has the option to reconvene the WMC sooner than five years.
- Department Of Ecology Request. Ecology, upon review of the annual report, has the option to request that the plan be revised sooner than five years.

Implementation Sequence

Implementation of some actions has already begun. The following are some examples:

- A stream enhancement project by The Tulalip Tribes along the West Fork Quilceda Creek north of 128th Street NE will be completed in 1996.
- A SWM project to reduce flooding and improve stream habitat along the West Fork south of 140th Street NE is in progress.
- The city of Arlington has adopted Ecology's stormwater standards.
- The city of Marysville is addressing flooding on the golf course and solving the culvert problem at 84th Street NE.
- The Snohomish Conservation District has completed the demonstration fencing project.

The sequence of events for implementation of the plan by jurisdictions is proposed follows:

1. The jurisdictions will pursue implementation of the watershed plan through program modifications and consideration of the inclusion of land use elements as part of the comprehensive plan.

2. The county will enter into interlocal plan implementation agreements with Arlington, Marysville and The Tulalip Tribes.
3. Based on the outcome of interlocal agreements, the county will pursue hiring a watershed steward to oversee implementation of the plan and implement all or part of many of the actions.
4. Jurisdictions will seek grant funding for as many actions as possible.
5. Jurisdictions will incorporate capital improvements in the plan into their CIP programs.
6. Jurisdictions will implement actions as funds become available, using priorities, realizing that funding may become available for lower priority actions before the highest priority actions.
7. SWM will annually review the implementation of the plan and encourage local jurisdictions to fund actions in the plan.
8. The Watershed Management Committee will revise the plan after five years, or earlier if needed.

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ABBREVIATIONS AND ACRONYMS

ABBREVIATIONS & ACRONYMS

BMP	Best Management Practices
CAR	Critical Areas Regulation
CIP	Capital Improvement Program
DNR	Washington Department of Natural Resources
Ecology	Washington Department of Ecology
FFA	Future Farmers of America
GMA	Growth Management Act
HPA	Hydraulic Permit Approval
I-5	Interstate 5
NPDES	Nonpoint Pollution Discharge Elimination System
Pers. comm.	Personal communications
MMC	Marysville Municipal Code
PSWQA	Puget Sound Water Quality Authority
RCW	Revised Code of Washington
RM	River Mile
RMZ	Riparian Management Zone
SAO	Sensitive Areas Ordinance
SCC	Snohomish County Code
SCD	Snohomish Conservation District
SEPA	State Environmental Policy Act
SHD	Snohomish Health District
SMMP	Shoreline Management Master Program
SWM	Snohomish County Public Works Surface Water Management Division
TAC	Technical Advisory Committee
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WIC	Watershed Implementation Committee
WMA	Watershed Management Area
WMC	Watershed Management Committee
WMZ	Wetland Management Zone
WRIA	Water Resource Inventory Area
WSDOT	Washington Department of Transportation
WSU	Washington State University

APPENDICES

APPENDIX A. RATING SYSTEM FOR SITE EROSION AND SEDIMENT MOVEMENT POTENTIAL, CITY OF EVERETT

CITY OF EVERETT RATING SYSTEM FOR SITE EROSION AND SEDIMENT MOVEMENT POTENTIAL

RATING CHECKLIST

Check each condition that describes the site to be developed. Add the points associated with each condition that applies. The total score will correspond to a seasonal limitation period for land alteration activities.

existing slope of site (average, weighted by areal extent):

_____ 2% or less..... 0
_____ >2-5% 5
_____ >5-10% 15
_____ >10-15% 30
_____ >15% 50

site area to be cleared:

_____ <5000 sq. feet..... 0
_____ 5000 sq. feet - 1 acre..... 5
_____ 1-2 acres..... 15
_____ >2-5 acres..... 30
_____ >5 acres..... 50

quantity of cut and/or fill on site:

_____ <5000 cubic feet..... 0
_____ 5,000 - 50,000 cubic feet..... 5
_____ >50,000 - 100,000 cubic feet..... 10
_____ >100,000 - 200,000 cubic feet..... 25
_____ >200,000 cubic feet..... 40

runoff potential of predominant soils:

_____ hydrologic soil group A*..... 0
_____ hydrologic soil group B*..... 10
_____ hydrologic soil group C*..... 20
_____ hydrologic soil group D*..... 40

classification of predominant soils:

_____ GW, GP, SW, SP soils#..... 0
_____ "dual" classifications#+..... 10
_____ GM, GC, SM, SC soils#..... 20
_____ ML, CL, MH, CH soils#..... 40

_____ **deep utility installation**..... 25

_____ TOTAL

* Soil Conservation Service, Soil Survey of Snohomish County
\# Unified Classification system
\+ GW-GM, GP-GM, GW-GC, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC

If the site is hydraulically near to a sediment/erosion sensitive feature, then the following seasonal restrictions apply given the total number of points accumulated in the rating:

Total Score	**Land alteration limited to:**
<75 points	February 1 to November 1
75-150 points	April 1 to October 1
>150 points	June 15 to September 15

If the site is not hydraulically near to a sediment/erosion sensitive feature, then the following seasonal limitations apply given the total points accumulated in the rating:

Total Score	**Land Alteration limited to:**
<100 points	no limitations
≥100 points	February 1 to November 1

In addition, seasonal limitations will be imposed on any work within the buffer area of a sediment/erosion sensitive feature. In general, work within 25 feet of the high water mark of a sediment/erosion sensitive feature, or top of bank of a stream, shall be restricted to the period between June 15 and September 15. Work outside of the 25 foot setback, but within the designated buffer area, shall generally be restricted to the period between April 1 and October 1.

If seasonal restrictions have been placed on project activities by another agency other than the City of Everett the most restrictive limitations imposed will apply.

NOTE:

If soil testing has been performed on the site, use the results to determine the predominant soil type on the site - if enough borings have been conducted to allow representation of the entire site. Otherwise, obtain the information from the Soil Survey of Snohomish County Area for the classification and runoff potential of the site's predominant soils.

When using the Soil Survey, if there is a question as to which soil type is dominant on a site - as when the site falls on a boundary between two soil types, or one of two soil types may be present on a site - the soil type resulting in the most points on the rating system will be assumed unless site soil tests indicate that another soil type dominates the site.

Definitions used in the rating system:

deep utility installations - 20 feet or deeper

hydraulic nearness - runoff from the site discharges to the sensitive feature without significant natural attenuation of flows that allows for suspended solids removal. The conditions that render a site hydraulically near to a sensitive feature include, but are not limited to, the following:

- the site is 200 feet or less uphill from the sensitive feature or its buffer

- runoff from the site is tightlined to the sensitive feature or flows to the sensitive feature through a channel or ditch where the conditions of flow do not allow settling of suspended sediments (i.e.. flows are too fast and/or turbulent)

- one of the following does not occur before runoff from the site enters the sensitive feature: sheet flow through a vegetated area with dense groundcover; flow through a wetland not included as a sensitive feature; flow through a vegetated drainage ditch or swale with low flow velocities and shallow depths; or a significant shallow or adverse slope between the site and the sensitive feature.

land alteration activities - as defined by the City of Everett's Design and Construction Standards and Specifications. In summary, activities which are commonly referred to as clearing, grubbing, excavation, filling, grading, and stockpiling are land alteration activities.

sediment/erosion sensitive feature - areas subject to significant degradation due to the effects of construction runoff or areas requiring special protection to prevent erosion. These areas include, but are not necessarily limited to, the following:

Silver Lake

category I or II wetlands and category III wetlands that have groundwater recharge as one of their primary functions (buffer areas included)

streams and buffer areas, especially streams supporting fish (buffer areas included)

sites containing contaminated soils where erosion could cause dispersal of contaminants

steep slopes (25% or greater) associated with one of the above features

Rationale for rating system

The following pages briefly explain some of the rationale behind the factors included in the rating system.

Existing slope of site:

The faster water is moving, the more ability it has to lift and carry soil particles. Greater slopes result in greater velocities.

Area to be cleared:

The greater the cleared area, the greater the exposed surface vulnerable to erosion.

Extensive cut and fill:

Extensive grading results in greater erosion on site. Changing the natural topography can expose relatively unweathered soils. Also, more and generally larger equipment is necessary on the site to perform the grading operations and to import fill material/export cut material.

Soil properties - classification and runoff potential of the site's predominant soils

The Unified Soil Classification system is used to help analyze a soil's erosion potential during construction. The analysis is based mostly on the particle size. Soils with a high proportion of fine sands, silts, and clays are the most erodible under construction conditions. These fine particles are also the most difficult to remove from water once they are suspended. The least erodible soils are sand and gravel mixtures with small percentages of fines.

Other properties of the soil determine whether rainfall will infiltrate the soil or become runoff. Increased runoff translates into increased erosion. The SCS Soil Survey of Snohomish County assesses the runoff potential of each soil series found in Snohomish County by assigning the particular soil to one of the following hydrologic groups:

A - low runoff potential
B - moderately low runoff potential
C - moderately high runoff potential
D - high runoff potential

Deep utility installations:

Installing utilities deeper than approximately 20 feet requires either the use of very large equipment or staged trenching. The amount of time the trench remains open and the quantity of spoils both increase. The trenches tend to collect runoff or groundwater and require pumping before work can continue. Spoil piles alongside trenches are susceptible to erosion.

* * * * * * * *

The listed precipitation data was used to evaluate monthly rainfall patterns. Analysis of the data indicated three logical three seasonal limitation periods. They are, to be applied to increasingly severe conditions: February 1 to November 1, April 1 to October 1, and June 15 to September 15.

Average monthly volumes of rainfall, from City of Everett precipitation records, 1949-86:

Month	Monthly volume (inches)
January	4.63
February	3.72
March	3.28
April	2.35
May	1.97
June	1.84
July	1.01
August	1.27
September	1.97
October	3.16
November	4.67
December	5.09

- Approximately 41% of the total year's rainfall occurs in the three month period from November 1 to February 1.

- Approximately 70% of the year's rainfall occurs in the six months between October 1 and April 1.

- Less than 10% of the year's rainfall occurs in the three month period between June 15 and September 15.

APPENDIX B. MODEL WETLAND ORDINANCE, WASHINGTON STATE DEPARTMENT OF ECOLOGY

MODEL WETLANDS PROTECTION ORDINANCE

Department of Ecology
September 1990

MODEL WETLAND PROTECTION ORDINANCE

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MODEL WETLAND PROTECTION ORDINANCE

Section 1: Findings of Fact and Purpose

1.1 Findings of Fact
The [City Council or Board of Commissioners] of the [local jurisdiction] hereby finds that:

a. Wetlands and their buffer areas are valuable and fragile natural resources with significant development constraints due to flooding, erosion, soil liquefaction potential, and septic disposal limitations.

b. In their natural state, wetlands provide many valuable social and ecological services, including:

1) controlling flooding and stormwater runoff by storing or regulating natural flows;
2) protecting water resources by filtering out water pollutants, processing biological and chemical oxygen demand, recycling and storing nutrients, and serving as settling basins for naturally occurring sedimentation;
3) providing areas for groundwater recharge;
4) preventing shoreline erosion by stabilizing the substrate;
5) providing habitat areas for many species of fish, wildlife, and vegetation, many of which are dependent on wetlands for their survival, and many of which are on Washington State and Federal Endangered Species lists;
6) providing open space and visual relief from intense development in urbanized area;
7) providing recreation opportunities; and
8) serving as areas for scientific study and natural resource education.

c. Development in wetlands results in:

1) increased soil erosion and sedimentation of downstream water bodies, including navigable channels;
2) increased shoreline erosion;
3) degraded water quality due to increased turbidity and loss of pollutant removal processes;
4) elimination or degradation of wildlife and fisheries habitat;
5) loss of fishery resources from water quality degradation, increased peak flow rates, decreased summer low flows, and changes in the streamflow regimen.
6) loss of stormwater retention capacity and slow-release detention resulting in flooding, degraded water quality, and changes in the streamflow regimen of watersheds;
7) loss of groundwater recharge areas;

d. Buffer areas surrounding wetlands are essential to maintenance and protection of wetland functions and values. Buffer areas protect wetlands from degradation by:

   1) stabilizing soil and preventing erosion;
   2) filtering suspended solids, nutrients and harmful or toxic substances;
   3) moderating impacts of stormwater runoff;
   4) moderating system microclimate;
   5) protecting wetland wildlife habitat from adverse impacts;
   6) maintaining and enhancing habitat diversity and/or integrity;
   7) supporting and protecting wetlands plant and animal species and biotic communities; and
   8) reducing disturbances to wetland resources caused by intrusion of humans and domestic animals.

e. The loss of the social and ecological services provided by wetlands results in a detriment to public safety and welfare; replacement of such services, if possible at all, can require considerable public expenditure.

f. A considerable acreage of these important natural resources has been lost or degraded by draining, dredging, filling, excavating, building polluting, and other acts inconsistent with the natural uses of such areas. Remaining wetlands are in jeopardy of being lost, despoiled, or impaired by such acts.

It is therefore necessary for the [local unit of government] to ensure maximum protection for wetland areas by discouraging development activities in wetlands and those activities at adjacent sites that may adversely affect wetland functions and values, to encourage restoration and enhancement of already degraded wetland systems, and to encourage creation of new wetland areas.

1.2 Purpose

It is the policy of the [local unit of government] to require site planning to avoid or minimize damage to wetlands wherever possible; to require that activities not dependent upon a wetland location be located at upland sites; and to achieve no net loss of wetlands by requiring restoration or enhancement of degraded wetlands or creation of new wetlands to offset losses that are unavoidable.

In addition, it is the intent of the [local unit of government] that activities in or affecting wetlands not threaten public safety, cause nuisances, or destroy or degrade natural wetland functions and values by:

a. Impeding flood flows, reducing flood storage capacity, or impairing natural flood control functions, thereby resulting in increased flood heights, frequencies, or velocities on

other lands;

b. increasing water pollution through location of domestic waste disposal systems in wetlands; unauthorized application of pesticides and herbicides; disposal of solid waste at inappropriate sites; creation of unstable fills; or the destruction of wetland soils and vegetation;

c. increasing erosion;

d. decreasing breeding, nesting, and feeding areas for many species of waterfowl and shorebirds, including those rare and endangered;

e. interfering with the exchange of nutrients needed by fish and other forms of wildlife;

f. decreasing habitat for fish and other forms of wildlife;

g. adversely altering the recharge or discharge functions of wetlands, thereby impacting groundwater or surface water supplies;

h. significantly altering wetland hydrology and thereby causing either short-or long-term changes in vegetational composition, soils characteristics, nutrient cycling, or water chemistry;

i. destroying sites needed for education and scientific research, such as outdoor biophysical laboratories, living classrooms, and training areas;

j. interfering with public rights in navigable waters and the recreation opportunities provided by wetlands for fishing, boating, hiking, birdwatching, photography and other passive uses; or

k. destroying or damaging aesthetic and property values, including significant public viewsheds.

The purposes of this chapter are to protect the public health, safety and welfare by preventing the adverse environmental impacts of development enumerated in Section 1 of this chapter, and by:

a. Preserving, protecting and restoring wetlands by regulating development within them and their buffers;

b. Protecting the public against losses from:

1. unnecessary maintenance and replacement of public facilities, including the dredging of ports and navigation channels;

2. publicly funded mitigation of avoidable impacts;

3. cost for public emergency rescue and relief operations; and

4. potential litigation from improper construction practices authorized for wetland areas;

c. Alerting appraisers, assessors, owners, and potential buyers or lessees to the development limitations of wetlands;

d. Providing [local unit of government] officials with information to evaluate, approve, condition, or deny public or private development proposals;

e. Adopting Governor Booth Gardner's interim goal to achieve no overall net loss in acreage and functions of Washington's remaining wetland base and the long-term goal to increase the quantity and quality of Washington's wetland resource base;

f. Implementing the policies of the Growth Management Act, the State Environmental Policy Act, Chapter 43.21C RWC, Puget Sound Water Quality Management Plan, Washington State Executive Order 90-04, [relevant local plans, policies and ordinances], and all other present and future [local unit of government] functional, environmental and community plans and programs.

Section 2: Definitions

For the purposes of this chapter, the following definitions shall apply:

a. "Applicant" means a person who files an application for permit under this chapter and who is either the owner of the land on which that proposed activity would be located, a contract vendee, a lessee of the land, the person who would actually control and direct the proposed activity, or the authorized agent of such a person.

b. "Best management practices" means conservation practices or systems of practices and management measures that:

1) Control soil loss and reduce water quality degradation caused by nutrients, animal waste, toxics, and sediment; and

2) Minimize adverse impacts to surface water and groundwater flow, circulation patterns, and to the chemical, physical, and biological characteristics of wetlands.

c. "Compensation project" means actions necessary to replace project-induced wetland and wetland buffer losses, including land acquisition, planning, construction plans, monitoring and contingency actions.

d. "Compensatory mitigation" means replacing project-induced wetland losses or impacts, and includes, but is not limited to, the following:

1) "Restoration" - Actions performed to reestablish wetland functional characteristics and processes which have been lost by alterations, activities, or catastrophic events within an area which no longer meets the definition of a wetland.
2) "Creation" - Actions performed to intentionally establish a wetland at a site where it did not formerly exist.
3) "Enhancement" - Actions performed to improve the condition of existing degraded wetlands so that the functions they provide are of a higher quality.

e. "Critical habitat" means habitat necessary for the survival of endangered, threatened, rare, sensitive or monitor species.
f. "Developable Area" means an area of land outside of wetlands and wetland buffers.
g. "Department" means the Washington state department of ecology.
h. "Emergent wetland" means a regulated wetland with at least 30 percent of the surface area covered by erect, rooted, herbaceous vegetation as the uppermost vegetative strata.
i. "Exotic" means any species of plants or animals that are foreign to the planning area.
j. "Existing and ongoing agriculture" includes those activities conducted on lands defined in RCW 84.34.020(2), and those activities involved in the production of crops or livestock, for example, the operation and maintenance of farm and stock ponds or drainage ditches, operation and maintenance of ditches, irrigation systems including irrigation laterals, canals, or irrigation drainage ditches, changes between agricultural activities, and normal maintenance, repair, or operation of existing serviceable structures, facilities, or improved areas. Activities which bring an area into agricultural use are not part of an ongoing operation. An operation ceases to be ongoing when the area on which it is conducted is converted to a nonagricultural use or has lain idle for more than five years, unless the idle land is registered in a federal or state soils conservation program, or unless the activity is maintenance of irrigation ditches, laterals, canals, or drainage ditches related to an existing and ongoing agricultural activity. Forest practices are not included in this definition.
k. "Extraordinary hardship" means strict application of this chapter and/or programs adopted to implement this chapter by the [Approval Authority] would prevent all reasonable economic use of the parcel.
l. "Forested wetland" means a regulated wetland with at least 20 percent of the surface area covered by woody vegetation greater than 20 feet in height.
m. Functions," "beneficial functions," or "functions and values" means the beneficial roles served by wetlands including, but not limited to, water quality protection and enhancement, fish and wildlife habitat, food chain support, flood storage, conveyance and attenuation, groundwater recharge and discharge, erosion control, wave attenuation, historical and archaeological and aesthetic value protection, and recreation. These beneficial roles are not listed in order of priority.
n. "High intensity land use" includes land uses which are

associated with moderate or high levels of human disturbance or substantial wetland habitat impacts including, but not limited to, medium and high density residential, multifamily residential, active recreation, and commercial and industrial land uses.

o. "High quality wetlands" are those regulated wetlands which meet the following criteria:

1) No, or isolated, human alteration of the wetland topography;

2) No human-caused alteration of the hydrology or else the wetland appears to have recovered from the alteration;

3) Low cover and frequency of exotic plant species;

4) Relatively little human-related disturbance of the native vegetation, or recovery from past disturbance;

5) If the wetland system is degraded, it still contains a viable and high quality example of a native wetland community; and

6) No known major water quality problems.

p. "Hydric Soil" means a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part. The presence of hydric soil shall be determined following the methods described in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands".

q. "Hydrophytic vegetation" means macrophytic plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. The presence of hydrophytic vegetation shall be determined following the methods described in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands".

r. "In-kind compensation" means to replace wetlands with substitute wetlands whose characteristics closely approximate those destroyed or degraded by a regulated activity. It does not mean replacement "in-category."

s. "Isolated wetlands" means those regulated wetlands which:

1) are outside of and not contiguous to any 100-year floodplain of a lake, river, or stream; and

2) have no contiguous hydric soil or hydrophytic vegetation between the wetland and any surface water.

t. "Low intensity land use" includes land uses which are associated with low levels of human disturbance or low wetland habitat impacts, including, but not limited to, passive recreation, open space, or agricultural os forest management land uses.

u. "Mitigation" includes avoiding, minimizing or compensating for adverse wetland impacts. Mitigation, in the following order of preference is:

1) Avoiding the impact altogether by not taking a certain action or parts of an action;

2) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

3) Rectifying the impact by repairing, rehabilitating or restoring the affected environment;

4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

5) Compensating for the impact by replacing, enhancing, or providing substitute resources or environments;

6) Monitoring the impact and the compensation project and taking appropriate corrective measures. Mitigation for individual actions may include a combination of the above measures.

v. "Native Vegetation" means plant species which are indigenous to the area in question.

w. "Offsite compensation" means to replace wetlands away from the site on which a wetland has been impacted by a regulated activity.

x. "Onsite compensation" means to replace wetlands at or adjacent to the site on which a wetland has been impacted by a regulated activity.

y. "Out-of-kind compensation" means to replace wetlands with substitute wetlands whose characteristics do not closely approximate those destroyed or degraded by a regulated activity. It does not refer to replacement "out-of-category."

z. "Practicable alternative" means an alternative that is available and capable of being carried out after taking into consideration cost, existing technology, and logistics in light of overall project purposes, and having less impacts to regulated wetlands. It may include an area not owned by the applicant which could reasonably have been or be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity.

aa. "Puget Sound" means all salt waters of the state of Washington inside the international boundary line between the State of Washington and the province of British Columbia, lying east of one hundred twenty-three degrees, twenty-four minutes west longitude.

bb. "Regulated wetlands," means ponds twenty acres or less, including their submerged aquatic beds, and those lands defined as wetlands under the federal clean water act, 33 u.s.c. Sec. 1251 et seq., and rules promulgated pursuant thereto and shall be those areas and those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Regulated wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands created as mitigation and wetlands modified for approved land use activities shall be considered as regulated wetlands. All category I wetlands shall be considered regulated wetlands. Regulated wetlands do not include category II and III wetlands less than 2,500 square feet and category IV wetlands less than 10,000 square feet. Regulated wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities. The applicant shall bear the burden of proving that the site was not previously a wetland. For identifying and delineating a regulated

wetland, local government shall consider the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands".

cc. "Regulated Activities" means any of the following activities which are directly undertaken or originate in a regulated wetland or its buffer:

1) The removal, excavation, grading, or dredging of soil, sand, gravel, minerals, organic matter, or material of any kind;

2) The dumping, discharging, or filling with any material;

3) The draining, flooding, or disturbing of the water level or water table;

4) The driving of pilings;

5) The placing of obstructions;

6) The construction, reconstruction, demolition, or expansion of any structure;

7) The destruction or alteration of wetlands vegetation through clearing, harvesting, shading, intentional burning, or planting of vegetation that would alter the character of a regulated wetland, provided that these activities are not part of a forest practice governed under chapter 76.09 RCW and its rules; or

8) Activities that result in a significant change of water temperature, a significant change of physical or chemical characteristics of wetlands water sources, including quantity, or the introduction of pollutants.

dd. "Repair or maintenance" means an activity that restores the character, scope, size, and design of a serviceable area, structure, or land use to its previously authorized and undamaged condition. Activities that change the character, size, or scope of a project beyond the original design and drain, dredge, fill, flood, or otherwise alter additional regulated wetlands are not included in this definition.

ee. "Scrub-shrub wetland" means a regulated wetland with at least 30 percent of its surface area covered by woody vegetation less than 20 feet in height as the uppermost strata.

ff. "Serviceable" means presently useable.

gg. "Unavoidable and necessary impacts" are impacts to regulated wetlands that remain after a person proposing to alter regulated wetlands has demonstrated that no practicable alternative exists for the proposed project.

hh. "Water-dependent" means requiring the use of surface water that would be essential to fulfill the purpose of the proposed project.

ii" "Wetlands," for the purposes of inventory, incentives, and nonregulatory programs, means those lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this definition, wetlands must have one or more of the following attributes:

1) At least periodically, the land supports predominantly hydrophytes;

2) The substrate is predominantly undrained hydric soil; and

3) The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

jj. "Wetland buffers" or "wetland buffer zones" is an area that surrounds and protects a wetland from adverse impacts to the functions and values of a regulated wetland.
kk. "Wetland classes," "classes of wetlands" or "wetland types" means descriptive classes of the wetlands taxonomic classification system of the United States fish and wildlife service (Cowardin, et al 1978).
11. "Wetlands permit" means any permit issued, conditioned or denied specifically to implement this chapter.
mm. "Wetland edge" means the boundary of a wetland as delineated based on the definitions contained in this chapter.

Section 3: General Provisions

3.1 Abrogation and Greater Restrictions
It is not intended that this chapter repeal, abrogate, or impair any existing regulations, easements, covenants, or deed restrictions. However, where this chapter imposes greater restrictions, the provisions of this chapter shall prevail.

3.2 Interpretation
The provisions of this chapter shall be held to be minimum requirements in their interpretation and application and shall be liberally construed to serve the purposes of this chapter.

Section 4: Lands to Which this Chapter Applies

4.1. Applicability
a. When any provision of any other chapter of the [local unit of government] conflicts with this chapter, that which provides more protection to wetlands and wetland buffers shall apply unless specifically provided otherwise in this chapter.

b. The [Approval Authority is authorized to adopt written procedures for the purpose of carrying out the provisions of this chapter. Prior to fulfilling the requirements of this chapter, [local unit of government] shall not grant any approval or permission to conduct a regulated activity in a wetland or wetland buffer including but not limited to the following:
[list all applicable permits and approvals, which may include the following: building permit, commercial or residential; binding site plan; conditional use permit; franchise right-of-way construction permit; grading and clearing permit; master plan development; planned unit development; right-of-way permit; shoreline substantial development permit; shoreline variance; shoreline conditional use permit; shoreline environmental redesignation; unclassified use permit; variance; zone reclassification; subdivision; short subdivision; special use permit; utility and other use permit; zone reclassification]; or any subsequently adopted permit or required approval not expressly exempted by this chapter.

Section 4.2. Maps and Inventory
This chapter shall apply to all lots or parcels on which wetlands and/or wetland buffers are located within the jurisdiction of [local unit of government]. The approximate location and extent of wetlands in the [local unit of government] is displayed on [Name of local government map or National Wetlands Inventory]. The [Name of local government map or National Wetlands Inventory] is to be used as a guide to the general location and extent of wetlands. Wetlands not shown on the [Name of local government map or National Wetlands Inventory] are presumed to exist in the [local unit of government] and are protected under all the provisions of this chapter. In the event that any of the wetland designations shown on the maps conflict with the criteria set forth in this chapter the criteria shall control.

Section 4.3 Determination of Regulatory Wetland Boundary
The exact location of the wetland boundary shall be determined by the applicant through the performance of a field investigation applying the wetland definition provided in Section 2 of this chapter. Qualified professional and technical scientists shall perform wetland delineations using the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands". The applicant is required under Section 6.3.c of this chapter to show the location of the wetland boundary on a scaled drawing as a part of the permit application.

The [Approval Authority], when requested by the applicant, may waive the delineation of boundary requirement for the applicant and, in lieu of delineation by the applicant, perform the delineation. The [Approval Authority] shall consult with qualified professional scientists and technical experts or other experts as needed to perform the delineation. The applicant may be charged for the costs incurred in accordance with the provisions of Section 6.3.d of this chapter.

Where [Approval Authority] performs a wetland delineation at the request of the applicant, such delineation shall be considered a final determination.

Where the applicant has provided a delineation of the wetland boundary, the [Approval Authority] shall verify the accuracy of, and may render adjustments to, the boundary delineation. In the event the adjusted boundary delineation is contested by the applicant, the [Approval Authority] shall, at the applicant's expense, obtain expert services to render a final delineation.

4.4 Wetlands Rating System
The following [Washington State or Puget Sound Region] rating system is hereby adopted as the rating system for the [local unit of government]. Wetlands buffer widths, replacement ratios and avoidance criteria shall be based on these rating systems.

a. Washington State Four-tier Wetlands Rating System.

1) Category I Criteria
   A. Documented habitat for endangered or threatened fish or animal species or for potentially extirpated plant species recognized by state or federal agencies; or
   B. High quality native wetland communities, including documented category I or II quality Natural Heritage wetland sites and sites which qualify as a category I or II quality Natural Heritage wetland; or
   C. High quality, regionally rare wetland communities with irreplaceable ecological functions, including sphagnum bogs and fens, estuarine, wetlands, or mature forested swamps; or
   D. Wetlands of exceptional local significance. The criteria for such a designation shall be developed and adopted by the local jurisdiction under appropriate public review and administrative appeal procedures. The criteria may include, but not be limited to, rarity, groundwater recharge areas, significant habitats, unique educational sites or other specific functional values within a watershed or other regional boundary.

2) Category II Criteria
   A. Regulated wetlands that do not contain features outlined in category I; and
   B. Documented habitats for sensitive plant, fish or animal species recognized by federal or state agencies; or
   C. Rare wetland communities listed in subsection 1)C which are not high quality; or
   D. Wetland types with significant functions which may not be adequately replicated through creation or restoration.
   E. Regulated wetlands with significant habitat value based on diversity and size.
   F. Regulated wetlands contiguous with salmonid fish-bearing waters, including streams where flow is intermittent; or
   G. Regulated wetlands with significant use by fish and wildlife.

3) Category III Criteria
   A. Regulated wetlands that do not contain features outlined in category I, II or IV.

4) Category IV Criteria
   A. Regulated wetlands which do not meet the criteria of a category I or II wetland; and
   B. Isolated wetlands that are less than or equal to one acre in size; and have only one wetland class; and have only one dominant plant species (monotypic vegetation); or
   C. Isolated wetlands that are less than or equal to two

acres in size, and have only one wetland class and a predominance of exotic species.

b. Puget Sound Region Wetlands Rating System

1) Category I Criteria
   A. Documented habitat for endangered or threatened plant, fish, or animal species or for potentially extirpated plant species recognized by state or federal agencies; or
   B. High quality native wetland communities, including documented category I or II quality Natural Heritage wetland sites and sites which qualify as a category I or II quality Natural Heritage wetland; or
   C. High quality, regionally rare wetland communities with irreplaceable ecological functions, including sphagnum bogs and fens, estuarine, wetlands, or mature forested swamps; or
   D. Wetlands of exceptional local significance. The criteria for such a designation shall be developed and adopted by the local jurisdiction under appropriate public review and administrative appeal procedures. The criteria may include, but not be limited to, rarity, groundwater recharge areas, significant habitats, unique educational sites or other specific functional values within a watershed or other regional boundary.

2) Category II Criteria
   A. Regulated wetlands that do not contain features outlined in category I; and
   B. Documented habitats for sensitive plant, fish or animal species recognized by federal or state agencies; or
   C. Rare wetland communities listed in subsection 1)C which are not high quality; or
   D. Wetland types with significant functions which may not be adequately replicated through creation or restoration. In the Puget Sound planning area, these wetlands may be demonstrated by the following characteristics:
      i. significant peat systems; or
      ii. forested swamps that have three canopy layers, excluding monotypic stands of red alder averaging 8 inches diameter at breast height or less; or
      iii. significant spring fed systems;
   E. Wetlands with significant habitat value based on diversity and size.
      i. 10 acres or greater in size; and 2 or more wetland classes together with open water at any time during a normal year; or
      ii. 10 acres or greater in size; and 3 or more wetland classes; and 5 or more subclasses of vegetation in a dispersed pattern; or

iii. 5 acres or greater in size; and 40 percent to 60 percent open water at any time during a normal year; and 2 or more subclasses of vegetation in a dispersed pattern;

F. Regulated wetlands contiguous with salmonid fish-bearing waters, including streams where flow is intermittent; or

G. Wetlands with significant use by fish and wildlife.

3) Category III Criteria

A. Regulated wetlands that do not contain features outlined in category I, II or IV.

4) Category IV Criteria

A. Regulated wetlands which do not meet the criteria of a category I or II wetland; and

B. Isolated wetlands that are less than or equal to one acre in size; and have only one wetland class; and have only one dominant plant species (monotypic vegetation); or

C. Isolated wetlands that are less than or equal to two acres in size, and have only one wetland class and a predominance of exotic species.

c. Wetland rating categories shall be applied as the regulated wetland exists on the date of adoption of the rating system by the local government; as the regulated wetland may naturally change thereafter; or as the regulated wetland may change in accordance with permitted activities. wetland rating categories shall not be altered to recognize illegal modifications.

d. Procedures for applying the wetland rating system. Reserved <u>(NOTE: Ecology's procedures for applying the wetland rating system uniformly will be available in July 1991.)</u>

Section 5: Regulated Activities and Allowed Activities

5.1 Regulated Activities

A permit shall be obtained from local government prior to undertaking the following activities in a regulated wetland or its buffer unless authorized by Section 5.2 below:

a. The removal, excavation, grading, or dredging of soil, sand, gravel, minerals, organic matter, or material of any kind;
b. The dumping, discharging, or filling with any material;
c. The draining, flooding, or disturbing of the water level or water table;
d. The driving of pilings;
e. The placing of obstructions;
f. The construction, reconstruction, demolition, or expansion of any structure;
g. The destruction or alteration of wetlands vegetation

through clearing, harvesting, shading, intentional burning, or planting of vegetation that would alter the character of a regulated wetland, provided that these activities are not part of a forest practice governed under chapter 76.09 RCW and its rules; or

h. Activities that result in a significant change of water temperature, a significant change of physical or chemical characteristics of wetlands water sources, including quantity, or the introduction of pollutants.

5.2 Allowed Activities

The following uses shall be allowed within a wetland or wetland buffer to the extent that they are not prohibited by any other chapter or law and provided they are conducted using best management practices, except where such activities result in the conversion of a regulated wetland or wetland buffer to a use to which it was not previously subjected and provided further that forest practices and conversions shall be governed by Chapter 76.09 RCW and its rules:

a. Conservation or preservation of soil, water, vegetation, fish, shellfish, and other wildlife;

b. Outdoor recreational activities, including fishing, birdwatching, hiking, boating, horseback riding, swimming, canoeing, and bicycling;

c. The harvesting of wild crops in a manner that is not injurious to natural reproduction of such crops and provided the harvesting does not require tilling of soil, planting of crops, or alteration of the wetland by changing existing topography, water conditions or water sources;

d. Existing and ongoing agricultural activities including farming, horticulture, aquaculture, irrigation, ranching or grazing,of animals. Activities on areas lying fallow as part of a conventional rotational cycle are part of an ongoing operation. Activities which bring an area into agricultural use are not part of an ongoing operation. An operation ceases to be ongoing when the area on which it was conducted has been converted to another use or has lain idle so long that modifications to the hydrological regime are necessary to resume operations.

e. The maintenance (but not construction) of drainage ditches;

f. Education, scientific research, and use of nature trails;

g. Navigation aids and boundary markers;

h. Boat mooring buoys;

i. Site investigative work necessary for land use application submittals such as surveys, soil logs, percolation tests and other related activities. In every case, wetland impacts shall be minimized and disturbed areas shall be immediately restored; and

j. The following uses are allowed within wetlands and/or wetland buffers provided that written notice at least ten days prior to the commencement of such work has been given to the [Approval Authority] and provided that wetland impacts are minimized and that disturbed areas are immediately restored:

1) Normal maintenance, repair, or operation of existing serviceable structures, facilities, or improved areas. Maintenance and repair does not include any modification that changes the character, scope, or size of the original structure, facility, or improved area and does not include the construction of a maintenance road and

2) Minor modification of existing serviceable structures within a buffer zone where modification does not adversely impact wetland functions.

5.3 Special Permit Uses
Any activity other than those specified in Section 5.2 may not be conducted in wetlands or wetland buffers except upon issuance of a Wetland Permit by the [Approval Authority].

Section 6. Procedures for Wetland Permits

6.1 Permit Requirements, Compliance
Except as specifically provided in Section 5.2, no regulated activity shall occur or be permitted to occur within a regulated wetland or wetland buffer without a written permit from the [Approval Authority]. Any alteration approved by such written permit shall comply fully with the requirements and purposes of this chapter, other applicable regulations, and any terms or conditions of said permit. All activities that are not allowed or permitted shall be prohibited.

6.2 Wetland Permits, Extensions

Application for a Wetland Permit to conduct any regulated activity not specifically authorized by Section 5.2 within a wetland or wetland buffer shall be made to the [Approval Authority] on forms furnished by that office. Permits shall normally be valid for a period of three years from the date of issue and shall expire at the end of that time unless a longer or shorter period is specified by the [Approval Authority] upon issuance of the permit.

An extension of an original permit may be granted upon written request to the [Approval Authority] by the original permit holder or the successor in title. Prior to the granting of an extension, the [Approval Authority] shall require updated studies and/or additional hearings if, in its judgement, the original intent of the permit is altered or enlarged by the renewal, if the circumstances relevant to the review and issuance of the original permit have changed substantially, or if the applicant failed to abide by the terms of the original permit.

6.3 Permit Applications

a. Request for Determination of Applicability
Any person seeking to determine whether a proposed activity or an area is subject to this chapter may request in writing a determination from the [Approval Authority]. Such a request for determination shall contain plans, data, and other information as may be specified by the [Approval Authority).

b. Pre-permit Consultations
Any person intending to apply for a Wetland Permit is strongly encouraged, but not required, to meet with the [Approval Authority) during the earliest possible stages of project planning in order to discuss wetland impact avoidance and minimization, and compensation before large commitments have been made to a particular project design. Effort put into preapplication consultations and planning will help applicants create projects which will be more quickly and easily processed.

c. Information Requirements
Unless the [Approval Authority] waives one or more of the following information requirements, applications for a Wetland Permit under this chapter shall include:

1) A description and maps overlaid on an aerial photograph at a scale no smaller than 1"=400' showing the entire parcel of land owned by the applicant and the exact boundary pursuant to Section 4.3 of the wetland on the parcel;
2) A description of the vegetative cover of the wetland and adjacent area including dominant species;
3) A site plan for the proposed activity overlaid on an aerial photograph at a scale no smaller than 1"=400' showing the location, width, depth and length of all existing and proposed structures, roads, sewage treatment, and installations within the wetland and its buffer;
4) The exact sites and specifications for all regulated activities including the amounts and methods;
5) Elevations of the site and adjacent lands within the wetland and its buffer at contour intervals of no greater than 5 feet;
6) Top view and typical cross-section views of the wetland

and its buffer to scale;
7) The purposes of the project and an explanation why the proposed activity cannot be located at other sites including an explanation of how the proposed activity is dependent upon wetlands or water-related resources as described in Section 7.2 of this chapter; and
8) Specific means to mitigate any potential adverse environmental impacts of the applicant's proposal.

The [Approval Authority] may require additional information, including, but not limited to, an assessment of wetland functional characteristics, including a discussion of the methodology used; documentation of the ecological, aesthetic, economic, or other values of a wetland; a study of flood, erosion, or other hazards at the site and the effect of any protective measures that might be taken to reduce such hazards; and any other information deemed necessary to verify compliance with the provisions of this chapter or to evaluate the proposed use in terms of the purposes of this chapter. The [Approval Authority] shall maintain and make available to the public, all information applicable to any wetland and its buffer.

d. Filing Fees

At the time of an application or request for letter of delineation, the applicant shall pay a filing fee as determined by the [Approval Authority]. Sufficient fees shall be charged to the applicant to cover the costs of evaluation of the application or request for delineation. These fees may be used by the [Approval Authority] to retain expert consultants to provide services pertaining to wetland boundary determinations, functional assessments, and evaluation of mitigation measures. As deemed necessary by the [Approval Authority], the [Approval Authority] may assess additional reasonable fees as needed to monitor and evaluate permit compliance and mitigation measures.

e. Notification

Upon receipt of the completed permit application, the [Approval Authority] shall notify the individuals and agencies, including federal and state agencies, having jurisdiction over or an interest in the matter to provide such individuals and agencies an opportunity to comment.

The [Approval Authority) shall establish a mailing list of all interested persons and agencies who wish to be notified of such applications.

f. Notice on Title

1) The owner of any property with field verified presence of wetland or wetland buffer pursuant to Section 4.3 on which a development proposal is submitted shall file for record with the appropriate Records Division a notice approved by the

[Approval Authority] in a form substantially as set forth in (2), below. Such notice shall provide notice in the public record of the presence of a wetland or wetland buffer, the application of this chapter to the property, and that limitations on actions in or affecting such wetlands and their buffers may exist.

The applicant shall submit proof that the notice has been filed for record before the [local unit of government] shall approve any development proposal for such site. The notice shall run with the land and failure to provide such notice to any purchaser prior to transferring any interest in the property shall be in violation of this chapter.

(NOTE: The form for such a notice may shall be developed and adopted by the local jurisdiction under appropriate administrative guidelines or rule procedures)

2) Form of Notice:

WETLAND AND/OR WETLAND BUFFER NOTICE

Legal Description: _____

_____

_____

Present owner: _____

NOTICE: This property contains wetlands or their buffers as defined by [local unit of government] Ordinance. The property

was the subject of a development proposal for _____

(type of permit) _____ application # _____

filed on (date) . Restrictions on use or alteration of the wetlands or their buffers may exist due to natural conditions of the property and resulting regulations. Review of such application has provided information on the location of wetlands or wetland buffers and restrictions on their use through setback areas. A copy of the plan showing such setback areas is attached hereto.

_____
Signature of owner

STATE OF WASHINGTON)
COUNTY OF _____)

On this day personally appeared before me to me known to be the individual(s) described in and who executed the within and foregoing instrument and acknowledged that they signed the same

as their free and voluntary act and deed for the uses and purposes therein stated.

Given under my hand and official seal this _____ day of _____ , _____. NOTARY PUBLIC in and for the state of Washington, residing at _____.

6.4 Permit Processing

a. Consolidation
The [Approval Authority] shall, to the extent practicable and feasible, consolidate the processing of wetlands related aspects of other [local unit of government] regulatory programs which affect activities in wetlands, such as subdivision, clearing and grading, floodplain, and environmentally sensitive chapter, etc., with the Wetland Permit process established herein so as to provide a timely and coordinated permit process.

b. Completeness of Application
No later than 10 working days after receipt of the permit application the [Approval Authority] shall notify the applicant as to the completeness of the application. An application shall not be deemed complete until and unless all information necessary to evaluate the proposed activity, its impacts, and its compliance with the provisions of this chapter have been provided to the satisfaction of the [Approval Authority]. Such determination of completeness shall not be construed as an approval or denial of the permit application.

(NOTE: It is not intended that every permit application be processed through a Public hearing. Local governments may wish to establish various levels of review, including administrative review, for projects depending on the potential impact of different project types on wetlands.)

c. Public Hearings
Following the submittal of an application determined to be complete by the [Approval Authority], the [Approval Authority shall hold a public hearing on the application, unless the [Approval Authority] finds that the activity is so minor as to not affect a wetland or wetland buffer. The [Approval Authority] shall, at least fifteen (15) days prior to the date of the hearing, confirm that the applicant has:

1) published a notice of the hearing at least once a week on the same day of the week for two consecutive weeks in a newspaper having a general circulation in the [local jurisdiction];

2) given notice to the latest recorded real property owners as shown by the records of the county assessor within at least three hundred feet of the boundary of the property upon which the regulated activity is proposed; and
3) posted a notice at the proposed site of activity and at public places of assembly near the site of the proposed activity.

The notices shall include a brief description of the project, including the location; notice of the time and place of the hearing; notice that the file regarding the permit application is available for public inspection during regular business hours; the address where the file may be inspected; a request for written comments prior to the hearing, and attendance and oral testimony by concerned parties at the hearing.

All hearings shall be open to the public. A record of the hearings shall be made. Any person may present evidence and testimony at the hearing. At the hearing, the applicant shall have the burden of demonstrating that the proposed activity will be in accordance with the purposes of this chapter and the standards set forth below.

d. Permit Action

1) Upon receipt of a complete application for a permit authorizing activities on a category I wetland or its buffer, local governments shall submit the application to the Washington State Department of Ecology for its review and comment. When such permit applications are submitted, the Washington State Department of Ecology should submit its comments or should request an extension of the review period within 30 days. Extensions may be up to 30 days in length. When submitted, no permit shall be issued under this subsection prior to receipt of such comments or the expiration of the time period or any extension.

2) The [Council, Board, or Commission] shall approve, approve with conditions, or deny a permit application within (30) working days of the public hearing, except that where additional information is required by the [Council, Board, or Commission], it may extend this period by 60 days. In acting on the application, the [Council, Board, or Commission] shall in writing deny, permit, or conditionally permit the proposed activity. If a decision must be made in a 90 day period and there is insufficient information or time to process the application, a denial will be issued.

Section 7: Standards for Permit Decisions

a. A permit shall only be granted if the permit, as conditioned, is consistent with the provisions of this chapter. Additionally, permits shall only be granted if:

1) A proposed action avoids adverse impacts to regulated wetlands or their buffers or takes affirmative and appropriate measures to minimize and compensate for unavoidable impacts;
2) The proposed activity results in no net loss; or
3) Denial of a permit would cause an extraordinary hardship on the applicant.

b. Wetlands permits shall not be effective and no activity thereunder shall be allowed during the time provided to file a permit appeal.

7.1 Wetland Buffers

a. Standard Buffer Zone Widths
Wetland buffer zones shall be required for all regulated activities adjacent to regulated wetlands. Any wetland created, restored or enhanced as compensation for approved wetland alterations shall also include the standard buffer required for the category of the created, restored, or enhanced wetland. All buffers shall be measured from the wetland boundary as surveyed in the field pursuant to the requirements of Section 2. The width of the wetland buffer zone shall be determined according to wetland category and the proposed land use.

1) Category I	
High intensity	300 feet
Low intensity	200 feet
2) Category II	
High intensity	200 feet
Low intensity	100 feet
3) Category III	
High intensity	100 feet
Low intensity	50 feet
4) Category IV	
High intensity	50 feet
Low intensity	25 feet

(NOTE: These buffer ranges have been established to reflect the impact of intense and uses on wetland functions and values. If local jurisdictions choose to adopt a single standard buffer width from within these ranges additional criteria should be added which will result in a reduction or increase in the standard based on landuse intensity and its impact on existing habitat values.)

b. Increased Wetland Buffers Zone Width
The [Approval Authority] shall require increased standard buffer zone widths on a case-by-case basis when a larger buffer is necessary to protect wetlands functions and values based on local conditions. This determination shall be supported by appropriate documentation showing that it is reasonably related to protection of the functions and values of the regulated wetland. Such determination shall be attached as a permit condition and shall demonstrate that:
1) a larger buffer is necessary to maintain viable populations of existing species; or
2) the wetland is used by species proposed or listed by the federal government or the state as endangered, threatened, rare, sensitive or monitor, critical or outstanding potential habitat for those species or has unusual nesting or resting sites such as heron rookeries or raptor nesting trees; or
3) the adjacent land is susceptible to severe erosion and erosion control measures will not effectively prevent adverse wetland impacts; or
4) the adjacent land has minimal vegetative cover or slopes greater than 15 percent.

c. Reduction of Standard Wetland Buffer Zone Width
The [Approval Authority] may reduce the standard wetland buffer zone widths on a case-by-case basis where it can be demonstrated that:
1) the adjacent land is extensively vegetated and has less than 15 percent slopes and that no direct or indirect, short - term or long-term, adverse impacts to regulated wetlands, as determined by the [Approval Authority], will result from a regulated activity. The [Approval Authority] may require long-term monitoring of the project and subsequent corrective actions if adverse impacts to regulated wetlands are discovered; or
2) the project includes a buffer enhancement plan using native vegetation which substantiates that an enhanced buffer will improve the functional attributes of the buffer to provide additional protection for wetlands functions and values. An enhanced buffer shall not result in greater than a 25 percent reduction in the buffer width, and the reduced buffer shall not be less than 25 feet.

d. Standard Wetland Buffer Width Averaging
Standard wetland buffer zones may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates all of the following:
1)that averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2)that the wetland contains variations in sensitivity due to existing physical characteristics;
3)that low intensity land uses would be located adjacent to

areas where buffer width is reduced, and that such low intensity land uses are guaranteed in perpetuity by covenant, deed restriction, easement, or other legally binding mechanism;
4)that width averaging will not adversely impact the wetland functional values; and
5)that the total area contained within the wetland buffer after averaging is no less than that contained within the standard buffer prior to averaging. In no instance shall the buffer width be reduced by more than 50% of the standard buffer or be less than 25 feet.

e. Except as otherwise specified, wetland buffer zones shall be retained in their natural condition. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required.

f. Permitted Uses in a Wetland Buffer Zone
Regulated activities shall not be allowed in a buffer zone except for the following:
1) activities having minimal adverse impacts on buffers and no adverse impacts on regulated wetlands. These may include low intensity, passive recreational activities such as pervious trails, nonpermanent wildlife watching blinds, short term scientific or educational activities, and sports fishing or hunting;
2) with respect to category III and IV wetlands, stormwater management facilities having no reasonable alternative on-site location; or
3) with respect to category III and IV wetlands, development having no feasible alternative location.

g. Building Setback Lines.
A building setback line of 15 feet is required from the edge of any wetland buffer. Minor structural intrusions into the area of the building setback may be allowed if the [Approval Authority] determines that such intrusions will not negatively impact the wetland. The setback shall be identified on a site plan which is filed as an attachment to the notice on title required by section 6.2.f.

7.2 Avoiding Wetland Impacts

a. Regulated activities shall not be authorized in a regulated wetland except where it can be demonstrated that the impact is both unavoidable and necessary or that all reasonable economic uses are denied.

b. With respect to category I wetlands, an applicant must demonstrate that denial of the permit would impose an extraordinary hardship on the part of the applicant brought about by circumstances peculiar to the subject property.

c. With respect to category II and III wetlands, the following provisions shall apply:
1) For water-dependent activities, unavoidable and necessary impacts can be demonstrated where there are no practicable alternatives which would not involve a wetland or which would not have less adverse impact an a wetland, and would not have other significant adverse environmental consequences.
2) Where nonwater-dependent activities are proposed, it shall be presumed that adverse impacts are avoidable. This presumption may be rebutted upon a demonstration that:
   A. the basic project purpose cannot reasonably be accomplished utilizing one or more other sites in the general region that would avoid, or result in less, adverse impact on a regulated wetland; and
   B. a reduction in the size, scope, configuration, or density of the project as proposed and all alternative designs of the project as proposed that would avoid, or result in less, adverse impact on a regulated wetland or its buffer will not accomplish the basic purpose of the project; and
   C. in cases where the applicant has rejected alternatives to the project as proposed due to constraints such as zoning, deficiencies of infrastructure, or parcel size, the applicant has made reasonable attempt to remove or accommodate such constraints.

d. With respect to category IV wetlands, unavoidable and necessary impacts can be demonstrated where the proposed activity is the only reasonable alternative which will accomplish the applicant's objectives.

e. Reasonable Use
If an applicant for a development proposal demonstrates to the satisfaction of the [Approval Authority] that application of these standards would deny all reasonable economic use of the property, development as conditioned shall be allowed if the applicant also demonstrates all of the following to the satisfaction of the [Approval Authority):

i. that the proposed project is water-dependent or requires access to the wetland as a central element of its basic function, or is not water-dependent but has no practicable alternative pursuant to Section 7.2;

ii. that no reasonable use with less impact on the wetland and its buffer is possible (e.g., agriculture, aquaculture, transfer or sale of development rights or credits, sale of open Space easements, etc.);

iii. that there is no feasible on-site alternative to the proposed activities, including reduction in density, phasing of project implementation, change in timing of

activities, revision of road and lot layout, and/or related site planning considerations, that would allow a reasonable economic use with less adverse impacts to wetlands and wetland buffers;

iv. that the proposed activities will result in minimum feasible alteration or impairment to the wetland's functional characteristics and its existing contours, vegetation, fish and wildlife resources, and hydrological conditions;

v. that disturbance of wetlands has been minimized by locating any necessary alteration in wetland buffers to the extent possible;

vi. that the proposed activities will not jeopardize the continued existence of endangered, threatened, rare, sensitive, or monitor species as listed by the federal government or the State of Washington;

vii. that the proposed activities will not cause significant degradation of groundwater or surface-water quality;

viii. that the proposed activities comply with all state, local and federal laws, including those related to sediment control, pollution control, floodplain restrictions, and on-site wastewater disposal;

ix. that any and all alterations to wetlands and wetland buffers will be mitigated as provided in Section 7.5.g.

x. that there will be no damage to nearby public or private property and no threat to the health or safety of people on or off the property; and

xi. that the inability to derive reasonable economic use of the property is not the result of actions by the applicant in segregating or dividing the property and creating the undevelopable condition after the effective date of this chapter.

If the [Approval Authority] determines that alteration of a wetland and/or wetland buffer is necessary and unavoidable, the [Approval Authority] shall set forth in writing in the file it maintains regarding a permit application its findings with respect to each of the items listed in this subsection.

4) With respect to category IV wetlands, unavoidable and necessary impacts can be demonstrated where the proposed activity is the only reasonable alternative which will accomplish the applicant's objectives.

7.3 Minimizing Wetlands Impacts

a. After it has been determined by the [Approval Authority] pursuant to Section 7.2 that losses of wetland are necessary and unavoidable or that all reasonable economic use has been denied, the applicant shall take deliberate measures to minimize wetland impacts.

b. Minimizing impacts to wetlands shall include but is not limited to:
1) limiting the degree or magnitude of the regulated activity;
2) limiting the implementation of the regulated activity;
3) using appropriate and best available technology;
4) taking affirmative steps to avoid or reduce impacts;
5) sensitive site design and siting of facilities and construction staging areas away from regulated wetlands and their buffers;
6) involving resource agencies early in site planning; and
7) providing protective measures such as siltation curtains, hay bales and other siltation prevention measures, scheduling the regulated activity to avoid interference with wildlife and fisheries rearing, resting, nesting or spawning activities.

7.4 Limited Density Transfer
For development proposals on lands containing wetland buffers, the [Approval Authority] shall determine allowable dwelling units for residential development proposals based on the formulas below.

The following formula for density calculations is designed to provide incentives for the preservation of wetlands and wetland buffers, flexibility in design, and consistent treatment of different types of development proposals. The formula shall apply to all properties within existing residential zones on which wetlands and wetland buffers are located.

The maximum number of dwelling units (DU) for a lot or parcel which contains wetlands and wetland buffers shall be equal to:
(Acres in Wetland Buffer)(DU/Acre)(Density Credit)

The density credit figure is derived from the following table:

Percentage of site in buffers	Density Credit
1-10%	100%
11-20%	90%
21-30%	80%
31-40%	70%
41-50%	60%
51-60%	50%
61-70%	40%

71-80%	30%
81-90%	20%
91-99%	10%

The density credit can only be transferred within the development proposal site. To the extent that application of the formula may result in lot sizes less than the minimum allowed by the underlying district, they are hereby authorized provided that the resultant lot is of sufficient size for a on-site waste disposal system if no sanitary sewer system exists.

The [Approval Authority] shall not allow credit for density for the portions of the site occupied by wetlands.

7.5 Acting on the Application

a. Special Use Permit Conditions
1) Sensitive Area Tracts
As a condition of any permit issued pursuant to this chapter, the permit holder shall be required to create a separate sensitive area tract or tracts containing the areas determined to be wetland and/or wetland buffer in field investigations performed pursuant to Section 4.3 Sensitive area tracts are legally created tracts containing wetlands and their buffers that shall remain undeveloped in perpetuity. Sensitive area tracts are an integral part of the lot in which they are created, are not intended for sale, lease or transfer, and shall be included if the area of the parent lot for purposes of subdivision method and minimum lot size.

A. Protection of Sensitive Area Tracts
The [Approval Authority] shall require, as a condition of any permit issued pursuant to this chapter, that the sensitive area tract or tracts created pursuant to Section 7.5.a be protected by one of the following methods:
i. The permit holder shall convey an irrevocable offer to dedicate to the [local unit of government] or other public or non-profit entity specified by the [Approval Authority] an easement for the protection of native vegetation within a wetland and/or its buffer or
ii. The permit holder shall establish and record a permanent and irrevocable deed restriction on the property title of all lots containing a sensitive area tract or tracts created as a condition of this permit. such deed restriction(s) shall prohibit in Perpetuity the development, alteration, or disturbance of vegetation within the sensitive area tract except for purposes of habitat enhancement as part of an enhancement project which has received prior written

approval from [local unit of government], and any other agency with jurisdiction over such activity.

(NOTE: The following is is suggested language)

2) The deed restriction shall also contain the following language:

A. "Before beginning and during the course of any grading, building construction, or other development activity on a lot or development site subject to this deed restriction, the common boundary between the area subject to the deed restriction and the area of development activity must be fenced or otherwise marked to the satisfaction of [local unit of government]."

B. Regardless of the legal method of protection chosen by the [Approval Authority], responsibility for maintaining tracts shall be held by a homeowners association, adjacent lot owners, the permit applicant or designee, or other appropriate entity as approved by the [Approval Authority].

C. The following note shall appear on the face of all plats, short plats, PUDS, or other approved site plans containing separate sensitive area tracts, and shall be recorded on the title of record for all affected lots:

NOTE: All lots adjoining separate sensitive area tracts identified as Native Vegetation Protection Easements or protected by deed restriction are responsible for maintenance and protection of the tracts. Maintenance includes insuring that no alterations occur within the separate tract and that all vegetation remains undisturbed unless the express written authorization of the [local unit of government) has been received.

The common boundary between a separate sensitive area tract and the adjacent land must be permanently identified. This identification shall include permanent wood or metal signs on treated or metal posts. Signs shall be worded as follows:

"Protection of this natural area is in your care. Alteration or disturbance is prohibited by law. Please call the [Approval Authority] for more information."

Sign locations and size specifications shall be approved by the [Approval Authority]. The [Approval Authority] shall require permanent fencing of the sensitive area tract or tracts when there is a substantial likelihood of the presence of domestic grazing animals within the

development proposal. The [Approval Authority] shall also require as a permit condition that such fencing be provided if, subsequent to approval of the development proposal, domestic grazing animals are in fact introduced.

3) Additional Conditions

A. The location of the outer extent of the wetland buffer and the areas to be disturbed pursuant to an approved permit shall be marked in the field, and such field marking shall be approved by the [Approval Authority) prior to the commencement of permitted activities. Such field markings shall be maintained throughout the duration of the permit.

B. The [Approval Authority] may attach such additional conditions to the granting of a special use permit as deemed necessary to assure the preservation and protection of affected wetlands and to assure compliance with the purposes and requirements of this chapter.

b. Bonding

1) Performance Bonds

The [Approval Authority] shall require the applicant of a development proposal to post a cash performance bond or other security acceptable to the [Approval Authority] in an amount and with surety and conditions sufficient to fulfill the requirements of Section 7.5.f and, in addition, to secure compliance with other conditions and limitations set forth in the permit. The amount and the conditions of the bond shall be consistent with the purposes of this chapter. In the event of a breach of any condition of any such bond, the [Approval Authority] may institute an action in a court of competent jurisdiction upon such bond and prosecute the same to judgement and execution. The [Approval Authority] shall release the bond upon determining that:

A. all activities, including any required compensatory mitigation, have been completed in compliance with the terms and conditions of the permit and the requirements of this chapter;

B. upon the posting by the applicant of a maintenance bond.

Until such written release of the bond, the principal or surety cannot be terminated or canceled.

2) Maintenance Bonds

The [approval Authority] shall require the holder of a development permit issued pursuant to this chapter to post a cash performance bond or other security acceptable to the

[Approval Authority] in an amount and with surety and conditions sufficient to guarantee that structures, improvements, and mitigation required by the permit or by this chapter perform satisfactorily for a minimum of two (2) years after they have been completed. The [Approval Authority] shall release the maintenance bond upon determining that performance standards established for evaluating the effectiveness and success of the structures, improvements, and/or compensatory mitigation have been satisfactorily met for the required period. For compensation projects, the performance standards shall be those contained in the mitigation plan developed and approved during the permit review process pursuant to Section 7.5.g. The maintenance bond applicable to a compensation project shall not be released until the [Approval Authority determines that performance standards established for evaluating the effect and success of the project have been met.

c. Other Laws and Regulations
No permit granted pursuant to this chapter shall remove an applicant's obligation to comply in all respects with the applicable provisions of any other Federal, State, or local law or regulation, including but not limited to the acquisition of any other required permit or approval.

d. Suspension, Revocation
In addition to other penalties provided for elsewhere, the [Approval Authority] may suspend or revoke a permit if it finds that the applicant or permittee has not complied with any or all of the conditions or limitations set forth in the permit, has exceeded the scope of work set forth in the permit, or has failed to undertake the project in the manner set forth in the approved application.

e. Publication of Notice
The [Approval Authority] shall cause notice of its denial, issuance, conditional issuance, revocation, or suspension of a permit to be published in a daily newspaper having a broad circulation in the area wherein the wetland lies. Such notice shall be published within five (5) working days of the decision or order and shall include at least the following:

1) A brief description of the project, including location;

2) The decision or order of the [Approval Authority] with respect to the project;

3) Notification that the permit file is open for public inspection during regular business hours, and the address where such file may be inspected; and

4) A statement of the procedures regarding appeal or judicial review of the decision, if applicable.

f. Compensating for Wetlands Impacts.

As a condition of any permit allowing alteration of wetlands and/or wetland buffers, or as an enforcement action pursuant to Section 8.2, the [Approval Authority] shall require that the applicant engage in the restoration, creation or enhancement of wetlands and their buffers in order to offset the impacts resulting form the applicant's or violator's actions. The Applicant shall develop a plan that provides for land acquisition, construction, maintenance and monitoring of replacement wetlands that recreate as nearly as possible the original wetlands in terms of acreage, function, geographic location and setting, and that are larger than the original wetlands. The overall goal of any compensatory project shall be no net loss of wetlands function and acreage and to strive for a net resource gain in wetlands over present conditions. Compensation shall be completed prior to wetland destruction, where possible.

Compensatory mitigation shall follow an approved mitigation plan pursuant to Section 7.5.g and shall meet the following minimum performance standards:

1) Given the uncertainties in scientific knowledge and the need for expertise and monitoring, wetland compensatory projects may be permitted only when the [Approval Authority] finds that the compensation project is associated with an activity or development otherwise permitted and that the restored, created, or enhanced wetland will be as persistent as the wetland it replaces. Additionally, Applicants shall:

A. demonstrate sufficient scientific expertise, supervisory capability, and financial resources to carry out the project;
B. demonstrate the capability for monitoring the site and to make corrections during this period if the project fails to meet projected goals; and
C. protect and manage or provide for the protection and management of the compensation area to avoid further development or degradation and to provide for long-term persistence of the compensation area.

2) Wetlands Restoration and Creation.
A. Any person who alters regulated wetlands shall restore or create equivalent areas or greater areas of wetlands than those altered in order to compensate for wetland losses.
B. Where feasible, restored or created wetlands shall be a higher category than the altered wetland.
C. Compensation areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the best

professional judgement of a qualified wetland ecologist using the best available techniques. Multiple compensation projects may be proposed for one project in order to best achieve the goal of no net loss.

D. Acreage replacement ratio. The following ratios apply to creation or restoration which is in-kind, onsite, timed prior to or concurrent with alteration, and has a high probability of success. These ratios do not apply to remedial actions resulting from illegal alterations. The first number specifies the acreage of wetlands requiring replacement and the second specifies the acreage of wetlands altered.

Category I	6:1
Category II or III	
Forested	3:1
Scrub-shrub	2:1
Emergent	1.5:1
Category IV	1.25:1

i. Increased Replacement Ratio.
The [Approval Authority] may increase the ratios under the following circumstances:
-uncertainty as to the probable success of the proposed restoration or creation;
- significant period of time between destruction and replication of wetland functions;
-projected losses in functional value; or
-offsite compensation.
ii. Decreased Replacement Ratio.
The [Approval Authority] may decrease these ratios under the following circumstance:
-findings of special studies coordinated with agencies with expertise which demonstrate that no net loss of wetland function or value is attained under the decreased ratio.
iii. In all cases, a minimum acreage replacement ratio of 1:1 shall be required.

3) Wetlands Enhancement.

A. Any Applicant proposing to alter wetlands may propose to enhance existing significantly degraded wetlands in order to compensate for wetland losses. Applicants proposing to enhance wetlands shall identify how enhancement conforms to the overall goals and requirements of the local wetlands protection program and established regional goals.

B. A wetlands enhancement compensation project shall be determined pursuant to Sections 7.5.f, provided that enhancement for one function and value will not degrade another function or value and that acreage replacement

ratios shall be doubled to recognize existing functional values and, provided further, that category I wetlands shall not be enhanced.

4) Wetland Type

A. In-kind compensation shall be provided except where the applicant can demonstrate that:
i. the wetland system is already significantly degraded and out-of-kind replacement will result in a wetland with greater functional value;
ii. scientific problems such as exotic vegetation and changes in watershed hydrology make implementation of in-kind compensation impossible; or
iii. out-of-kind replacement will best meet identified regional goals (eg., replacement of historically diminished wetland types).
iv. where out-of-kind replacement is accepted, greater acreage replacement ratios may be required to compensate for lost functional values.

5) Location.

A. On-site compensation shall be provided except where the applicant can demonstrate that:
i. the hydrology and ecosystem of the original wetland and those who benefit from the hydrology and ecosystem will not be substantially damaged by the onsite loss; and
ii. onsite compensation is not scientifically feasible due to problems with hydrology, soils, waves, or other factors; or
iii. compensation is not practical due to potentially adverse impact from surrounding land uses; or
iv. existing functional values at the site of the proposed restoration are significantly greater than lost wetland functional values; or
v. that established regional goals for flood storage, flood conveyance, habitat or other wetland functions have been established and strongly justify location of compensatory measures at another site.

B. Offsite compensation shall occur within the same watershed as the wetland loss occurred, provided that category IV wetlands may be replaced outside of the watershed when there is no reasonable alternative.

C. In selecting compensation sites, applicants shall pursue siting in the following order of preference:
i. upland sites which were formerly wetlands;
ii. idled upland sites generally having bare ground or vegetative cover consisting primarily of exotic introduced species, weeds, or emergent vegetation;
iii. other disturbed upland.

6) Timing.

A. Where feasible, compensatory projects shall be completed prior to activities that will disturb wetlands, and immediately after activities that will temporarily disturb wetlands. In all other cases, except for category I wetlands, compensatory projects should be completed prior to use or occupancy of the activity or development which was conditioned upon such compensation. Construction of compensation projects shall be timed to reduce impacts to existing wildlife and flora.

7) Cooperative Restoration, Creation or Enhancement Projects.

A. The [Approval authority] may encourage, facilitate, and approve cooperative projects wherein a single applicant or other organization with demonstrated capability may undertake a compensation project with funding from other applicants under the following circumstances:
i. restoration, creation or enhancement at a particular site may be scientifically difficult or impossible; or
ii. creation of one or several larger wetlands may be preferable to many small wetlands.

B. Persons proposing cooperative compensation projects shall:
i. submit a joint permit application;
ii. demonstrate compliance with all standards;
iii. demonstrate the organizational and fiscal capability to act cooperatively; and
iv. demonstrate that long term management can and will be provided.

g. Mitigation Plans

All wetland restoration, creation and/or enhancement proJects required pursuant to this chapter either as a permit condition or as the result of an enforcement action shall follow a mitigation plan prepared by qualified wetland professionals approved by the [Approval Authority]. The applicant or violator shall receive written approval of the mitigation plan by the Approval Authority prior to commencement of any wetland restoration, creation or enhancement activity. Unless the [Approval Authority], in consultation with qualified wetland professionals, determines, based on the size and nature of the development proposal, the nature of the impacted wetland, and the degree of cumulative impacts on the wetland from other development proposals, that the scope and specific requirements of the mitigation plan may be reduced from what is listed below, the mitigation plan shall contain at least the following components:

1) Baseline Information. A written assessment and accompanying maps of the:
-impacted wetland including, at a minimum, wetland delineation; existing wetland acreage; vegetative, faunal

and hydrologic characteristics; soil and substrate conditions; topographic elevations and
-compensation site, if different from the impacted wetland site, including at a minimum: existing acreage; vegetative, faunal and hydrologic conditions; relationship within watershed and to existing waterbodies; soil and substrate conditions, topographic elevations; existing and proposed adjacent site conditions; buffers; and ownership.

2) Environmental Goals and Objectives. A written report shall be provided identifying goals and objectives and describing:
-the purposes of the compensation measures including a description of site selection criteria, identification of compensation goals; identification of target evaluation species and resource functions, dates for beginning and completion, and a complete description of the structure and functional relationships sought in the new wetland. The goals and objectives shall be related to the functions and values of the original wetland or if out--of-kind, the type of wetland to be emulated; and
-A review of the available literature and/or experience to date in restoring or creating the type of wetland proposed shall be provided. An analysis of the likelihood of success of the compensation project at duplicating the original wetland shall be provided based on the experiences of comparable projects, if any. An analysis of the likelihood of persistence of the created or restored wetland shall be provided based on such factors as surface and ground water supply and flow patterns, dynamics of the wetland ecosystem; sediment or pollutant influx and/or erosion, periodic flooding and drought, etc., presence of invasive flora or fauna, potential human or animal disturbance, and previous comparable projects, if any.

3) Performance Standards. Specific criteria shall be provided for evaluating whether or not the goals and objectives of the project and for beginning remedial action or contingency measures. Such criteria may include water quality standards, survival rates of planted vegetation, species abundance and , diversity targets, habitat diversity indices, or other ecological, geological or hydrological criteria.

4) Detailed Construction Plans. Written specifications and descriptions of compensation techniques shall be provided including the proposed construction sequence, grading and excavation details, erosion and sediment control features needed for wetland construction and long-term survival, a planting plan specifying plant species, quantities, locations, size, spacing, and density; source of plant materials,

propagules, or seeds; water and nutrient requirements for planting; where appropriate, measures to protect plants from predation; specification of substrate stockpiling techniques and planting instructions; descriptions of water control structures and water-level maintenance practices needed to achieve the necessary hydrocycle/hydroperiod characteristics; etc. These written specifications shall be accompanied by detailed site diagrams, scaled cross-sectional drawings, topographic maps showing slope percentage and final grade elevations, and any other drawings appropriate to show construction techniques or anticipated final outcome. The plan shall provide for elevations which are appropriate for the desired habitat type(s) and which provide sufficient tidal prism and circulation data.

5) Monitoring Program. A program outlining the approach for monitoring construction of the compensation project and for assessing a completed project shall be provided. Monitoring may include, but is not limited to:

A. Establishing vegetation plots to track changes in plant species composition and density over time;
B. using photo stations to evaluate vegetation community response;
C. sampling surface and subsurface waters to determine pollutant loading, and changes from the natural variability of background conditions (pH, nutrients, heavy metals);
D. measuring base flow rates and storm water runoff to model and evaluate water quality predictions, if appropriate;
E. measuring sedimentation rates, if applicable; and
F. sampling fish and wildlife populations to determine habitat utilization, species abundance and diversity.

A protocol shall be included outlining how the monitoring data will be evaluated by agencies that are tracking the progress of the compensation project. A monitoring report shall be submitted annually, at a minimum, documenting milestones, successes, problems, and contingency actions of the compensation project. The compensation project shall be monitored for a period necessary to establish that performance standards have been met, but not for a period less than five years.

6) Contingency Plan. Identification of potential courses of action, and any corrective measures to be taken when monitoring or evaluation indicates project performance standards are not being met.

7) Permit Conditions. Any compensation project prepared pursuant to this section and approved by the [Approval Authority] shall become part of the application for the permit.

8) Performance Bonds and Demonstration of Competence.
A demonstration of financial resources, administrative, supervisory, and technical competence and scientific expertise of sufficient standing to successfully execute the compensation project shall be provided. A compensation project manager shall be named and the qualifications of each team member involved in preparing the mitigation plan and implementing and supervising the project shall be provided, including educational background and areas of expertise, training and experience with comparable projects. In addition, bonds ensuring fulfillment of the compensation project, monitoring program, and any contingency measure shall be posted pursuant to Section 7.5 in the amount of one hundred twenty (120) percent of the expected cost of compensation.

9) Regulatory authorities are encouraged to consult with and solicit comments of any federal, state, regional, or local agency, including tribes, having any special expertise with respect to any environmental impact prior to approving a mitigation proposal which includes wetlands compensation. The compensation project proponents should provide sufficient information on plan design and implementation in order for such agencies to comment on the overall adequacy of the mitigation proposal.

10) Compensatory mitigation is not required for regulated activities:

A. For which a permit has been obtained that occur only in the buffer or expanded buffer and which have not adverse impacts to regulated wetlands; or
B. allowed activities pursuant to Section 5.2 provided such activities utilize best management practices to protect the functions and values of regulated wetlands.

7.6 Appeals
Any decision of the [Approval Authority] in the administration of this chapter may be appealed to [hearing body]. The [hearing body] shall give substantial weight to any discretionary decision of the [Approval Authority] rendered pursuant to this Chapter.

7.7 Modification of Wetland Permits
A Wetland Permit holder may request and the [Approval Authority] may approve modification of a previously issued Wetland Permit.

7.8 Resubmittal of Denied Permit Applications
A Wetland Permit application which has been denied may be modified and resubmitted no earlier than one hundred eighty (180) days following action on the original application. A permit application shall be considered a resubmittal if the site proposed for development was the subject of a Wetland Permit application within the previous one hundred eighty (180) days.

Section 8: Temporary Emergency Permit, Enforcement

8.1 Temporary Emergency Permit
Notwithstanding the provisions of this chapter or any other laws to the contrary, the [Approval Authority] may issue a temporary emergency wetlands permit if:

a. The [Approval Authority] determines that an unacceptable threat to life or severe loss of property will occur if an emergency permit is not granted; and

b. The anticipated threat or loss may occur before a permit can be issued or modified under the procedures otherwise required by this act and other applicable laws.

Any emergency permit granted shall incorporate, to the greatest extent practicable and feasible but not inconsistent with the emergency situation, the standards and criteria required for non-emergency activities under this act and shall:

a. be limited in duration to the time required to complete the authorized emergency activity, not to exceed 90 days; and

b. require, within this 90 day period, the restoration of any wetland altered as a result of the emergency activity, except that if more than the 90 days from the issuance of the emergency permit is required to complete restoration, the emergency permit may be extended to complete this restoration.

Issuance of an emergency permit by the [Approval Authority] does not preclude the necessity to obtain necessary approvals from appropriate federal and state authorities.

Notice of the issuance of the emergency permit and request for public comments shall be published at least once a week on the same day of the week for two consecutive weeks in a newspaper having a general circulation in the [local jurisdiction] no later than 10 days after issuance of the emergency permit.

The emergency permit may be terminated at any time without process upon a determination by the [Approval Authority] that the action was not or is no longer necessary to protect human health or the environment.

8.2 Enforcement

The [Approval Authority] shall have authority to enforce this chapter, any rule or regulation adopted, and any permit or order issued pursuant to this chapter, against any violation or threatened violation thereof. The [Approval Authority] is authorized to issue violation notices and administrative orders, levy fines, and/or institute legal actions in court. Recourse to

any single remedy shall not preclude recourse to any of the other remedies. Each violation of this chapter, or any rule or regulation adopted, or any permit, permit condition, or order issued pursuant to this chapter, shall be a separate offense, and, in the case of a continuing violation, each day's continuance shall be deemed to be a separate and distinct offense. All costs, fees, and expenses in connection with enforcement actions may be recovered as damages against the violator.

a. Enforcement actions shall include:
1) Civil Penalties, Administrative Orders and Actions for Damages and Restoration.

A. The [Approval Authority] may bring appropriate actions at law or equity, including actions for injunctive relief, to ensure that no uses are made of a regulated wetland or their buffers which are inconsistent with this chapter or an applicable wetlands protection program.

B. The [Approval Authority] may serve upon a person a cease and desist order if an activity being undertaken on regulated wetlands or its buffer is in violation of the act, these rules or a local wetlands protection program. Whenever any person violates this chapter or any permit issued to implement this chapter, the [local unit of government] may issue an order reasonably appropriate to cease such violation and to mitigate any environmental damage resulting therefrom.

i. Content of order. The order shall set forth and contain:
-A description of the specific nature, extent, and time of violation and the damage or potential damage; and
-A notice that the violation or the potential violation cease and desist or, in appropriate cases, the specific corrective action to be taken within a given time. A civil penalty may be issued with the order.
-Effective date. The cease and desist order issued under this section shall become effective immediately upon receipt by the person to whom the order is directed.
-Compliance. Failure to comply with the terms of a cease and desist order can result in enforcement actions including, but not limited to, the issuance of a civil penalty.

C. Any person who undertakes any activity within a regulated wetland or its buffer without first obtaining a permit required by this chapter, except as allowed in Section 5.2, or any person who violates one or more conditions of any permit required by this chapter or of any order issued pursuant to subsection B of this section shall incur a penalty allowed per violation. In the case of a

continuing violation, each permit violation and each day of activity without a required permit shall be a separate and distinct violation. The penalty amount shall be set in consideration of the previous history of the violator and the severity of the environmental impact of the violation. The penalty provided in this subsection shall be appealable to the superior court within the subject jurisdiction.

D. Aiding or abetting. Any person who, through an act of commission or omission procures, aids or abets in the violation shall be considered to have committed a violation for the purposes of the penalty.

E. Notice of penalty. Civil penalties imposed under this section shall be imposed by a notice in writing, either by certified mail with return receipt requested or by personal service, to the person incurring the same from the department and/or the [local unit of government], or from both jointly. The notice shall describe the violation, approximate the date(s) of violation, and shall order the acts constituting the violation to cease and desist, or, in appropriate cases, require necessary corrective action within a specific time.

F. Application for remission or mitigation. Any person incurring a penalty may apply in writing within thirty days of receipt of the penalty to the [Approval Authority] for remission or mitigation of such penalty. Upon receipt of the application, the [Approval Authority] may remit or mitigate the penalty only upon a demonstration of extraordinary circumstances, such as the presence of information or factors not considered in setting the original penalty.

G. Orders and penalties issued pursuant to this subsection may be appealed as provided for by in Section 7.6.

H. Criminal penalties shall be imposed on any person who wilfully or negligently violates this chapter or who knowingly makes a false statement, representation, or certification in any application, record or other document filed or required to be maintained under this chapter or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device, record or methodology required to be maintained pursuant to this chapter or pursuant to a Wetland Permit.

Section 9: Non-Conforming Activities

A regulated activity that was approved prior to the passage of this chapter and to which significant economic resources have been

committed pursuant to such approval but which is not in conformity with the provisions of this chapter may be continued subject to the following:

a. No such activity shall be expanded, changed, enlarged or altered in any way that increases the extent of its non-conformity without a permit issued pursuant to the provisions of this chapter;

b. Except for cases of discontinuance as part of normal agricultural practices, if a non-conforming activity is discontinued for 12 consecutive months, any resumption of the activity shall conform to this chapter;

c. If a non-conforming use or activity is destroyed by human activities or an act of God, it shall not be resumed except in conformity with the provisions of this chapter;

d. Activities or adjuncts thereof that are or become nuisances shall not be entitled to continue as non-conforming activities.

Section 10: Judicial review

Any decision or order issued by the [Approval Authority] pursuant to this chapter, including decisions concerning denial, approval, or conditional approval of a Wetland Permit, may be judicially reviewed in the [Circuit Court), provided that:

a. available administrative remedies, including appeals available pursuant to Section 7.6, have been exhausted; and

b. such review is commenced by the filing with the court and the [Approval Authority] of a legal action within thirty (30) working days after service of such order or issuance of notice of such decision, as the case may be.

Based on these proceedings and the decision of the court, the [Approval Authority] may, within the time specified by the court, elect to:

a. Institute negotiated purchase or condemnation proceedings to acquire an easement or fee interest in the applicant's land;

b. Approve the permit application with lesser restrictions or conditions; or

c. other appropriate actions ordered by the court that fall within the jurisdiction of the [Approval Authority].

Section 11: Amendments

These regulations and the [Name of Local Government Map] may from time to time be amended in accordance with the procedures and requirements in the general statutes and as new information concerning wetland Location, soils, hydrology, flooding, or wetland plants and wildlife become available.

Section 12: Severability

If any clause, sentence, paragraph, section or part of this chapter or the application thereof to any person or circumstances shall be adjudged by any court of competent Jurisdiction to be invalid, such order or judgement shall be confined in its operation to the controversy in which it was rendered and shall not affect or invalidate the remainder of any part thereof to any other person or circumstances and to this end the provisions of each clause, sentence, paragraph, section or part of this law are hereby declared to be severable.

Section 13: Assessment Relief

The Assessors [of Local Government] shall consider wetland regulations in determining the fair market value of land. Any owner of an undeveloped wetland who has dedicated an easement or entered into a perpetual conservation restriction with the [local unit of government] or a nonprofit organization to permanently control some or all regulated activities in the wetland shall have that portion of land assessed consistent with those restrictions. Such landowner shall also be exempted from special assessments on the controlled wetland to defray the cost of municipal improvements such as sanitary sewers, storm sewers,
and water mains.

Section 14 Non-regulatory Incentive Program. Reserved

Section 15: Codification

Section 16: Effective Date

APPENDIX C. COMMENTS ON THE QUILCEDA/ALLEN WATERSHED PLAN

State of
Washington
House of
Representatives

September 15, 1998

Quilceda/Allen Watershed Committee
ATTN: Janet Carroll, Senior Planner
Surface Water Management Division
2930 Wetmore Avenue
Everett, WA 98201

RE: Quilceda/Allen watershed

Dear Ms. Carroll:

Thank you for allowing me the opportunity to publicly comment on the Quilceda/Allen watershed plan. Although I am unable to attend your ceremony due to previous engagements in Olympia, allow me to take this opportunity to express my dedication to the watershed plan, on behalf of the people of the 38th legislative district.

The Quilceda/Allen watershed is a public resource to be managed and enjoyed by a variety of watershed users. Managing the watershed is about protecting the streams, wetlands and their inhabitants, AND protecting water resources for residents, homes, and businesses as well. The changes in watershed streams affect the quality of life of the area. Many areas I played in as a child have now been replaced by houses and roads, thus having a major impact on our water resources.

I believe it is urgent that the Quilceda/Allen watershed plan be implemented immediately. Leaving the plan as a long term goal instead of a fast track item allows locked in land speculators to develop under antiquated science. Such action puts our children's health and the health of the economy of the region at risk. The immediate implementation of the plan is necessary for the healthful well being of our children who WILL play in waters legally defined as too polluted for human contact.

I believe the management recommendations will maintain the salmon resource, protect water quality, and prevent flooding given the land use decisions that have been made by a very capable committee. I fully support the efforts of those agencies and jurisdictions who will implement individual plans of actions. I believe, as the Quilceda/Allen Watershed Management Committee believes, that it is essential to implement strong management recommendations to meet the watershed's goals, including maintaining salmon habitat, improving water quality, protecting wetlands and groundwater, and educating citizens. I am optimistic that this plan can make a difference.

I have enjoyed the opportunity to work with many of you to improve our watershed management systems and to provide increased services to those who must utilize those systems. Please call on me for any additional assistance I can provide.

Thank you for allowing me the opportunity to add my "voice" to the many other supporters of your well-intended plan. If you have further questions, or if I can be of additional assistance, please do not hesitate to contact my office.

Sincerely,

Jeralita "Jeri" Costa
State Representative
38th Legislative District

JC:dr

cc: Robert Drewel, Snohomish County Executive
Rick Larsen, Council District 1
Kirke Siervers, Council District 2
Gary Nelson, Council District 3
Barbara Cothern, Council District 4
Dave Somers, Council District 5

Oral Comments - Quilceda/Allen Open House. September 16, 1998

Mike Pappa, Marysville

Rep. Jeri Costa was going to be here tonight but I guess they have a committee week in Olympia so they all have to be there. So she asked me to deliver this letter to the committee and I was going to read it, but I'm not going to read it now, expressing her concerns and offering any assistance the committee might need.

I have some comments, and I am just going to skim over them. I appreciate all the hard work the committee has done over the years to get the plan going. I wanted to thank(them) - there were a lot of other members of the community that worked over the last couple of months to get the plan going to like when we had our watershed meeting back in January. Tim Thometz a great speaker, eloquent speaker was there and some of you folks at DOE and at the county Surface Water Management have been really helpful. What I really have to say is full steam ahead. There is no reason to wait on this. The problems aren't going to go away. We have some real water quality problems around here. Fecal coliform is real high. The last couple of weeks I did a little testing on my own just down in Jennings Park and the fecal levels down in there are tremendous. We shouldn't leave this plan on the shelf any more because we need to address these things.

The League of Women Voters of Snohomish County

P.O. Box 1146, Everett WA 98206 Telephone (206) 334-8922

Sept. 23, 1998

Janet Carroll
SWM, Snohomish County Public Works
2930 Wetmore Ave.
Everett, WA 98201

Re: Quilceda/Allen Watershed Management Plan

Dear Janet:

The League of Women Voters commends the Quilceda/Allen Watershed Management Committee and Snohomish County Surface Water Management for their detailed analysis of this watershed and accompanying management recommendations.

We are particularly concerned that the water in these stream systems frequently violates standards of the federal Clean Water Act, that there is a possibility of contamination and depletion of the Marysville trough aquifer, and that habitat for potentially endangered salmonid species is being lost.

The continuing rapid urbanization of the area will result in further degredation of the Quilceda/Allen watershed unless many of the management recommendations from this report are implemented soon. We realize this will be an expensive and politically difficult task, but we urge all local jurisdictions involved to rise to the challenge.

Sincerely,

Julie Langabeer

Julie Langabeer
Natural Resources Chair

QUILCEDA/ALLEN WATERSHED MANAGEMENT PLAN
COMMENT FORM

Sept. 16, 1998

Please provide your comments on the Watershed Plan. Thank you very much.

What is your interest in the project?

- ☐ I own a business in the watershed.
- ☐ I own property in the watershed.
- ☒ I live in the watershed.
- ☐ I live outside the immediate area, but frequently travel through the watershed.
- ☒ I am an interested/concerned citizen.
- ☐ Other _____

I have the following comments about the draft plan.

Many species of salmon stay out to sea for several years. The rapid pace of development and the lack of enforcement of laws against fish blocking culverts may result in the loss of an enormous gene pool which is now out to sea.

Every single culvert installed in the last 5 years should be inspected for fish passage capabilities and repaired by the installer and/or land owner as necessary before the end of 1998

Please add this recommendation to the plan.

Bruce Sutton
6308 100th St NE
Marysville WA 98270
1-360-653-3903

QUILCEDA/ALLEN WATERSHED MANAGEMENT PLAN

COMMENT FORM

Sept. 16, 1998

Please provide your comments on the Watershed Plan. Thank you very much.

What is your interest in the project?

- [X] ~~I own~~ My husband owns a business in the watershed.
- [ ] I own property in the watershed.
- [ ] I live in the watershed.
- [X] I live outside the immediate area, but frequently travel through the watershed.
- [X] I am an interested/concerned citizen.
- [X] Other I am concerned about maintaining a healthy environment. I live downstream of the watershed. (at Priest Point.)

I have the following comments about the draft plan.

I think the plan gives an excellent assessment of the situation and provides a detailed blueprint of actions which could make the Quilceda/Allen a healthier watershed.

When it's not safe for kids to wade in the creeks, it's time to start doing things differently. I am also not ready to give up on the survival of salmon and other fish & wildlife in this area.

Julie Langabeer
200 Priest Point Dr. N.W.
Marysville, WA 98271

APPENDIX D. RESPONSE TO COMMENTS

RESPONSE TO COMMENTS:

The Honorable Jerilita Costa, U.S. House of Representatives

The Watershed Management Committee appreciates your support for the watershed plan and agrees that the plan should be implemented as soon as possible. The committee also appreciates your offer of assistance.

Mike Pappa, Marysville, WA

The Watershed Management Committee appreciates your support for the watershed plan and particularly your efforts to keep the plan moving. We agree that the watershed problems are serious and that the plan should not just lie on the shelf.

Julie Langabeer, The League of Women Voters of Snohomish County

The Watershed Management Committee appreciate your support for the watershed plan and also wants to see the local jurisdiction implement the plan as soon as possible.

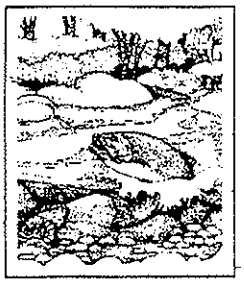
Bruce Tipton, Marysville, WA

The Watershed Management Committee shares your concern about laws not being enforced and the watershed plan include recommendations to address that issue. We have added the management recommendation regarding regular inspection of culverts for fish passage as you suggested. We are happy to inform you that the Adopt-A-Stream Foundation has just begun a survey of all culverts in the watershed to identify those that block fish passage.

Julie Langabeer, Marysville, WA

The Watershed Management Committee shares you concern about fish and wildlife habitat in the Quilceda/Allen watershed and also your support for the watershed plan.

APPENDIX E. CONCURRENCE FROM THE IMPLEMENTING AGENCIES



The Adopt-A-Stream Foundation

Northwest Stream Center
600-128th Street SE
Everett, WA 98208-6353
(425) 316-8592, 771-6671
fax (425) 338-1423

Janet Carroll, Senior Planner
Surface Water Management Division
Snohomish County Public Works
2930 Wetmore Avenue
Everett, WA 98201

January 13, 1999

RE: *Quilceda/Allen Watershed Management Plan Draft*

Dear Janet,

The Adopt-A-Stream Foundation (AASF) is very interested in carrying out education activities outlined in the draft *Quilceda/Allen Watershed Management Plan.* That plan identifies the following references to activities/projects to be carried out by the Adopt-A-Stream Foundation:

> Q/A 67: The Adopt-A-Stream Foundation should coordinate field trips for Marysville and Lakewood district schools.
>
> Q/A 71 The Adopt-A-Stream Foundation should provide workshops for teachers interested in coordinating Adopt-A-Stream Programs in the watershed.
>
> Q/A 91 Adopt-A-Stream ....should include ground water education in all workshops for citizens, teachers, and students.

As you know, the AASF is a non-profit corporation with a limited budget. We are in the process of organizing all of our education and outreach programs under the banner of *Streamkeeper Academy.* Currently, we are seeking funding to cover the costs associated with *Streamkeeper Academy* programs and will include the field trip and workshop activities referenced above in our funding search. However, if funding is not available, we will not be able to carry out those tasks. Regarding the ground water reference above, all of our education workshops include an introduction to ground water with emphasis on the relationship to stream flow.

This year, the AASF is planning to conduct several fee based *Streamkeeper Field Training* workshops as well as *Streamkeeper Teacher Workshops*, a half day event designed to provide teachers with "state of the art" environmental education techniques that can be put immediately to use in the classroom. Generally these accredited events, which include both watershed field trips and stream monitoring, are subsidized by grants from host organizations or foundations. We would be very pleased to establish a financial partnership with SWM that would enable us to conduct a series of *Streamkeeper Field Training* and *Streamkeeper Teacher Workshops* for audiences in the Quilceda/Allen watersheds.

The enclosed *Streamkeeper Catalog* provides you with an outline those workshops mentioned above as well as our *Salmon Fashion Show and Adopt A Stream Challenge* school assembly program. Please contact me if you would like any additional information.

Sincerely Yours,

Thomas B. Murdoch
Executive Director.

CITY OF ARLINGTON

Public Works Department

(360) 435-3811 *FAX (360) 435-7944*

November 12, 1998

Ms. Janet Carroll
Snohomish County Public Works
Surface Water Management Division
2930 Wetmore Avenue
Everett, WA 98201

RE: Statement of Concurrence - Quilceda Allen Watershed Management Plan

Dear Janet:

The City of Arlington has reviewed the Quilceda Allen Watershed Management Plan. This letter serves as our formal Statement of Concurrence with action plan recommendations that require specific action by the City of Arlington.

The ability of the City of Arlington to concur with the action plan recommendations is limited to our legal mandate, the availability of funding, and other priorities not included in the plan. Funding to implement the action plan recommendation is dependent on budgetary appropriations approved by the City of Arlington.

Sincerely,

Kenneth B. Reid
Director of Public Works

KBR/sp

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

October 29, 1998

Quilceda/Allen Watershed Management Committee
C/o Janet Carroll
Snohomish County Public Works
2930 Wetmore Avenue
Everett, Washington 98201

Dear Quilceda/Allen Watershed Management Committee Members:

RE: Watershed Action Plan - Statement of Concurrence

The Department of Ecology (Department) has been identified as an implementing agency as part of a cooperative venture for the following nonpoint source recommendations:

1. Q/A 100 - Add to Enforcement Staffing.
2. Q/A 42 - Workshops and Distribution of Fact Sheets on Independent Cleanup Process.
3. Q/A 44 - Underground Storage Tank Survey.

For the above actions the Department consents to the following:

1. The Department will carry out this specific action conditionally upon availability of resources.

2. The Department Voluntary Clean-up Program has already held workshops on this at the Northwest Regional Office. Additional fact sheets and other resources will be distributed on an ongoing basis as the Department hears about contaminated sites.

3. The Department will not do a survey. Existing lists of leaking tanks are available for distribution.

Sincerely,

John Glynn
Water Quality Manager
Northwest Regional Office

JG:js:clm

City of Marysville
INCORPORATED 1891

Planning & Building Department

December 1, 1998

Janet Carroll
Snohomish County Public Works
Surface Water Management Division
2930 Wetmore Avenue
Everett, WA 98201

Subject: Statement of Concurrence – Quilceda/Allen Creek Watershed Management Plan

Dear Janet:

The City of Marysville has reviewed the Quilceda/Allen Creek Watershed Plan. This letter serves as our formal Statement of Concurrence with action plan recommendations that require specific action by the City of Marysville. We commented on an earlier draft of the plan in November, 1996. Thank you for incorporating the majority of our concerns into the final draft.

The ability of the City of Marysville to concur with the action plan recommendations is limited by our legal mandate, the availability of funding and other city priorities not included in the plan. Our original comment letter noted that one-time plan actions in addition to annual maintenance/monitoring actions recommended within the plan far exceed existing revenue sources and budget for surface water management within both City and County. Funding to implement the action plan recommendations within the City is dependent on budgetary appropriations approved by the Marysville City Council.

The City has taken steps already to implement many of the actions identified in the draft plan and is committed to working with the County to monitor plan implementation following formal adoption.

Sincerely,

Gloria Hirashima
City Planner

cc: Dave Weiser, Mayor
Dave Zabell, City Administrator
Ken Winckler, Public Works Director

80 Columbia Ave. ◆ Marysville, Washington ◆ 98270 ◆ (360) 651-5100 ◆ FAX (360) 651-5099

Snohomish Conservation District

528 - 91st Ave. NE, Suite C - Everett, WA 98205 -1535- 425.335.5634 Fax: 425.335.5024

November 16, 1998

Janet Carroll
Surface Water Management
2930 Wetmore Ave.
Everett, WA 98201

Subject: Quilceda/Allen Watershed Management Plan

Dear Janet,

The Snohomish Conservation District Staff has reviewed the Public Review Draft Quilceda Allen Watershed Management Plan and has provided you with general verbal comments. The District has no substantive comments on the plan and concurs with the contents.

If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Kim Levesque,
District Manager

THE TULALIP TRIBES

ECONOMIC & COMMUNITY DEVELOPMENT DIVISION

Marilyn R. Sheldon, Executive Director
Barrett Schmanska, Community Development Mgr.
T. Peter Mills, Business Park.
Don Hoerner, CFO
Robert Cleveland, Information Systems
Grants & Contracts

6700 TOTEM BEACH ROAD
MARYSVILLE, WA 98271-9694
(360) 651-4025
FAX (360) 651-4026

The Tulalip Tribes are the successors in interest to the Snohomish, Snoqualmie, and Skykomish tribes and other tribes and band signatory to the Treaty of Point Elliott.

October 15, 1998

Janet Carroll
Snohomish County Public works
Surface Water Management Division
2930 Wetmore Avenue
Everett, WA 98201

SUBJECT: STATEMENT OF CONCURRENCE - QUILCED CREEK WATERSHED MANAGEMENT PLAN

Dear Janet:

The Tulalip Tribes of Washington has reviewed the Quil Ceda Creek Watershed Plan. This letter serves as our formal Statement of Concurrence with action plan recommendations that require specific action by the Tulalip Tribes.

The ability of the Tulalip Tribes to concur with the action plan recommendations is limited by our legal mandate, the availability of funding, and other priorities not included in the plan. Funding to implement the action plan recommendation is depended on budgetary appropriations approved by the Tulalip Tribes.

Sincerely,
THE TULALIP TRIBES

Barrett Schmanska, CD Manager

SNOHOMISH COUNTY COUNCIL
SNOHOMISH COUNTY, WASHINGTON

MOTION NO. 99- 097

A MOTION PROVIDING THAT SNOHOMISH COUNTY CONCURS WITH THE RECOMMENDATIONS OF THE QUILCEDA ALLEN WATERSHED MANAGEMENT PLAN

WHEREAS, the Quilceda/Allen watershed, in west central Snohomish County, has important surface and ground water resources, including fish and wildlife habitat, natural and constructed drainage systems, and public waters that benefit the citizens of the County; and

WHEREAS, the County was awarded a Centennial Clean Water Grant by the Washington State Department of Ecology to complete the Quilceda/Allen Watershed Management Plan for the purpose of protecting and restoring water resource values throughout the watershed; and

WHEREAS, the County's Surface Water Management Division initiated the planning process under the authority of Chapter 400-12 WAC and contacted local and tribal governments, special purpose districts, special interest groups, watershed residents, and appropriate state agencies to solicit their participation as members of a Quilceda/Allen Watershed Management Committee for the purpose of developing a watershed plan; and

WHEREAS, the Quilceda/Allen Watershed Management Committee has developed the Quilceda/Allen Watershed Management Plan, which recommends a wide range of measures to reduce flooding, protect and restore fish habitat, and improve water quality throughout the watershed; and

WHEREAS, the Quilceda/Allen Watershed Management Plan was developed on the basis of scientific analyses, information collected at public meetings, and recommendations of a technical advisory committee with representatives from various agencies with scientific and resource management responsibilities within the watershed; and

WHEREAS, the Quilceda/Allen Watershed Management Committee distributed drafts of the watershed plan and solicited comments on the plan from the Department of Ecology, implementing entities (including the City of Marysville, the Tulalip Tribes, the Snohomish Health District, and the City of Arlington), and the public; the SEPA review process has been initiated, and public meetings and hearings have been conducted; and

WHEREAS, the Quilceda/Allen Watershed Management Committee has reviewed and responded to comments received on the draft plan, prepared final revisions to the plan, and has forwarded the final proposed plan to Snohomish County and to other implementing agencies for statements of concurrence;

NOW, THEREFORE, ON MOTION, the Snohomish County Council concurs with the recommendations of the Quilceda/Allen Watershed Management Plan dated January, 1999, and intends that recommendations within the County's jurisdiction will be considered for implementation as indicated below, subject to county initiatives responding to any listing of threatened or endangered species under the federal Endangered Species Act and recognizing that implementation of program recommendations must be considered in the context of other county priorities not included in the plan;

(1) The Council anticipates that the plan's proposals for land use regulations within the County's jurisdiction will be brought before the Council for consideration in accordance with Chapter 32.07, Snohomish County Code, during subsequent annual legislative updates of the county's comprehensive plan and implementing regulations as required by chapter 36.70A.130 RCW. The Executive is requested to develop appropriate recommendations for Council consideration.

(2) The Council anticipates that capital projects proposed in the Quilceda/Allen Watershed Management Plan for implementation by the County will be considered for inclusion in annual updates of the county's capital facilities plan developed under Chapter 36.70A.130 RCW.

(3) The Council anticipates that other actions proposed by the Quilceda/Allen Watershed Management Plan for implementation by the County, including those related to public outreach, scientific research, and incentive programs, will be considered annually for inclusion in the Executive's proposed budget. The Council also encourages the Executive to apply for state and federal grant funds to assist the County in plan implementation.

Dated this 10th day of March, 1999

SNOHOMISH COUNTY COUNCIL
Snohomish County, Washington

Richard R. Gissa
Chair of the Council

ATTEST
Barbara Gibouski
Clerk of the Council, Asst.

SNOHOMISH
HEALTH
DISTRICT

M. Ward Hinds, M.D., M.P.H.
Health Officer

Environmental Health Division
3020 Rucker Avenue, Suite 104
Everett, WA 98201-3900
(425) 339-5250 (425) 339-5270
Fax: (425) 339-5254 TDD: (425) 339-5252

November 9, 1998

Ms. Janet Carroll, Senior Planner
Snohomish County Surface Water Management
2930 Wetmore Avenue
Everett, WA 98201

Subject: Statement of Concurrence:
Quilceda/Allen Watershed Management Plan

Dear Ms. Carroll:

I want to take this opportunity to commend and congratulate you and the Quilceda/Allen Watershed Management Committee on the completion of the Quilceda/Allen Watershed Management Plan. The plan is a straightforward document that does a commendable job of bringing together diverse pieces of the puzzle of addressing nonpoint pollution.

As the local jurisdictional public health agency, the Health District has a mandate to enforce *Chapter 246-272, the State Board of Health Rules and Regulations for Onsite Sewage Disposal Systems.* Consequently, the District is the logical and legitimate agency to be charged with the recommendations in the plan that deal with onsite sewage disposal. It is in this light that the related recommendations contained in the plan have been reviewed and given our general acceptance and concurrence.

With regard to the specific recommendations which are to be implemented by the Snohomish Health District:

Q/A 35. Subsidy for Replacing Failed Septic Systems

The Health District is in agreement that financial assistance in the repair of failed onsite systems is an important tool in decreasing nonpoint pollution from failed systems. In 1996, the District was involved in the initial planning of the Snohomish County Onsite System Repair Loan Program, in conjunction with the Department of Ecology, Snohomish County, and the Stilliguamish Clean Water District. However, due to circumstances outside of the District's control, the program was never established. In the future, if funds become available for similar loan programs, the Snohomish Health District would be willing to participate in the planning and establishment of such a loan program.

Subject: Statement of Concurrence:
Quilceda/Allen Watershed Management Plan

Q/A 36. Septic Maintenance Reminder Data Base

The Health District is now entering all onsite sewage records/as-builts into a computer system capable of generating current mailing labels and printing out the onsite sewage information specific for each property within Snohomish County. Mailing of "homeowner packets" which include licensed pumper's lists, operation and maintenance information, and the as-built drawing of the septic system, can be done on a regular basis. When all records of properties located within Snohomish County have been entered into the database, routine mailings of homeowner packets will take place.

The septic tank pumping business is extremely competitive and there is not a large profit margin in pumping residential septic tanks. Therefore, it is highly unlikely that the individual pumping businesses would offer discounts and incentives for homeowner routine septic system maintenance, unless an outside source of funds for these discounts is provided.

Q/A 37. Information on Septic Operation and Maintenance

The Snohomish Health District has a significant program of public education. This program includes general educational materials and handouts, a series of homeowner videos available to all Snohomish County residents who utilize an onsite sewage disposal system, public presentations and demonstrations conducted by the District, and public advisory advertisements placed in area newspapers. While it is the intent of the Health District that this program continue, it is a certain reality that the resources and support will be necessary.

Q/A 39. Information on Pet Waste Disposal

The Snohomish Health District responds to complaints concerning pet waste. Although there are no specific county regulations regarding pet waste, the District provides information to concerned citizens that includes Snohomish County Solid Waste Division (SCSWD) brochures. If funds become available, the District would be in a position to draft specific regulations regarding pet waste disposal.

Subject: Statement of Concurrence:
Quilceda/Allen Watershed Management Plan

Regulations and Programs for Addressing Hazardous Waste Problems

The Snohomish Health District is mandated to enforce Chapters 3.1 and 3.5 of the Sanitary Code. These include Solid Waste and Moderate Risk Waste. In December of 1994, Snohomish Health District adopted *Regulations Governing Moderate Risk Waste Handling, Chapter 3.5.* These regulations cover handling, storage, and disposal requirements for both households and small businesses. They also cover permitting requirements for moderate risk waste collection facilities. The District has grants from DOE that allows them to assist in hazardous waste sites and other problems. If other funding sources become available, the Health District would be interested in developing educational materials concerning proper handling of hazardous wastes for households and small businesses.

I trust that this letter of concurrence, with all its caveats, is accepted in the cooperative spirit in which it is written. Aside from the ongoing limitations associated with availability of resources and support, the Health District stands ready to move forward with our responsibilities and implementation measures outlined in the Quilceda/Allen Watershed Management Plan.

Sincerely,

Robert A. Pekich, Director
Environmental Health Division

RAP/bm/ch

WASHINGTON STATE DEPARTMENT OF
Natural Resources

JENNIFER M. BELCHER
Commissioner of Public Lands

January 25, 1999

Janet Carroll
Snohomish County Public Works
Surface Water Management Division
2930 Wetmore Avenue
Everett, WA 98201

Re: Statement of Concurrence – Quilceda/Allen Creek Watershed Management Plan

Dear Ms. Carroll:

The Department of Natural Resources (DNR) has reviewed the Quilceda/Allen Watershed Management Plan. This letter serves as our formal Statement of Concurrence with the action plan recommendations that require specific action by the DNR.

The ability of the DNR to concur with the action plan recommendations is limited by our legal mandate, the availability of funding, and other priorities not included in the plan. Funding to implement the action plan recommendations is dependent on budgetary appropriations approved by the Washington State legislature.

We would also like to take this opportunity to congratulate you, the members of the Watershed Management Committee, and County staff on all the hard work it took to produce this plan.

Thank you for the opportunity to review the management plan and for incorporating our recommended changes into the final draft of the plan.

Sincerely,

Jim Cahill
NW Region, Forest Practice Coordinator

cc: Bill Wallace, NW Region Manager
Candace Johnson, NW Assistant Region Manager (State Lands)
Greg Aris, NW District Manager (State Lands)
Dan Pugmire, NW District Manager (Forest Practices)
Al McGuire, DNR Forester (State Lands)
Kristi McClelland, Forester (Forest Practices)
Jay Guthrie, DNR Forester (State Lands)
Tom Murley, DNR Forester (State Lands)

COOPERATIVE EXTENSION

Washington State University

SNOHOMISH COUNTY

600 128th Street SE
Everett, WA 98208-6353
425-338-2400 FAX: 425-338-3994
4-H: 425-357-6044
Master Gardeners: 425-357-6010
Home Page: http://snohomish.wsu.edu
TDD 1-800-833-6388

January 28, 1999

Janet Carroll
Snohomish County Public Works
Surface Water Management Division
2930 Wetmore Avenue
Everett, Washington 98201

RE: Quilceda/Allen Watershed Management Plan Concurrence

Dear Ms. Carroll:

Mike Hackett, Ned Zaugg, Holly Kennell, John Munn and I of Washington State University Cooperative Extension of Snohomish County have reviewed the Quilceda/Allen Creek Watershed Management Plan. This letter serves as our formal Statement of Concurrence with action plan recommendations that require specific action by Cooperative Extension. Specifically, these include:

1. Q/A 52 and 53: Workshops on use of toxic chemicals in gardening and distribution of information regarding use of pesticides and herbicides (landscaping chemicals) and associated water quality problems – and alternative options. Our Extension Horticulturist and Master Gardeners are presently addressing these concerns and actions through in-store and phone clinics, demonstration gardens, seminars and call-in clinics.

2. Q/A 30 and 31: Waste and pasture management seminars for commercial dairies and small farms are being offered annually.

3. Q/A 32 and 33: Model fencing demonstrations and stream enhancement projects in agricultural areas near Lakewood and Marysville-Pilchuck High Schools; FFA and 4-H youth involvement in developing and implementing a farm-water quality management plan and student recognition programs remain to be implemented.

Collaboration with Snohomish Conservation District will continue. Of course implementation of actions that require funding are dependent on County and landowner resources. Cooperative Extension staff are committed to accomplishing these actions with the County.

Sincerely,

Curt Moulton

Curt Moulton, Chair
County Extension Agent

Cc: John Munn
Holly Kennell
Mike Hackett
Ned Zaugg

APPENDIX F. SEPA DETERMINATION OF NONSIGNIFICANCE

DETERMINATION OF NON-SIGNIFICANCE

FILE NAME: Quilceda/Allen Watershed Management Plan

DESCRIPTION OF PROPOSAL:

The Quilceda/Allen Watershed Management Plan proposes an overall program to control nonpoint pollution and protect water resources within the watershed. The plan was developed by the Quilceda/Allen Watershed Management Committee and the Surface Water Management Division of Snohomish County Public Works. The watershed management committee includes watershed residents, and representatives of businesses located in the watershed and governmental agencies.

The plan has been divided into seven sections, including a watershed characterization section which describes existing conditions within this urbanizing watershed. Several problems within the watershed related to water quality, water quantity, and fish and wildlife habitat are identified. In another section of the plan, goals and objectives related to solving these watershed problems are developed. Alternative recommended solutions are generated within the plan's other sections to solve these problems which affect the watershed's environment, including impacts to residents, businesses, and homes.

A total of 131 watershed actions are proposed to address water resource, non-point pollution, and flooding problems. The actions are part of an integrated strategy which includes land acquisition, landowner incentives, and educational outreach in combination with regulatory /enforcement mechanisms and capital improvement projects. Snohomish County Public Works-Surface Water Management Division will be the lead agency responsible for coordinating implementation of 101 watershed-wide and 30 planing area actions.

LOCATION:

The Quilceda/Allen watershed is located in western Snohomish County, north of the City of Everett. The watershed includes the City of Marysville, part of the City of Arlington, part of the Tulalip Reservation, and unincorporated Snohomish County. The watershed is approximately 11 miles in length and 8 miles wide, encompassing an area of approximately 50 square miles.

The issuance of this Determination of Non significance should not be interpreted as acceptance or approval of the subject proposal as presented. Snohomish County reserves the right to deny or approve said proposal subject to conditions if it is determined to be in the best interest of the County and/or necessary to the general health, safety, and welfare of the public to do so.

PROPONENT: Snohomish County
LEAD AGENCY: Snohomish County
DEPARTMENT: Public Works
2930 Wetmore Avenue
Everett, WA 98201

THRESHOLD DETERMINATION: The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 433.21C.030(2)(c). This decision was made after review by Snohomish County of a completed environmental checklist and other information on file with the agency. This information is available for public review upon request.

This DNS is issued under 197-11-340-(2); the lead agency will not act on this proposal for 15 days from the date below. Written comments may be submitted to the lead agency, to the attention of Crilly R. Ritz, Senior Planner at the above address. Comments must be received by October 1, 1998.

RESPONSIBLE OFFICIAL: Peter E. Hahn
TITLE: Public Works Director

DATE: 7/28/98 **SIGNATURE:** Jack P. Bakkenes

For further information, contact Crilly R. Ritz, Senior Planner at the Department of Public Works, 388-3488, EXT. 4586.

DISTRIBUTION:

Federal Agencies:
Army Corps of Engineers
National Marine and Fisheries Service
Natural Resources Conservation Service
Environmental Protection Agency

State Agencies:
Department of Ecology
Department of Fish and Wildlife
Department of Natural Resources

County Departments:
Parks and Recreation
Planning and Development Services

Cities
City of Marysville
City of Arlington

Tribes
Tulalip Tribe

Other
Marysville School District
Snohomish Health District

News Media:
The Herald, Marysville Globe