Section 5

Pataha Creek Implementation Area

5.1 Overview of the Pataha Creek Implementation Area

The Pataha Creek subbasin drains into the Tucannon River at River Mile 11.2. Although in other studies it has been included as part of the Tucannon River subbasin, it is described as a separate implementation area because of unique characteristics that differentiate it from the rest of the Tucannon subbasin. Pataha Creek drains 114,166 acres (185 sq. mi.). Major tributaries of Pataha Creek are seasonal streams that include Dry Pataha Creek, Sweeney Gulch, Balmaier Gulch, Linville Creek, Tatman Gulch, and Dry Hollow.

The topography of the watershed is primarily long slopes intersecting steep canyons. Elevations range from 900 feet above sea level at the confluence with the Tucannon River to 5,600 feet at the highest point upstream in the subbasin.

As described further in Section 7, the geology of the Pataha Creek subbasin consists of basalt flows of the Columbia River Basalt Group, which is overlain by fine-grained loess soils. The average flow thickness is about 90 to 120 feet and the loess ranges in thickness from 200 to 300 feet. An important geologic feature of the Pataha Creek subbasin is the Hite Fault. This fault crosses the Tucannon River and continues beneath Pataha Creek at right angles. The Hite Fault is still active and may be the cause of elevated ground water temperatures well above the standard geothermal gradient recorded in local wells (Covert *et al.* 1995).

The primary land use is based on agricultural production with non-irrigated cropland farming and livestock production. Winter wheat, spring grain, peas, and bluegrass seed are the major crops grown on non-irrigated cropland. Most of the irrigated cropland is located in bottomland areas along Pataha Creek and includes hay, small grains, and some rotation pasture. The primary city is the City of Pomeroy, located on Pataha Creek in the northeastern portion of the subbasin.

5.2 Surface Water Resources

The Pataha Implementation Area is located mainly in Garfield County and partially in Columbia County. Pataha Creek is the major stream reach located within this area.

Pataha creek is the largest tributary to the Tucannon River, which drains into the Snake River. The major tributaries of Pataha Creek include Dry Pataha Creek, Sweeney Gulch, Balmaier Gulch, Linville Creek, Tatman Gulch, and Dry Hollow (Gephart, et. al., 2001, unpublished work).

This section provides an analysis of available gauging station data, a description of the available instream flow studies for the Pataha Implementation Area, a discussion of instream flow requirements, and identification of instream flow needs.

5.2.1 Gauging Data and Stream Flows

Very little stream flow data is available for the Pataha Implementation area. There are currently no USGS gauging stations to record stream flow in the area, and therefore, there is no long-term record of flow. Consistent measurement of stream flows has only been occurring in recent years.

The Washington State University (WSU) Department of Biological Systems and Center for Environmental Education began an extensive water quality monitoring program in the Pataha Implementation Area in 1998 to determine the effects of existing conservation practices that had been installed to reduce erosion and sediment delivery into Pataha Creek and Tucannon River. As part of this monitoring program, spot stream flow measurements were collected at various locations along Pataha Creek. These spot measurements can be useful for specific research or management activities, and in the long run provide a fairly representative record of stream flow even though the record is not continuous.

In support of the watershed planning efforts in the Middle Snake River Basin, the Washington Department of Ecology (Ecology) and the Asotin County Public Utility District proposed to install additional gauging locations in WRIA 35. These monitoring stations are either telemetry or manual stage height stations. Telemetry stations record the stage height every fifteen minutes and data is then imported into Ecology's stream flow database, providing a continuous record of stream flow. Manual stage height stations record the river stage height 6 to 8 times a year, which can then be converted to instantaneous stream flow using a rating table or flow curve.

Ecology also operates a basin water quality monitoring station that are either long-term or basin stations. Long-term stations are monitored every water year (October 1 till September 30), whereas basin stations are monitored for one water year and sometimes returning every five years. Grab samples are taken usually once or twice a month and stream flow, when recorded, is either estimated or measured. Ecology water quality monitoring stations do not provide a continuous record of stream flow.

General Stream Gauging Locations

The WSU Monitoring Program collected stream flow data at 3 locations on Pataha Creek. The locations are shown on Exhibit 5-1 and listed in Table 5.2-1.

Table 5.2-1
Washington State University Monitoring Stations[1]

Site ID	Location	Count
Pataha1	PATAHA CREEK AT DELANEY	74
Pataha3	PATAHA CREEK AT MARENGO ROAD BRIDGE	49
Pataha5	PATAHA CREEK AT DEMAND RESIDENCE	46

[1] Sources: Washington State University Center for Environmental Education, 2002.
Washington State Department of Biological Systems Engineering, 2003.

Ecology recently installed 2 gauging stations in the Pataha Implementation Area in 2003. 1 station is a telemetry station installed at the mouth of Pataha Creek (Ecology 35F050), and the other is a manual stage height station located on Pataha Creek near Pataha, Washington (Ecology 35F100). Conversion tables have not yet been developed for these sites (Jim Peterson, personal communication, 2003). Therefore, data from these locations are not included in this stream flow analysis.

Ecology also operates a water quality monitoring station, 35F070, in Pataha Creek. Ecology 35F070 is a basin station with limited flow data (monthly grab samples were taken for one water year). The location of the Ecology gages are shown on Exhibit 5-1 and listed in Table 5.2-2.

Table 5.2-2

Washington Department of Ecology Monitoring Stations[1]

Station Code	Station Type	Site Name	River Mile	Period of Record	Data Type	Count
35F050	Stream flow, Water Quality	PATAHA CREEK AT MOUTH		2003	Telemetry	46[2]
35F100	Stream flow	PATAHA CREEK NEAR PATAHA		2003	Manual Stage Height	5
35F070	Water Quality	PATAHA CREEK AT ARCHER ROAD	6.1	1996 – 1997	Basin	12

[1] Source: Ecology, 2003.
[2] Count as of 12/5/2003.

INSERT EXHIBIT 5-1 (Map showing all Ecology and UW gauges/monitoring stations.)

The Washington State Conservation Commission report, "Salmonid Habitat Limiting Factors Water Resource Inventory Areas 33 (Lower) & 35 (Middle) Snake Watersheds & Lower Six Miles of the Palouse River" also contains one stream flow record from WDFW in 1999.

Although the data collected from the Ecology and WSU sites are limited at this time, the period of record will continue to expand for these sites. These will be useful in monitoring and evaluating flow enhancement activities under an adaptive management approach.

Summary of Existing Data

Within the Pataha Implementation Area, the most useful data for analyzing stream flows is available from WSU for Pataha Creek. Ecology also has a monitoring location with stream flow data; however, only 1 year of data is available at that location.

Table 5.2-3 summarizes:

- WSU and Ecology monitoring stations with spot stream flow data
- Potential value and limitations of these data for characterizing stream flows
- Volume of stream flow passing this gage in an average year based on available data

Table 5.2-3
Spot Stream flow Data: Pataha Implementation Area

Type	Station	Site Name and Potential Planning Value	Period of Record	Volume[3] (afy)
PATAHA CREEK				
WSU[1]	Pataha 1	PATAHA CREEK AT DELANEY Indicates the majority of stream flow entering Tucannon River from Pataha Creek with the exception of contributions from Dry Hollow.	1998 – 2001; 2003	8,954
WSU[1]	Pataha 3	PATAHA CREEK AT MARENGO ROAD BRIDGE Located in downstream of Linville Gulch. Indicates stream flow leaving Pomeroy including contributions from Linville Gulch and Tatman Gulch.	1998 – 2001; 2003	10,231
WSU[1]	Pataha 5	PATAHA CREEK AT DEMAND RESIDENCE Located upstream of the Dry Creek confluence. Indicates stream flow contribution from headwaters to Dry Creek.	1998 – 2001; 2003	3,860
Ecology[2]	35F070	PATAHA CREEK AT ARCHER Limited stream flow data available at this time. Data collected at this site will supplement WSU Pataha 1 monitoring station.	1996 – 1997	

[1] Sources: Washington State University Center for Environmental Education, 2002.
Washington State Department of Biological Systems Engineering, 2003.
[2] Source: Ecology, 2003.
[3] Total volume of stream flow passing the gage in an average flow year in acre-feet/yr.

The complete stream flow record for the WSU stations are summarized in Exhibits 5-2 through 5-4. The average monthly stream flows observed for the WSU stations over the period of record, and calculated 10% and 90% exceedance flows are summarized in Exhibits 5-5 through 5-7.

The exceedance flows were calculated from the average monthly flows for the full period of record. The 10% exceedance flow represents the flow that would be exceeded an average of only 10% of the time, and the 90% exceedance flow would be exceeded an average of 90% of the time. Although there are different standards depending on the application or analysis, the 10% exceedance flow could be considered to represent average high flows and the 90% exceedance flow to be low average flows.

The complete stream flow record for Ecology 35F070 is summarized in Exhibit 5-8.

Exhibit 5-2
Pataha Creek at Delaney
Complete Record: WSU Monitoring Station Pataha 1
(9/1998 to 5/2001; 2/2003 to 11/2003)

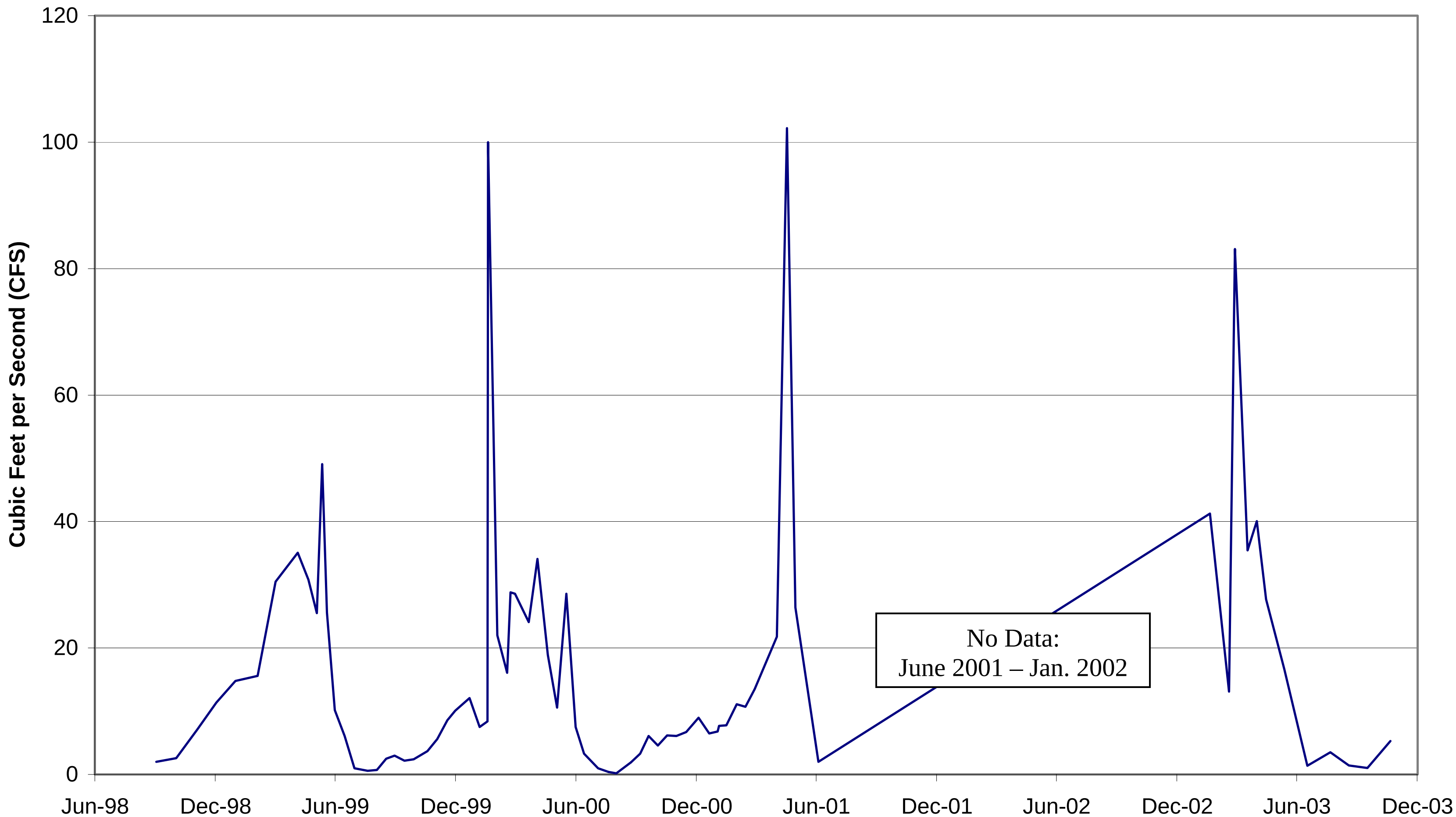


Exhibit 5-3
Pataha Creek at Marengo Road Bridge
Complete Record: WSU Monitoring Station Pataha 3
(9/1998 to 6/2001; 2/2003 to 11/2003)

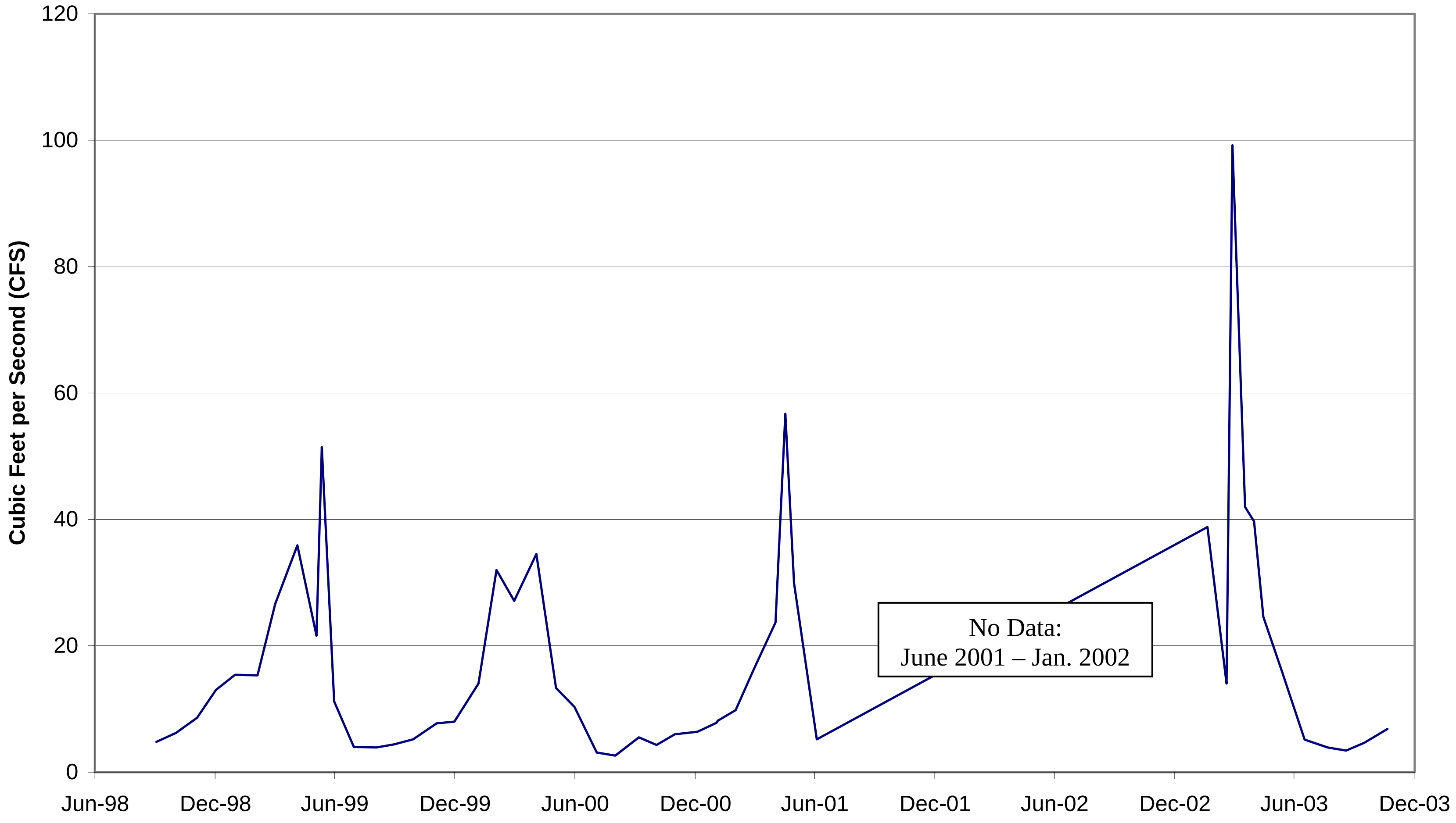


Exhibit 5-4
Pataha Creek at Demand Residence
Complete Record: WSU Monitoring Station Pataha 5
(9/1998 to 6/2001; 2/2003 to 11/2003)

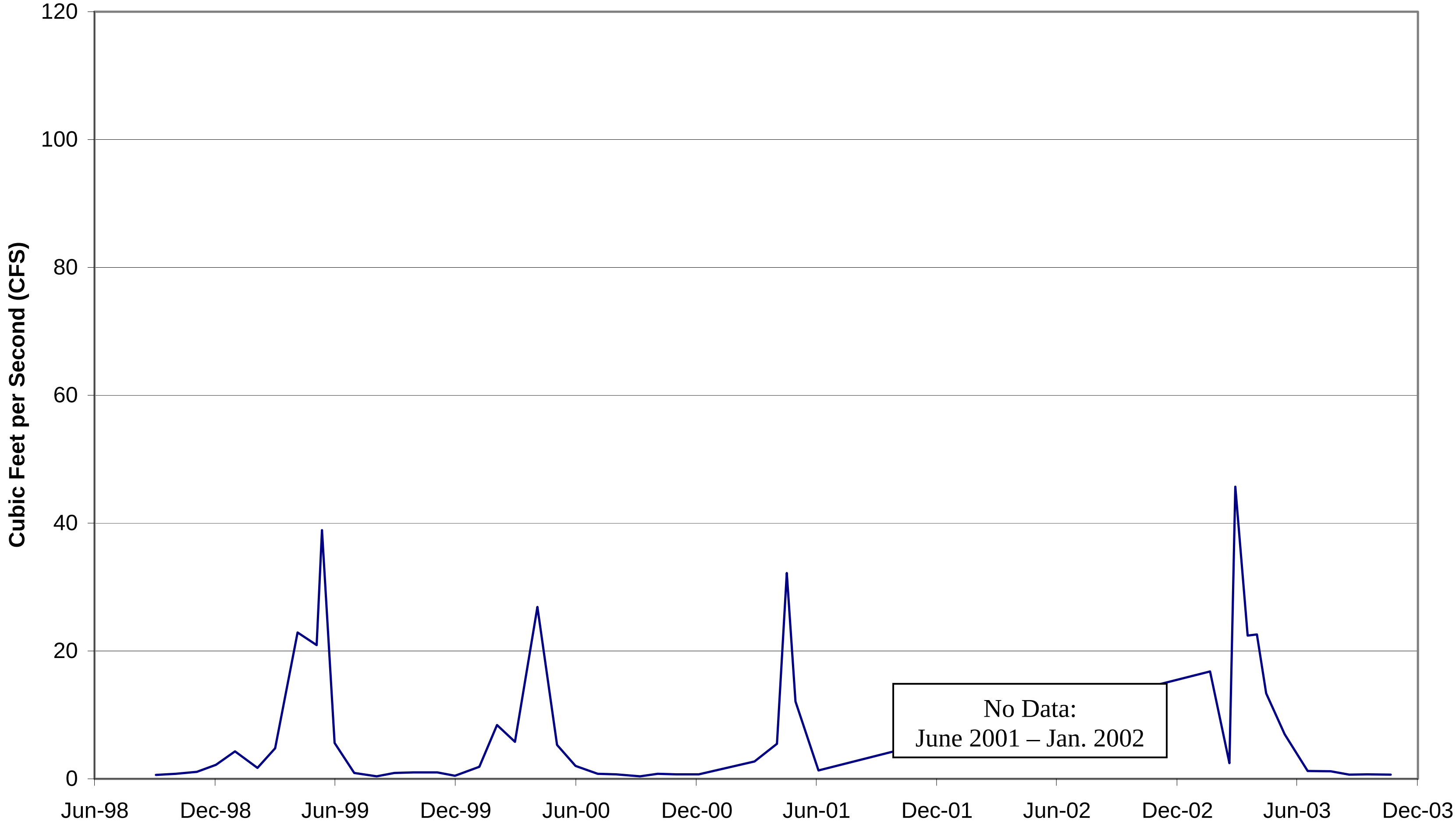


Exhibit 5-5
Pataha Creek at Delaney
Average Monthly, 90% Exceedance, and 10% Exceedance Flows
Mean Annual Volume = 8,954 ac-ft, WSU Monitoring Station Pataha 1
(9/1998 to 5/2001; 2/2003 to 11/2003)

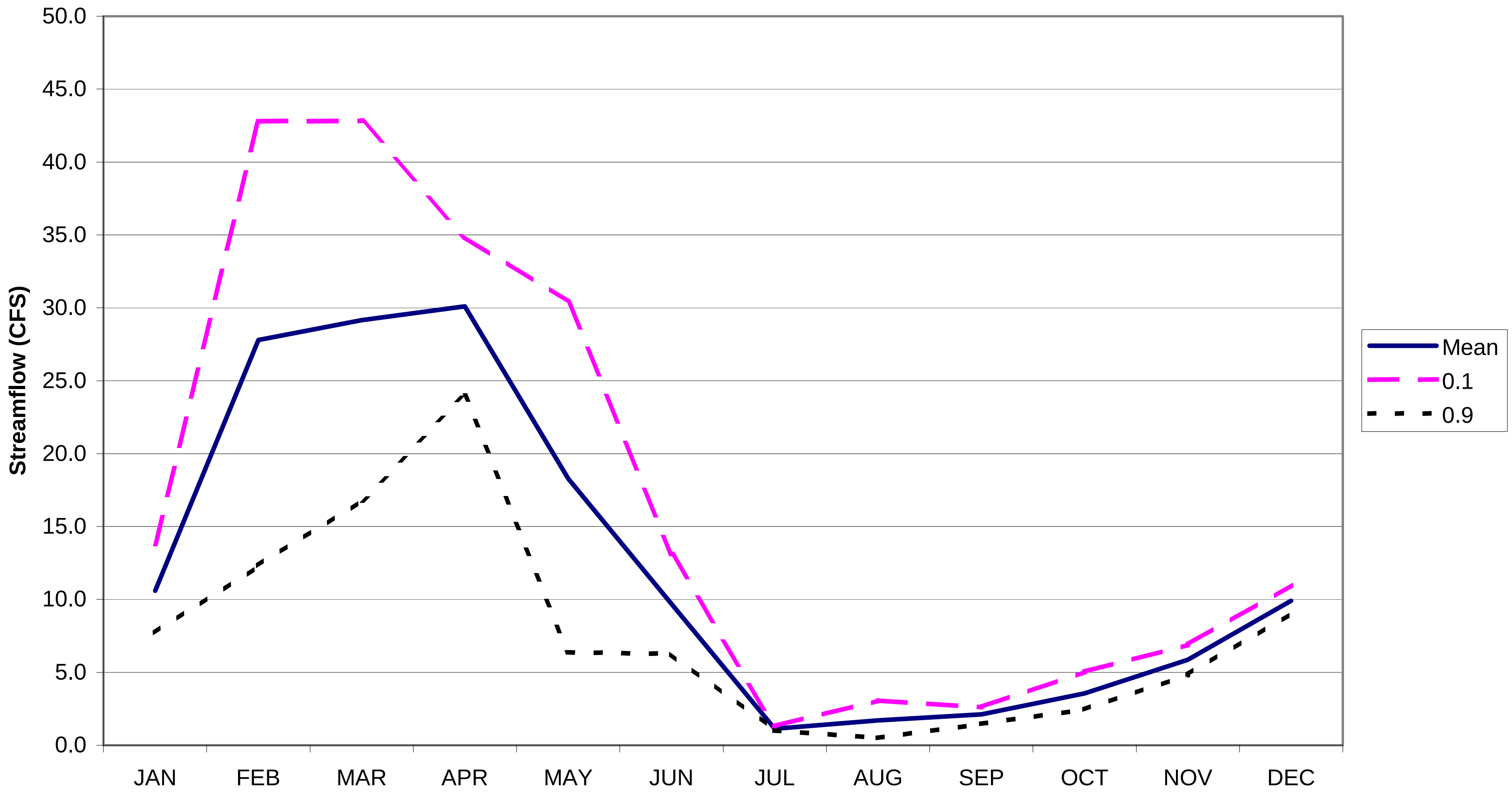


Exhibit 5-6
Pataha Creek At Marengo Road Bridge
Average Monthly, 90% Exceedance, and 10% Exceedance Flows
Mean Annual Volume = 10,231 ac-ft, WSU Monitoring Station Pataha 3
(9/1998 to 6/2001; 2/2003 to 11/2003)

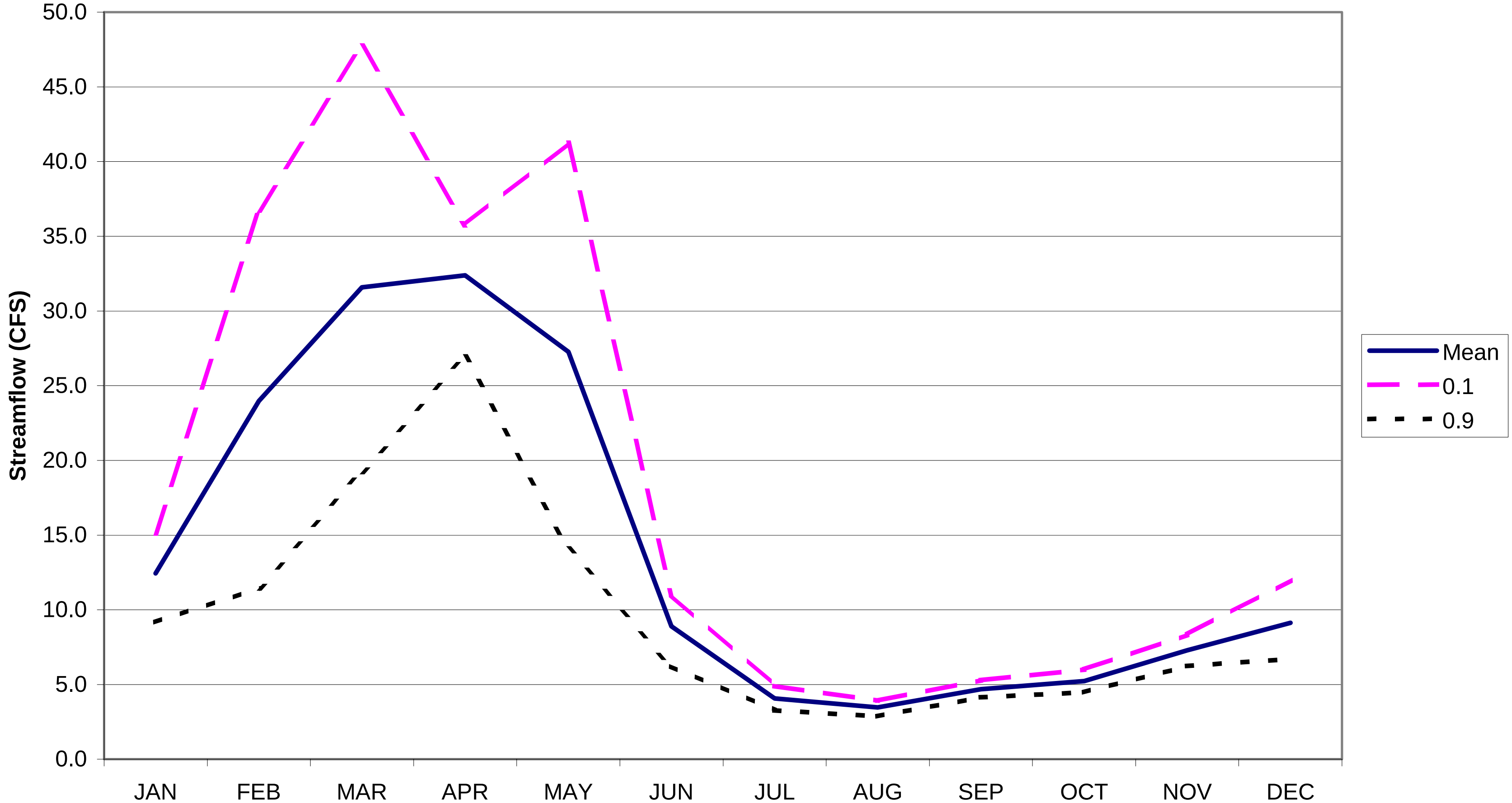


Exhibit 5-7
Pataha Creek at Demand Residence
Average Monthly, 90% Exceedance, and 10% Exceedance Flows
Mean Annual Volume = 3,860 ac-ft, WSU Monitoring Station Pataha 5
(9/1998 to 6/2001; 2/2003 to 11/2003)

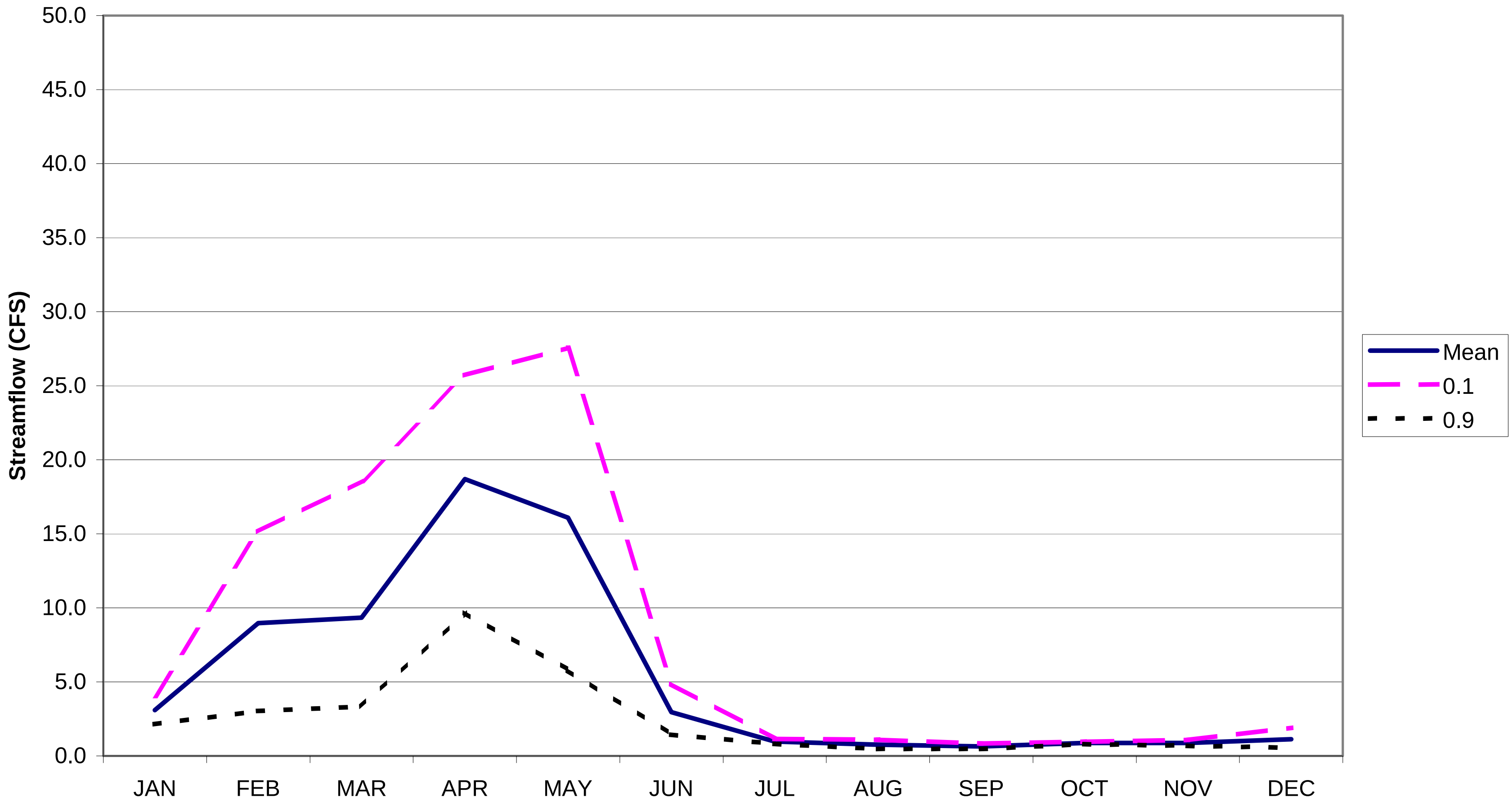
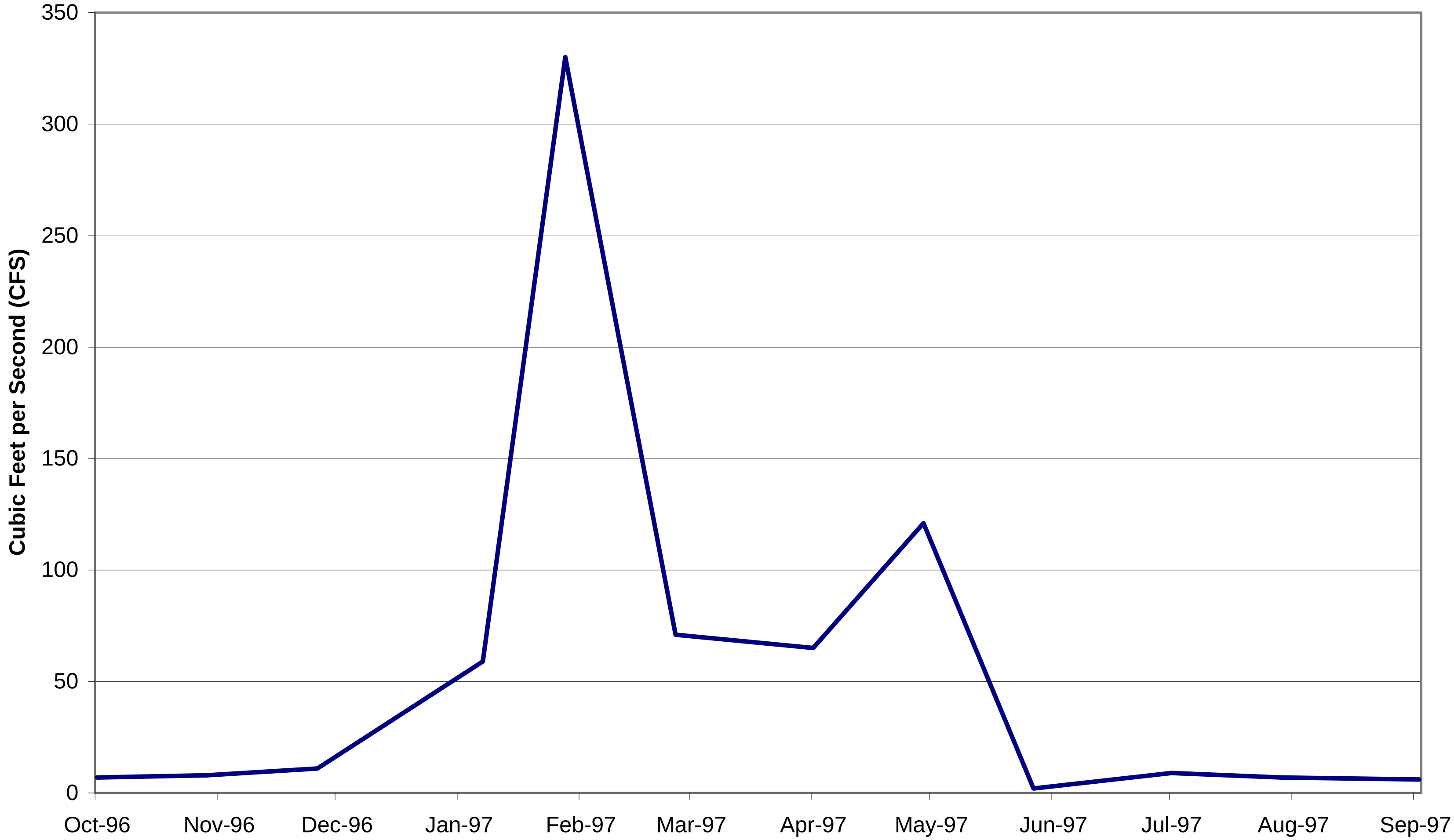


Exhibit 5-8
Pataha Creek at Archer Road
Complete Record: Ecology Monitoring Site 35F070
(10/1996 to 9/1997)



The following summarizes the data available, and seasonal and long-term trends suggested by the data, for each of the streams in the Implementation Area:

Pataha Creek:

The period of record from WSU monitoring locations for Pataha Creek and its tributaries is short, and data was collected between 1 and 4 times monthly. The general stream flow pattern of Pataha Creek suggested by the WSU monitoring data coincides with winter precipitation and spring snowmelt. The long-term trend cannot be determined since the period of record is short. However, from existing data, peak flows generally occur mostly in the late winter and spring, varying from year to year. The following summarizes the available data for each of reach of Pataha Creek:

Pataha Creek from Headwaters to Dry Pataha Creek Confluence

- WSU monitoring data at Pataha 5 (Exhibits 5-4 and 5-7) is only available for recent years. The records indicate a mean annual flow of about 5 cfs, average low flows of 0.6-1.0 cfs in late summer, and average high flows of 9-20 cfs between February and May. Average late summer flows are about 6 percent of the average spring flows. The total annual stream flow volume in this reach is about 3,860 acre-feet per year. The long-term trend cannot be determined.

- During the first week of August 1986, flows were recorded at 1.1 cfs near RM 52, and 6.7 cfs by RM 40 near Columbia Center (Pomeroy Conservation District Landowner Steering Committee, 1998). In early September 1998, flows of 1.2 cfs and 1.1 cfs were recorded on Pataha Creek 200 feet below the culvert at the Iron Springs Road, and 100 feet above the culvert at Columbia Center, respectively (Kuttel, 2002). These records generally correspond with the average late summer low flows recorded by WSU.

Pataha Creek from Dry Pataha Creek Confluence to Sweeney Gulch Confluence

- No stream flow data is available for this stream reach.

Pataha Creek from Sweeney Gulch Confluence to Balmaier Gulch Confluence

- No stream flow data is available for this stream reach.

Pataha Creek from Balmaier Gulch Confluence to Tatman Gulch Confluence

- Ecology 35F100 has begun collecting stage height data for this reach. However, because this is a recently installed station and a conversion table has not yet been developed, no stream flow data is currently available.

Pataha Creek from Tatman Gulch Confluence to Dry Hollow Gulch Confluence

- WSU monitoring data for Pataha 3 (Exhibits 5-3 and 5-6), located downstream of Tatman Gulch, and Pataha 1 (Exhibits 5-2 and 5-5), located just upstream of Dry Hollow Creek confluence, is only available for recent years. The long-term trend cannot be determined.

- The WSU records at Pataha 3 indicate a mean annual flow of about 14 cfs, average low flows range from 3.5-5.2 cfs in late summer, and average high flows of 24-32 cfs between February and May. Average late summer flows are about 15 percent of the average spring flows. The total annual stream flow volume in this reach is about 10,230 acre-feet per year.

- The WSU records at Pataha 1 indicate a mean annual flow of about 12.5 cfs, average low flows range from 1.1-3.5 cfs in late summer, and average high flows of 18-30 cfs between February and May. Average late summer flows are about 7 percent of the average spring flows. The total annual stream flow volume in this reach is about 8,950 acre-feet per year.

- Ecology 35F070 is located between WSU Pataha 1 and Pataha 3 monitoring stations, and also collected stream flow data monthly for 1 water year between October 1996 and September 1997. The highest flows recorded were 330 cfs in early February 1997, and 121 cfs in early May 1997 (Ecology, 2003). The lowest flow recorded at this location was 2 cfs in early June 1997 (Ecology, 2003). The high flows recorded by Ecology in 1997 are significantly higher than flows recorded by WSU between 1998 and 2003.

- The single monthly flow values summarized above represent the best available flow data for Pataha Creek. However, given that these are single monthly flow values, and the lack of repeat measurements in location and time, there remains little consistent flow data for the Pataha Implementation Area.

Pataha Creek from Dry Hollow Gulch Confluence to mouth

- Stage height data has been collected almost continuously since October 2003 at Ecology 35F050. However, because this is a recently installed station and a conversion table has not yet been developed, no stream flow data is currently available.

(NOTE: From conversation with Glen Mendel, a draft report will be completed in January 2005 that may have additional stream flow information pertinent to this Implementation Area.)

Adequacy of Existing Data

The following summarizes the usefulness of the available data for quantifying the stream flow entering or originating within the Implementation Area:

Pataha Creek:

Pataha Creek from Headwaters to Dry Pataha Creek Confluence

- The stream flow entering this reach can be estimated using WSU monitoring station Pataha 5. Long-term trends may be determined as more data is collected.

Pataha Creek from Dry Pataha Creek Confluence to Sweeney Gulch Confluence

- No stream flow data is available for this stream reach.

Pataha Creek from Sweeney Gulch Confluence to Balmaier Gulch Confluence

- No stream flow data is available for this stream reach.

Pataha Creek from Balmaier Gulch Confluence to Tatman Gulch Confluence

- An Ecology manual stage height station (35F100) has been installed in this reach. Instantaneous stream flow records will be available as more data is collected. However, contributions from Balmaier Gulch cannot be determined from this data.

Pataha Creek from Tatman Gulch Confluence to Dry Hollow Gulch Confluence

- The stream flow entering this reach can be estimated using WSU monitoring stations Pataha 1 and 3, and Ecology station 35F070. As more data is collected at these locations, stream flow trends in this reach can be better analyzed. Contributions from Tatman Gulch and Linville Gulch are not known. It may be possible to roughly estimate this contribution if data is collected at Pataha 3 and Ecology station 35F050 for the same dates.

Pataha Creek from Dry Hollow Gulch Confluence to mouth

- An Ecology telemetry station (35F050) has been installed near Tucannon River confluence. Continuous stream flow records will be available as more data is collected and a conversion table is developed. Contributions from Dry Hollow Gulch is not known at this time, but may be estimated from data collected at Pataha 1 and Ecology station 35F050 as more data is collected.

5.2.2 Instream Flow Requirements

A listing of specific stream flow requirements is presented in this subsection. The general discussion on instream flows and instream flow studies are presented in Section 9. Pataha Creek subbasin currently has no instream flow requirements, however, there is one surface water source limitation (SWSL) on Pataha Creek. A description of the SWSL is shown in Table 5-4.

Table 5.2-4
Surface Water Source Limitations in the Pataha Creek Subbasin

Stream Name	Type	Location	Documentation Basis
Pataha Creek	Low Flow 10 cfs	Township 11N, Range 41E, Section 04	Letter from Game, Oct. 29, 1968

No instream flow studies have been conducted in the Pataha Creek subbasin.

5.3 Water Demand Projections

This section includes the demand projections for the Pataha Creek subbasin. A general discussion of water use is included in Section 2. In general, there are five major categories of water users identified in the Pataha Creek subbasin. These are: (i) major public water systems (City of Pomeroy); (ii) small public water systems (small system less than 500 connections); (iii) self-supplied commercial/industrial users (primarily in near Pomeroy); (iv) individual household wells; and (v) agricultural water users. Pomeroy is a relatively small community, while pasture and rangeland, cropland, and forestland are the predominant land uses within the Pataha Creek subbasin. Thus, the most significant water use is associated with agricultural use (including stock watering and pastures).

A summary of principal water demands for municipal and rural residential needs, along with agricultural demands are outlined in the subsections below.

5.3.1 Municipal and Rural Residential Demand

Planning for future water supply needs requires projection of long-term demand to quantify probable water resource requirements. Important at the scale of watershed planning & for water purveyors. For watershed planning, quantifying current and projected diversions for domestic, commercial, and industrial uses is essential to determine the distribution of instream and out-of-stream water resources and demands. For municipalities, such forecasts guide the sizing and identification of long-range supply facilities.

The method for conducting the demand projections is described in the Asotin Creek Implementation Area section under Section 3.3.1. As described in that section, the demand projection is based on the population and per capita demand derived from the DOH formula. The population forecasts described in Section 2.4 is used as the basis for the demand projections. For convenience the population projections for Pataha Creek subbasin is repeated below in Table 5.3-1 and the per capita demand is repeated in Table 5.3-2.

Table 5.3-1
Population Projections
for Pataha Creek Subbasin

	City of Pomeroy	Rural Columbia Co.	Rural Garfield Co.
1990	1,393	-	-
1995	1,491	-	-
2000	1,517	479	815
2005	1,536	470	819
2010	1,591	470	819
2015	1,647	470	819
2020	1,706	470	819
2025	1,766	470	819

Table 5.3-2 Average Rainfall and Per Capita Residential Demand					
	Asotin County	**City of Asotin**	**Columbia County**	**Garfield County**	**Whitman County**
Average Rainfall (inches/year)[1]	14.4	13.3	25.3	16.3	18.1
Average per Capita Demand (gallons)[1]	300.9	320.6	206.7	276.3	257.3

(1) Rounded to the nearest tenth.

Using sub-basin populations forecasts shown in Table 5.3-1 and per capita demand shown in Table 5.3-2 the planning unit projected average day demand for residential connections through 2025. The results of this calculation for the Pataha Creek subbasin are provided in Table 5.3-3 in gallons per day and in Table 5.3-4 in acre feet per year.

Table 5.3-3 Average Day Demand Projections for Pataha Creek Subbasin			
Year	**City of Pomeroy**	**Rural Columbia Co.**	**Rural Garfield Co.**
1990	-	-	-
1995	-	-	-
2000	384,912	9,685	52,464
2005	411,992	9,503	52,762
2010	419,176	9,503	52,762
2015	424,505	9,503	52,762
2020	439,572	9,503	52,762
2025	455,174	9,503	52,762

Units in Gallons per day

Table 5.3-4 Average Annual Volume Projections for Pataha Creek Subbasin (Acre feet per year)			
	City of Pomeroy	**Rural Columbia Co.**	**Rural Garfield Co.**
1990	-		
1995	-		
2000	431	11	59
2005	462	11	59
2010	470	11	59
2015	476	11	59
2020	493	11	59
2025	510	11	59

Units in acre feet per year

As discussed with the Asotin subbasin (Section 3.3.1), the portion of the projected demand associated with surface water versus ground water was not done for the Level 1 assessment. However, based on a comparison of the water rights for non-irrigation purposes (see Section 5.4), surface water use is higher on annual basis than ground water use in the subbasin. Although the City of Pomeroy uses ground water as their source, most smaller systems and individual users rely on surface water sources in the subbasin. Based strictly on the water rights ratios, it is estimated that ground water use accounts for over approximately 40 percent of the source of water for non-irrigation use in the Pataha Creek subbasin.

5.3.2 Agricultural Demand

A general discussion on agricultural water use and measurement is provided in Section 3.3.2. That section also includes a description of the methods used to estimate agricultural water use in the basin. This section includes the findings of that analysis for the Pataha Creek subbasin.

Current water rights data indicate a total of 625 acres are being irrigated with surface water in the Subbasin[1]. Primary crops include grass hay, alfalfa hay and grain. Diversions generally take place from early May through August[2]. Surface water is primarily drawn from Pataha Creek. Ground water rights are withdrawn from well near the Pataha Creek. There is potential for stock watering from exempt wells in the Subbasin, but the extent and impact of this water use is unknown.

Table 5.3.5 provides estimates of agricultural water usage in the Pataha Subbasin. These estimates are based on the number of acres devoted to each crop type and the estimated amount of water applied to these crops annually.

[1] Personal communication with Duane Bartels, District Manager, Pomeroy Conservation District, February 2004
[2] Personal communication with Duane Bartels, February 2004

Table 5.3.5 Agricultural Water Use by Crop in the Pataha Subbasin*			
Irrigated Crop	**Acreage (Pataha Subbasin)**	**Estimated Water Use per Acre (afy)**	**Estimated Total Annual Irrigation (afy)**
Hay (Grass)	117	2.0	234
Hay (Alfalfa)	180	2.5	450
Orchard	328	2.8	918
TOTALS	625	n/a	1602

** Data provided by Pomeroy Conservation District*
*** Estimates from AgriMet ET data from the Legrow, Washington weather station, May – August, 2003*

The irrigated acreages associated with the water rights in the subbasin are summarized in Table 5.3-6 below. Possessing a water right does not mean that it is currently beneficially used nor that it was included in the acreage noted above.

Table 5.3-6 Irrigation Water Right Summary in the Pataha Subbasin			
Purpose	**Acreage**	**Peak Flow (cfs)**	**Annual Volume (afy)**
Surface – Primary	158	2.94	625
Surface - Supplemental	40	0.52	135(est.)
Ground – Primary	664	8.73	2229
Ground - Supplemental	145	3.24	485
Primary Totals	822	11.67	2,854

** Data compiled from DOE WRATS database, no warranties to accuracy are implied.*

As in the Asotin and Middle Snake Subbasins, the amount of land in the Pataha Subbasin suitable and available for cultivation and the uncertainty of agricultural crop markets will likely prohibit future increases in agricultural activity. Irrigation systems consist of hand and wheel line sprinklers. These are relatively simplistic irrigation systems, with an estimated 65% field application efficiency[3]. These systems are considered appropriate for the terrain and crops grown in the Subbasin[4]. For these reasons, and in an effort to include conservative estimates in the Level 1 Assessment, it is anticipated that agricultural water use in the Pataha Subbasin will remain constant. However, changes in irrigation timing or use of storage to collect water for use during the dry summer months could potentially impact stream flows in the Subbasin.

[3] Washington State University, 1985, Washington State Irrigation Guide
[4] Personal communication with Duane Bartels, February 2004

5.4 Water Rights and Claims

Section 2.9 includes a general discussion of the water rights and claims status for the WRIA 35 watershed as a whole. This section includes a subbasin-specific summary of the types of use and the estimated quantities of water rights for the Pataha Creek subbasin.

In order to derive the subbasin-specific water rights, all of the water rights were mapped based on their location per the township-range-section description in the WRATS database (refer to Section 2.9). The same analysis as conducted to prepare Tables 2.8-1 and 2.8-3 was used, except that only those water rights within the Pataha Creek subbasin were included in the evaluation. Tables 5.4-1 and 5.4-2 include summaries of the types of use and associated quantities for surface and ground water permitted and certificated water rights, respectively. Water rights with irrigation being one of the purposes of use accounts for approximately 75 percent of the total annual water rights allocated. Ground water is the predominant source of water in the subbasin, with almost 70 percent of the water rights in terms of total annual quantities having ground water as a source.

Table 5.4-1
Summary of Surface Water Rights[1] for Pataha Creek Subbasin

Purpose of Use	Number of Records	Annual Quantity, Qa (afy)	Instantaneous Quantity, Qi (cfs)
IR	7	625.00	2.94
DM	2	552.00	0.76
DS	2	1.00	0.02
DM ST WL	1	10.00	0.21
DS ST	1	2.00	0.01
ST	1	2.00	0.02

NOTES:
1 The detailed summary by Purpose of Use only includes data pertaining only to water right permits and certificates, as listed in the Department of Ecology Water Rights Application Tracking System (WRATS) database (February 4, 2004). Quantities of water associated with claims and water right applications are not included in this table. There are no annual or instantaneous quantities associated with water right applications, because they are not appropriated rights since they have not yet been approved.

- ***CI***--*Commercial and Industrial Manufacturing*
- ***DM***--*Domestic Multiple*
- ***DS***--*Domestic Single*
- ***IR***--*Irrigation*
- ***ST***--*Stock Watering*
- ***WL***--*Wildlife Propagation*

Table 5.4-2
Summary of Ground Water Rights[1] for Pataha Creek Subbasin

Purpose of Use	Number of Records	Annual Quantity, Qa (afy)	Instantaneous Quantity, Qi (gpm)
IR	11	1003.3	1814
DS IR	10	552	1185
DS IR ST	4	178.28	275
DM IR	3	36.69	90
CI	2	40	185
DM	2	26	30
IR ST	2	387.5	465
MU	2	278	1250
DG RW	1	4.59	50

NOTES:
(1) The detailed summary by Purpose of Use only includes data pertaining only to water right permits and certificates, as listed in the Department of Ecology Water Rights Application Tracking System (WRATS) database (February 4, 2004). Quantities of water associated with claims and water right applications are not included in this table. There is no feasible means of evaluating the validity, or documenting the amount of, water associated with claims. There are no annual or instantaneous quantities associated with water right applications, because they are not appropriated rights, since they have not been approved.

- ***CI***--*Commercial and Industrial Manufacturing*
- ***DG***--*Domestic General (use of water for all domestic uses not specifically defined in the water right record or not defined by the other specific domestic use categories.*
- ***DM***--*Domestic Multiple (more than one dwelling none of which are under municipal control)*
- ***DS***--*Domestic Single (one dwelling with lawn and garden, up to one-half acre)*
- ***IR***--*Irrigation*
- ***MU***--*Domestic Municipal*
- ***RW***--*Railway (use of water to serve railway equipment and facilities)*
- ***ST***--*Stock Watering*

5.5 Surface Water Quality

Various degrees of water quality impairment can restrict the beneficial uses of surface and ground water for the purposes of recreational, drinking, industrial, and agricultural uses, as well as for fish habitat. This section includes a discussion of surface water quality in the Pataha Implementation Area. Water quality parameters and regulations are discussed in Sections 3.5.1 and 3.5.2 respectively. Ground water quality is discussed basin-wide in the ground water section (Section 7.6) since it is impractical to describe ground water strictly within the boundaries of individual subbasins.

5.5.1 Surface Water Quality Criteria and 303(d) List

The State of Washington recently adopted revised surface water quality standards on June 25, 2003. However, the changes must be reviewed and adopted by EPA and other federal agencies before they go into effect. Key changes applicable to the study area include a focus on pollution prevention, targeting (1) temperature requirements, (2) new criteria for ammonia, and (3) classifying fresh waters by actual use rather than by class. While these revisions do not change the general process to achieve water quality standards, the mechanics of that process and the goals for specific water bodies will change.

Under the revised water quality standards for Washington, surface waters of the state are assigned to be protected for certain designated uses and the water quality criteria associated with them, as described in WAC 173-201A-200. Use designation for waters of the state are described in WAC 173-201A-600. The designated uses and water quality standard assigned to waterbodies in the Pataha Implementation Area are described in Table 5.5-1.

Pataha Creek is listed on the 1998 and 2002 303(d) list of impaired waters for fecal coliform bacteria and temperature. Note that the 2002 303(d) list has yet to be approved by EPA. Ecology had proposed a bacteria TMDL on the segment of Pataha Creek from the mouth at the Tucannon River (RM 11.2) to the headwaters for the 2001 watershed cycle, but has not been completed. The 1998 and 2002 303(d) listed streams and impaired waters within the Pataha Implementation Area are summarized in Table 5.5-2 and are illustrated in Exhibit 5.5-1 and 5.5-2, respectively. Elevated stream temperature is the primary water quality concern in the Implementation Area, thought to be due to lack of riparian vegetation (Kuttel 2002). The 303(d) lists are developed based on monitoring data collected by Ecology as well as information and data submitted to Ecology by other entities. All data is checked for accuracy and compliance with established QA/QC procedures prior to establishing the listings.

In October 1999, a limited Class II inspection and receiving water survey was conducted at Pomeroy Waste Water Treatment Plant (WWTP) to determine its efficiency and assess impacts of effluent discharge on Pataha Creek. One of the point sources of pollution for Pataha Creek was identified to be the Pomeroy. From the study it was determined that while biochemical oxygen demand (BOD), TSS, total residual chlorine, and pH were within the permissible limits at the WWTP, fecal coliform levels above and below the WWTP water quality criteria and instream ammonia concentrations below the WWTP exceeded chronic water quality criteria

(Abstract from Ecology website based on Cusiman 1992, also mentioned in Gephart et al. 2001). The recommendations made as a result of the study was to improve treatment for ammonia and land application of effluent during the summer in order to mitigate the effects of ammonia and BOD on water quality. A TMDL was accepted by EPA based on the 1991 Class II inspection report and as a result, new water quality limits were included in the NPDES discharge permit for the Pomeroy WWTP. The City plans to upgrade the WWTP and enhance the nitrification for lower ammonia nitrogen concentrations in order to meet the new limits (Gephart et al 2001).

Table 5.5-1 Water Quality Standards for waterbodies: Pataha Implementation Area			
Waterbody	**Designated Uses**	**Water Quality Standards[5]**	
All waters, including tributaries, above the junction of Pataha Creek and Dry Pataha Creek not in or above the Umatilla National Forest.	▪ Char ▪ Primary Contact Recreation ▪ Domestic, Industrial, Agricultural and Stock water supply ▪ Wildlife habitat, harvesting, commerce/ navigation, boating and aesthetics	**Temperature**, 7-day average of daily max.	12°C (53.6°F)
		Dissolved Oxygen, 1-day min.	9.5 mg/L
		Turbidity[1] Background Turbidity ≤ 50 NTU: Background Turbidity > 50 NTU:	 < 5 NTU over background < 10% increase
		Total Dissolved Gas[2]	< 110% saturation
		pH[3]	6.5 – 8.5, variation of < 0.2
		Fecal coliform[4]	< 100 colonies/100mL
All waters, including tributaries, above the junction of Pataha Creek and Dry Pataha Creek that are in the Umatilla National Forest.	▪ Char ▪ Extraordinary Primary Contact Recreation ▪ Domestic, Industrial, Agricultural and Stock water supply ▪ Wildlife habitat, harvesting, commerce/ navigation, boating and aesthetics	**Temperature**, 7-day average of daily max.	12°C (53.6°)
		Dissolved Oxygen, 1-day min.	9.5 mg/L
		Turbidity[1] Background Turbidity ≤ 50 NTU: Background Turbidity > 50 NTU:	 < 5 NTU over background < 10% increase
		Total Dissolved Gas[2]	< 110% saturation
		pH[3]	6.5 – 8.5, variation of < 0.2
		Fecal coliform[4]	< 50 colonies/100mL
All water, including tributaries, below the junction of Pataha Creek and Dry Pataha Creek until confluence with Tucannon River	▪ Salmon and trout spawning, non-core rearing, and migration ▪ Primary Contact Recreation ▪ Domestic, Industrial, Agricultural and Stock water supply ▪ Wildlife habitat, harvesting, commerce/ navigation, boating and aesthetics	**Temperature**, 7-day average of daily max.	17.5°C (63.5°F)
		Dissolved Oxygen, 1-day min.	8.0 mg/L
		Turbidity[1] Background Turbidity ≤ 50 NTU: Background Turbidity > 50 NTU:	 < 5 NTU over background < 10% increase
		Total Dissolved Gas[2]	< 110% saturation
		pH[3]	6.5 – 8.5, variation of < 0.5
		Fecal coliform[4]	< 100 colonies/100mL

Source: WAC 173-201A.
Notes:
[1] Turbidity is measured in Nephelometric Turbidity Units (NTU). Ecology may allow modification of the turbidity criteria to allow a temporary area of mixing during and immediately after necessary in-water construction activities.
[2] Total dissolved gas criteria does not apply when the stream flow exceeds the 7-day, 10-year frequency flood.
[3] pH variation is for human caused variations within the given range.
[4] Not more than 10% of all samples obtained for calculating the geometric mean value may exceed the fecal coliform organism levels shown in the table.
[5] Toxic, radioactive, or deleterious material concentrations, and aesthetic values are not shown in this table. Toxic, radioactive, or deleterious material concentrations shall be below the potential to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health as determined by Ecology; and aesthetic values must not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

Table 5.5-2
303(d) Listed and Impaired Stream Segments: Pataha Implementation Area[1]

Segment Description [Stream ID; Listing ID(s)]	Parameter(s) Exceeding Standards	1998 List (#)	2002 List[2]		Comments
			4	5	
Pataha Creek upstream from Dry Pataha Creek confluence [BT00LT; 22436]	Temperature			X	based on Umatilla National Forest unpublished data
Pataha Creek near Dry Pataha Creek confluence [BT00LT; 21213]	Fish Habitat		X		based on Kuttel 2002, factors limiting salmon uses: streambank condition, substrate embeddedness, and pools
Pataha Creek near Sweeney Gulch confluence [BT00LT; 40551, 40531]	Fecal Coliform			X	based on WSU data
	Temperature			X	
Pataha Creek just downstream from Benjamin Gulch confluence [BT00LT; 21214, 8828, 22437]	Fish Habitat		X		based on Kuttel 2002, factors limiting salmon uses: riparian, and substrate embeddedness
	Ammonia-N		X		based on Ecology data; TMDL approved by EPA on 9/9/94
Pataha Creek downstream from Benjamin Gulch confluence, near Geiger Gulch [BT00LT; 22437, 10455, 8160]	Temperature			X	based on Umatilla National Forest unpublished data
	Fecal Coliform	X (216, 217)			based on Umatilla National Forest unpublished data and Ecology data; assessed as 'Waters of Concern' (Category 2) in 2002/2004 assessment
Pataha Creek upstream from Linville Gulch confluence [BT00LT; 13861]	Temperature			X	based on WDFW unpublished data
Pataha Creek downstream from Linville Gulch confluence [BT00LT; 40530, 40550]	Temperature			X	based on WSU data
	Fecal Coliform			X	
Pataha Creek near Owens Road [BT00TL; 40529, 40549, 4968]	Temperature			X	based on WSU data
	Fecal Coliform			X	
	Fish Passage Barrier			X	based on WDFW SSHEAR Fish Passage Inventory
Pataha Creek near Archer Road [BT00TL; 11141, 16797]	pH			X	based on Ecology monitoring data
	Fecal Coliform			X	
Pataha Creek upstream from Dry Hollow confluence [BT00TL; 40528, 40548]	Temperature			X	based on WSU data
	Fecal Coliform			X	
Pataha Creek near mouth [BT00TL; 13847, 21215]	Temperature			X	based on WDFW unpublished data
	Fish Habitat		X		based on Kuttel 2002, factors limiting salmon uses: riparian, streambank condition, floodplain connectivity, substrate embeddedness, pools

[1] *Source: Ecology 2004b.*
[2] *The 2002/2004 Categories 4 and 5 are shown in the table.*

5.5.2 Existing Surface Water Quality Monitoring

Water quality monitoring stations in the Pataha Implementation area have been present since the late 1960's. Historical water quality data in the Implementation Area is available from federal and state agencies such as the EPA STORET database, Ecology, USGS, and U.S. Forest Service (USFS). Station locations and years of record for all water quality monitoring sites in the Pataha Implementation Area are listed in Table 5.5-3 and illustrated in Exhibit 5.5-3.

The Pomeroy Ranger District of the Umatilla National Forest, USFS, has also been monitoring water quality within the area in recent years as part of the requirements under the National Forest Management Act. In addition, the Center for Environmental Education (CEEd) at Washington State University (WSU) has been monitoring water quality at five stations in Pataha Creek (Exhibit 5.5-3) to determine the effectiveness of agricultural conservation practices for the Pomeroy Conservation District. The results of the study are documented in the "Pataha Creek 1998-2001 Water Quality Final Report" (CEEd 2002). Subsequent to the study, CEEd has continued to monitor temperature, total suspended solids, and fecal coliform levels, as well as pH and dissolved oxygen levels at four of the five stations. The summary of monitoring in 2003 is documented in the "Quarterly Report Water Quality Monitoring Through 3rd Quarter February – October 2003" (WSU 2003).

Table 5.5-3
Water Quality Monitoring Stations: Pataha Implementation Area[1]

Agency	Station Number	Description	Years of Record for Water Quality Data
Ecology	35F050	Pataha Creek near mouth	2003 (3 days)
	35F070	**Pataha Creek at Archer Road**	1997
	35F095	Pataha Creek at Tatman Road	2003 (3 days)
	35F110	**Pataha Creek at Rosy Grade**	2002
USGS	13344300	Pataha Creek near Pomeroy	1968 (2 days)
USFS (Umatilla National Forest)	14030007	Pataha Creek at Forest Service Boundary	1969; 1973; 1974
	14030008	**Pataha Creek at Pomeroy**	1973-1976; 1995-1997; 2001-2003
	14030016	Pataha Creek ½ mile above Forest Service Boundary	1975-1982
	14030018	**Pataha Creek above campground site at Forest Service Boundary**	1993-1994; 1999-2003
WSU	Pataha 1	**Pataha Creek , below Dry Hollow Confluence – SR 261 at Delaney**	1998-2000; 2003
	Pataha 2	**Pataha Creek – SR 12 at Dodge Junction**	1998-2000; 2003
	Pataha 3	**Pataha Creek – SR 12 at Marengo Road Bridge**	1998-2000; 2003
	Pataha 4	**Pataha Creek, upstream of Sweeney Gulch confluence**	1998-2000; 2003
	Pataha 5	**Pataha Creek, near Columbia Center**	1998-2000; 2003

[1] *Sources: Ecology 2004a; EPA STORET 2004, Umatilla National Forest 2002, WSU 2001.*
***Bold** indicates stations with the most information.*

The stations with the most recent information in Pataha Creek include Ecology 35F070 and 35F110, USFS 14030008 and 14030018, and the WSU monitoring locations. Ecology 35F070 and 35F110 are basin stations with monthly grab samples taken over the 1997 and 2002 water years, respectively. Water quality parameters at the Ecology stations include: dissolved oxygen, pH, temperature, total suspended solids, turbidity, fecal coliform bacteria, soluble reactive phosphorus, total phosphorus, ammonia, nitrate plus nitrite, and total nitrogen. USFS 14030008 and 14030018 have monitored total suspended solids and turbidity from early 1990's to 2002 (EPA STORET 2004). Daily temperature information was recorded at these two locations for the summer months of 2003.

The WSU monitoring locations, Pataha 1 through 5, have sampled for temperature, total suspended solids, fecal coliform levels, stream discharge, ammonia, nitrate, total Kjeldahl nitrogen, and total phosphorous between 1998 and 2000. Pataha 1, 3, 4, and 5 have continued to monitor temperature, total suspended solids, fecal coliform levels, and have also begun monitoring dissolved oxygen concentration and pH levels in 2003.

Water quality information for the tributaries to Pataha Creek is not available.

5.5.3 Areas of Impacted Water Quality

The following is a discussion of the specific water quality parameters that impact Pataha Creek. Elevated stream temperature and excessive fecal coliform concentrations are the primary water quality concerns in Pataha Creek, as can be seen from the water quality monitoring data and the 303(d) lists. In addition, total suspended solids concentrations, turbidity, and high pH levels are also of concern as potential limiting factors to salmonid rearing in the lower and middle portions of Pataha Creek. Pataha Creek has been identified as a major contributor of sediment to the Tucannon River, causing braided stream formations in the Tucannon (Gephart et al. 2001).

- **Pataha Creek from Headwaters to Dry Pataha Creek Confluence:** Table 5.5-4 summarizes the current water quality conditions in this reach.

  Temperature: Umatilla National Forest, WSU and Ecology have recorded water temperatures in this reach (see Exhibit 5.5-3). Exhibit 5.5-4 shows the mean, minimum, and maximum water temperatures recorded by USFS 14030018 in Pataha Creek at the Forest Service Boundary above the campground between June and September of 2003. The annual summer maximum temperatures recorded between 1992 and 2003 at this location is shown in Table 5.5-5. The 7-day mean of daily maximum values recorded range from 58ºF to 63ºF (14.4ºC to 17.2ºC), which exceeds the maximum designated use temperature standard of 12°C (53.6°F) for char spawning and rearing every year that data is available. The data recorded by WSU Pataha 5, located 1 mile SE of the Columbia Center, and by Ecology 35F110, located near Columbia Center, are consistent with the USFS data. Exhibit 5.5-5 shows that the mean temperatures in the summer months for 1999 through 2003 all exceed the maximum designated use temperature standard. These have resulted in the placement of this reach on the 2002 303(d) list for temperature (see Table 5.5-2).

Insert Table 5.5-4

Table 5.5-5 Annual Summer Maximum Temperatures: Pataha Creek from Headwaters to Dry Creek Confluence[1] Umatilla National Forest Data												
Station	**7-day moving average of the daily maximum Temperature, °F (°C)**											
	'92	**'93**	**'94**	**'95**	**'96**	**'97**	**'98**	**'99**	**'00**	**'01**	**'02**	**'03**
USFS 14030018	63 (17.2)	58 (14.4)	-	58 (14.4)	-	M[2]	62 (16.7)	60 (15.6)	60 (15.6)	M[2]	-	61 (16.1)

[1]*Source: Tucannon Ecosystem Analysis (Umatilla National Forest 2002); and unpublished data (Umatilla National Forest 2004).*
[2]*M: Missing data for period of maximum stream temperature*

Fecal Coliform Bacteria: WSU Pataha 5 recorded fecal coliform concentrations about 1 mile SE of the Columbia Center and Ecology 35F110 also collected fecal coliform concentrations in the vicinity. Although this reach of Pataha Creek is not listed on the 303(d) list, 26 out of the 70 samples collected by WSU Pataha 5, and 6 out of 12 samples collected by Ecology 35F110 exceeded the designated use criteria for primary contact recreation of 100colonies/100mL for fecal coliform concentrations. Exhibit 5.5-6 shows the fecal coliform concentrations recorded by WSU Pataha 5 and Ecology 35F110 for the period of record. Generally, the mean monthly fecal coliform concentrations were higher in the summer months from June through September, ranging from 28 colonies/100mL to 1,000 colonies/100mL. In November 1999 and 2000, mean fecal coliform concentrations peaked at 1,626 colonies/100mL and 4,494 colonies/100mL, respectively.

pH: pH concentrations were recorded by WSU Pataha 5 and Ecology 35F110. During the period of record, the pH concentrations for all samples were within the acceptable range of 6.5 and 8.5. The mean pH concentration recorded was 7.8 at WSU Pataha 5, and 7.9 at Ecology 35F110. Exhibit 5.5-7 shows the pH concentrations recorded by WSU and Ecology for the period of record.

Dissolved Oxygen: Dissolved oxygen concentrations were recorded by Ecology 35F110 for the 2002 water year, and in 2003 by WSU Pataha 5. The dissolved oxygen concentration was below the minimum 9.5 mg/L standard for char in July and August 2002 and from May through September 2003. The mean monthly dissolved oxygen was lowest in July 2003 at 7.5 mg/L. Exhibit 5.5-8 shows the mean monthly dissolved oxygen concentrations recorded by WSU and Ecology in 2002 and 2003.

Turbidity: USFS 14030018 monitored turbidity from 1983 to 2002; however from 1983 to 1989, data was recorded in Jackson Candle Units (JTU). Only in 1999 did USFS begin recording Turbidity in Nephelometric Turbidity Units (NTU). Ecology 35F110 also monitored turbidity in the 2002 water year. The data recorded by Ecology is generally consistent with the USFS data. Exhibit 5.5-9 shows the mean turbidity recorded by USFS and Ecology from 1999 to 2002. USFS 14030018 records indicate that turbidity ranged from 0.5 NTU, on November 20, 1999, to 86.4 NTU, recorded on June 18, 2002. A peak turbidity of 50 NTU was recorded by Ecology on March 13, 2002.

Suspended Solids: Umatilla National Forest, WSU and Ecology have recorded total suspended solids concentration in this reach. However, USFS 14030018 and WSU Pataha 5 provide the longest records. Exhibit 5.5-10 shows the mean monthly total suspended solids concentrations recorded at these two stations. The mean monthly total suspended solids concentration recorded were well below the USFS recommended standard of 80mg/L. There were only very few occurrences of the total suspended solids concentration exceeding the recommended standard: 2 out of 70 records at WSU Pataha 5, and 14 out of 1,907 records at USFS 14030018.

Nutrients: Ammonia, nitrate, total Kjeldahl nitrogen (TKN) and total phosphorous were monitered at WSU Pataha 5 in 2003, while Ecology 35F110 recorded ammonia and total phosphorous in the 2002 water year. Exhibit 5.5-11 shows the ammonia concentration recorded in 1999 and 2003 by WSU and Ecology. Ammonia concentrations in 1999 collected by WSU Pataha 5 ranged from 0.055 to 0.47 mg/L, with a mean concentration of 0.276 mg/L. In the 2002 water year, Ecology's record indicates that ammonia concentrations were below 0.05 mg/L, with a mean of 0.014mg/L.

WSU Pataha 5 recorded nitrate concentrations ranging from 0.001 to 0.07 mg/L, with a mean concentration of 0.029 mg/L, and TKN concentrations ranging from 0.166 mg/L to 0.554 mg/L, with a mean concentration of 0.318 mg/L.

Exhibit 5.5-12 shows the total phosphorous concentration recorded in 1999 and 2003 by WSU and Ecology. Total phosphorous concentrations in 1999 collected by WSU Pataha 5 ranged from 0.015 mg/L to 0.099 mg/L, with a mean of 0.067 mg/L. In the 2002 water year, Ecology's record indicates higher concentrations ranging from 0.06 mg/L to 0.207 mg/L, with a mean of 0.1 mg/L. Although the designated use of this reach is classified for char, it is useful to compare to the USFWS recommended range of 0.01 mg/L to 0.3 mg/L for trout. The total phosphorous concentrations collected at both locations are within the 0.01 mg/L to 0.3 mg/L range.

- **Pataha Creek from Dry Pataha Creek Confluence to Sweeney Gulch Confluence:** Water quality information for this reach was collected by WSU Pataha 4, located just upstream of the Sweeney Gulch confluence Temperature, fecal coliform concentration and total suspended solids concentration were monitored between March 1999 and July 2001. These were continued in 2003, in addition to pH and dissolved oxygen monitoring. There was no water quality data available on turbidity for this stream reach. Table 5.5-6 summarizes the current water quality conditions in this reach.

Insert Table 5.5-6

Temperature: Exhibit 5.5-13 shows the mean water temperatures recorded by WSU Pataha 4 for the period of record. The mean summer temperatures recorded during this period range from 54.8ºF to 76.6ºF (12.7ºC to 24.8ºC), with the highest temperatures occurring in the months of June and July. The maximum designated use temperature standard of 17.5°C (63.5°F) for salmon and trout spawning, non-core rearing, and migration was exceeded every July for the period of record, resulting in the placement of this reach on the 2002 303(d) list for temperature (see Table 5.5-2).

Fecal Coliform Bacteria: Fecal coliform concentrations recorded by WSU Pataha 4 indicate that out of the 51 samples taken, 33 samples exceeded state criteria, thus listing this segment of Pataha Creek on the 2002 303(d) list (see Table 5.5-2). Exhibit 5.5-14 shows the fecal coliform concentrations recorded by WSU Pataha 4 for the period of record. The mean fecal coliform concentrations per month exceed the state criteria 10 months of the year.

pH: The pH concentrations recorded by WSU Pataha 4 indicate that 2 out of 20 samples collected were outside the acceptable range of 6.5 and 8.5, with a mean pH concentration of 7.7. Exhibit 5.5-15 shows the pH concentrations recorded by WSU in 2003.

Dissolved Oxygen: Dissolved oxygen concentrations recorded by WSU Pataha 4 indicated that 11 out of 20 samples collected were below the minimum 9.5 mg/L standard for char, occuring from May through September 2003. Exhibit 5.5-16 shows the mean monthly dissolved oxygen concentrations recorded by WSU in 2003.

Suspended Solids: Exhibit 5.5-17 shows the mean monthly total suspended solids concentrations recorded at WSU Pataha 4. Out of 70 samples collected, 6 samples exceeded the USFS recommended standard of 80 mg/L.

Nutrients: Ammonia, nitrate, total Kjeldahl nitrogen (TKN) and total phosphorous were monitered at WSU Pataha 4 in 1999. The ammonia concentration recorded ranged from 0.111 to 0.47 mg/L, with a mean concentration of 0.270 mg/L. The nitrate concentration ranged from 0.004 to 0.85 mg/L, with a mean concentration of 0.231 mg/L. The TKN concentration ranged from 0.222 mg/L to 0.665 mg/L, with a mean concentration of 0.443 mg/L. The total phosphorous concentration ranged from 0.062 mg/L to 0.189 mg/L, with a mean of 0.145 mg/L. This is within the USFWS recommended range of 0.01 mg/L to 0.3 mg/L for trout.

- **Pataha Creek from Sweeney Gulch Confluence to Tatman Gulch Confluence:** Water quality information for this reach was collected by USFS 14030008, which is located at Pomeroy, Washington. Turbidity and total suspended solids were monitored from 1973 to 1976, 1994 to 1997, and 2001 to 2003. Some temperature data was also collected in 1973 and 1974. In recent years, USFS has began monitoring daily temperature in the summer and early fall months. No water quality data is available on fecal coliform bacteria, pH levels, dissolved oxygen concentration, or nutrients for this stream reach. Table 5.5-7 summarizes the current water quality conditions in this reach.

Insert Table 5.5-7

Temperature: Umatilla National Forest has recorded water temperatures in this reach (see Exhibit 5.5-3). Exhibit 5.5-18 shows the mean, minimum, and maximum water temperatures recorded by USFS 14030008 in Pataha Creek at Pomeroy between June and November of 2003. The annual summer maximum temperatures recorded between 1992 and 2003 at this location is shown in Table 5.5-8. The 7-day mean of daily maximum values recorded range from 67ºF to 73ºF (19.4ºC to 22.8ºC), which exceeds the maximum designated use temperature standard of 17.5°C (63.5°F) for salmon and trout spawning, non-core rearing, and migration every year that data is available. These have resulted in the placement of this reach on the 2002 303(d) list for temperature (see Table 5.5-2).

Table 5.5-8
Annual Summer Maximum Temperatures:
Pataha Creek from Sweeney Gulch Confluence to Tatman Gulch Confluence[1]
Umatilla National Forest Data

Station	7-day moving average of the daily maximum Temperature, °F (°C)											
	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03
USFS 14030008	71 (21.7)	67 (19.4)	-	69 (20.6)	-	72 (22.2)	73 (22.8)	70 (21.1)	M[2]	69 (20.6)	-	69 (20.6)

[1]Source: Tucannon Ecosystem Analysis (Umatilla National Forest 2002); and unpublished data (Umatilla National Forest 2004).
[2]M: Missing data for period of maximum stream temperature

pH: USFS 14030008 recorded a pH concentration of 8.5 on August 21, 1973.

Turbidity: USFS 14030008 monitored turbidity from 1973 to 1976, and 1994 to 1997, 2001 to 2002; however the data was recorded in Jackson Candle Units (JTU). Only after 1999 did USFS begin recording turbidity in Nephelometric Turbidity Units (NTU). Exhibit 5.5-19 shows the mean turbidity recorded by USFS from October 2001 to June 2002. The records indicate that turbidity ranged from 0.8 NTU, on November 27, 2001 and December 4, 2001, to 1080 NTU on March 12, 2002.

Suspended Solids: Exhibit 5.5-20 shows the monthly total suspended solids concentrations recorded at USFS 14030008. The mean monthly total solids concentrations exceeded the USFS recommended standard of 80mg/L 3 out of the 9 months during the period of record. Total suspended solids concentration ranged from 0.7 mg/L on November 27, 2001 to 1083 mg/L on December 3, 2002.

- **Pataha Creek from Tatman Gulch Confluence to mouth:** Table 5.5-9 summarizes the current water quality conditions in this reach. Water quality for this reach was collected from 1999 to 2001 and in 2003 by WSU Pataha 1, Pataha 2 and Pataha 3, located just below Dry Hollow Confluence, at Dodge Junction, and at Marengo Road Bridge, respectively. Ecology 35F070 also collected water quality data in the 1997 water year at Archer Road (see Exhibit 5.5-3).

Insert Table 5.5-9

Temperature: WSU Pataha 1, Pataha 2, Pataha 3 recorded water temperatures from 1999 to 2001, and in 2003, while Ecology 35F070 recorded water temperatures in the 1997 water year. The mean summer temperatures recorded at the WSU stations range from 11.5ºC to 25.2ºC (52.7ºF to 77.4ºF), with an average temperature of 19.7ºC (67.5ºF). Exhibit 5.5-21 shows the mean, minimum, and maximum water temperatures recorded by WSU and by Ecology 35F070 in this reach for the period of record. The records indicate that for the summer months of July and August, the mean temperatures at all locations exceed the maximum designated use temperature standard of 17.5°C (63.5°F) for salmon and trout spawning, non-core rearing, and migration for every year data is available. These have resulted in the placement of this reach on the 2002 303(d) list for temperature (see Table 5.5-2).

Fecal Coliform Bacteria: Fecal coliform concentrations were recorded by WSU Pataha 1, Pataha 2 and Pataha 3 from 1999 to 2001 and 2003, and by Ecology 35F070 in the 1997 water year. Exhibit 5.5-22 shows the mean monthly fecal coliform concentrations recorded by WSU and Ecology in this reach for the period of record. The records indicate that the fecal coliform standard of 100 colonies/100mL was exceeded from May through September for every year data was recorded, thus listing this segment of Pataha Creek on the 2002 303(d) list (see Table 5.5-2). Generally, the mean monthly fecal coliform concentrations were higher in the summer months from June through September, ranging from 206 colonies/100mL to 1,268 colonies/100mL at the WSU sites. The highest fecal coliform concentration recorded was 12,220 colonies/100mL at WSU Pataha 3, located just downstream of Linville Gulch confluence, on May 31, 2000.

pH: pH concentrations were recorded by Ecology 35F070 in the 1997 water year, and by WSU Pataha 1 and Pataha 3 in 2003. Exhibit 5.5-23 shows the mean pH concentrations recorded by WSU and Ecology in this reach for the period of record. The pH concentrations recorded by Ecology 35F070 indicate that from July through October 1997, the pH levels exceeded the acceptable upper limit of 8.5. The data from WSU Pataha 1 also show that pH levels were greater than 8.5 in May and June 2003. These have resulted in the placement of this reach on the 2002 303(d) list for pH (see Table 5.5-2).

Dissolved Oxygen: Dissolved oxygen concentrations were recorded by Ecology 35F070 for the 1997 water year, and by WSU Pataha 1 and Pataha 3 in 2003. Exhibit 5.5-24 shows the mean dissolved oxygen concentrations recorded by WSU and Ecology in this reach for the period of record. The records indicate that the mean dissolved oxygen concentration were above the minimum 8.0 mg/L standard for salmon and trout spawning, non-core rearing, and migration from February through April 2003 at WSU Pataha 3. Exhibit 5.5-8 shows the mean monthly dissolved oxygen concentrations recorded by WSU and Ecology in 2002 and 2003.

Turbidity: Ecology 35F070 monitored turbidity in the 1997 water year (Exhibit 5.5-25). The turbidity recorded ranged from 2.6 NTU, on October 6, 1996, to 2,000 NTU, recorded on June 1, 1997.

Suspended Solids: Total suspended solids concentrations were recorded by WSU Pataha 1, Pataha 2 and Pataha 3 from 1999 to 2001 and in 2003; and by Ecology 35F070 in the 1997 water year. Exhibit 5.5-26 shows the mean monthly total suspended solids concentrations recorded by WSU and Ecology in this reach for the period of record. The mean monthly total suspended solids concentration recorded were well below the USFS recommended standard of 80mg/L. There were only very few occurences of the total suspended solids concentration exceeding the recommended standard: 2 out of 70 records at WSU Pataha 5, and 14 out of 1,907 records at USFS 14030018.

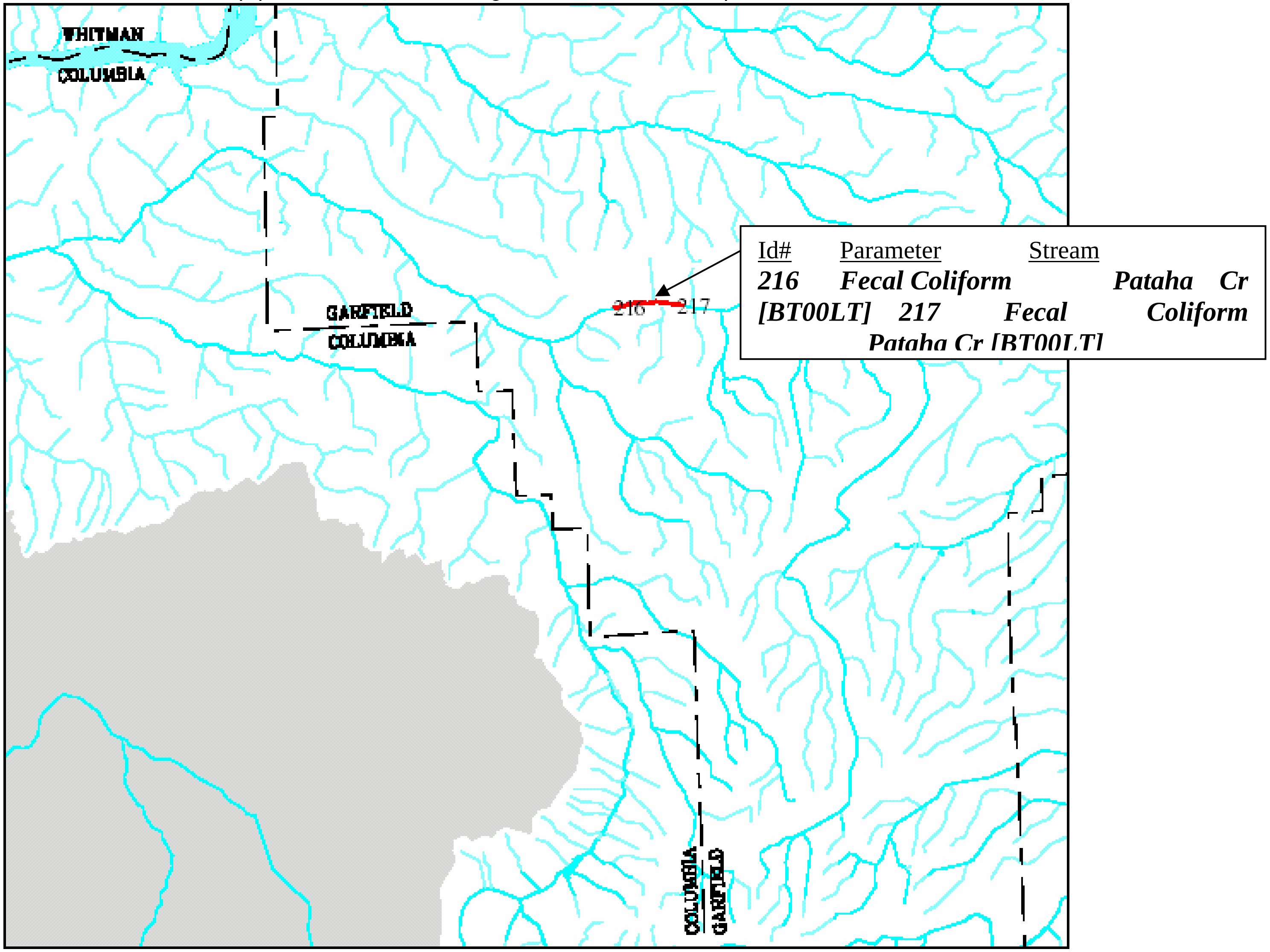
Nutrients: Ammonia and total phosphorous were monitered at WSU Pataha 1, Pataha 2, and Pataha 3 in 1999 and 2002, and at Ecology 35F070 in the 1997 water year. The WSU monitoring stations also monitored nitrate and total Kjeldahl nitrogen (TKN) in 1999. Exhibit 5.5-27 shows the ammonia concentration recorded by WSU and Ecology for the period of record. Ammonia concentrations in 1997 water year ranged from 0.01 mg/L to 0.133 mg/L, with a mean concentration of 0.033 mg/L. The mean monthly ammonia concentration recorded at the WSU monitoring stations ranged from 0.012 mg/L to 0.331 mg/L, with mean concentrations ranging from 0.095 mg/L to 0.152 mg/L.

The nitrate concentration in 1999 at the WSU monitoring stations ranged from 0.016 mg/L to 1.876 mg/L, with mean concentrations ranging from 0.378 mg/L to 1.21 mg/L. The TKN concentration in 1999 at the same locations ranged from 0.277 mg/L to 1.384 mg/L, with mean concentrations ranging from 0.857 mg/L to 0.871 mg/L.

Exhibit 5.5-28 shows the total phosphorous concentration recorded by WSU and Ecology for the period of record. Total phosphorous concentrations in the 1997 water year collected by Ecology ranged from 0.134 mg/L to 0.483 mg/L, with a mean concentration of 0.236 mg/L. The USFWS recommended range of 0.01 mg/L to 0.3 mg/L for trout was exceeded in March and April 1997 at the Ecology 35F070 monitoring station. The mean monthly concentrations recorded by the WSU monitoring stations ranged from 0.096 mg/L to 0.298 mg/L, which was within the 0.01 mg/L to 0.3 mg/L range.

Exhibit 5-5.1

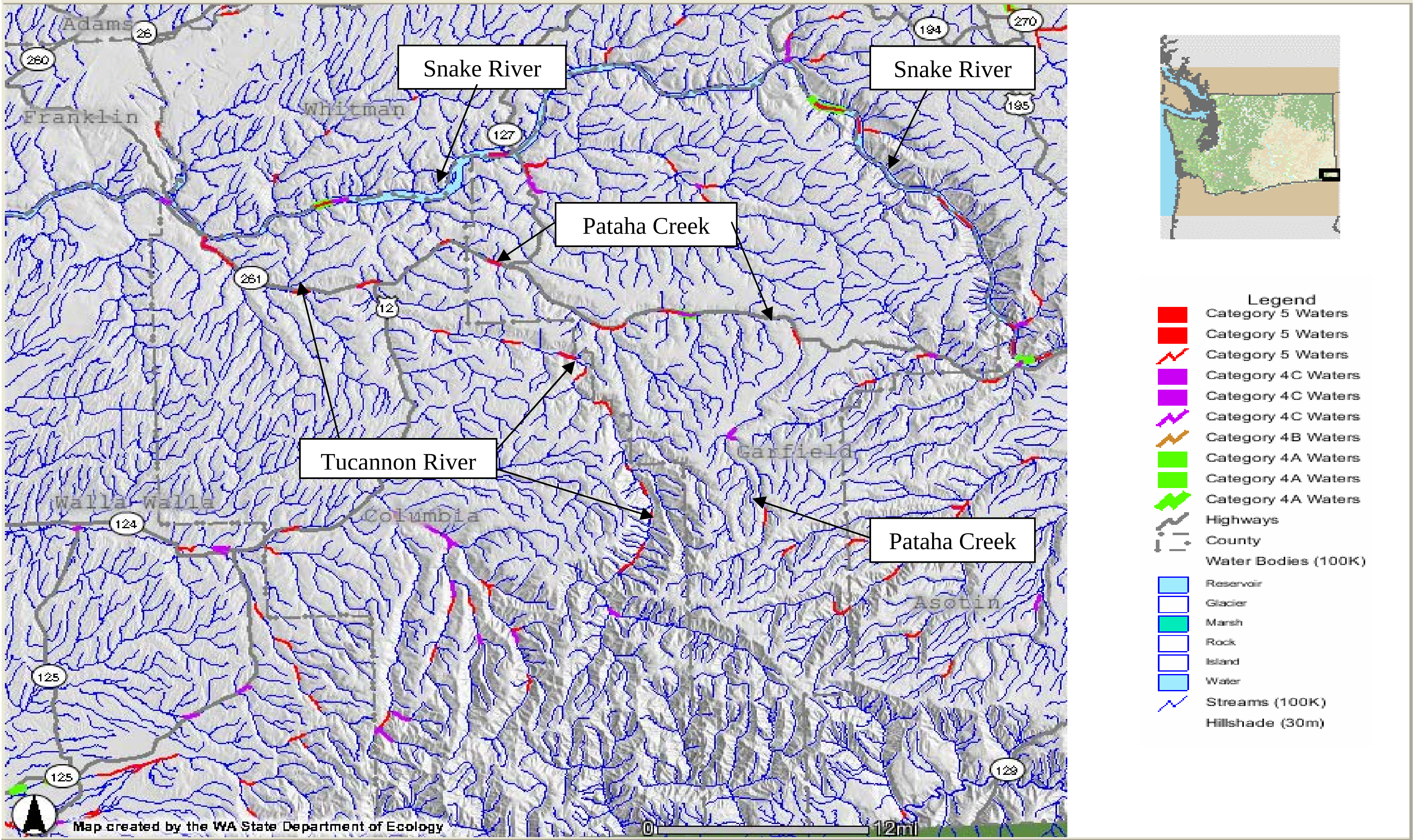
1998 303(d) Listed Stream Segments: Pataha Implementation Area



Source: Ecology, 2004. WRIA 35 - Middle Snake webpage

Exhibit 5.5-2

2002 303(d) Listed and Impaired Stream Segments: Pataha Implementation Area



Source: Water Quality Assessment of Washington webpage (Ecology 2004b).