Summary of Economic Conditions in WRIA 1

Prepared for

The WRIA 1 Planning Unit and Joint Board

by

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Chapter 1 Introduction

WRIA 1 participants have expressed a desire to understand the potential economic consequences of any watershed management plan they might implement. It would be impossible, however, to understand the likely changes from watershed management without first having an accurate picture of the regional economy in its current form. This report begins that process by broadening and deepening our understanding of economic conditions in the watershed.

In the second chapter, we summarize current and expected future trends in the WRIA 1 economy. In this chapter we seek to broaden the reader's understanding of the WRIA 1 economy by providing a description of the current economy with some historical context that shows how the economy achieved its current form. The chapter focuses on Whatcom County both because it dominates the economic landscape of WRIA 1 and because it includes the locations of the five initiating governments. For completeness, however, we do provide descriptions of the economic activities in the WRIA 1 portions of Skagit County and British Columbia.

In the third chapter, we provide descriptions of population, employment, and land use for the four sub-basins being considered for detailed watershed management planning. This chapter will deepen the reader's understanding of what economic activities take place in each of the drainages within these four sub-basins.

We hope that this document promotes discussion among WIRA 1 participants. We also hope that this report produces comments and information sources that we can incorporate into our analysis of watershed management alternatives as the project moves forward.

DATA COLLECTION

Collecting and formatting the population, employment, land use and other data was an important part of this process. In many cases, apportioning the population and employment data to the drainages within the four sub-basins we examined required additional analysis. This was particularly true for population, where census blocks and drainages represent different geographical boundaries. The following sections briefly describe the primary data sources used in this report.

POPULATION

Our estimates of population in the Whatcom and Skagit County portions of the WRIA are based on analysis of 2000 Census data. Within Whatcom County, we estimated population in the drainages of the four focus areas by identifying 2000 census blocks that fell, either as a whole or in part, within each drainage. For those blocks that were only partially included in a

drainage, we allocated residents and households to the drainage based on that drainage's relative share of housing units. These counts of housing units, in turn, were estimated through spatial analysis of 2001 Tax Assessors parcel records provided by staff at PUD #1. These data identify each tax parcel as a geographic point based on location information included within each parcel identification number. We based our counts of housing units on a given parcel on land use information included in the four-digit land use code included within each tax record.

Our estimates of population in the Skagit County portions of the WRIA are also based on spatial analysis Census 2000 census block data. For Skagit County, however, our allocations of population in blocks that were only partially inside the WRIA were based on analysis of USGS land cover coverages.

EMPLOYMENT

The Washington State Employment Security Division (ESD) reports covered employment data in Whatcom County using nine broad economic sectors. Covered employment includes those wage and salary jobs covered by unemployment insurance, which is most, but not all of all jobs in the County. They do the same for other counties, including Skagit County. The data are particularly useful since they also report the location of the jobs within the County, making it possible to know how many jobs of which type exist in the sub-basins and drainages of the U.S. portions of WRIA 1.

For the purposes of this report, we have used the employment data as they are reported by the State. We understand that the WRIA 1 planning unit may decide to that these data should be reported using different categories in our future work, pending decisions by that body and the Joint Board on economic sectors.

FUTURE EMPLOYMENT AND POPULATION

Future projections of employment and population are based on projections adopted for the Whatcom County Comprehensive plan. The County projects population and employment for the year 2022 for each of the incorporated areas, as well as a general projection for all unincorporated parts of the county. We use these projections to estimate population and employment growth at the drainage level.

LAND USE

Our estimates of land use for the Whatcom County portions of the WRIA were based on spatial analyses of Whatcom County 2000 Tax Assessor's parcel data that were provided to us by staff at PUD #1. Our summary of acres of land use for the Whatcom County portion of the WRIA as a whole, and for each of the drainages within the four focus areas, reflect the sum of parcel acreages within each land use category (as defined by the four-digit land use codes included in the Assessor's tax parcel records).

OTHER DATA SOURCES

Certain sectors, such as the agricultural sector, tend to be more severely underreported than others. The State recently produced a report that estimates total agricultural employment, including owners and unpaid family workers as well as paid employees.[1] We use this data in Chapter 3 to estimate the number of farm jobs at the drainage level.

BACKGROUND REPORTS AND PROCESSES

A number of recent, and in many cases ongoing, processes have produced information in addition to the economic data sources we have described. We have examined a number of these reports as we prepared this document. We describe a few of these below.[2]

SUMMARY CHARACTERIZATION FOR WRIA1

The staff team for WRIA 1 produced a draft document summarizing the economic and physical characteristics of the watershed. The staff team also produced summary sheets for several of the sub-basins in the watershed. This report is intended to expand on economic discussions contained in those documents.

COMMERCIAL AND INDUSTRIAL ZONED PROPERTIES UTILITY INFRASTRUCTURE STUDY

The Whatcom County Planning GIS department published the Commercial and Industrial Zoned Properties Utility Infrastructure Study in September 2001. The department published the report to assist developers and planners in assessing commercial and industrial sites and to facilitate economic development of County land zoned commercial and/or industrial.

- The County's undeveloped commercial and industrial land is primarily concentrated along the western boundary, south of Birch Bay. Several undeveloped parcels exist along I-5 north of Bellingham, as well.

- The report includes detailed maps of infrastructure, including gas and electric lines, water and sewer, and fiber optics. The County is well served by all, and the report includes detailed maps showing the proximity of developed and undeveloped land to key infrastructure.

[1] "Agricultural Workforce in Washington State 2000," prepared by Loretta Payne, Washington State Employment Security, August, 2001.

[2] ECONorthwest is also engaged in an information collection process for assessing non-market values for this project. We recognize the importance of these values will be reporting on these efforts in the near future.

WHATCOM COUNTY AND CITY COMPREHENSIVE PLANNING PROCESSES

The planning department for Whatcom County is presently updating the County's comprehensive plan. The County expects to complete the plan in 2003, having been granted an extension beyond 2002 deadlines. As part of this process, the County and cities are evaluating the development capacity of their respective urban growth areas in the context of growth forecasts for population and employment.

In addition, the County and cities are updating the individual elements of their comprehensive plans, as necessary. For some elements, planners expect to see very few changes. In other cases, more substantial overhauls of the elements are needed. The County, in particular, seeks to update the economic development of their plan.

Chapter 2 Watershed Overview

In Chapter 1, we presented a summary overview of the WRIA 1 study area. As discussed, most of the study consists of land and water within the Whatcom County boundaries. The remaining areas include land and water in Skagit County, Washington, and a portion of British Columbia in Canada. The WRIA 1 Management plan serves stakeholders primarily from Whatcom County.

This report focuses on economic activity in Whatcom County, because Whatcom County people compose the majority of the study area's land (84 percent), population (80-90 percent), and jobs (percentage is uncertain, likely 80-90 percent, as well). Conversely, nearly all of Whatcom County's population (98.5 percent) lives within the WRIA boundaries.

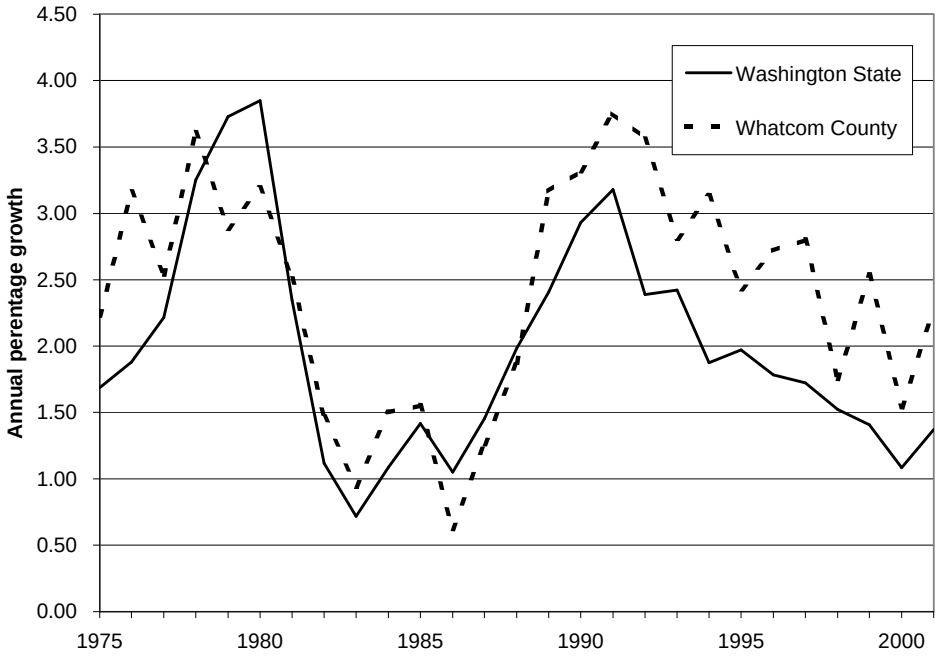
Whatcom County accounts for a very high percentage of drivers of WRIA 1 water demand. Therefore, this chapter discusses demographic and economic trends in Whatcom County, for direct application to future analysis of the WRIA1 study area.

POPULATION

Population in Whatcom County has typically grown at percentage rates roughly parallel to rates for Washington State (Figure 2-1). During the 1990s, Whatcom County's population grew at a slightly faster percentage rate than Washington State. The trends since 1975 suggest that Washington State growth is a good indicator of Whatcom County growth.

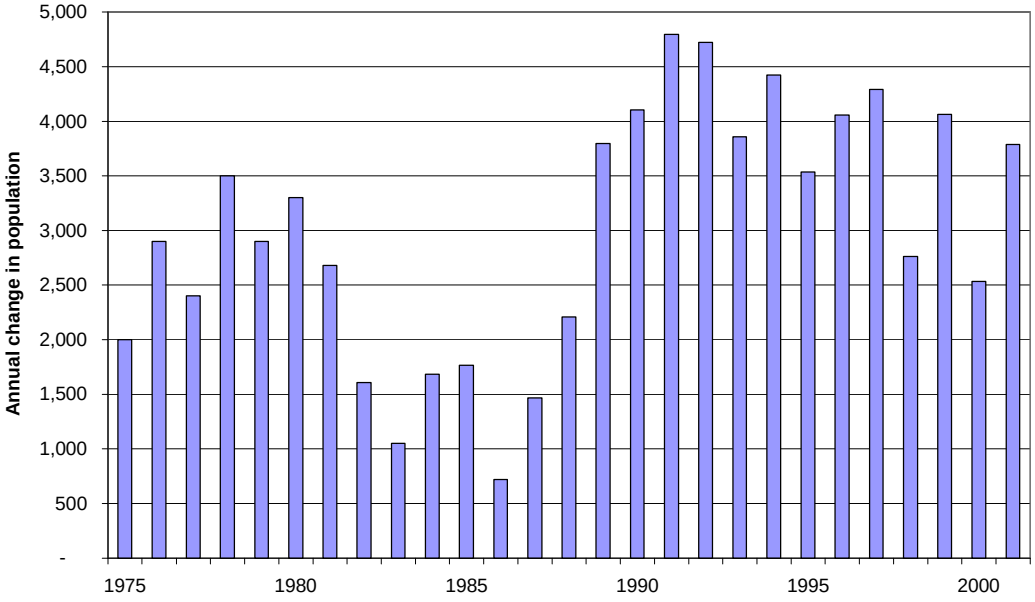
Understanding trends in population change require looking at the data from more than one perspective. As shown in Figure 2-2, annual population growth, in terms of the net change in the number of people, in several recent years (e.g., 1999 and 2001) has been among the highest numbers for the past 25 years. Other recent years (e.g., 1998 and 2000) have been lower, and more consistent with growth of the late 1970s.

Figure 2-1. Annual population growth, Whatcom County and Washington State, 1975-2001



Source: Washington State Office of Financial Management, U.S. Census Bureau

Figure 2-2. Annual population growth in Whatcom County, 1975-2001

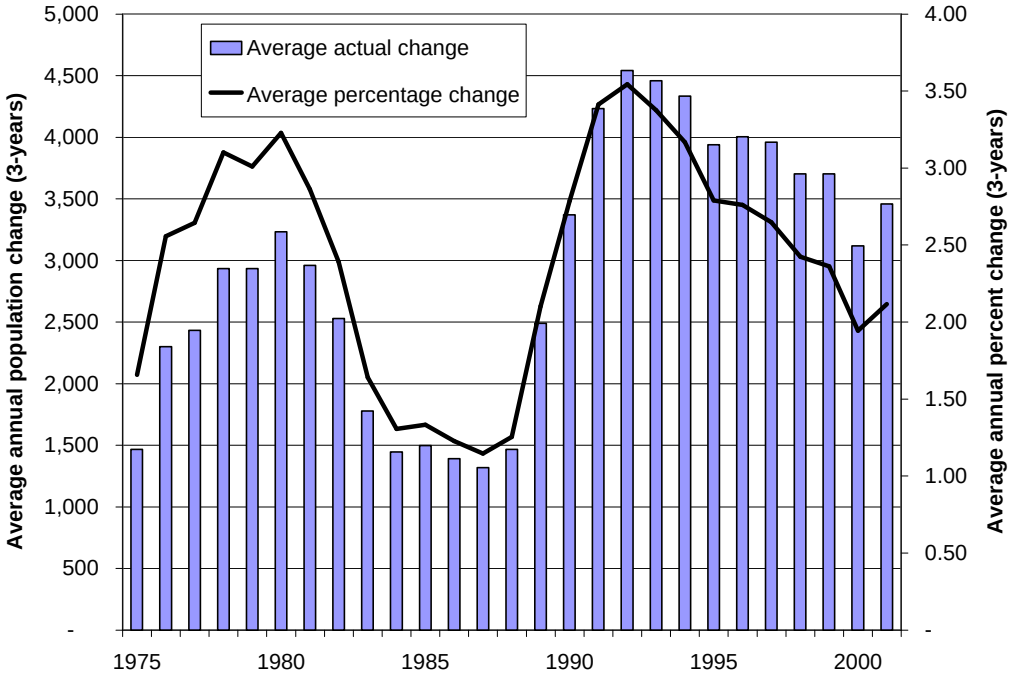


Source: Washington State Office of Financial Management, U.S. Census Bureau

We can remove some of the noise by averaging three years of growth (Figure 2-3). The three-year moving average shows steady decline in

population growth from the peak three years ending in 1992 (1990-1992) through to 2001, with a dip in 2000.

Figure 2-3. Three-year moving average of annual net population growth and percentage change for Whatcom County, 1975-2001



Source: Washington State Office of Financial Management, U.S. Census

The three preceding charts all point to a few key trends. First, Whatcom County growth trends largely follow growth trends for Washington State. Also, population growth in the 1990s was stronger than in the 1980s and late 1970s, both in percentage change and net growth. Finally, after a peak in population growth in 1991 and 1992, population growth declined through 2000.

The age cohort profile of Whatcom County has shifted over the last ten years. The bars in Figures 2-4 and 2-5 show County population by age group for 1990 and 2000, respectively. In Figure 2-5, the black dots represent the number of people we would expect in 2000 if no one had moved in or out of Whatcom County from 1990 – 2000.[3] The difference between the population represented by the black dots and the respective bar indicates the amount of net-migration in Whatcom County during the period. A black dot plotted inside of the bar end shows that on net, *in*-migration occurred for that age group; a black dot outside the bar end suggests net *out*-migration.

[3] To estimate this, we took the population from 1990 per each age group and moved it forward ten years. We then subtracted out the deaths in each age group over the decade during the decade. This method is not perfect, since we could not adjust death rates for net migration. It does, however, represent a good estimate of the isolated effects of migration on population by age group.

Figure 2-4. Whatcom County population by age group, 1990

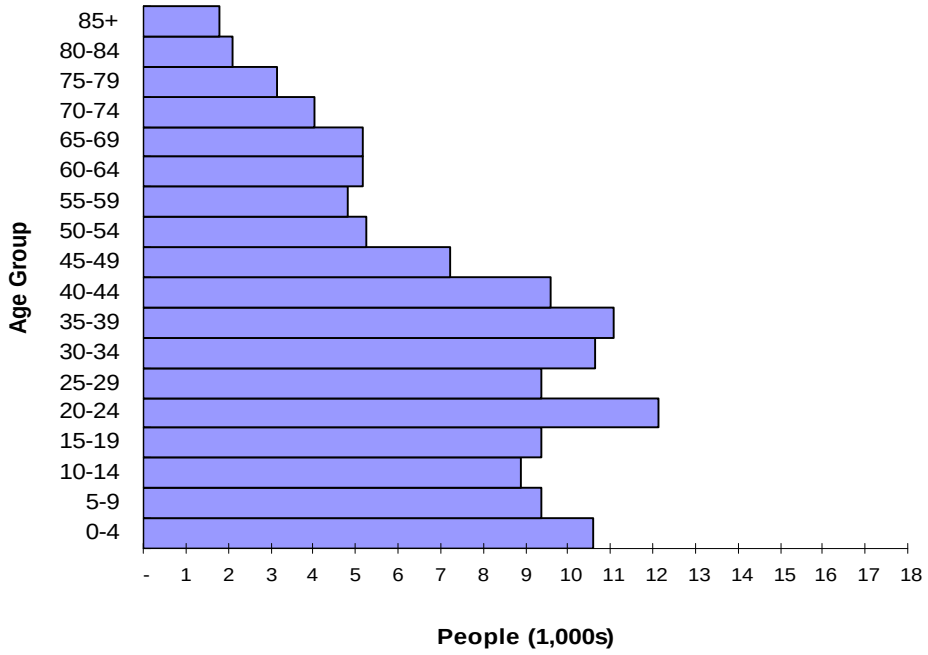
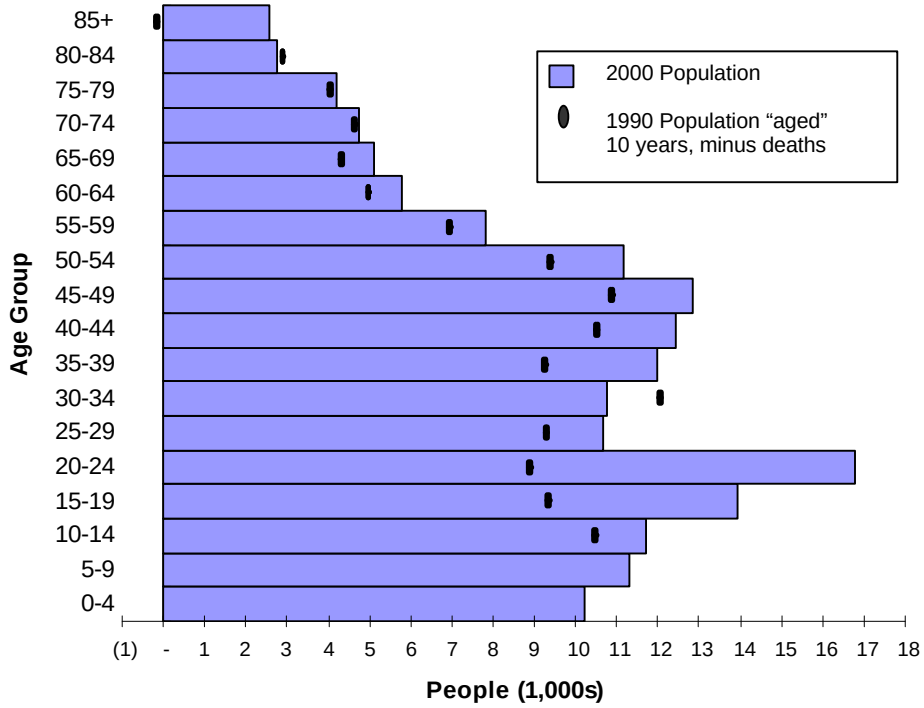


Figure 2-5. Whatcom County population by age group, 2000



Source: U.S. Census Bureau, Washington State Department of Health Center for Health Statistics.

For most of the age groups, population grew at a rate that closely matched the total population growth rate over the same period. A couple of differences are readily apparent. The first is the seemingly large amount of

in-migration in the 85 years and older age group. The black dot in the negative range shows that more people in that age group died during the 1990s than were 75 or older and living in Whatcom County in 1990. This is possible by the effects of in-migration in this age group during the 1990s.

The other notable change in Figures 2-4 and 2-5 is the increase in population in the age brackets of 15-19 and 20-24 years old. The rapid growth of the 15-24 year old age groups illustrates the impact of growing enrollments at Western Washington University and other higher education institutions. The State legislature made a conscious decision in the mid-1990's to relax strict limits on enrollments throughout the university system. As recently as 2000, enrollment grew 3.5 percent. In the near future, the University expects enrollment to increase as the children of baby boomers continue to matriculate. Eventually, enrollment growth will slow or stagnate, however, once this cohort ages into their mid-20s. Beyond that point, the University will contribute less to County growth than has been the case in the last ten years. Enrollment caps will likely come and go, and the other factors (state or university policy, land supply, etc.) may constrain campus growth.

CURRENT ECONOMIC ACTIVITY

JOBS

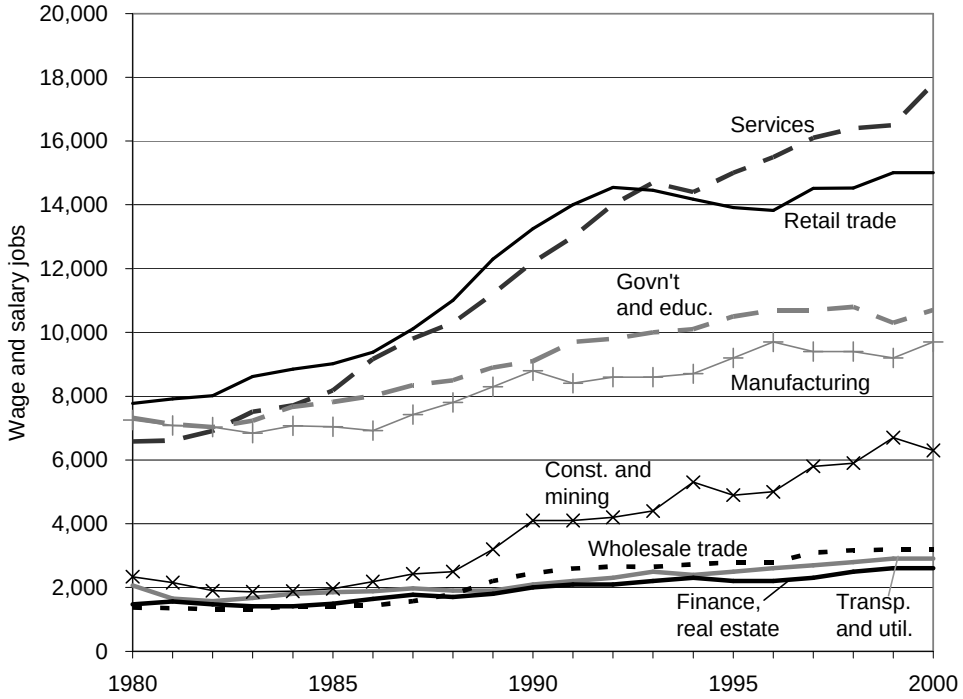
Job growth in Whatcom County has been more volatile than population growth (Figure 2-6). Annual percentage growth in jobs exceeded population growth throughout the late 1980s. During the 1990s, percentage growth in jobs and population were fairly consistent with each other. Both population and job growth trended downward during 1990s to present.

Figure 2-6. Annual percentage change in Whatcom County population and jobs, 1975-2001

Source: Washington State Office of Financial Management, U.S. Census Bureau, and Washington State Employment Security Division (excludes agricultural jobs)

The mix of employment in Whatcom County has diversified considerably during the past twenty years (Figure 2-7). In 1980, Whatcom County had a more similar amount of employment in each sector of services, retail trade, manufacturing, and government and education. Following national trends, services jobs in Whatcom County have since grown more rapidly than any other sector, becoming the largest sector of employment.

Figure 2-7. Whatcom County jobs by sector, 1980-2000



Source: Washington State Employment Security Division.

The employment data in Figure 2-7 excludes some agricultural employment, though some are included in the services sector. ESD estimates there were 3,290 agricultural workers in Whatcom County in 2000, including wage and salary workers, as well as owners and unpaid family workers.

As shown above, the Whatcom County economy includes employment in a broad range of industry sectors. Table 2-1 shows the number of jobs in more specific sectors, as of April 2001.

Table 2-2 below shows the major employers as identified by Whatcom County Economic Development Council, along with the sectors. We do not know for certain which employers correspond to which industries in Table 2-1, though many are likely obvious to people familiar with the companies.

Table 2-1. Whatcom County top industry employment, April 2001

Industry	SIC	2-DIGIT SIC DEFINITION	Number of locations	Covered jobs
Services	80	Health Services	283	5,155
Retail	58	Eating and Drinking Places	322	4,936
Construction	17	Special Trade Contractors	394	2,453
Retail	54	Food Stores	86	2,219
Services	73	Business Services	222	2,214
Wholesale	50	Wholesale Trade - Durable Goods	227	1,728
Services	83	Social Services	142	1,677
Retail	59	Miscellaneous Retail	211	1,429
Retail	55	Automotive Dealers and Service Stations	124	1,389
Retail	53	General Merchandise Stores	17	1,388
Services	87	Engineering, Accounting & Management	193	1,366
Construction	24	Lumber and Wood Products, exc. Furniture	55	1,310
Agriculture	01	Agricultural Production - Crops	159	1,306
Construction	15	General Building Contractors	283	1,268
Manufacturing	20	Food and Kindred Products	35	1,252
Wholesale	51	Wholesale Trade - Nondurable Goods	138	1,083
Services	79	Amusement and Recreation Services	78	1,019
Transportation	42	Trucking and Warehousing	115	984
Manufacturing	33	Primary Metal Industries	*	*
Finance	60	Depository Institutions	76	910
Services	70	Hotels and Other Lodging Places	55	892
Utilities	48	Communications	22	883
Agriculture	02	Agricultural Production - Livestock	170	826
Manufacturing	29	Petroleum Refining & Related Industries	3	807

Source: Washington State Employment Security Division.
Note: Refers to employment covered by State unemployment insurance, excludes approximately 10 to 14 percent of jobs of most sectors. "*" indicates the data have been suppressed according to ESD confidentiality rules and Washington State law. Suppressed table cells indicate fewer then three employers in the industry, or that one of the employers accounts for at least 80 percent of countywide employment in that industry.

Table 2-2. Top 25 employers in Whatcom County, August 2002

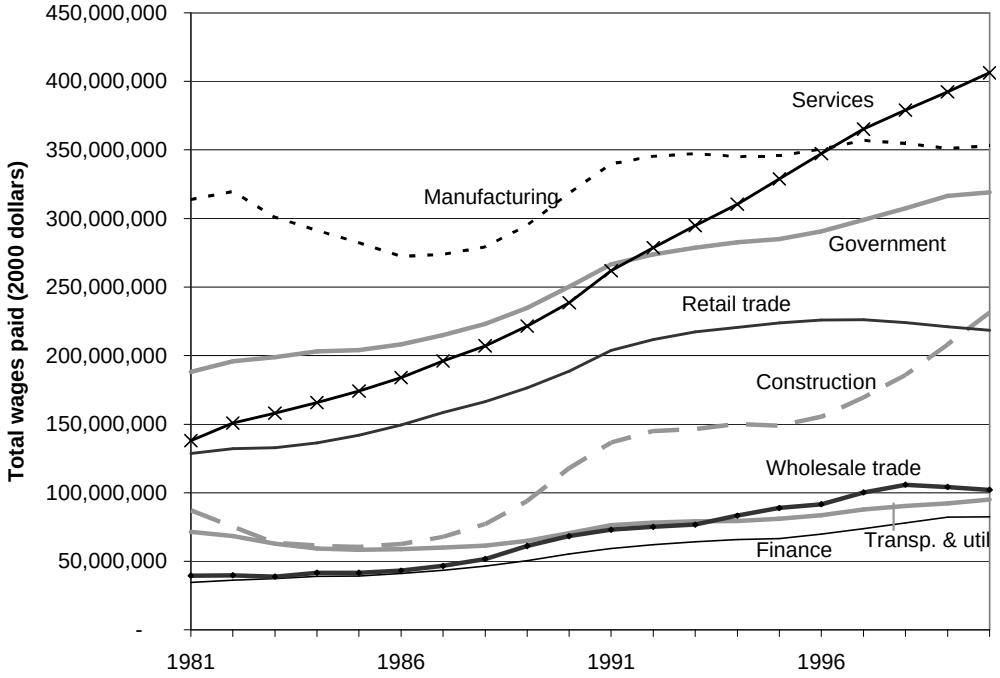
Rank	Company/Organization	Employed
1	Western Washington University	1842
2	St. Joseph Hospital	1800
3	Bellingham School District	1244
4	City of Bellingham	808
5	Haggen, Inc.	807
6	Whatcom County	800
7	Ferndale School District	742
8	Intalco	689
9	Brown & Cole Stores	620
10	Voicestream	563
11	BP Cherry Point Refinery	485
12	Olympic Health Management	413
13	Lummi Indian Business Council	403
14	Resort Semiahmoo	375
15	GP	350
16	Wal-Mart	346
17	Bellingham Technical College	325
18	Whatcom Community College	320
19	Mt. Baker School District	318
20	Alpha Technologies	317
21	Madrona Medical Group	303
22	Kodiak Fish Co., Inc.	300
23	American Cordage Group, Inc.	293
24	Wal-Mart Stores, Inc.	257
25	Tosco Corp.	250

Source: WorkSource Whatcom

WAGES

Wages paid out to jobs in Whatcom County have varied over time and across industries (Figure 2-8). Services wages, in total, have increased to be the highest wage-generating industry in Whatcom County. This does *not* imply that services jobs are the highest paid jobs. The sharp increase in wages from service sector jobs reflects that sector's growing portion of employment within Whatcom County. Wages paid to manufacturing jobs remain the second most wages paid, in spite of the sector's rank of fourth in jobs, as shown previously in Figure 2-7.

Figure 2-8. Total wages paid by industry in Whatcom County, 1981-2000 (adjusted for inflation)



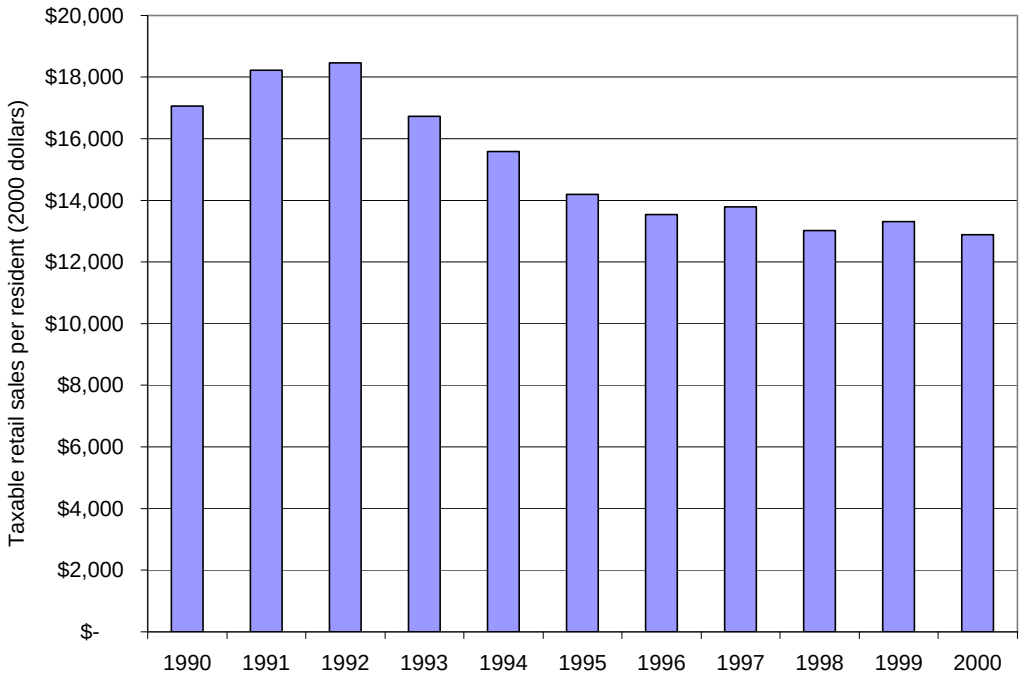
Source: Economy.com, Washington State Employment Security Division

RETAIL SALES

We include this glance at retail sales activity because of the changes that have occurred in Whatcom County's retail sector in recent years. Figure 2-7 above shows that retail employment had led all other sectors in Whatcom County during the 1980s. In recent years, services job growth grew substantially and services became the sector with the most jobs in Whatcom County.

This trend with services jobs growth occurred nationwide, and the trend in retail jobs is common among Washington counties of similar size to Whatcom County. (In both Yakima and Spokane counties, retail jobs led county employment until the late 1980s.) Less common, however, has been the decline in retail sales within Whatcom County during the 1990s (Figure 2-9). The data represented in Figure 2-9 show the amount of taxable retail sales in Whatcom County per Whatcom County resident from 1990 to 2000, adjusted for inflation.

Figure 2-9. Taxable retail sales per capita in Whatcom County, 1990-2000 (2000 dollars)



Source: Washington State Department of Revenue, U.S. Bureau of Economic Analysis, U.S. Census Bureau, Washington State Office of Financial Management

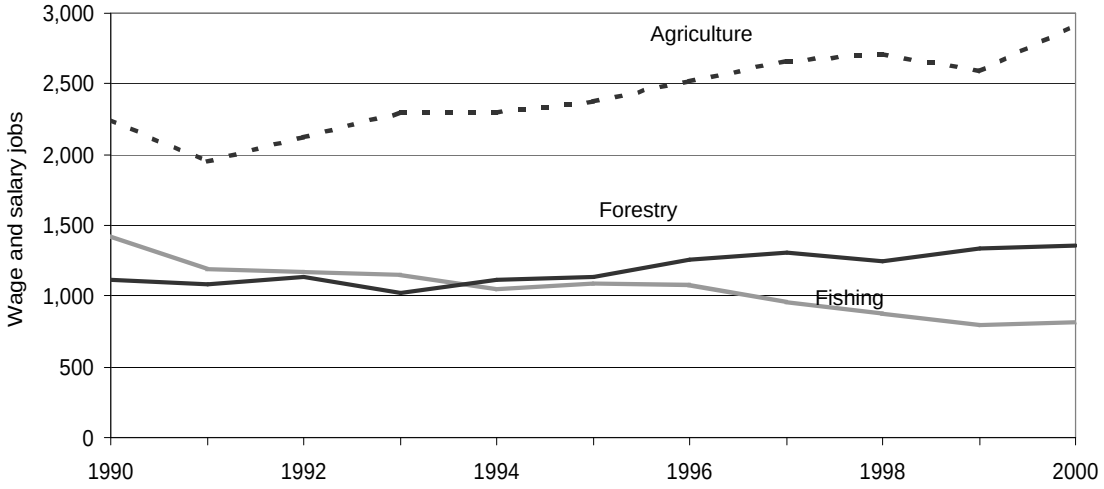
As shown in Figure 2-9, retail sales per person in Whatcom County decline steadily from 1992 through 1996. This trend has leveled off somewhat since 1996. Several factors likely have contributed to this decline. Local planners have pointed toward a weakening Canadian dollar resulting in decreased shopping by Canadians coming to Whatcom County.

AGRICULTURE, FISHING AND FORESTRY

The State reports these economic activities as a single sector. Some additional information on this sector is warranted, however, given the relatively large land use requirements and proximity to water resources. This section includes a breakdown of employment and wages in the agriculture, fishing and forestry sectors.

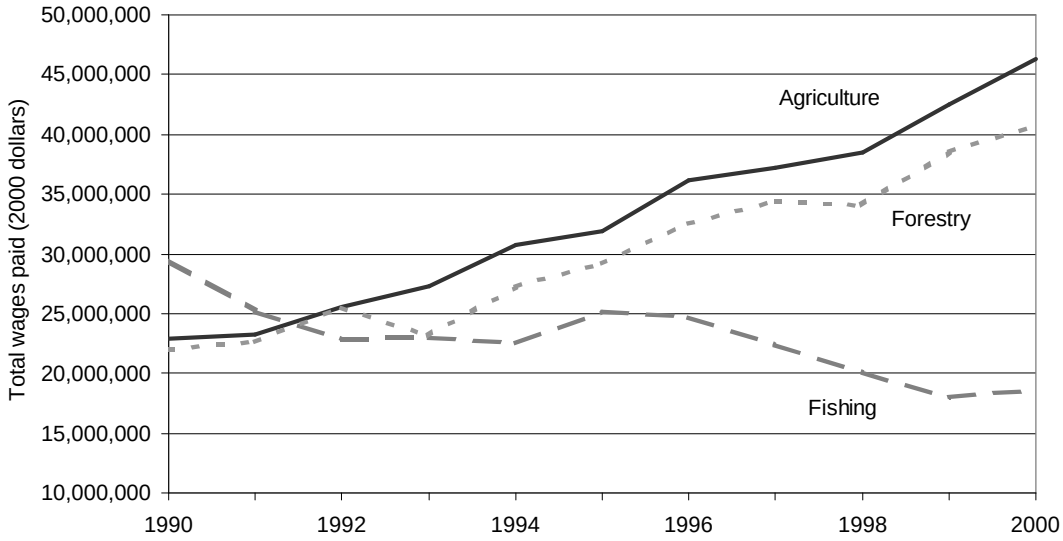
Figure 2-10 shows employment data for the three sectors. Included in the fishing and forestry categories are employment numbers for other related groups. For fishing these are such jobs as seafood processors and canneries. For forestry they are logging, milling, and similar jobs. Although not considered fishing or forestry jobs in the strictest sense by the Employment Security Department and generally listed as subsectors of manufacturing, they do stem from the fishing and forestry industries, and therefore can be considered in a broader sense as part of the same trade.

Figure 2-10. Whatcom County agriculture, fishing and forestry jobs, 1990-2000



Source: Center for Business and Economic Research, using data from the Washington State Employment Security Division.

Figure 2-11. Total wages paid in agriculture, fishing and forestry in Whatcom County, 1990-2000 (adjusted for inflation)



Source: Center for Business and Economic Research, using data from the Washington State Employment Security Division.

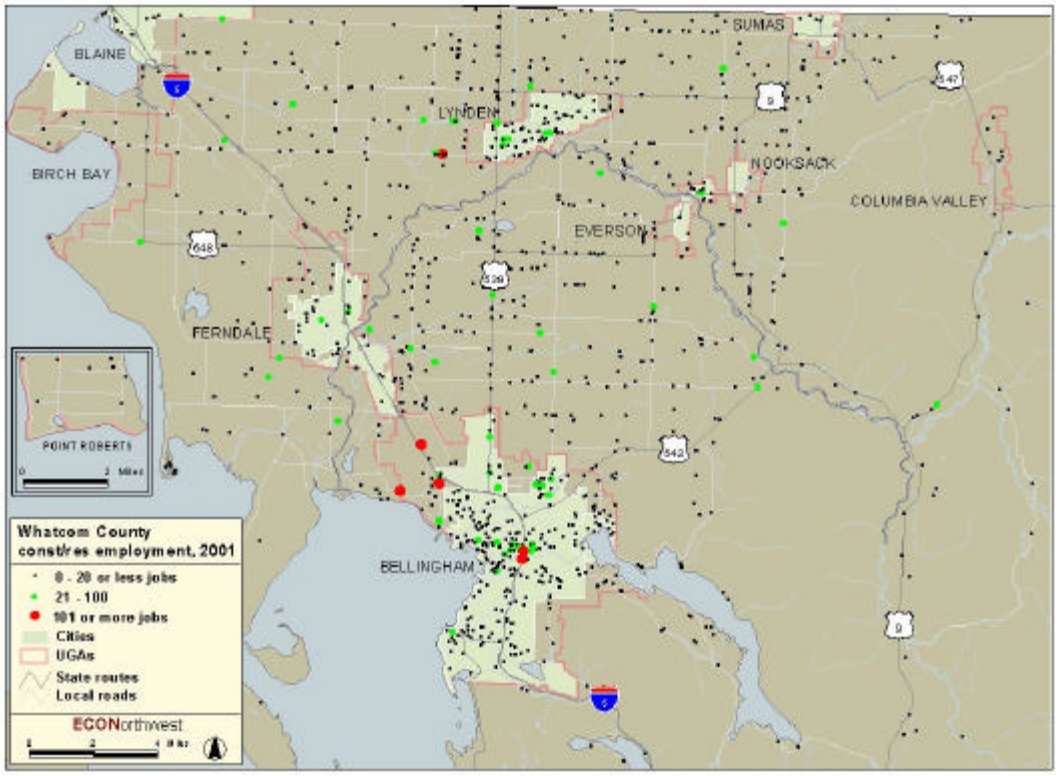
As shown in Figure 2-11 total wages paid in the fishing industry have fallen by over a third in the last ten years, while agriculture and forestry sectors have doubled. However, when considering wages paid in all industries in Whatcom County, these three industry groups comprise only a small portion of total wages paid in the County. (compare Figure 2-11 to Figure 2-8,). It is important to note also that there are relatively few people employed

in these sectors, so while the changes in total wages paid look dramatic they are affecting only a very small section of the economy.

ECONOMIC CENTERS

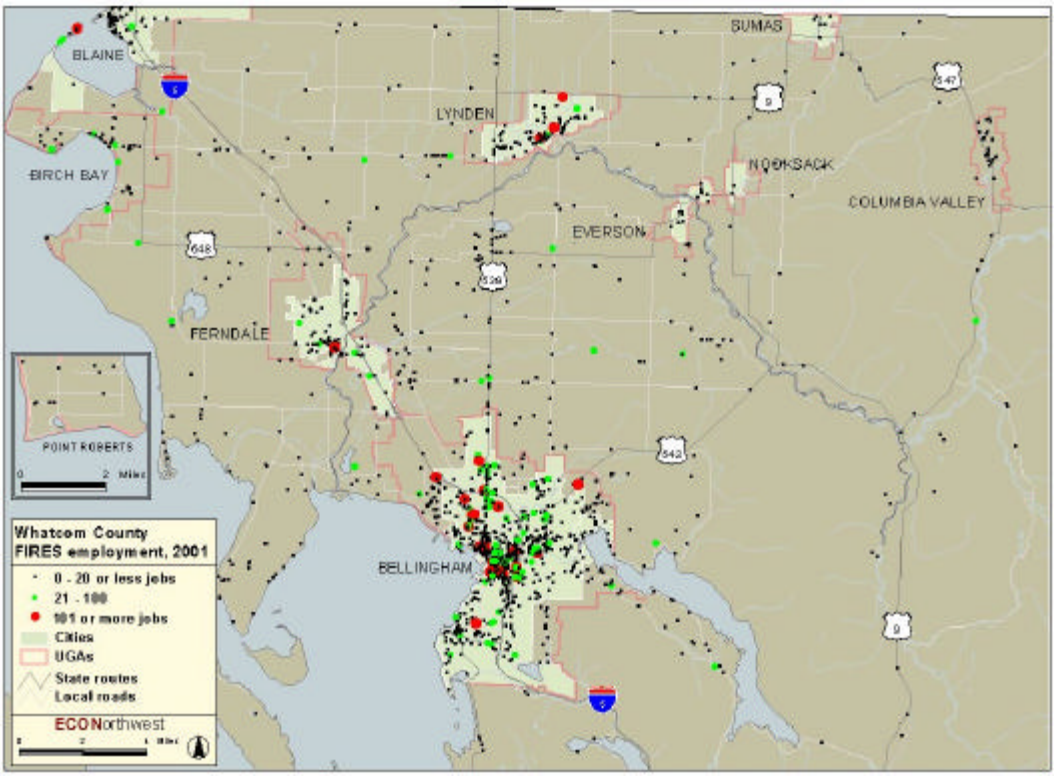
In this section, we present maps showing the location detail of employment represented by the ESD data for Whatcom County (Figures 2-12 through 2-16). As discussed, the data represent jobs as located according to ESD records in April 2001. The figures show the degree to which each industry clusters among the cities in Whatcom County. Not represented in these figures is agricultural direct employment. Some agricultural services firms are captured by the services category.

Figure 2-12. Whatcom County construction/resources employment, 2001



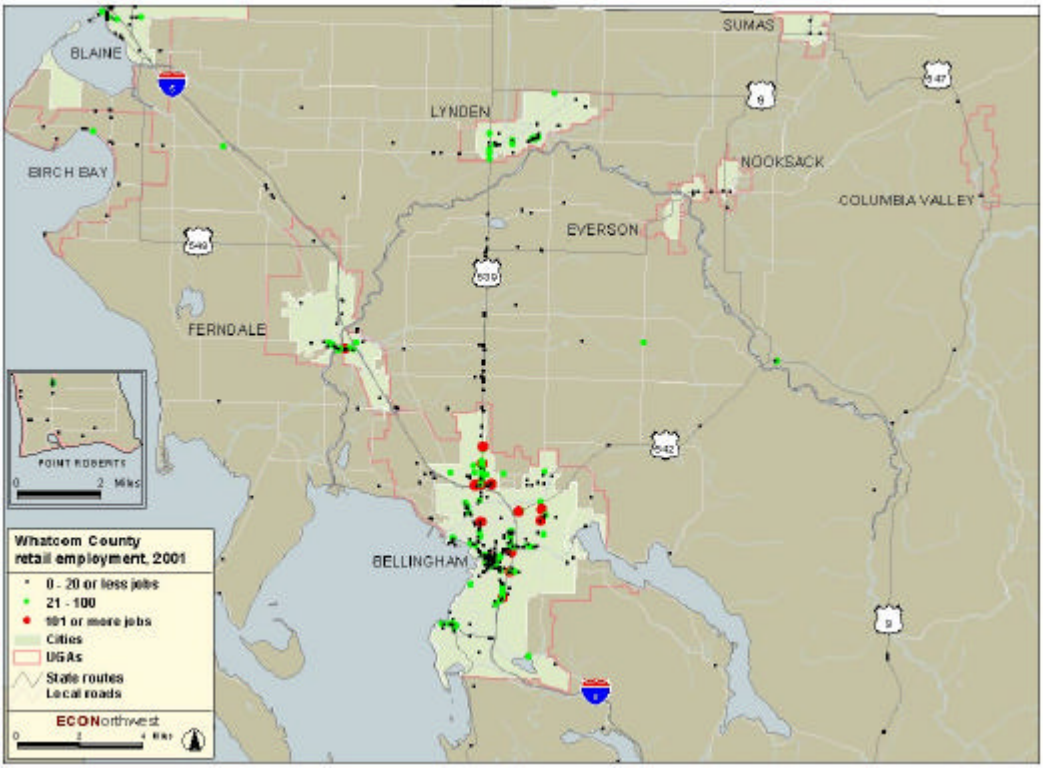
Source: Employment Security Department, 2001

Figure 2-13. Whatcom County finance, insurance, real estate, and services employment, 2001



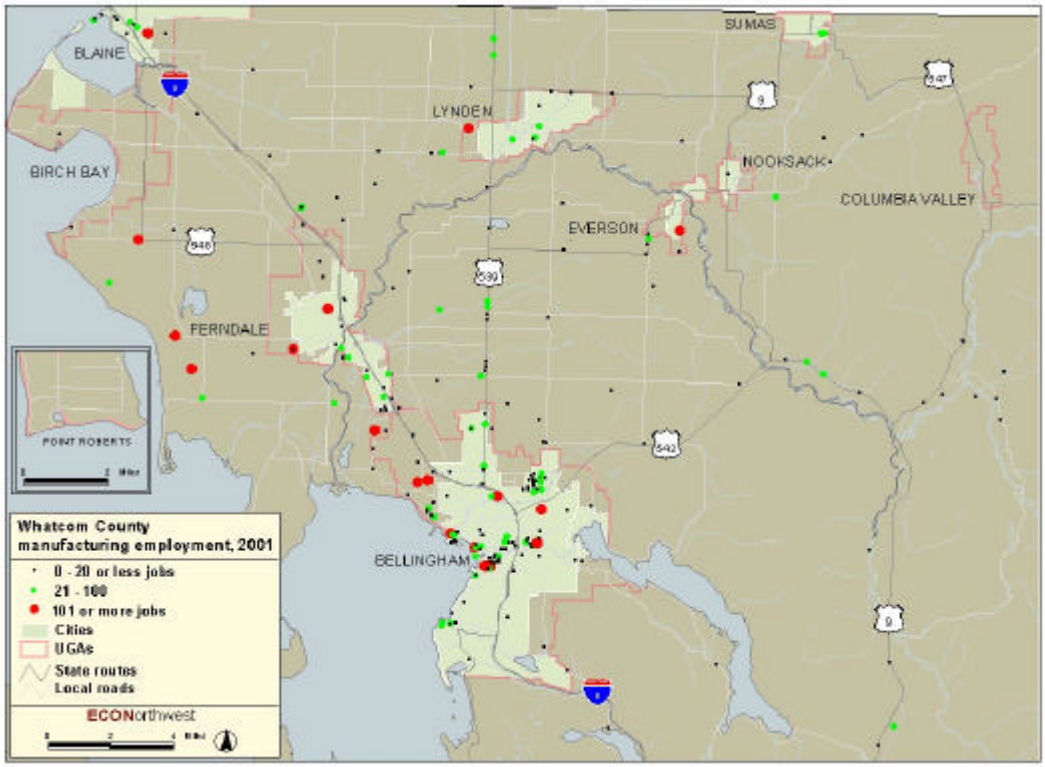
Source: Employment Security Department, 2001

Figure 2-14. Whatcom County retail employment, 2001



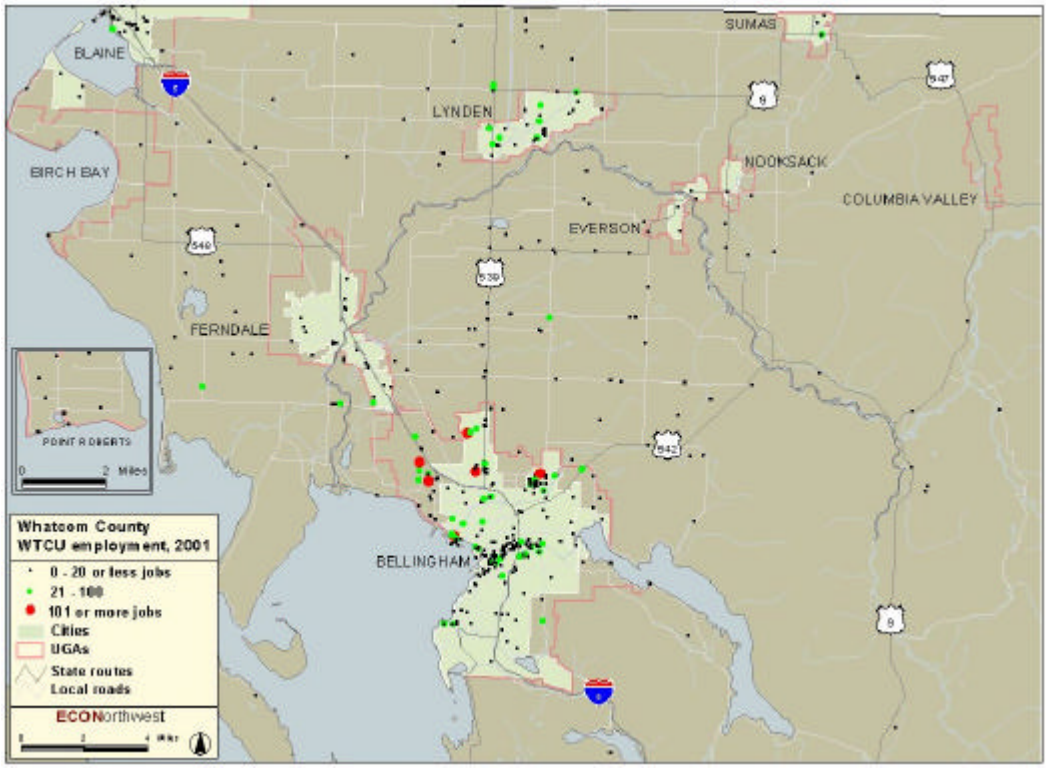
Source: Employment Security Department, 2001

Figure 2-15. Whatcom County manufacturing employment, 2001



Source: Employment Security Department, 2001

Figure 2-16. Whatcom County wholesale, transportation, communications, and utilities employment, 2001



Source: Employment Security Department, 2001

FORECASTED GROWTH

In preparation for their respective comprehensive planning efforts, representatives of Whatcom County and the County's seven municipalities recently developed a set of draft 2002-2022 Population, Housing, and Employment forecasts. The County Growth Management Oversight Committee (CGMOC) identified forecasted population, housing, and employment growth for the County's nine designated urban areas, Point Roberts, and the remaining rural areas of the County.

In total, the CGMOC's draft forecasts anticipate adding roughly 94,000 new residents to Whatcom County between 2000 and 2022 (Table 2-3).

Table 2-3. GMOC's 2000-2022 Population forecast and historic population

	1990	2000	2022
Bellingham	61,250	78,040	123,622
Blaine	3,538	4,779	7,942
Everson	1,761	2,256	3,912
Ferndale	6,986	9,934	17,322
Lynden	6,453	9,604	16,900
Nooksack	616	895	1,881
Sumas	792	995	1,669
Columbia Valley	471	2,490	5,000
Point Roberts	923	1,308	2,210
Birch Bay	2,283	4,532	9,619
Other Uninc.	42,707	51,981	71,006
Total	**127,780**	**166,814**	**261,083**

Source: *Draft 2002-2022 Population, Housing and Employment Growth Projections: A Summary of 20-year Growth Projections for the Greater Bellingham Area* and *Whatcom County Population and Economic Forecasts,* prepared for Whatcom County GCMOC by ECONorthwest.

In addition to 94,000 new residents, the GCMOC anticipates the addition of almost 56,000 new industrial, commercial, and retail jobs across the County from 2001 to 2022 (Table 2-4). Not surprisingly, the bulk of these forecasted new jobs are expected to emerge in the County's four largest cities: Bellingham, Blaine, Ferndale, and Lynden.

Table 2-4. 2001-2022 Non-farm and non-governmental employment growth implied by GCMOC's 2022 employment forecasts[45]

	Industrial	Commercial	Retail	Total
Bellingham	7,208	21,677	10,385	39,270
Blaine	438	1,113	352	1,903
Everson	184	23	40	247
Ferndale	734	1,079	744	2,557
Lynden	650	1,792	1,036	3,478
Nooksack	12	6	31	49
Sumas	140	31	27	198
ColumbiaValley	2	40	107	149
PointRoberts	27	69	110	206
BirchBay	21	379	78	478
OtherUninc.	4,453	2,062	820	7,335
Total	**13,869**	**28,271**	**13,730**	**55,870**

Source: *Draft 2002-2022 Population, Housing and Employment Growth Projections: A Summary of 20-year Growth Projections for the Greater Bellingham Area* and *Whatcom County Population and Economic Forecasts*, prepared for Whatcom County GCMOC by ECONorthwest.

CANADA'S LOWER FRASIER RIVER VALLEY

The government of British Columbia collects economic and demographic data by local health area. A local health area is a sub-provincial administrative area, similar to a school district in the US. The Chilliwack, Abbotsford, and Langley local health areas (areas 33, 34, and 35, respectively) contain portions of land that falls within the WRIA 1 boundary. The majority of the land in these three health areas, however, drains into the Lower Frazier River in Canada.

[4] The employment categories included in the Whatcom County *Draft 2002-2022 Population, Housing, and Employment Growth Projections* use the classifications of Industrial and Retail, but the draft forecasts use the descriptor *Office* employment to refer to remaining non-farm, non-government industries. In this presentation, we refer to those same commercial categories as *Commercial.* This Commercial category includes the Finance, Insurance, and Real Estate (FIRE) sector, whose activities largely take place in offices. However, Commercial also includes Services, which encompasses activities ranging from software development to auto mechanics, car washes, and workout clubs.

Table 2-5. Population, households, and employment by local health area, 2001

Local Health Area	Population	Households	Employment
Chilliwack (33)	72,050	27, 035	26,947
Abbotsford (34)	117,429	41,638	42,979
Langley (35)	115,103	43,084	46,271
Total	304,582	111,757	117,197

Source: BC Stats, Ministry of Management Services

The combined population of the three areas is over 300,000 persons (Table 2-5). In the Chilliwack and Langley health areas, however, the population centers are far removed from the WRIA 1 boundary and closer to the Frazier River itself (Table 2-6). We estimate that less than 10 percent of population of these areas falls within WRIA 1. The city of Abbotsford, by contrast, overlaps the WRIA 1 boundary at the top of a jutting spike of WRIA 1, northwest of the city of Sumas. It appears that some portion of the population of the city falls within the WRIA 1 area. We estimate that approximately 25,000 Canadian residents from all three health areas live within the WRIA 1 boundary, most of those in and around the city of Abbotsford.

Table 2-6. Population 2001, and employment by jurisdiction, 1996

Major Cities	Population	Employment
Chilliwack (33)	62,927	28,145
Abbotsford (34)	115,463	51,285
Langley (35)	23,343	11,520

Source: Statistics Canada, community profiles, 1996, 2001

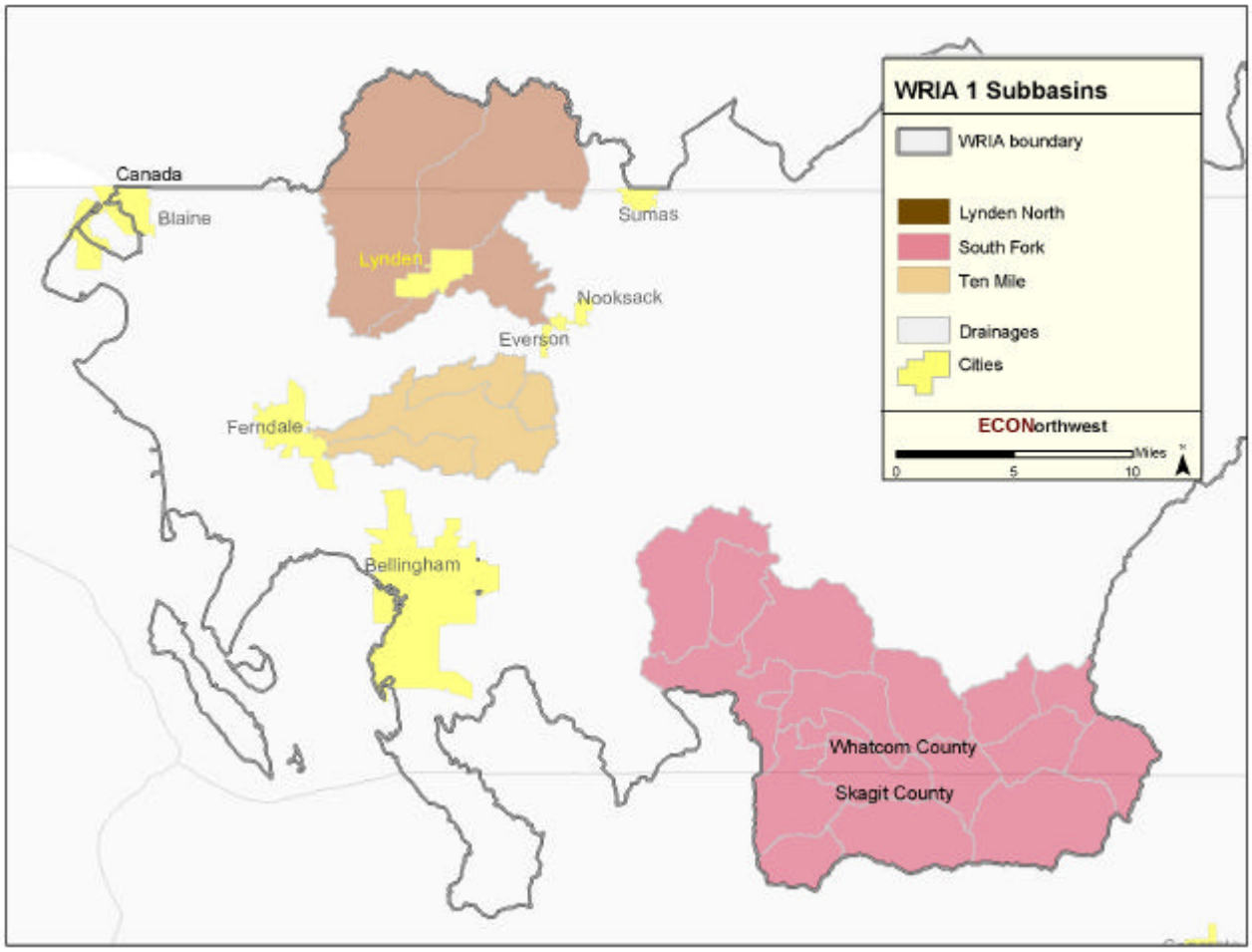
SKAGIT COUNTY REGIONS IN WRIA 1

The WRIA 1 boundary dips into Skagit County in three places. The largest of the three is in the East and is part of the South Fork Nooksack sub-basin. The central portion is quite small and part of the Lake Whatcom sub-basin. Both of these areas contain very few residents and little economic activity. We estimate that approximately 1100 people live in the Skagit County portion of WRIA 1, nearly all of them in the most western portion.

Chapter 3 Sub-basin profiles

As part of the watershed management plan, the Parametrix team will develop detailed management scenarios for three sub-basins with WRIA 1. These focus areas include South Fork Nooksack, Ten Mile, and Lynden North. As Figure 3-1 shows, two of the three sub-basins (the South Fork Nooksack sub-basin is the exception) include some land that falls within a city limit, shown in yellow on the map.

Figure 3-1. Sub-basins of interest in the WRIA 1 planning process



Additionally, two of the three sub-basins contain lands outside of Whatcom County. The area of the South Fork Nooksack sub-basin that spills into Skagit County contains little, if any, residential or commercial activity. The Canadian portion of the Lynden North sub-basin, however, is populated. The previous chapter discusses the population and economic activities located in that region. Our analysis in this chapter covers only the U.S. portion of the Lynden North sub-basin.

FORECASTED GROWTH

Forecasts of population and employment growth for each drainage are based on a set of 2022 forecasts that were recently developed and adopted by Whatcom County's Growth Management Oversight Committee.[6]

Forecasts of population and employment growth for each drainage are ECONorthwest's *allocation* of CGMOC's adopted forecasts of growth for Whatcom County's nine urban areas, Point Roberts, and the remaining unincorporated areas of the County to specific drainages.

Our allocation of population growth is a demand-driven allocation. That is, the growth allocated to a sub-area within a given CGMOC forecast area is distributed based on the sub-area's share of the forecast area's growth from 1990 to 2000. The rationale behind this allocation scheme is that the areas have grown most rapidly in recent years are the areas for which demand for new housing is the strongest.[7]

Our allocation of employment growth is based on the relative distribution of existing developable capacity of commercial- or industrial-zoned land. Our assessment of capacity is based on identifying vacant land, as defined in the land-use categorization of the Whatcom County Assessor's Office[8], and identifying redevelopable land, which we define as any tax parcel with (assessed value of improvements)/(assessed value of land) of less than 0.5.[9][10]

Figures 3-2 and 3-3 describe the geographical distribution of our allocation of forecasted growth.

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[6] As a source for these draft forecasts, we used the document entitled *Draft 2002-2022 Population, Housing, and Employment Growth Projections,* as provided to us by staff at the City of Bellingham.

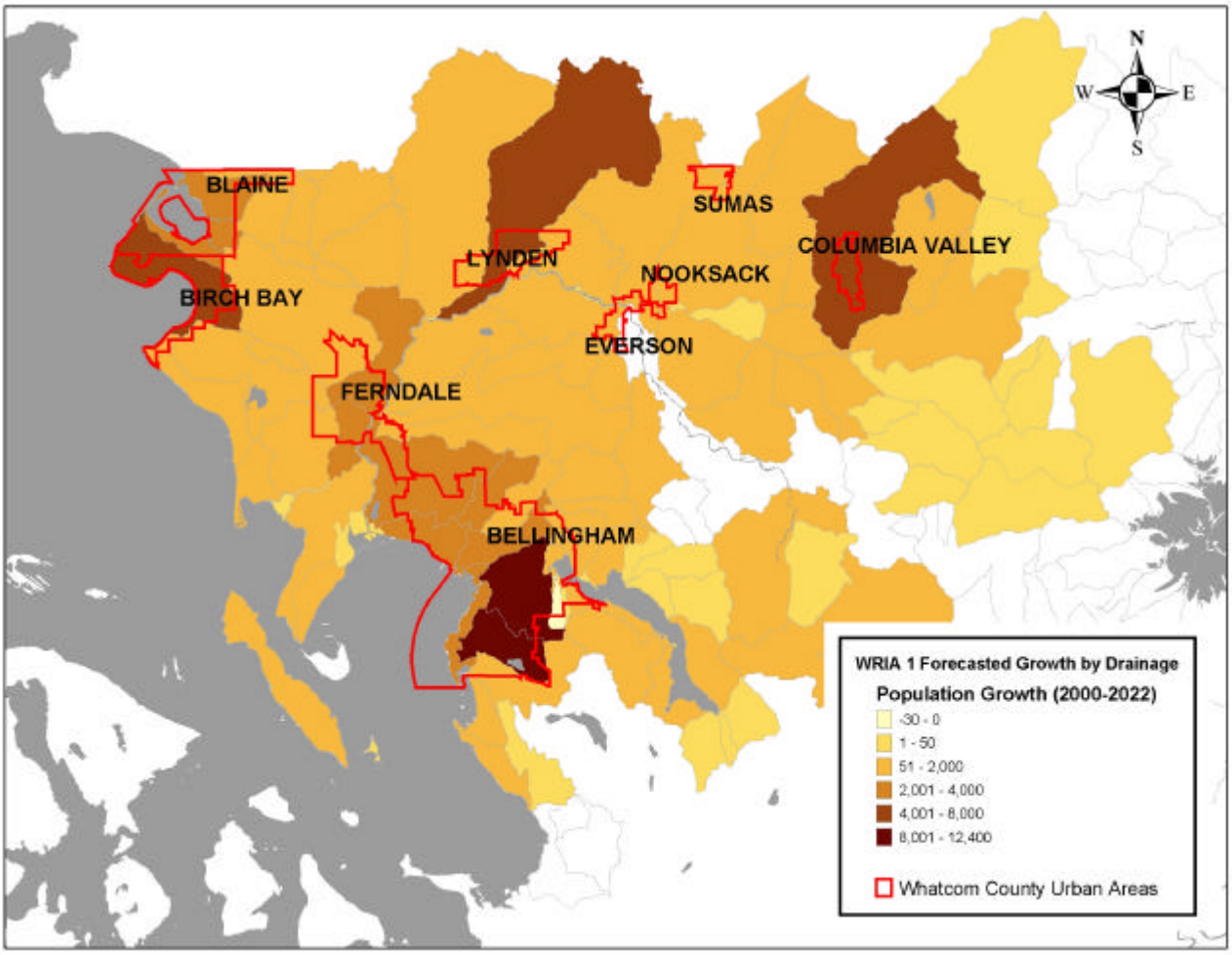
[7] Our estimate of the distribution of 1990-2000 growth direct comparison of four separate units of geography: 1990 census blocks, 2000 census blocks, GGMOC forecast areas, and WRIA 1 drainages. To execute these comparisons, we generated a common denominator geographical unit. This common denominator identified as unique geographical units all geographical areas with a unique combination of the four geographies of comparison. We allocated 1990 and 2000 census block populations to each unit of our common denominator geography on the basis of land area. For those areas where population growth from 1990 to 2000 was negative, allocation of future growth was also negative, but constrained in its degree to prevent the impossible outcome of population in an area dropping below zero.

[8] Assessor's data used in the analysis include a 2001 ArcView digital map layer provided by planners at Whatcom County, a 2002 database of Assessor's records, and a 1999 ArcView point-level digital map layer provided by staff at PUD #1.

[9] While we recognize the importance of the demand component in determining where new commercial development will occur within in given forecast area, we do not have adequate data to identify future or even recent trends in the distribution of new commercial activities. However, since 10 of the 11 CGMOC's forecast areas are relatively constrained in their areas (the seven cities, the two unincorporated urban areas and Point Roberts), the allocation of new jobs based on developable capacity in these areas is likely to provide a workable forecast allocation. For the remaining portions of rural Whatcom County, however, demand for commercial development is likely to vary widely from one region of the county to another. Consequently, our forecast allocation based on capacity is likely to produce less reliable results.

[10] As Whatcom County and its cities continue to develop their assessments of buildable lands, as required by the statutes of the Growth Management Act, more complete data about the distribution of developable capacity will become available.

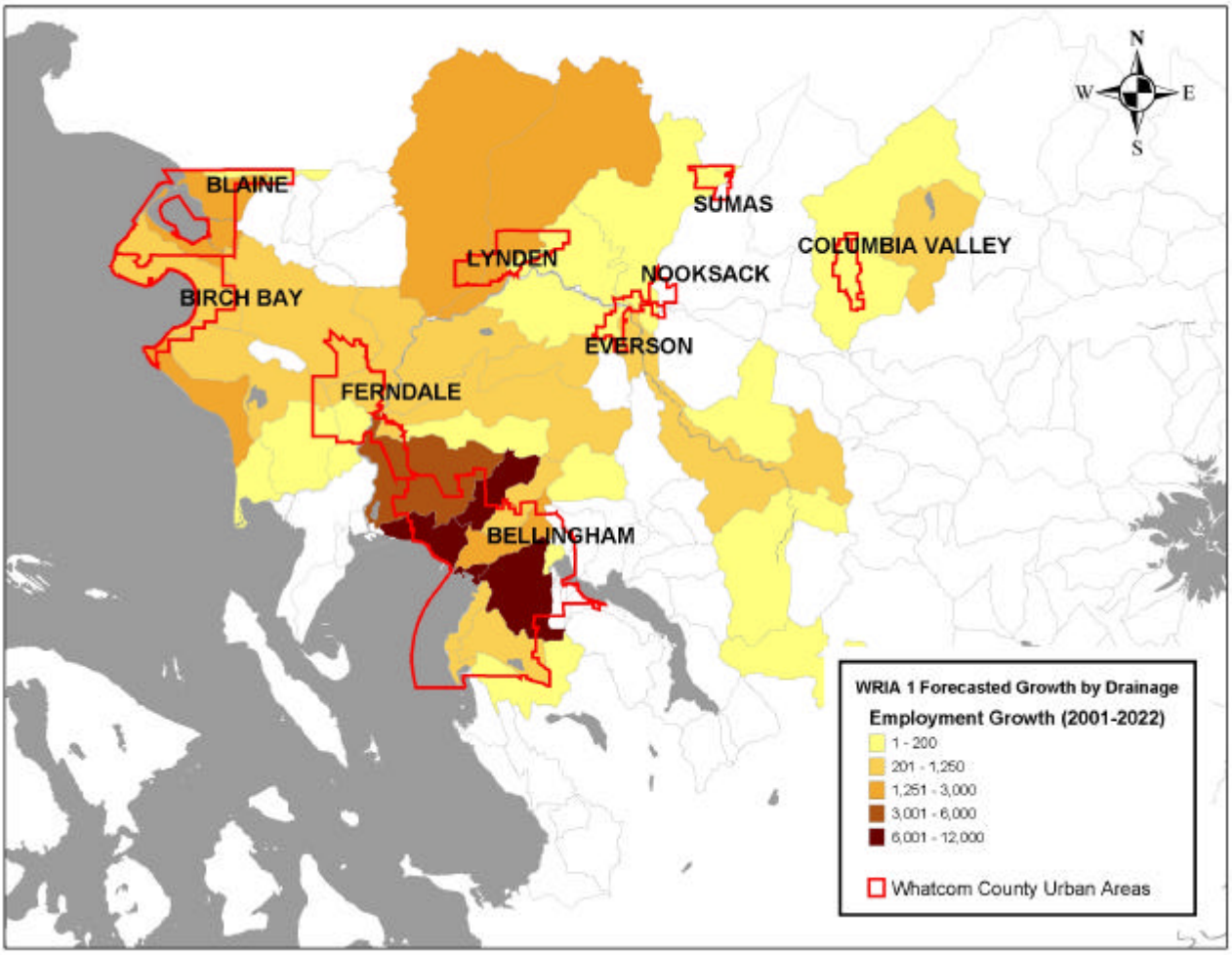
448 **Figure 3-2. Allocation of forecasted 2000-2022 population growth to drainage**



449

450 Source: ECONorthwest analysis of Whatcom County Growth Management Oversight Committee draft 2002-2022 growth forecasts
451 by forecast area.

Figure 3-3. Allocation of forecasted 2001-2022 employment growth to drainage



Source: ECONorthwest analysis of Whatcom County Growth Management Oversight Committee draft 2002-2022 growth forecasts by forecast area.

Note: Allocations of retail, industrial, and commercial employment within the Nooksack urban area are based on vacant and redevelopable *commercial* capacity because Nooksack has no industrial-zoned developable capacity. Allocation of Retail and Commercial employment within the Kendall drainage (which includes all of the Columbia Valley urban area) include all forecasted growth for Columbia Valley in spite of the fact that, under our methodology, Columbia Valley does not currently have any developable commercially-zoned land.

The following sections discuss the current and forecasted economic characteristics of each of the three focus areas. We discuss the population, employment, and land-use characteristics by drainage area within each sub-basin or watershed. Appendix A contains tables of current and projected population and employment for all drainages in the watershed.

SOUTH FORK NOOKSACK

The South Fork Nooksack sub-basin dominates the Southeast portion of WRIA 1. The sub-basin extends into substantial portions of unpopulated Skagit County, and includes 18 separate drainages:

- Lower South Fork Nooksack
- Black Slough
- Hutchinson
- South Acme Area
- Upper Skookum Area
- Elbow Lake
- Bell
- Lower Skookum
- Saxon
- Heart Lake Area
- Edfro
- Wanlick
- Dye
- Cavanaugh
- Howard
- Upper South Fork Nooksack-East
- Upper South Fork Nooksack-West
- Deer, Roaring, & Plumbago

ECONOMIC PROFILE

Population

Of the 18 drainages included in the sub-basin, only four are populated: Lower South Fork Nooksack, Black Slough, Hutchinson, and South Acme Area. According to our analysis of Census 2000 data and household counts by tax parcel, these four drainages had a combined population of 1,064 persons, living in 384 households in year 2000 (Table 3-1). The Lower South Fork Nooksack drainage is the most populous of the sub-basins drainages, with the South Acme Area and Black Slough drainages close behind.

Table 3-1. 2000 Counts of population and households by drainage

Drainage	Population	Households
Lower South Fork Nooksack	406	144
South Acme Area	305	103
Black Slough	262	101
Hutchinson	91	36
South Fork Nooksack Total	**1,064**	**384**

Source: ECONorthwest analysis of U.S. Census Bureau Census 2000 counts by census block and Whatcom County tax parcel records.

Note: Estimates of population and households for census blocks that include but extend beyond the boundary of each drainage are based on ECONorthwest's calculation of the share of housing units that fall inside versus outside the drainage boundary. Housing unit counts are based on GIS coverages of 2001 parcel points that were provided to us by PUD #1 staff.

Employment

Non-agricultural employment in the South Fork Nooksack sub-basin is concentrated in only two drainages: the Lower South Fork Nooksack and the South Acme Area (Table 3-2). In total, these two drainages serve as home to 94 "covered" employees, with employment distributed more-or-less evenly among the Construction/Resources, Manufacturing, Trade, Services, and Transportation Communications and Utilities (TCU) sectors of the economy.[11]

Table 3-2. 2001 Covered employment by non-farm sector by drainage

Drainage	Const/ Res	FIRES	Manu.	Retail	TCU	Total
Lower South Fork Nooksack	6	5	0	*	*	37
South Acme Area	*	*	*	13		57
Total	21*		19	20*		94

Source: Washington State Department of Employment Security

* Data suppressed for confidentiality, per Washington State law. Asterisks indicate suppressed data.
Data are suppressed when two or fewer employers compose all employers summed, or when one employer accounts for 80 percent or more of the summed employment.
Does not include agricultural, government or education jobs.

Agricultural employment is more difficult to estimate by drainage, in part because it is more difficult to understand at the county level and beyond. Part of the difficulty rests in the fact that the state data only report covered data. Many farm employees, especially owners and family members, are not covered and not counted. Estimation difficulties notwithstanding, however, the State has estimated total farm employment of 3,290 in Whatcom County in 2000, not counting seasonal workers.

[11] "Covered" employment represents all employees that are "covered" under the State's unemployment insurance act. This excludes proprietors, self-employed individuals, and others. The Puget Sound Regional Council estimates that, on a regional basis, for every 100 "covered" employees, there exists an additional 15 to 20 non-covered employees.

One method for apportioning estimated farm jobs to the sub-basin level is to assume that farm employment is proportional to farm acres in use.[12] For South Fork Nooksack, we estimate 146 farm jobs using this method, most of which are concentrated in the Lower South Fork (58 jobs) and Black Slough (53 jobs) drainages.

LAND USE

The South Fork Nooksack sub-basin covers roughly 118,000 acres in Whatcom and Skagit Counties. Within the Whatcom County portion of the sub-area, the dominant use is "Undeveloped/Forestry/Open Space," which occupies more than 50,000 acres.

Among the seven drainages for which we have access to comprehensive tax parcel information, parcels that are categorized as forests comprise more than 37,000 of the 46,000 acres of land. Of the remaining 9,000 acres, agricultural uses makes up more than 4,600 acres, while 2,100 acres are categorized as residential. Commercial uses account for tax parcels with a total area of 413 acres (Table 3-3).

[12] Economically, it makes sense to consider how many acres of agricultural production support each farm job. At the County or WRIA level, this calculation is a simple exercise. Variations in crop and livestock type, however, make the relationship less straight forward at the sub-basin and drainage level. For all of Whatcom County, land identified for dairy use comprises about 36 percent of all farm land. Within the individual sub-basins, however, that percentage varies – it is slightly less than 22 percent in the South Fork Nooksack, 24 percent in Ten Mile, and nearly 46 percent in Lynden North.

Table 3-3. Tax parcel total acres by land use and selected drainage (2001)

CATEGORY	Black Slough	Edfro	Hutchinson	Lower Skookum	Lower South Fork Nooksack	Saxon	South Acme Area	Total
Residential	533		194		844	3	546	**2,120**
Agriculture	1,661		76		1,829		1,104	**4,670**
Commercial	114	1	33	1	119		145	**413**
Manufacturing							4	**4**
Fishing Activities & Related Services							12	**12**
Forest	427	621	5,186	6,420	6,798	306	3,034	**22,792**
Forestry Activities & Related Services			25				73	**98**
Mining Activities & Related Services							98	**98**
Non-Commercial Forest & Forest Reserves	2,494	1,181	5,697	384	1,365	153	2,924	**14,198**
Open Space	54		68		219		0	**341**
Park Or Facilities					22			**22**
Undeveloped And Unused Land Area	246		51		249		437	**983**
Water Areas	2		3	0	177		258	**440**
Total	**5,531**	**1,803**	**11,333**	**6,805**	**11,622**	**462**	**8,635**	**46,191**

Source: ECONorthwest analysis of 2001 Whatcom County tax parcel coverages.

Note: Reported areas represent the areas of tax parcels (or portions of tax parcels) that fall within the boundaries of each identified drainage. Land use categories represent aggregations of major land use codes. *Residential* uses include all parcels with four-digit land use codes beginning with "1"; *Manufacturing* uses include all land use codes that begin with "2" or "3"; *Commercial* uses include all codes that begin with "4", "5", or "6"; *Park or Facilities* include all codes that begin with "7"; *Agriculture* includes uses with codes that begin with "81" or "83"; *Forest* includes uses with codes that begin with "87" or "88"; and *Open Space* includes uses with codes that begin with "94" or "95". The remaining use categories are consistent with individual 2-digit land use categories as they appear in Whatcom County's Land Use Lookup reference tables.

FORECASTED GROWTH

Of the four drainages in the South Fork sub-basin, the Lower South Fork Nooksack and the South Acme Area drainages are expected to receive the greatest amount of population growth. In total, our allocation of planned growth to the South Fork Nooksack sub-basin suggests that the sub-basin will increase by 317 people from 2000 to 2022, an increase of roughly 30 percent.

Table 3-4. Forecasted 2000-2022 population growth

Drainage	Population
Lower South Fork Nooksack	96
South Acme Area	96
Hutchinson	75
Black Slough	50
South Fork Nooksack Total	317

Source: ECONorthwest analysis of U.S. Census Bureau Census 1990 and 2000 counts by census block and Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections, generated for the Whatcom County Comprehensive Plan.

Our allocation of planned employment growth suggests that employment in the South Fork Nooksack sub-basin is expected to increase at a slightly faster rate than growth in population. In total, our allocation of the Comprehensive Plan forecasts suggest that the Lower South Fork Nooksack and the South Acme area will receive similar levels of commercial and retail growth.

Table 3-5. Forecasted 2001-2022 non-farm and non-governmental employment growth

Drainage	Industrial	Commercial	Retail	Total
Lower South Fork Nooksack	-	18	7	25
South Acme Area	-	15	6	20
Total	**-**	**33**	**3**	**46**

Source: ECONorthwest analysis of Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections and vacant and redevelopable tax parcels by zoning category.

TEN MILE

The Ten Mile watershed is located in the central portion of the WRIA. The watershed's westernmost extremes include portions of the City of Ferndale, as well as portions of the City's Urban Growth Area (UGA). Ten Mile includes four drainages:

- Ten Mile
- Deer
- Fourmile
- Fazon

ECONOMIC PROFILE

Population

Of the four drainages included in the sub-basin, Ten Mile is the most heavily populated, with an estimated 2000 population of 3,621, and more than 1,250 households. In total, the Ten Mile watershed was home to an estimated 7,252 people and nearly 2,500 households in 2000 (Table 3-6).

Table 3-6. 2000 Counts of population and households by drainage

Drainage	Population	Households
Ten Mile	3,621	1,253
Deer	1,659	567
Fourmile	1,278	425
Fazon	694	236
Total	**7,252**	**2,481**

Source: ECONorthwest analysis of U.S. Census Bureau Census 2000 counts by census block and Whatcom County tax parcel records.

Note: Estimates of population and households for census blocks that include but extend beyond the boundary of each drainage are based on ECONorthwest's calculation of the share of housing units that fall inside versus outside the drainage boundary. Housing unit counts are based on GIS coverages of 2001 parcel points that were provided to us by PUD #1 staff.

Employment

Non-agricultural employment in the Ten Mile watershed is dominated by the Construction/Resources (Cont/Res), Retail, and Finance, Insurance, Real Estate, and Services (FIRES) sectors of the economy (Table 3-7). In total, the watershed is home to firms employing slightly less than 1,400 covered employees. We estimate that the sub-basin also contains an estimated 391 farm jobs, located mostly in the Ten Mile (196) and Four Mile (101) drainages.

Table 3-7. 2001 Covered employment by non-farm sector by drainage

Drainage	Const/ Res	FIRES	Manu	Retail	TCU	Total
Deer	119	*	*	*	*	223
Fazon	27	*	*		*	37
Fourmile	81	69	60	*	15	238
Ten Mile	231	211	101	262	57	862
Total	458	306	180	311	105	1,360

Source: Washington State Department of Employment Security

* Data suppressed for confidentiality, per Washington State law. Asterisks indicate suppressed data.
Data are suppressed when two or fewer employers compose all employers summed, or when one employer accounts for 80 percent or more of the summed employment.
Does not include agricultural, government or education jobs.

LAND USE

The Ten Mile watershed covers roughly 22,700 acres of land. By far, the two most dominant land uses in the watershed are agriculture (12,300 acres) and residential (6,300 acres). Commercial uses are also well represented in the watershed, with more than 1,100 acres identified with commercial land use codes (Table 3-8).

Table 3-8. Tax parcel total acres by land use and selected drainage (2001)

CATEGORY	Deer	Fazon	Fourmile	Ten Mile	Total
Agricultural Related Activity				1	**1**
Agriculture	2,133	875	3,170	6,168	**12,346**
Commercial	265	91	137	626	**1,119**
Forest	106	249	36	359	**750**
Manufacturing	4		6	24	**35**
Mining Activities & Related Services	103	31	206	26	**366**
Non-Commercial Forest & Forest Reserves	3			26	**29**
Open Space	33	26	25	346	**430**
Parks Or Facilities	2	3	43	59	**107**
Residential	1,367	785	604	3,569	**6,326**
Undeveloped And Unused Land Area	351	86	64	606	**1,107**
Water Areas	4		7		**11**
Total	**4,369**	**2,147**	**4,298**	**11,811**	**22,625**

Source: ECONorthwest analysis of 2001 Whatcom County tax parcel coverages.

Note: Reported areas represent the areas of tax parcels (or portions of tax parcels) that fall within the boundaries of each identified drainage. Land use categories represent aggregations of major land use codes. *Residential* uses include all parcels with four-digit land use codes beginning with "1"; *Manufacturing* uses include all land use codes that begin with "2" or "3"; *Commercial* uses include all codes that begin with "4", "5", or "6"; *Park or Facilities* include all codes that begin with "7"; *Agriculture* includes uses with codes that begin with "81" or "83"; *Forest* includes uses with codes that begin with "87" or "88"; and *Open Space* includes uses with codes that begin with "94" or "95". The remaining use categories are consistent with individual 2-digit land use categories as they appear in Whatcom County's Land Use Lookup reference tables.

FORECASTED GROWTH

In the Ten Mile focus area, two of the four drainages: Deer and Ten Mile, are expected to accommodate much of the area's future growth. In total, the Ten Mile focus area is expected to grow by slightly less than 1,700 people from 2000 to 2022.

Table 3-9. Forecasted 2000-2022 population growth

Drainage	Population
Deer	671
Ten Mile	592
Fazon	276
Fourmile	128
Ten Mile Total	**1,667**

Source: ECONorthwest analysis of U.S. Census Bureau Census 1990 and 2000 counts by census block and Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections, generated for the Whatcom County Comprehensive Plan.

In terms of employment growth, our allocation of forecasted growth suggests that three of the four drainages in the Ten Mile focus area will serve as home to new commercial activity: Deer and Ten Mile, which include portions of the Ferndale urban area, and Fourmile, which includes portions of Everson's urban area.

Table 3-10. Forecasted 2001-2022 non-farm and non-governmental employment growth

Drainage	Industrial	Commercial	Retail	Total
Deer	-	110	44	154
Fourmile	-	222	88	310
Ten Mile	7	303	184	494
Total	**7**	**635**	**316**	**959**

Source: ECONorthwest analysis of Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections and vacant and redevelopable tax parcels by zoning category.

LYNDEN NORTH

The Lynden North watershed is located in the North central portion of the WRIA, with portions of two of its three drainages extending well into British Columbia. The watershed includes all of the City of Lynden and its Urban Growth Areas. The drainages included in the Lynden North watershed are Bertrand, Fishtrap, and Kamm.

ECONOMIC PROFILE

Population

With a total population of 13,200, Lynden North is the most populous of the four focus areas identified in the Watershed Planning process. In 2000, the watershed had almost 4,700households, more than half of which were located in the Fishtrap drainage (Table 3-11).

Table 3-11. 2000 Counts of population and households by drainage

Drainage	Population	Households
Fishtrap	7,125	2,647.71
Bertrand	3,204	1,025.80
Kamm	2,880	1,019.95
Total	**13,209**	**4,693**

Source: ECONorthwest analysis of U.S. Census Bureau Census 2000 counts by census block and Whatcom County tax parcel records.

Note: Estimates of population and households for census blocks that include but extend beyond the boundary of each drainage are based on ECONorthwest's calculation of the share of housing units that fall inside versus outside the drainage boundary. Housing unit counts are based on GIS coverages of 2001 parcel points that were provided to us by PUD #1 staff.

Employment

As the most urban of the four focus areas, Lynden North also supports the highest levels of non-agricultural commercial activity. Bertrand, Fishtrap, and Kamm each support firms employing more than 1,200 employees. All sectors are well represented, with *Finance, Insurance, Real Estate, and Services* activities providing the greatest number of jobs in the area, and *Construction/Resources*, and *Retail* close behind.

Table 3-12. 2001 Covered employment by non-farm sector by drainage

Drainage	Const/ Res	FIRES	Manu	Retail	WTCU	Total
Bertrand	632	163	365	484	279	1,923
Fishtrap	296	401	134	220	188	1,239
Kamm	217	688	55	314	84	1,358
Total	**1,145**	**1,252**	**554**	**1,018**	**551**	**4,520**

Source: Washington State Department of Employment Security

* Data suppressed for confidentiality, per Washington State law. Asterisks indicate suppressed data.
Data are suppressed when two or fewer employers compose all employers summed, or when one employer accounts for 80 percent or more of the summed employment.
Does not include agricultural, government or education jobs.

The Lynden North sub-basin contains the highest concentration of farm land, and hence the most farm jobs supported, among the four sub-basins examined. An estimated 717 farm jobs reside in this sub-basin. The Bertrand drainage alone has over 10,000 agricultural acres, supporting over 320 jobs.

LAND USE

The Lynden North watershed covers roughly 57,000 acres of land, half falling in Whatcom County, and the remaining half falling in British Columbia. Of the 28,000 acres falling in Whatcom County, the vast majority (22,500 acres) is identified with agricultural land use codes. Of the remaining

5,500 acres, 2,500 acres have residential land use identifiers and 1,100 acres are commercial. With 33 acres of land currently identified with manufacturing use codes, Lynden North has a very similar manufacturing land base to that found in the Ten Mile watershed.

Table 3-13. Tax parcel total acres by land use and selected drainage (2001)

CATEGORY	Bertrand	Fishtrap	Kamm	Total
Agricultural Related Activity	1	11	0	**12**
Agriculture	10,187	7,532	4,824	**22,542**
Commercial	224	445	360	**1,030**
Forest	285	76	43	**404**
Forestry Activities & Related Services	28			**28**
Manufacturing	4	23	6	**33**
Mining Activities & Related Services	67	7	8	**81**
Non-Commercial Forest & Forest Reserves	1	39		**40**
Open Space	51	86	154	**291**
Parkk Or Facilities	255	109	103	**466**
Residential	1,107	814	661	**2,582**
Undeveloped And Unused Land Area	301	152	125	**578**
Water Areas		96	18	**114**
Total	**12,511**	**9,390**	**6,301**	**28,203**

Source: ECONorthwest analysis of 2001 Whatcom County tax parcel coverages.

Note: Reported areas represent the areas of tax parcels (or portions of tax parcels) that fall within the boundaries of each identified drainage. Land use categories represent aggregations of major land use codes. *Residential* uses include all parcels with four-digit land use codes beginning with "1"; *Manufacturing* uses include all land use codes that begin with "2" or "3"; *Commercial* uses include all codes that begin with "4", "5", or "6"; *Park or Facilities* include all codes that begin with "7"; *Agriculture* includes uses with codes that begin with "81" or "83"; *Forest* includes uses with codes that begin with "87" or "88"; and *Open Space* includes uses with codes that begin with "94" or "95". The remaining use categories are consistent with individual 2-digit land use categories as they appear in Whatcom County's Land Use Lookup reference tables.

FORECASTED GROWTH

As the most heavily populated of the three focus areas, and as an area of Whatcom County that has seen relatively high levels of growth in recent years, the Lynden North sub-basin is expected to continue to see strong population growth in coming decades. In total, our allocation of forecasted growth suggests that population in the sub-basin will increase by more than 60 percent from 2000 to 2022. Of the three drainages that comprise the sub-basin, Fishtrap, which cuts through the heart of the City of Lynden, is expected to see the largest share of growth.

Table 3-14. Forecasted 2000-2022 population growth

Drainage	Population
Fishtrap	5,335
Bertrand	1,584
Kamm	1,448
Lynden North Total	**8,367**

Source: ECONorthwest analysis of U.S. Census Bureau Census 1990 and 2000 counts by census block and Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections, generated for the Whatcom County Comprehensive Plan.

In percentage terms, our allocation of forecasted employment growth suggests that commercial activity in the Lynden North focus area will grow even more rapidly than population. With total forecasted non-farm, non-governmental growth of more than 3,500 employees, employment in Lynden North is expected to increase by more than 70%. With large areas of commercial- and industrial-zoned land, our capacity-driven forecast allocation suggests that Bertrand will accommodate a large portion of Lynden's commercial growth.

Table 3-15. Forecasted 2001-2022 non-farm and non-governmental employment growth

Drainage	Industrial	Commercial	Retail	Total
Bertrand	-	1,287	741	2,028
Fishtrap	650	438	253	1,341
Kamm	-	86	50	136
Total	**650**	**1,811**	**1,044**	**3,506**

Source: ECONorthwest analysis of Whatcom County draft 2002-2022 Population, Housing, and Employment Growth Projections and vacant and redevelopable tax parcels by zoning category.

Appendix A

Note: Drainages with zero values for either population of employment have been omitted from the following tables.

Table A-1. Population by drainage, 2000

Drainage	Population	Households
Academy	681	218
Agate Bay	351	125
Anderson/Whatcom	36	14
Austin/Beaver	2279	893
Baker	784	324
Bells	71	25
Bertrand	2986	956
Black Slough	256	99
Blaine	4099	1598
Blodel	367	206
Blue Canyon	60	25
Brannian	8	4
Breckenridge	1864	602
Cable	459	162
California	2947	1034
Canyon Lake	7	3
Carpenter	173	62
Cherry Point	405	174
Chuckanut	439	172
Coal	29	11
Cornell	4	1
Dale	644	235
Deer	1659	567
Donavan	140	51
Eagle Ridge	187	67
Eliza Island	5	3
Fazon	693	236
Fingalson	190	63
Fir	1	1
Fishtrap	6819	2534
Fort Bellingham	9830	4262
Fourmile	1278	425
Fragrance Lake	463	192
Geneva	236	83
Glacier	6	4
Hamilton	157	56
Haynie	333	115
Hedrick	7	2
Hillsdale	1382	462
Hutchinson	66	26
Johnson	2600	902
Jordan	1139	393
Kamm	2578	913
Kendall	2761	895
Kenny	9	3

Lake Terrell	668	232
Lake Whatcom (water)	122	46
Larrabee	178	93
Little Campbell	142	57
Lower Anderson	1131	393
Lower Canyon	2	1
Lower Dakota	1199	423
Lower Middle Fork Nooksack	230	85
Lower South Fork Nooksack	384	136
Lower Squalicum	8355	3673
Lummi Island	782	363
Lummi Peninsula East	310	87
Lummi Peninsula West	1850	573
Lummi River	1	0
Maple	222	84
McCormick	1105	394
Middle North Fork Nooksack	124	62
Nooksack Channel (water)	16	7
Nooksack Deming to Everson	1496	505
Nooksack River Delta	140	36
North Fork Dakota	603	210
North Shore	153	56
Olsen	9	3
Oriental	586	208
Padden	11429	4533
Point Roberts	1132	528
Porter	1	0
Saar	366	121
Sandy Point	1353	567
Schell	5184	1896
Schneider	4366	1503
Scott	1742	535
Semiahmoo	4209	1818
Silver	3752	1397
Silver Beach	2098	824
Slide Mountain	282	110
Smith	334	122
South Acme Area	284	96
South Bay	312	144
South Bellingham	7774	3119
South Fork Anderson	10	4
South Fork Dakota	580	183
Spring	2259	1045
Strawberry	1044	368
Sudden Valley	1139	458
Sumas City	259	99
Swift	31	14
Ten Mile	3575	1237
Toad	1644	591
Upper Squalicum	200	74
Whatcom	24228	9954
Wiser Lake/Cougar Creek	3242	1053

731 Source: ECONorthwest analysis using 2000 census data.

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733 **Table A-2. Employment by drainage, 2000.**

Drainage	Const/Res	FIRES	Manufact.	Retail	WTCU	Total
Academy	7	*			*	12
Agate Bay	*	*				57
Anderson/Whatcom		*				*
Austin/Beaver	14	59	*	*	*	105
Baker	292	350	141	318	258	1,359
Bells				*		*
Bertrand	632	163	365	484	279	1,923
Black Slough	*					*
Blaine	42	645	281	328	226	1,522
Blodel	*	*				*
Breckenridge	147	18	158	*	*	336
Cable	*	*			*	8
California	127	31	89	154	26	427
Canyon Lake	*		*			*
Carpenter	*	*		*	*	7
Cherry Point	*	*	*	*	*	*
Chuckanut	12	*		*	*	27
Dale	141	*		*	5	165
Deer	119	*	*	36	29	223
Eagle Ridge	*					*
Fazon	27	3	*		*	37
Fingalson	*	*			*	22
Fishtrap	296	401	134	220	188	1,239
Fort Bellingham	791	1,114	1,077	565	885	4,432
Fourmile	81	69	60	*	*	238
Fragrance Lake		*		*		11
Geneva	*	*				*
Glacier		*		*	*	49
Hamilton	*	*	*		*	36
Haynie	*	*	*			11
Hillsdale	16	6	*	*	*	28
Johnson	187	40	86	86	40	439
Jordan	103	34	*	*	12	297
Kamm	217	688	55	314	84	1,358
Kendall	*	30		*		47
Lake Terrell	*	*	*	*	6	548
Lake Whatcom (water)	*	*				9
Little Campbell	*	*		*	78	127
Lower Anderson	35	*		*	11	59
Lower Dakota	24	5				29
Lower Middle Fork Nooksack	*	4	*		*	14
Lower South Fork Nooksack	6	5	*	*	*	37
Lower Squalicum	297	4,234	647	1,508	419	7,105
Lummi Island	24	*		19	*	58
Lummi Peninsula East	*	7	*			22
Lummi Peninsula West	61	21	*	*	62	179
Lummi River		*				*
McCormick	31	*	*	*	*	39
Middle North Fork Nooksack	*	13		*		25

Nooksack Channel (water)	*	*				20
Nooksack Deming to Everson	116	34	217	59	13	439
Nooksack River Delta		*				*
North Fork Dakota	35	10			3	48
North Shore	*					*
Oriental	*	*	*		*	*
Padden	102	628	4	720	12	1,466
Point Roberts	*	45	*	107	36	194
Porter	*	34	-	22	*	104
Racehorse	*					*
Saar	38	*			*	55
Sandy Point	*	*	*		*	*
Schell	49	470	*	230	*	779
Schneider	133	55	*	35	*	360
Scott	52	24	*	*	33	113
Semiahmoo	24	240	*	87	*	368
Silver	357	613	677	377	626	2,650
Silver Beach	22	45		*	*	78
Slide Mountain	*	*				5
Smith	*	*	32			45
South Acme Area	*	*	*	13		57
South Bay	*					*
South Bellingham	174	2,398	1,213	1,574	368	5,727
South Fork Dakota	144	*	*	*	*	201
Spring	182	1,229	114	2,672	628	4,825
Strawberry	11	*			*	45
Sudden Valley	4	6				10
Sumas City		13			-	13
Swift	*				*	6
Ten Mile	231	211	101	262	57	862
Toad	23	14			98	135
Upper Squalicum	*	*			*	*
Whatcom	898	3,675	1,044	2,638	848	9,103
Wiser Lake/Cougar Creek	165	46	9	22	44	286
Total	**6,759**	**18,152**	**8,667**	**13,021**	**5,571**	**52,170**

Source: Washington State Employment Security Department.

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Table A-3. Forecasted population growth, 2022

Drainage	Allocated Plan Growth	2000 Population	Total Forecasted Population
Academy	459	681	1140
Agate Bay	194	351	545
Anderson/Whatcom	7	36	43
Austin/Beaver	1970	2279	4249
Baker	101	784	885
Bells	52	71	123
Bertrand	1584	2986	4570
Black Slough	50	256	306
Blaine	2654	4099	6753
Blodel	96	367	463
Blue Canyon	72	60	132
Boulder	5		5
Brannian	21	8	29
Breckenridge	1252	1864	3116
Cable	204	459	663
California	1387	2947	4334
Canyon Lake	19	7	26
Carpenter	47	173	220
Cherry Point	534	405	939
Chuckanut	272	439	711
Coal	57	29	86
Cornell	4	4	8
Cultus	5		5
Dale	79	644	723
Deer	671	1659	2330
Donavan	15	140	155
Eagle Ridge	12	187	199
Eliza Island	7	5	12
Fazon	276	693	969
Fingalson	146	190	336
Fir	1	1	2
Fishtrap	5335	6819	12154
Fort Bellingham	3350	9830	13180
Fourmile	128	1278	1406
Fragrance Lake	251	463	714
Geneva	38	236	274
Glacier	6	6	12
Hamilton	84	157	241
Haynie	258	333	591
Hedrick	4	7	11
Hillsdale	463	1382	1845
Hutchinson	75	66	141
Johnson	1688	2600	4288
Jordan	807	1139	1946
Kamm	1448	2578	4026
Kendall	5321	2761	8082
Kenny	15	9	24
Lake Terrell	504	668	1172
Lake Whatcom (water)	34	122	156
Larrabee	180	178	358

Little Campbell	161	142	303
Lower Anderson	403	1131	1534
Lower Canyon	2	2	4
Lower Clearwater	3		3
Lower Dakota	602	1199	1801
Lower Middle Fork Nooksack	87	230	317
Lower South Fork Nooksack	96	384	480
Lower Squalicum	3711	8355	12066
Lummi Island	390	782	1172
Lummi Peninsula East	519	310	829
Lummi Peninsula West	976	1850	2826
Lummi River	3	1	4
Lummi River Delta	1		1
Maple	155	222	377
McCormick	498	1105	1603
Middle North Fork Nooksack	101	124	225
Nooksack Channel (water)	17	16	33
Nooksack Deming to Everson	1142	1496	2638
Nooksack River Delta	14	140	154
North Fork Dakota	345	603	948
North Shore	45	153	198
Olsen	22	9	31
Oriental	-30	586	556
Oyster Creek	31		31
Padden	8085	11429	19514
Point Roberts	902	1132	2034
Porter	8	1	9
Racehorse	13		13
Rocky	2		2
Saar	156	366	522
Sandy Point	638	1353	1991
Schell	3300	5184	8484
Schneider	3471	4366	7837
Scott	988	1742	2730
Semiahmoo	5120	4209	9329
Silver	3325	3752	7077
Silver Beach	1495	2098	3593
Slide Mountain	108	282	390
Smith	55	334	389
Smith/Whatcom	5	0	5
South Acme Area	96	284	380
South Bay	362	312	674
South Bellingham	2890	7774	10664
South Fork Dakota	108	580	688
Spring	2558	2259	4817
Strawberry	690	1044	1734
Sudden Valley	566	1139	1705
Sumas City	230	259	489
Swift	24	31	55
Ten Mile	592	3575	4167
Toad	1387	1644	3031
Upper Squalicum	101	200	301
Whatcom	12343	24228	36571
Wiser Lake/Cougar Creek	846	3242	4088

737 Source: ECONorthwest analysis using Whatcom County Comprehensive plan data

Table A-4. Forecasted employment by industry, 2022

Drainage	Industrial	Office	Retail	Total Non-Gov, Non-Ed	2000 Total	Total Projected
Baker	271	224	107	602	1,359	1,961
Bertrand	-	1,287	741	2,028	1,923	3,951
Blaine	438	1,060	335	1,833	1,522	3,355
California	319	642	278	1,238	427	1,665
Cherry Point	2,976	-	-	2,976	*	*
Chuckanut	23	-	-	23	27	50
Deer	-	110	44	154	223	377
Fishtrap	650	438	253	1,341	1,239	2,580
Fort Bellingham	943	5,776	2,767	9,486	4,432	13,918
Fourmile	-	222	88	310	238	548
Johnson	152	42	69	263	439	702
Jordan	186	-	-	186	297	483
Kamm	-	86	50	136	1,358	1,494
Kendall	107	40	2	149	47	196
Lake Terrell	835	-	-	835	548	1,383
Little Campbell	-	53	17	70	127	197
Lower South Fork Nooksack	-	18	7	25	37	62
Lower Squalicum	1,393	475	228	2,095	7,105	9,200
Maple	-	196	78	273	-	273
McCormick	-	102	40	142	39	181
Nooksack Deming to Everson	184	151	79	415	439	854
Padden	-	527	252	779	1,466	2,245
Point Roberts	27	69	110	206	194	400
Sandy Point	95	-	-	95	*	*
Schell	0	82	56	139	779	918
Schneider	262	139	96	496	360	856
Scott	-	0	1	1	113	114
Semiahmoo	21	379	78	478	368	846
Silver	3,999	1,549	861	6,409	2,650	9,059
Silver Beach	-	9	4	13	78	91
Smith	-	29	11	40	45	85
South Acme Area	-	15	6	20	57	77
South Bellingham	106	718	344	1,168	5,727	6,895
Spring	523	7,447	3,568	11,538	4,825	16,363
Sumas City	-	3	3	6	13	19
Ten Mile	7	303	184	494	862	1,356
Whatcom	457	5,516	2,643	8,616	9,103	17,719
Wiser Lake/Cougar Creek	-	440	175	615	286	901

Source: ECONorthwest analysis using Whatcom County Comprehensive plan data

Appendix B

PER-EMPLOYEE AND PER-RESIDENT WATER USE ESTIMATION METHODS

GENERAL PROCESS

One clear imperative for providing water use estimates is that the process should work well with the economic impact analysis. Since the impact analysis deals with the potential shifting of jobs and people from drainage to drainage, the best method for estimating water use is to calculate estimates of water use by job and person. Obviously, some jobs require more water resources than others; so having a process that allows for differences among job types (especially at the sector level) is also desirable. Finally, some drainage will have activities with unique water use characteristics that can be accommodated by this process (the Cherry Point industries, for example).

In coordination with USU, we developed a database that will permit the quick estimation of water use and will be included the DSS. Table 1 shows the elements of this database. Notice that the fields in the database provide for per employee and per resident water use rates by specific drainage (the fields DrainageID and DrainageNM) and specific water use category (the fields UserCategoryID and UserCategoryNM).

Table 1. Water Use Database Structure

Field Name	Field Type	Field Size	Description
DrainageID	Long	4	ID number for each drainage
DrainageNM	Text	50	Drainage name (Optional)
UserCategoryID	Long	4	User-defined ID (includes residential)
UserCategoryNM	Text	50	Category name for user type
DailyRate	Double	8	Daily water use rate by Drainage and User Category

Source: Utah State University

Table 2 lists the individual categories we have identified with potentially unique water use rates. The number "-9999" listed under the "DrainageID" column indicates that these would be default rates if there were not unique rates identified for a particular drainage. In other words, the database allows the user to refine water use estimates by location, if necessary, as new information becomes available. In general, the categories include residents and the state reported employment sectors as categories. The one exception is the separation of education workers from other government workers to account for the additional water use associated with the student population. Also, agricultural water use is being modeled by Utah State University (USU), so we have not included those jobs in this process. Our method for

estimating water use covers the remaining sectors of economic activity, as well as household use, and can be incorporated into the DSS.

Table 2. Water Use Rates, by User Category and Drainage

UserCategoryID	DailyRate (gallons per day, per worker or per person)	DrainageID
Residential	88.0	-9999
Construction	15.0	-9999
Education	76.9	-9999
FIRE	15.0	-9999
Government (Non-	15.0	-9999
Manufacturing	42.7	-9999
Retail	15.0	-9999
Services	15.0	-9999
TCU	15.0	-9999
Wholesale	15.0	-9999

Source: ECONorthwest, using data from Utah State University and PUD #1.

NOTES ON GENERAL WATER USE DATA

For general information about water use at the parcel or household level, we relied on the "Water Use Rate Table" produced as Appendix D of USU's Surface Water Quantity Report in Phase 2 of the project. This table was compiled by PUD to determine water use estimates. Many of the estimates are by parcel, such as a house, school, or manufacturing facility.

NOTES ON SPECIFIC USER CATEGORIES

The following notes show how we calculated the user rates listed in Table 2. They are preliminary and we expect to refine and update these estimates as new data and information become available.

Residential

The most straightforward manner for calculating per-resident water use is to use an estimate of water use per household and divide by the average number of persons per household in Whatcom County (2.5). The data from the PUD indicated household use averaged 220 gallons per day.

Education

The PUD water use data show a mean 5.525 acre-feet of water use per school. They assume 500 users per school in their estimates, counting both students and faculty. In order to check this estimate, we estimated the faculty student ratio across the 7 school districts in the county and estimated the average number of school district employees per school. Those data are presented in Table 3 below. We also divided total enrollment by the number

of schools in the watershed (66) to get the average student population per school.

From these calculations, we know that the average school has 445 students and 56 school employees, a total of 501 persons per school. The use rate entered into the database, however, needs to be the amount of water used per employee, accounting for the student usage during the day. To get this figure, we used the faculty-student ratio to determine the average number of faculty at each school. We then divided total school water use by this number.

Table 3: School District Student-Employee Ratio

School Dist. (37)	Total Individual employees	Total Enrollment	Enrollment grades 9-12	Students per employee
501 Bellingham	1234	9856.73	3339.67	7.99
502 Ferndale	602	4978.82	1500.60	8.27
503 Blaine	237	1894.94	533.28	8.00
504 Lynden	350	2433.73	817.20	6.95
505 Meridian	185	1531.71	506.62	8.28
506 Nooksack Valley	243	1759.66	542.63	7.24
507 Mount Baker	284	2250.98	711.40	7.93
All Districts	3135			7.81

Source: Washington Department of Education.

Manufacturing

The PUD data has an estimated average annual water use of 2.87 acre-feet per manufacturing parcel. They also estimate 60 employees per parcel, so that average water use per-employee is a straightforward calculation. In the near future, ECO plans to recalculate the average number of employees per parcel using the employment data for 2001.

Perhaps more than any other user category, manufacturing presents the need for unique water use rates by drainage. The Cherry Point industries are one example. Because of state confidentiality laws, however, ECO cannot combine the employment data we have with water use information to get per-employee estimates. In cases like this, we suggest that the local entity with specific knowledge of exceptional water use cases supply the use rate for use in the DSS.

Retail, Services and Other Sectors

The PUD data have two estimates for general commercial water use. The first is a flat 15 gallons per day per worker. The second is average water use per parcel or job site. The two produced similar results, in terms of water use per employee, so Table 2 includes the 15 gallons per day per-employee rate for all retail, services, government (non-education), wholesale, and construction workers.

Other Water Uses

So far, this method does not account for some water use categories that do not easily lend themselves to per-employee calculations. Water use related to cemeteries, parks, and golf courses are of particular interest. One way to accommodate these uses is to summarize, by drainage, the total number of acres of each multiplied by average water use for each type of land use. In this way, the water used for these purposes is added to the water use tied directly to employees. For these parcels, water use would only change from manual inputs that shift the number of acres devoted to each use or the amount of water used per acre.