Pataha Creek Model Watershed

Habitat Conservation Projects

Progress Report
2000 - 2002

DOE/BP-14994-2

April 2003

This Document should be cited as follows:

Bartels, Duane, "Pataha Creek Model Watershed; Habitat Conservation Projects", 2000-2002 Progress Report, Project No. 199902100, 55 electronic pages, (BPA Report DOE/BP-14994-2)

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P.O. Box 3621
Portland, OR 97208

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

PATAHA CREEK MODEL WATERSHED

January 2000–December 2002 Habitat Conservation Projects

Cooperators:
Bonneville Power Administration
Washington State Conservation Commission
Washington State Department of Fish and Wildlife
Natural Resource Conservation Service
Umatilla National Forest, Pomeroy Ranger District
Farmers and Ranchers of the Pataha Watershed

Completion report
Project 1997-088-00 # 97AP37117 BPA Contract 00000356

Progress Report
Project 1999-021-00 # 99AP14994 BPA Contract 00004289
Project 1999-059-00 # 99BI-19595 BPA Contract 00006874

April 2003

Jan 2000 thru Dec 2002 Habitat Projects Completed

Prepared for:

U.S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife Division

Washington State Conservation Commission

Washington Department of Fish and Wildlife

Umatilla National Forest, Pomeroy Ranger District

Natural Resources Conservation Service

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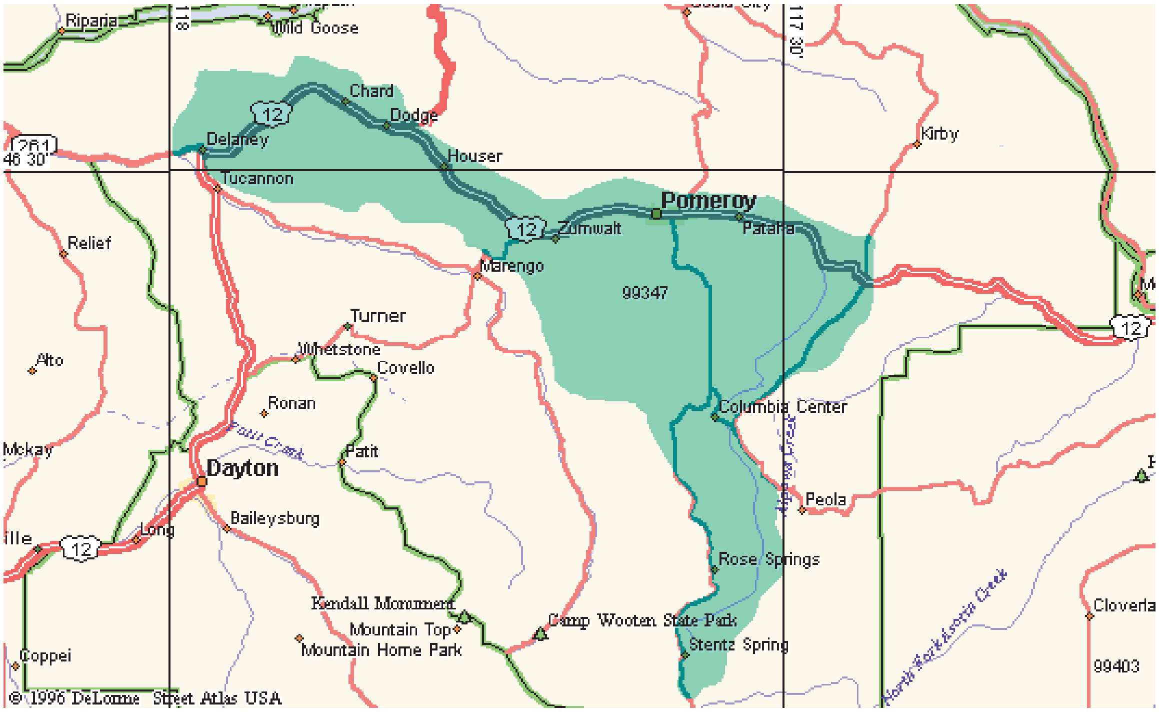

Pataha Creek Watershed
Located in Garfield County in SE Washington

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Abstract

The projects outlined in detail on the attached project reports were implemented from calendar year 2000 through 2002 in the Pataha Creek Watershed. The Pataha Creek Watershed was selected in 1993, along with the Tucannon and Asotin Creeks, as model watersheds by NPPC. In previous years, demonstration sites using riparian fencing, off site watering facilities, tree and shrub plantings and upland conservation practices were used for information and education and were the main focus of the implementation phase of the watershed plan. These practices were the main focus of the watershed plan to reduce the majority of the sediment entering the stream. Prior to 2000, several bank stabilization projects were installed but the installation costs became prohibitive and these types of projects were reduced in numbers over the following years. The years 2000 through 2002 were years where a focused effort was made to work on the upland conservation practices to reduce the sedimentation into Pataha Creek.

Over 95% of the sediment entering the stream can be tied directly to the upland and riparian areas of the watershed.

The Pataha Creek has Steelhead in the upper reaches and native and planted rainbow in the mid to upper portion. Suckers, pikeminow and shiners inhabit the lower portion because of the higher water temperatures and lack of vegetation. The improvement of riparian habitat will improve habitat for the desired fish species. The lower portion of the Pataha Creek could eventually develop into spawning and rearing habitat for Chinook salmon if some migration barriers are removed and habitat is restored.

The upland projects completed during 2000 through 2002 were practices that reduce erosion from the cropland. Three-year continuous no-till projects were finishing up and the monitoring of this particular practice is ongoing. Its direct impact on soil erosion along with the economical aspects is being studied. Other practices such as terrace, waterway, sediment basin construction and the installation of strip systems are also taking place.

The years 2000 through 2002 were productive years for the Pataha Creek Model Watershed but due to the fact that most of the cooperators in the watershed have reached their limitation allowed for no-till and direct seed/ two pass of 3 years with each practice, the cost share for these practices is lower than the years of the late 90's. All the upland practices that were implemented have helped to further reduce erosion from the cropland. This has resulted in a reduction of sedimentation into the spawning and rearing area of the Fall Chinook salmon located in the lower portion of the Tucannon River. The tree planting projects have helped in reducing sedimentation and have also improved the riparian zone of desired locations inside the Pataha Creek Watershed. The CREP (Conservation Reserve Enhancement Program) along with the CCRP (Continuous Conservation Reserve Program) are becoming more prevalent in the watershed and are protecting the riparian areas along the Pataha Creek at an increasing level every year. Currently roughly 197 acres of riparian has been enrolled along the Pataha Creek in the CREP program.

Forward

Due to the high value of the fish resource in the Tucannon River, there have been many studies and planning efforts directed at restoring resource conditions in this watershed. Pataha Creek, as the largest sub-watershed in the Tucannon watershed has been identified as one of the primary contributors of sediment to the Tucannon River.

Frank Reckendorf and Mike VanLiew conducted one of these studies. They conducted a study from September 1985 to April 1986 to determine sediment intrusion into artificial redds in the Tucannon Watershed. Under this study, the textural composition of artificial redds was monitored over a 6 month period to determine sediment intrusion into salmonid spawning beds. The artificial redds were constructed in September 1985, at four sites on the Tucannon River in Southeast Washington. Freeze-core samples were then collected 4 times, from October 1985 to April 1986. The data indicated a marked increase in the percentage of fines and sand sized material present in the redds due to sediment intrusion from winter runoff on the Tucannon River. The apparent decrease in both pore size and relative permeability of the artificial redds due to sediment intrusion reflects a potential decrease in the survival-to-emergence of salmonid.

Under this study the affects of fine sediment and organic matter on salmonid reproduction have been studied intensively for more than three decades, both in site and in the laboratory (Everest et al, 1987). Sands, silts, clays and organic matter that are deposited in gravel spawning beds – referred to as redds – adversely affect the survival to emergence of salmonid populations. Clogging of gravel beds by fine sediments and organic matter reduce the availability of dissolved oxygen needed by salmonid embryos and fry. Fine sediments that are deposited in gravel beds also restrict metabolic wastes produced by incubating salmonid eggs (Alonso et al, 1988). Moreover, fine sediments that clog the interstices of gravel spawning beds entrap the fry within the gravel as they try to emerge.

The following are publications used in the preparation of the Pataha Creek Model Watershed Plan and also in parts of this proposal.

<u>Sampling of Sediment Intrusion into Artificial Redds in the Tucannon Watershed (Reckendorf & VanLiew, 1989</u>: This was a study completed under the authority of the Soil Conservation Service to determine the affect of sedimentation on artificial redds at four sites in the Tucannon Watershed.

<u>Tucannon River Watershed Plan (USDA 1991)</u>: This plan was prepared under authority of PL-566 and recommends certain conservation practices that would lower water temperature and reduce the amount of sediment delivered to the stream. This plan provides federal cost-share funds to private landowners to help establish the recommended practices. In stream habitat improvement, however, was not included as part of the planning or funding of this project.

<u>Sediment Transport, Water Quality and Changing Bed Conditions, Tucannon River, Washington (Hecht et al. 1982)</u>: This plan identified and discussed the effects of land use and other watershed influences on the water quality and fish habitat of the river. It also discussed the effects of reduced water quality on the aquatic populations within the stream.

Ecological Investigations on the Tucannon River, Washington (Kelley and Associates 1982): This study is the second part of the 1981 USDA report listed above, and includes the related biological investigations for the report.

Southeast Washington Cooperative River Basin Study (USDA 1984): The objective of this study was to provide a basin-wide evaluation of existing land management and stream habitat conditions related to erosion and sediment problems.

Tucannon Basin Final Report - Assessment of Ongoing Management Activities (USDA Forest Service 1993): This report analyzes the potential impacts of forest activities, within the Umatilla National Forest, on Chinook salmon in the Tucannon River.

Pataha Creek Water Quality Report 1998-2001: The objective of this study is to evaluate the water quality in the Pataha Creek watershed in an effort to determine the effectiveness of agricultural conservation practices in southeast Washington's Pomeroy Conservation district. Data presented were collected between March 1999 and July 2001, and then analyzed by Washington State University's Department of Biological Systems and by the Center for Environmental Education.

1.0 Budget Summary

2000 thru 2002 Pataha Creek Model Watershed Projects

BPA Contract #	BPA Project Name	Total Cost	BPA Funding	Cost Share	Percentage of total cost
97AP37117	No-till seeding 3 yr. Program	$2,661	$1,996	$665	
99BI-19595	No-till seeding	$90,472	$45,236	$45,236	
99BI-19595	Direct Seeding/Two Pass	$91,722	$45,861	$45,861	
99BI-19595	Bank Stabilization	$992	$744	$248	
99BI-19595	Critical Area Planting	$5,700	$4,275	$1,425	
99BI-19595	Grassed Waterway	$1,663	$1,247	$416	
99BI-19595	Tree Planting	$49,860	$37,395	$12,465	
99BI-19595	Terrace Rebuilt	$1,816	$1,362	$454	
99BI-19595	Sediment Basins	$7,077	$5,308	$1,769	
99BI-19595	Irrigation Water Management	$816	$612	$204	
99BI-19595	Grasses and Legumes in Rotation	$927	$695	$232	
99BI-19595	Fencing	$2,809	$2,107	$702	
99BI-19595	Pasture and Hay land Planting	$6,666	$5,000	$1,666	
99BI-19595	Pipeline	$10,000	$5,000	$5,000	
99BI-19595	Water Quality monitoring	$4,498	$4,498	$0	
99BI-19595	Demo Windmill	$14,035	$10,526	$3,509	
99AP14994	Administration	$138,741	$138,741	$0	
	Totals	**$430,455**	**$310,603**	**$119,852**	
		100%	72%	28%	

2.0 Project Summaries

Project: Watershed Project Coordination and Administration from 2000 thru 2002 using contract 99AP14994

The Pomeroy Conservation District was provided a grant from the Bonneville Power Administration (BPA) for the purpose of the continued funding for the administration of the implementation of the Pataha Creek Model Watershed Plan. This plan was a pilot effort to encourage private landowners to join government agencies in finding solutions to loss of salmon habitat and critical riparian area. The goal of the plan was to set into motion efforts to return the upper Pataha Creek Watershed and lower Tucannon River to productive capacity for salmon spawning and rearing.

The Pataha's high delivery of sediment and high water temperatures into the Spawning and rearing area of the lower Tucannon River was determined to be the main problem in the Pataha Creek Watershed.

The conservation district hired a watershed coordinator to bring together the Technical experts of state and federal agencies with private landowners to jointly find solutions to habitat problems within the watershed. The technical representatives provide the scientific background and information on the critical needs of the fish while the landowners provide the common sense backstop to ensure that the action items suggested by the agencies are attainable, physically and financially within the watershed.

The Pomeroy Conservation District has worked with the Washington State Conservation Commission, Bonneville Power Administration, and the Natural Resource Conservation Service since the beginning of this pilot program. We have jointly implemented conservation practices to help reduce the erosion and resulting sedimentation moving from our uplands into the Tucannon River. We have also installed practices within the riparian area to improve bank stability, riparian vegetation and in-stream fish habitat.

The grant (99AP14994) was used for salaries and benefits for the coordinator and administrative assistant, travel expenses, and goods and services needed for the administration of these implementation grants for the years 2000 thru 2002.

The following summary reflects those expenses:

Salaries			
	Coordinator	$48,741	
	Clerical	$22,116	
	Total		$70,857
Benefits			
	Employment Sec.	$ 366	
	Labor & Industry	$ 341	
	Medicare	$ 1,027	
	Soc. Sec.	$ 4,391	
	Med. Insurance	$23,417	
	Retirement	$ 5,902	
	AL, SL, Holidays	$ 4,143	
	Total		$39,586
Goods and Services			
	Administrative Support	$ 125	
	Cellphone	$ 540	
	Communications	$ 360	
	GIS	$ 5,501	
	Information Edu.	$ 1,717	
	Internet Service	$ 474	

Office Supplies	$ 5,163	
Postage	$ 2,193	
Printing & Reprod.	$ 1,522	
Storage	$ 2,415	
Supplies	$ 16	
Support of existing Proj.	$ 187	
Weather Stations	$ 2,550	
Total		$ 22,959
Travel		
Annual Meeting	$ 3,018	
Regional Seminar	$ 954	
NWPPC meeting	$ 157	
Per Diem	$ 970	
Other travel	$ 239	
Total		$ 5,339
Total Coordinator expenses		**$138,741**

The following charts illustrate the projects implemented under contracts 97AP37117 and 99BI-19595. Tons of soil saved are calculated using the RUSLE (Revised Universal Soil Loss Equation) and is the amount of soil saved using the practice compared to a conventional method of seed production using cultivation with no conservation practices involved in the crop production program.

Project: No-till completed in Pataha WS with 3-year contract 97AP37117.

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
23	Slayco	$1996	$1996	89	798

Project: No-till seeding in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2000

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8165	Max Scoggin	$1,275	$1,275	85	340
8192	Regie Waldher	$1,452	$1,452	97	968
8196	Baker Shelton	$1,768	$1,768	130	649
8205	RC Farms	$4,278	$4,278	285	1,141
8198	Shawley Limited Partner	$2,010	$2,010	134	670
8199	Niebel Farms	$3,828	$3,828	255	766
8206	John Flerchinger	$ 960	$ 960	64	384
8208	Ken Ledgerwood	$3,764	$3,764	251	1,004
8213	Warren Acres	$1,358	$1,358	91	453
8214	Robert Cox	$2,846	$2,846	190	949

8216	Baker Shelton	$2,070	$2,070	138	690
	Totals	**$25,609**	**$25,609**	**1,720**	**8,014**

Project: No-till seeding in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2001

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8212	Mike Anderson	$2,730	$2,730	182	728
8213	Warren Acres	$465	$465	31	155
8236	Williams Bros.	$2,025	$2,025	135	540
	Totals	**$5,220**	**$5,220**	**348**	**1,423**

Project: No-till seeding in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2002

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8236	Williams Bros.	$2,025	$2,025	135	540
8240	Virgil Bowles	$ 675	$ 675	45	225
8245	Slaybaugh Bros.	$3,000	$3,000	200	1,800
8246	Baker Shelton	$4,731	$4,731	315	1,262
8247	Gilbert Farm Partnership	$1,539	$1,539	103	410
	Totals	**$11,970**	**$11,970**	**798**	**4,237**

Figure 1 John Deere 750 No-till Drill

This drill (Figure 1) and others similar to this are used to no-till grain crops into soil that has remained undisturbed since the last crop. The drills are capable of preparing a seed bed, placing fertilizer and seeding in one operation. The advantage of this seeding system is the overall reduction in soil erosion and the improvement of soil health. When soil is not cultivated as it has been in the past, a much lower amount of carbon dioxide is released into the atmosphere. The soil is not left exposed to the elements and will not erode from the crop fields into nearby streams. No-till or direct seeding in conjunction with annual cropping and crop rotations is one of the very best ways to reduce upland erosion and the resulting sedimentation into our fish bearing streams.

Project: Two Pass in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2000

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8161	Scott Davis	$662	$662	66.2	132
8174	Warren Acres	$780	$780	78	234
8186	Shawley Family	$2,500	$2,500	250	750
8189	Bob Cox	$5,000	$5,000	500	3,000
8190	Buddy Boyd	$271	$271	27.1	271
8191	Pat McGreevy	$193	$193	19.3	115.8
8194	Paul Kimble	$826	$826	82.6	660.8

8195	Slayco	$2,194	$2,194	235.6	942.4
8202	Wynn Stallcop	$1,174	$1,174	117.4	587
8207	Bob Bingman	$1,132	$1,132	113.2	566
8210	Herres Land Co.	$1,823	$1,823	182.3	546.9
	Total	**$16,555**	**$16,555**	**1,672**	**7,806**

Project: Direct Seeding in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2001

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8218	Slayco	$3,610	$3,610	361	3,249
8219	Tetrick Inc.	$1,847	$1,847	185	739
8221	Warren Acres	$1,920	$1,920	192	960
8224	Pataha Creek Farms	$1,000	$1,000	100	500
8227	Bob Bingman	$2,523	$2,523	252	1,252
8230	Max Scoggin	$1,010	$1,010	101	808
8231	RC Farms	$3,600	$3,600	360	1,440
8232	Dale Heitstuman	$619	$619	61.9	310
8233	Herres Land Co.	$4,259	$4,259	425.9	1,818
8235	Wynn Stallcop	$1,686	$1,686	168.6	674
	Total	**$22,074**	**$22,074**	**2,207**	**11,760**

Project: Direct Seeding in Pataha Creek Watershed, BPA Contract #99BI-19595 in 2002

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8229	WP Farms	$1,040	$1,040	104	520
8237	Tetrick Inc.	$1,877	$1,877	188	751
8241	Pataha Creek Farms	$2,915	$2,915	292	875
8242	Max Scoggin	$1,400	$1,400	140	420
	Total	**$7,232**	**$7,232**	**723**	**2,565**

Figure 2 Straw Boss fertilizer applicator

The two pass/direct seeding system is very similar to no-till seeding. The difference is that under a two-pass/direct seed system, the fertilizer is applied in a separate operation from the seeding of the crop.

Two pass/direct seeding is as good as no-till in reducing soil erosion. It leaves large amounts of residue on the soil surface for protection against wind and water erosion. It opens up the ground so moisture may enter more readily.

Unlike no-till seeding, most two pass/direct seed systems disturb the soil in such a manner that the overall soil health is not improved and larger amounts of carbon dioxide escape into the atmosphere.

The availability of the necessary equipment to do this conservation practice is much higher than a no-till operation. Most of the chemical and fertilizer dealers have the fertilizer equipment available and many have purchased drills capable of seeding into the high residue.

This practice is the next best thing to no-till and has brought many cooperators into the area of minimum tillage, annual cropping and crop rotations.

Project: Bank Stabilization in Pataha Creek Watershed, BPA Contract #9BI-19595

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8229	Blaine Fletcher	$744	$248		

One bank stabilization project was completed in 2000. This simply involved the cabling of woody debris into the inside curve of an eroding bank on the lower Pataha Creek. Although there are several of these type sites on the Pataha, most of them a being stabilized with livestock exclusion programs such as CREP or CCRP or some other riparian restoration program. This particular practice was used more in previous years but proved too costly and the board of supervisors felt that other practices should be addressed that would accomplish more at a lesser cost.

Bank Stabilization project on lower Pataha Creek in 2000

Project: Critical Area planting in Pataha Creek Watershed, BPA Contract #9BI-19595

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8223	L&M Ranch	$4,275	$1,425	28	313

Figure 3

Critical Area planting is a practice used on a very limited basis in the Pataha Watershed. There are areas in the watershed like that illustrated in Figure 3 that need taken out of production. These areas have been severely eroded over the years and are very low on organic matter. These areas are small acreages of a few acres here and there that are too small to enroll in any kind of program such as CRP or CCRP. The ground is planted to grass for a period of ten years and the producer is paid $15 per acre for the length of the contract up front. After the contract ends in 10 years, the land may be returned to production. In most cases, it will remain as pasture land with grazing allowed.

Project: Riparian and Upland Fencing in Pataha Creek Watershed, BPA Contract #99BI-19595

Upland and Riparian Fencing in Pataha Creek WS 2000-2002

CS #	Operator	BPA CS	Operator CS	Feet	Tons soil saved
8089	L&M Ranches	$1,583	$528	9,000	
8249	Ron Kessler	$524	$175	1,500	
	Total	$2,107	$703	10,500	

Figure 4

In the Pataha Creek Watershed, riparian fencing (figure 4) is being accomplished through BPA Cost Share programs. As the picture shows, the riparian area along much of the Pataha Creek lacks protection to help stabilize the high stream banks. Riparian fencing has allowed the landowner to remove livestock from the areas of these high banks. This then allows them to establish trees and grasses on and along these banks to protect them from collapsing into the stream. New programs such as the new CREP program will allow more farmers access to funding in the county to implement this particular practice.

Project: Grass planting in Pataha Creek Watershed BPA Contract #99BI-19595

Figure 5

This field (figure 5) was planted to grass as part of a 5-year crop rotation. The planting of grass increases the organic matter of the soil and reduces erosion dramatically. Grass in rotation as a conservation practice has been reduced over the last few years because of the elimination of burning as part of pest and weed control. New breeds of grass are being developed and hopefully will enable the increase use of this as a conservation practice.

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
8197	Williams Bros.	$642.60	$642.60	42	252
	In stream project sites	$52	$100	5	??
	Total	**$694.60**	**$742.60**	**47**	**252**

Project: Tree planting in Pataha Creek Watershed BPA Contract #99BI-19595

CS #	Operator	BPA CS	Operator CS	Acres	Tons soil saved
	University of Idaho	$1,986			
	Dayton Tractor	$10,529			
	DeRuwe, Inc	$4,236			
8139	Ray Noonan	$387	$387	½	
	Trees for Pataha	$12,008			
	DeRuwe, Inc.	$6,461			
	Robert Cox	$200	$200		
	Pomeroy Booster Club	$1,000			

8220	Fred Knebel	$501	$501		
	Meyers Hardware	$88			
	Total	**$37,395**			

Figure 6

Figure 7

Tree planting occurred over 5 miles of the Pataha Creek during the 2000-2002 calendar years. (Figure 6) shows hand planting taking place along the upper Pataha. The Salmon Corps, Pomeroy High School Football Team, and private individuals conducted this type planting. The whips that were used for planting were procured from the WACD Plant Materials Center in Bow WA and the rooted stock purchased from the University of Idaho in Moscow Idaho.

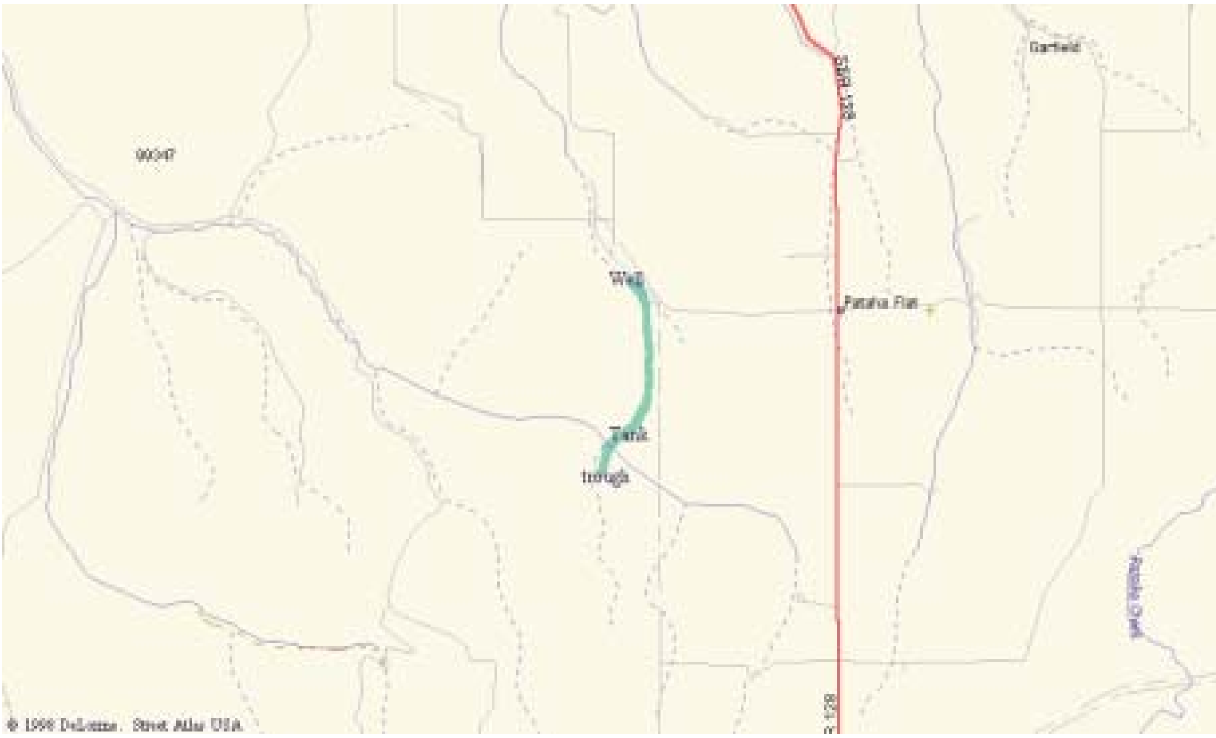
(Figure 7) shows one mechanical means used to plant rooted stock in some of the rocky areas along the Pataha and Tucannon. This unit was developed by Dayton Tractor and worked very well in getting the plants into the cobbles and river gravel.

Figure 8

(Figure 8) shows another mechanical device developed by Dayton Tractor for planting trees along the banks of the Pataha and Tucannon. This is a stinger unit that attaches on the end of a boom on a track hoe and allows for the planting of the trees along the rocky and steep banks.

An increased interest in the CREP program has taken place over the last couple years and many more acres of riparian area is being renovated and re-vegetated under that program with less funding being utilized from BPA funding.

Project: Off-Site Watering in Pataha Creek Watershed BPA Contract #99BI-19595



CS #	Operator	BPA CS	Operator CS	Feet	Feet of Riparian area
8238	Baker Shelton	$5,000	$1,666	5,800	700 ft
	Total	**$5,000**	**$1,666**	**5,800**	**700 ft**

One off-site livestock watering facility was developed under BPA funding in 2002. An area of a tributary stream to the Pataha Creek was signed up under the Continuous CRP program. That program would fund a storage tank, troughs and pipeline within 250 ft. of the riparian area. There was no electric power near the site and the drilling of a well was not feasible. There is an existing well within a mile of the site so a pipeline was needed to utilize the well for the livestock water source. The only cost share from BPA was for the pipeline. This project aided in the removal of livestock from the riparian area that improve water quality for fish located in the Pataha Creek.

Project: Sediment Basin construction and cleanout in Pataha Creek Watershed BPA Contract #99BI-19595

CS #	Operator	BPA CS	Operator CS	Cyds. moved	
8175	Berger Keatts	$1,083	$1,083	3,838	
8187	Tetrick, Inc.	$789	$789	2,797	
8188	Hastings Farms	$814	$814	2,884	

8184	Herres Land Co.	$469	$469	1,816	
8209	Larry Hoppe	$1,561	$1,561	3,122	
8225	Allen Ernster	$592	$592	1,184	
	Total	**$5,308**	**$5,308**	**15,641**	

Figure 9

Sediment Basins were dominant practices in the watershed over the years. Construction was completed by the use of backhoe or dozers like the one pictured in Figure 9. However in recent years, installation of this practice has declined significantly. Most of the problem areas already have basins or another conservation practice implemented. The reduced implementation can also be attributed to the fact that the adoption of no-till and direct seeding has reduced the runoff from fields and the producers no longer feel the need for building sediment basins.

Project: Terrace construction in Pataha Creek Watershed, BPA Contract #99BI-19595

CS #	Operator	BPA CS	Operator CS	Cyds	Tons of soil saved
8200	Bob Bingman	$236	$236	900	99
8149	Scott Davis	$1,126	$1,126	3,493	350
	Total	**$1,362**	**$1,362**	**4,393**	**449**

Figure 10

Terrace construction and rebuild (Figure 10), like sediment basins, has diminished in use over the last few years. Terraces require constant maintenance to function correctly and also make the cropland less efficient to farm because of all the small pieces that are formed by installing terrace systems. New technology is leading the way to fewer and fewer terraces remaining in the fields.

Project: Other projects in Pataha Creek Watershed BPA Contract #99BI-19595

An irrigation management project involved the cost sharing of a portable pump and hose for the watering of trees planted along a tributary to the Pataha. The CS for this project was $612 with an overall cost of $1,224.

Two grassed waterways were also constructed in the watershed. Waterways, like terraces and sediment basins, are giving way to newer practices that eliminate or reduce runoff before it starts, such as no-till and direct seeding. Those waterways that are already established are being maintained at the producer's own expense.

Project: Demonstration Windmill in Pataha Creek Watershed BPA Contract #99BI-19595

Figure 11

A new and innovative project was undertaken in 2002 with the construction of this windmill on Sweeney Gulch within the Pataha Creek Watershed.

With an increased focus on restoration and improvement of riparian area and the continued effort to improve water quality through the CREP, DOE, CCRP, and other programs, some producers are being asked to remove cattle from this riparian area and provide drinking water from other sources. Many of these sites are located in remote areas with no access to electrical service or it would be very cost prohibitive to get power to the site.

At some sites, generators are used to pump the water from the well into storage tanks where it then gravity flows into troughs for the livestock. This option requires site visits several times a week depending on the number of cattle being watered.

The idea of using an old watering method incorporated with the latest technology led to the idea of purchasing a windmill from Dutch Industries in Canada.

Many farmsteads currently have wells, that in the past, used windmills to pump water for there domestic and livestock watering needs. As a person travels around the watershed, many of these old windmill sites can be located.

The demonstration windmill will be used to show this old watering method coupled with new technology. Figure 11 shows the windmill nearing completion. Figure 12 thru 14 shows the construction process. Figure 15 shows the windmill location, pipeline, and trough location. The landowner provided the well site while the livestock operator that leases the pasture provided the pipeline and installation. BPA provided cost share for the windmill and watering troughs at the end of the pipeline.

This windmill provides water from a 90 ft. well to two separate watering sites located on the ridge top away from the Pataha Creek. It pumps 4 gpm with a 15 mile per hour wind. One site is 2,269 feet from the windmill while the other is 2,862 feet. Both sites have removed the livestock from watering out of the near by streams, both of which contain Steelhead.

The BPA project costs associated with this alternate watering facility is about $10,000. Total cost associated with the entire project with well cleaning, pipeline and its installation is roughly $16,000.

Figure 12

Figure 13

Figure14

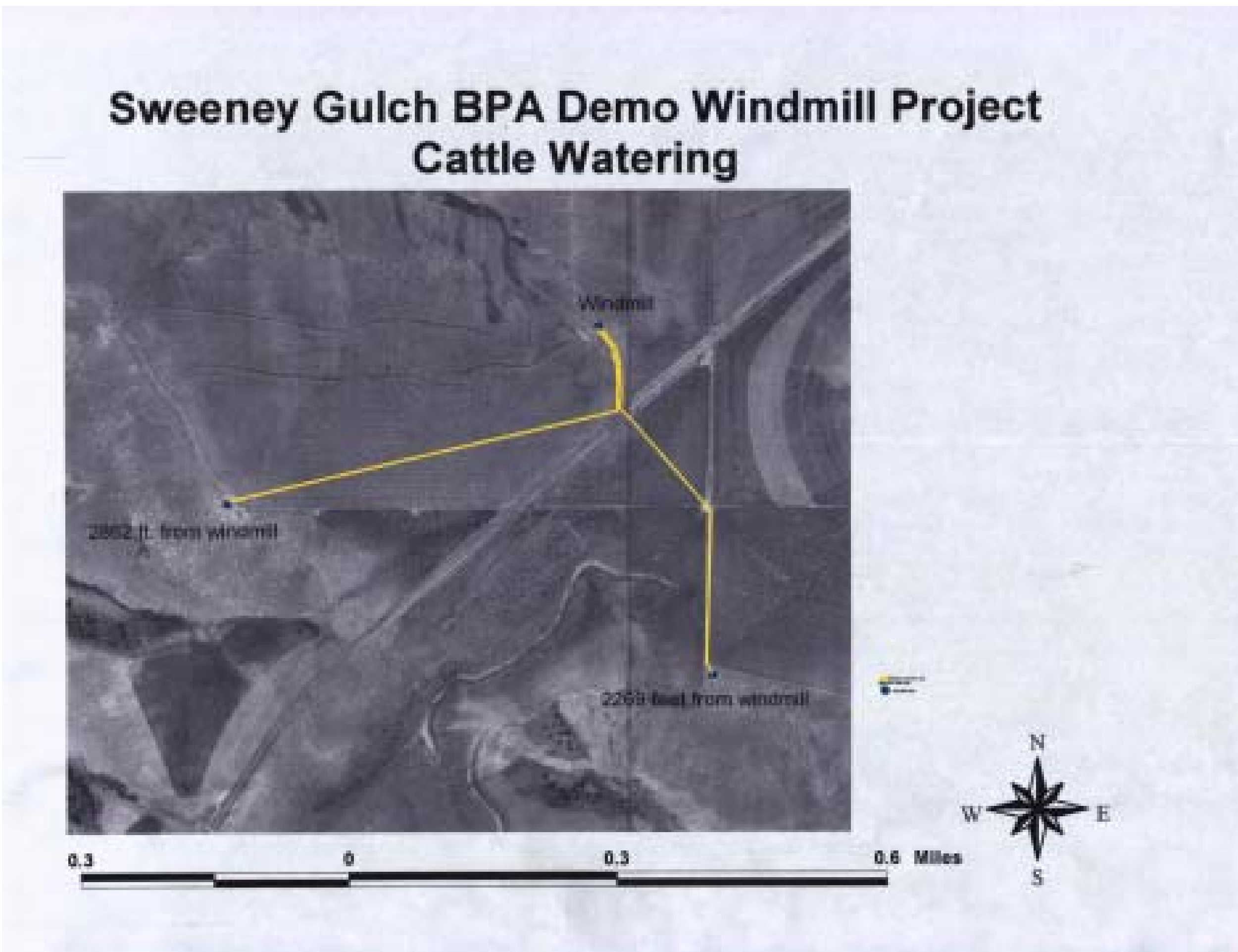


Figure 15

Figure 3 Water quality monitoring station P-4

The water quality-monitoring program in the Pataha Creek Watershed, Deadman Creek Watershed, and Alpowa Creek Watershed was funded under several different funding programs. Besides BPA, the Washington State Conservation Commission provided funding under a Limiting Factors grant. The initial program ended in June of 2001 but is being reinstated under a current Department of Ecology grant received by the district in 2002. The following information was extracted from the WSU final report for the Pataha Creek Watershed.

3.0 Introduction

The objective of this study is to evaluate the water quality in the Pataha Creek watershed in an effort to determine the effectiveness of agricultural conservation practices in southeast Washington's Pomeroy Conservation district. Data presented were collected between March 1999 and July 2001, and then analyzed by Washington State University's Department of Biological Systems and by the Center for Environmental Education.

Pataha Creek is listed as a water quality limed stream by the state of Washington for fecal coliform and is included on the 303(d) list. (WDOE 2000). Washington's Department of Ecology has designated Pataha Creek as a Class A stream according to the beneficial use criteria (Table 1).

Table 1 Washington state class A criteria for water quality

	Temperature*	TSS**	Fecal Coliform*	Flow*	Common Uses*
Class A	Should not exceed 18°C (64°F) due to human activities. For temperatures exceeding 18°C, activities raising temperatures 0.3°C will not be allowed.	<80 mg/L	Shall not exceed 100cfu/100mL and no more than 10% of the samples can exceed 200 cfu/100mL.	Must sustain common uses	Recreation, fish migration, rearing, and spawning

*WAC 127-201A, **USFW 1995

3.1 Watershed Overview

Located in southeastern Washington, Pataha Creek is the principal tributary to the Tucannon River and is often considered as a separate water body (Steering Committee 1997). Draining an area of 183 square miles, Pataha Creek generally flows west from its headwaters in the Blue Mountains (5,647 ft) to its confluence with the Tucannon River (748 feet;

Primary tributaries to Pataha Creek include:Bihmaier Gulch, Sweeney Gulch, and Tatman Gulch. Average annual precipitation is approximately 16 inches per year. While this does not lend to particulary large flows, warm rains following a period of accumulating snow have resulted in damaging floods in 1950, 1964, 1966, 1971, and 1996 (FEMA 1993). Summers in the Pataha watershed are typically hot, while winters tend to be cold.

3.2 Methods

3.2.1 Monitoring Protocol

Five monitoring stations were designated within the main stem of Pataha Creek (Figure 4; Pat 5 – Pat 1). Pat 5, the highest in the watershed was located in the foothills of the Blue Mountains, just upstream of Columbia Center. Pat 4 was located approximately six miles upstream of the city of Pomeroy while Pat 3 was located four and a half miles downstream. Pat 2 was set at Dodge and Pat 1 was located about one mile upstream of the confluence with the Tucannon River. The following list provides a more precise description of each site.

Pataha 1
SR 261 at Delaney; 100 yards west of culvert-bridge, below Dry Hollow confluence
46º 30' 52.1"N, 117º 58' 25.6" W
T 12 N, R 39 E, S 19

Pataha 2
SR 12 at Dodge Junction; Owens Road Bridge
46º 31' 27.9" N, 117º 49' 19.2" W
T 12 N, R 40 E, S17

Pataha 3
SR 12 at Marengo Road Bridge

46º 27' 49.4" N, 117º 42' 20.9" W
T 11 N, R 41 E, S 5

Pataha 4
1/4 mi south of SR 12 at Bergschneider's upstream of Sweeney Gulch confluence
46º 21' 36.1" N, 117º 28' 2.1" W
T 11 N, R 43 E, S 7

Pataha 5
1 mi. SE of Columbia Center on Pataha Creek Road, private drive on south side of road
46º 20' 40.9" N, 117º 32' 31.2" W
T 10 N, R 42 E, S 15

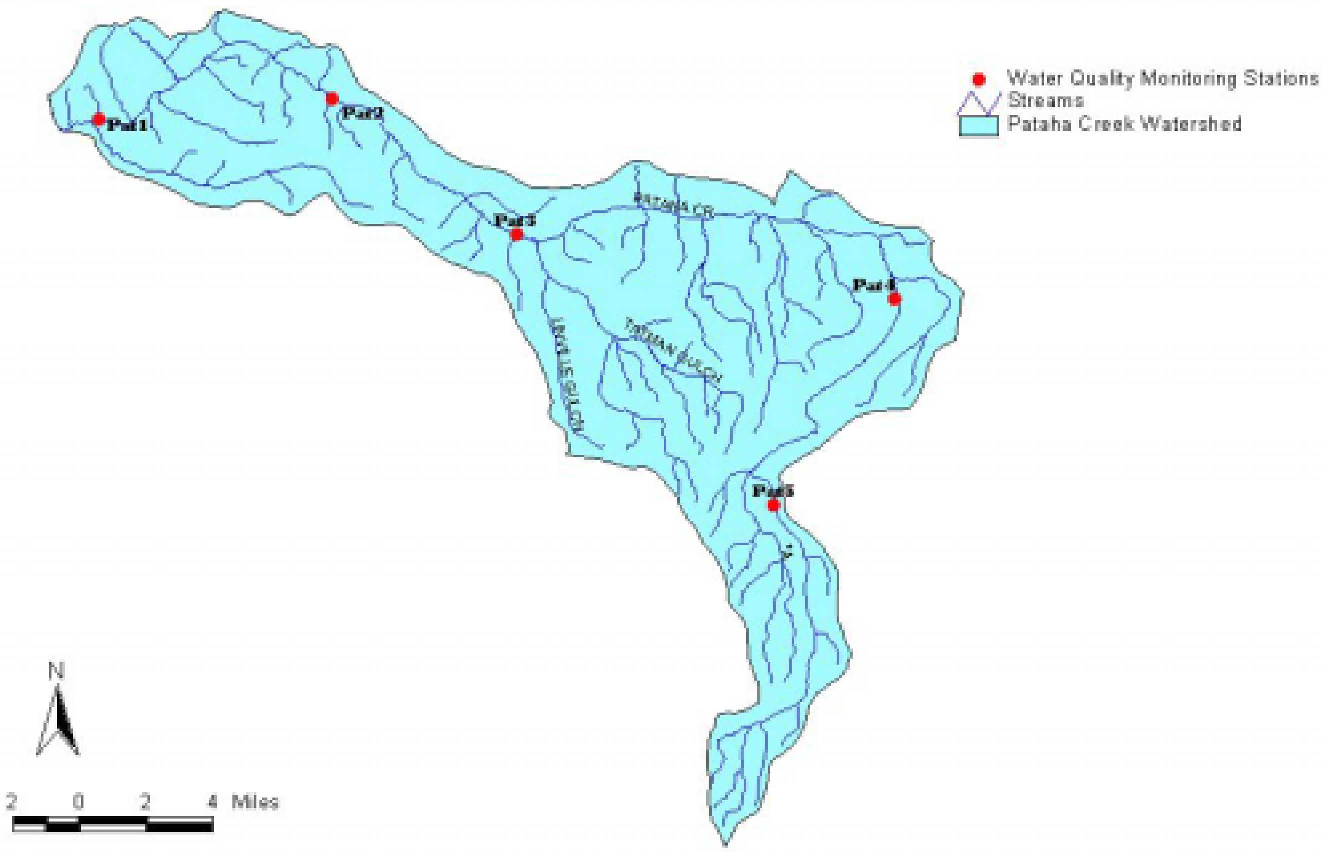


Figure 4 Water quality-monitoring stations defined in the 1999-2001 Pataha watershed study

Temperature (°C), sediment (Total Suspended Solids –TSS), Fecal coliform (cfu/100mL), flow (cfs), ammonia (ppm), nitrate (ppm), total Kjeldahl nitrogen (TKN –ppm), and total phosphorus (ppm) were monitored from samples collected and immediately transported to the WDOE certified water quality lab at Washington State University.

3.2.2 Laboratory Methods

Analyses were performed according to the analytical, quality control, and quality assurance procedures approved by WDOE.

3.2.3 Statistical Methods

Mean

Data from each site was compiled into tables and graphs in order to recognize spatial and temporal trends. Monthly values represent the mean (average) value of all data taken for each month. All data points have been assigned the same weight, such that no single value affects the mean more strongly than any other data point in the same year. The monthly values were then averaged such that each year carries equal weight.

Standard Deviation

Standard deviations, or the spread in data, were calculated for each parameter as well. Generally, larger standard deviations indicate less certainty in the precision of the data; however, since monthly values are taken over a period of time when the parameter may very well be changing with respect to time, the magnitude of the standard deviation may be due to a trend in the parameter measured rather than variability of the measurement. For example, in the summer temperatures may rise significantly over the period of a month. This rise in temperature causes a spread in the monthly data, which thereby increases the standard deviation. In contrast, total suspended solids probably do not change significantly over the period of a month throughout most of the year (except in the early spring). Therefore, any changes in data points are due to variability and are correctly evaluated with respect to the standard deviation.

t-Test

In order to compare data from different sites and from different time periods a statistical method must be applied. The separate variance t-test of inferential statistics has been chosen (Oct 1993). Table 2 reports how a t-test was applied to each parameter.

Table 2 Questions that each t-test answers.

Parameter	Question
Temperature	Are average summer temperatures significantly different?
Sediment	Are average annual TSS levels significantly different?
Fecal coliform	Are average annual Fecal coliform levels significantly different?
Nutrients	Are average annual nutrient concentrations significantly different?

All t-tests were applied using a 90% confidence interval. That is to say, if the answer to any of the questions is yes, one could be 90% certain no mistake has been made. This however, does not imply that if the answer is no that one could be 90% confident that such is the case. The certainty applies only to inferences made about differences. A “better safe than sorry” applies to saying that two parameters are the same.

4.0 Results and Discussion

Although the monitoring period runs from March 1999 – July 2001, the sampling period will be referred to as 1999-2001 to simplify the text and shorten titles.

Temperature, sediment and fecal coliform levels were analyzed as a function of distance since larger changes should be expected along larger distances
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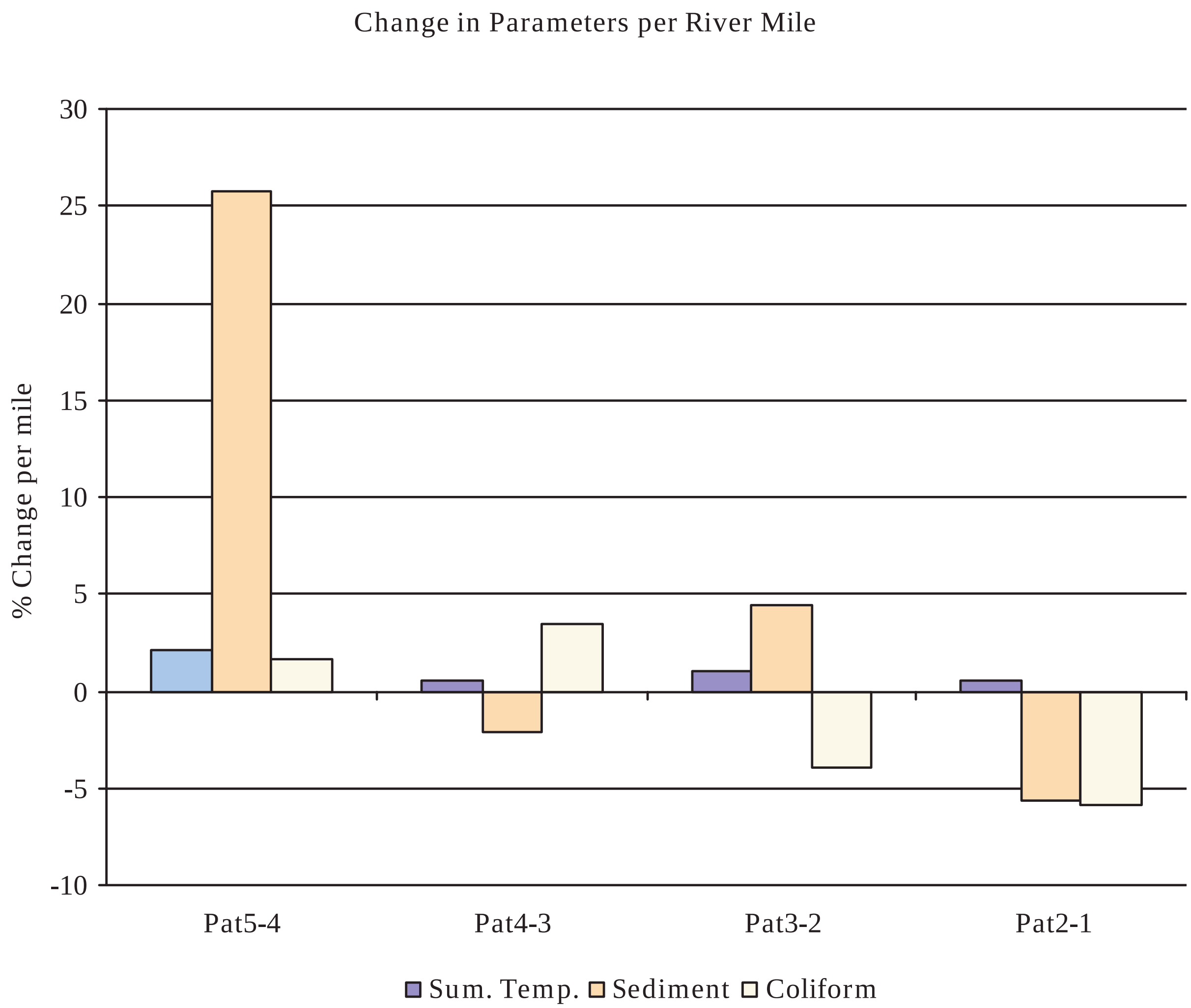

Figure 5). No dramatic changes were recorded with the exception of a 25% increase in TSS concentrations between Pat 5 and Pat 4.

All changes in temperature were increases, but the greatest increase (between Pat 5 and Pat 4) was below 2.25%. Coliform levels increase between sites Pat 5 and Pat 3, then decrease between Pat 3 and Pat 1.

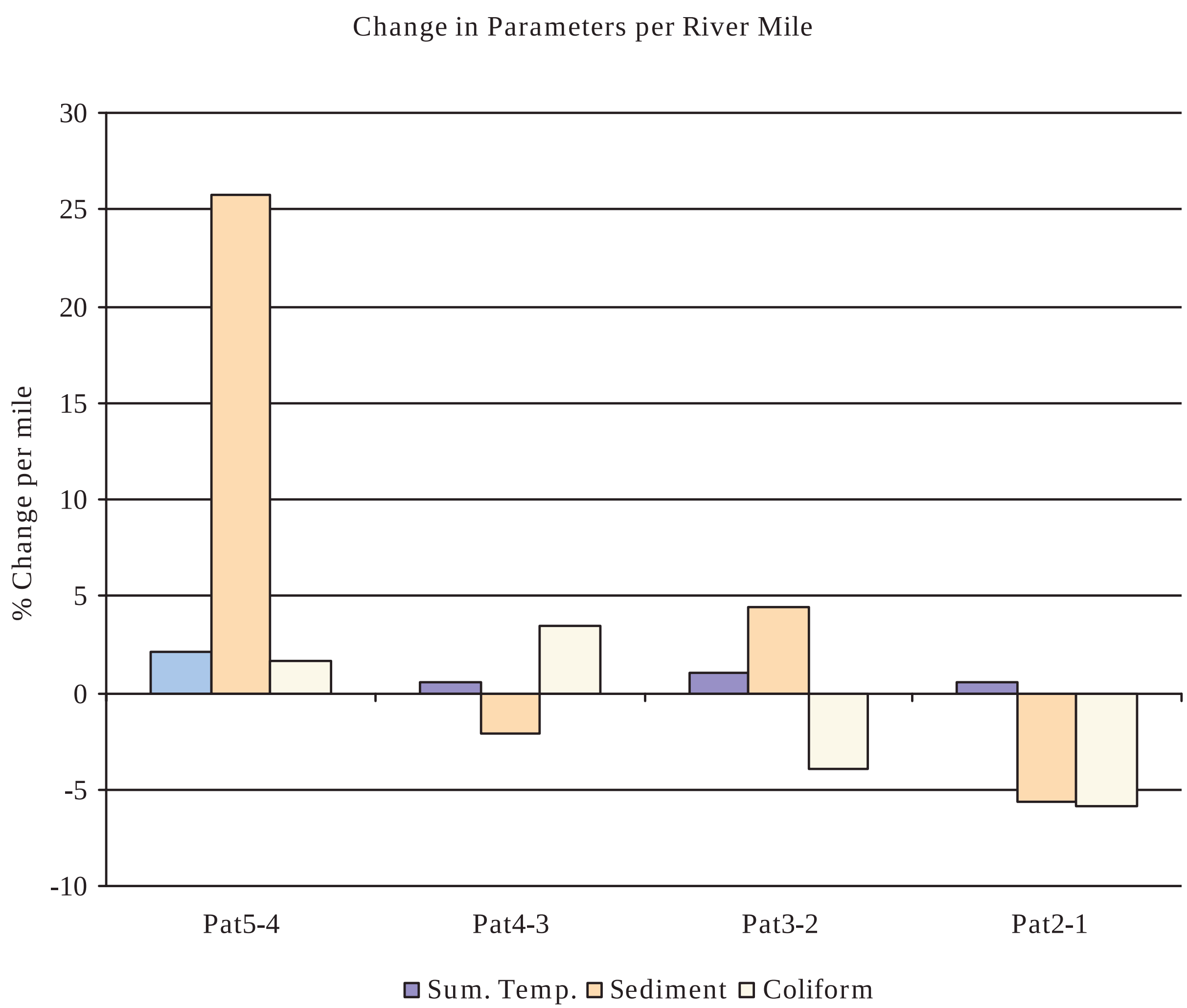

Figure 5 Change in parameters per river mile

4.1 Temperature

Elevated temperatures are the most common reason for 303(d) listing in the state of Washington. Excessive temperatures may result from a variety of factors, but are most often associated with a loss of stream canopy. Many aquatic species are stressed or killed by excessively high water temperatures. Higher temperatures promote faster biological growth rates and more rapid transformation of nutrients. Warm water holds less oxygen and other gasses. Cooler temperatures cause water to become more viscous, hold more oxygen, and suppress rapid biological growth rates.

Temperatures in Pataha Creek were highest in 1999, and were essentially equal in 2000 and 2001 (Figure 6). All sites exceeded the state standard of 18°C annually, except for site Pat 5, whose monthly average never exceeded the standard.

Mean monthly stream temperatures peak in July and are lowest during fall and winter months (Figure 6). Downstream monitoring sites Pat 3 – Pat 1, were significantly ($P \leq 0.10$) warmer than upstream sites (Pat 4 – Pat 5).

Historic temperatures are similar to those in the current study with the exception of August, where the historic value was much higher than that in the data collected more recently (Table 3). A meaningful statistical analysis could not be completed based on available data.

Table 3 Historic and current (1999-2001) temperatures from Pataha Creek (WDOE 2001).

	Historic Temp. (°C)	**Current Temp. (°C)**
10/6/96	14.4	9.98
11/3/96	6.1	3.37
12/1/96	5.2	3.18
1/12/97	-0.8	1.84
2/2/97	3.9	4.00
3/2/97	5.8	8.74
4/6/97	9.3	10.75
5/4/97	13.5	13.32
6/1/97	14.4	19.16
7/6/97	23.2	21.10
8/3/97	27	20.20
9/7/97	19	13.38

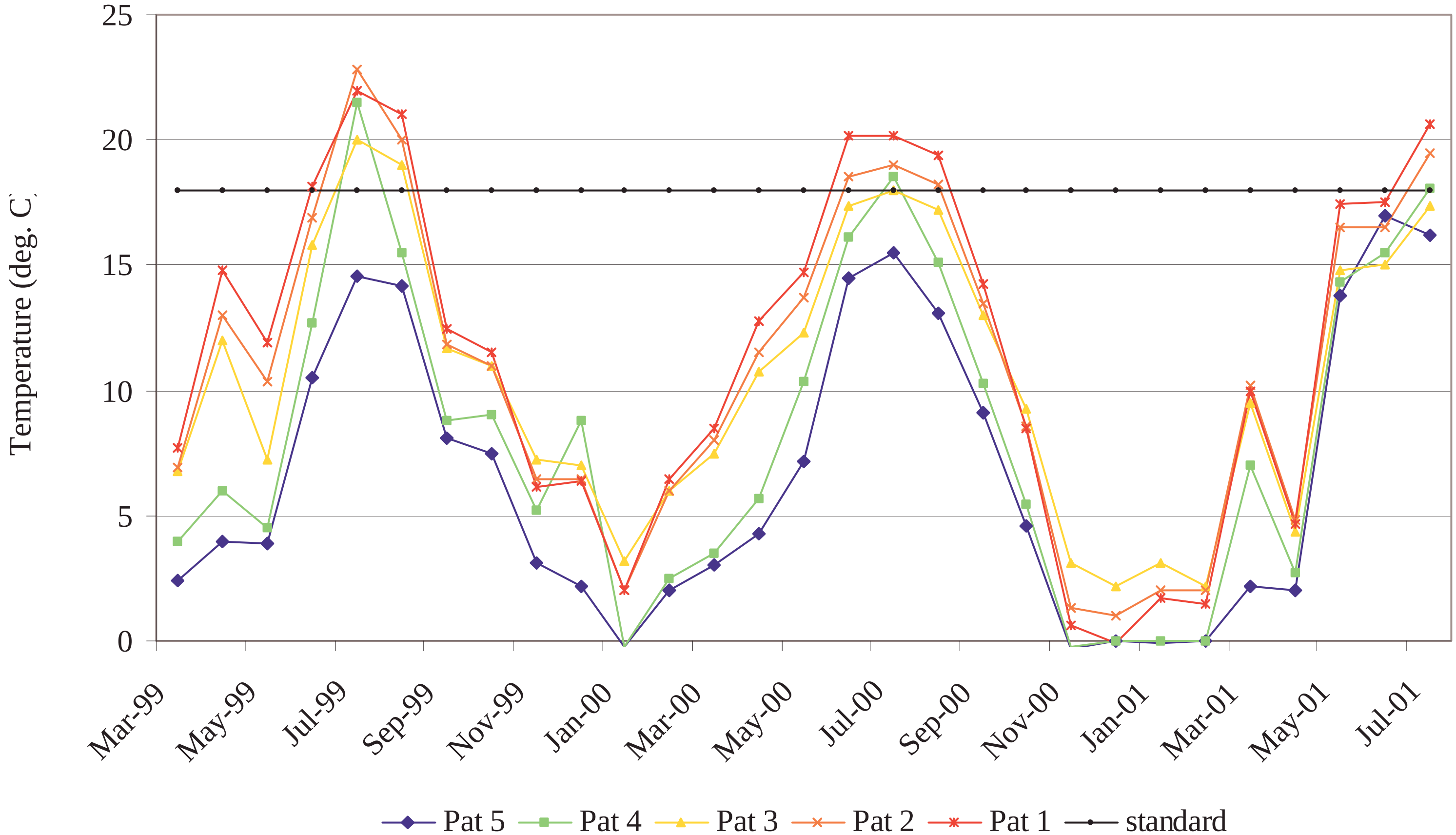

Figure 6 Mean annual stream temperatures at Pataha Creek monitoring sites (1999-2000)

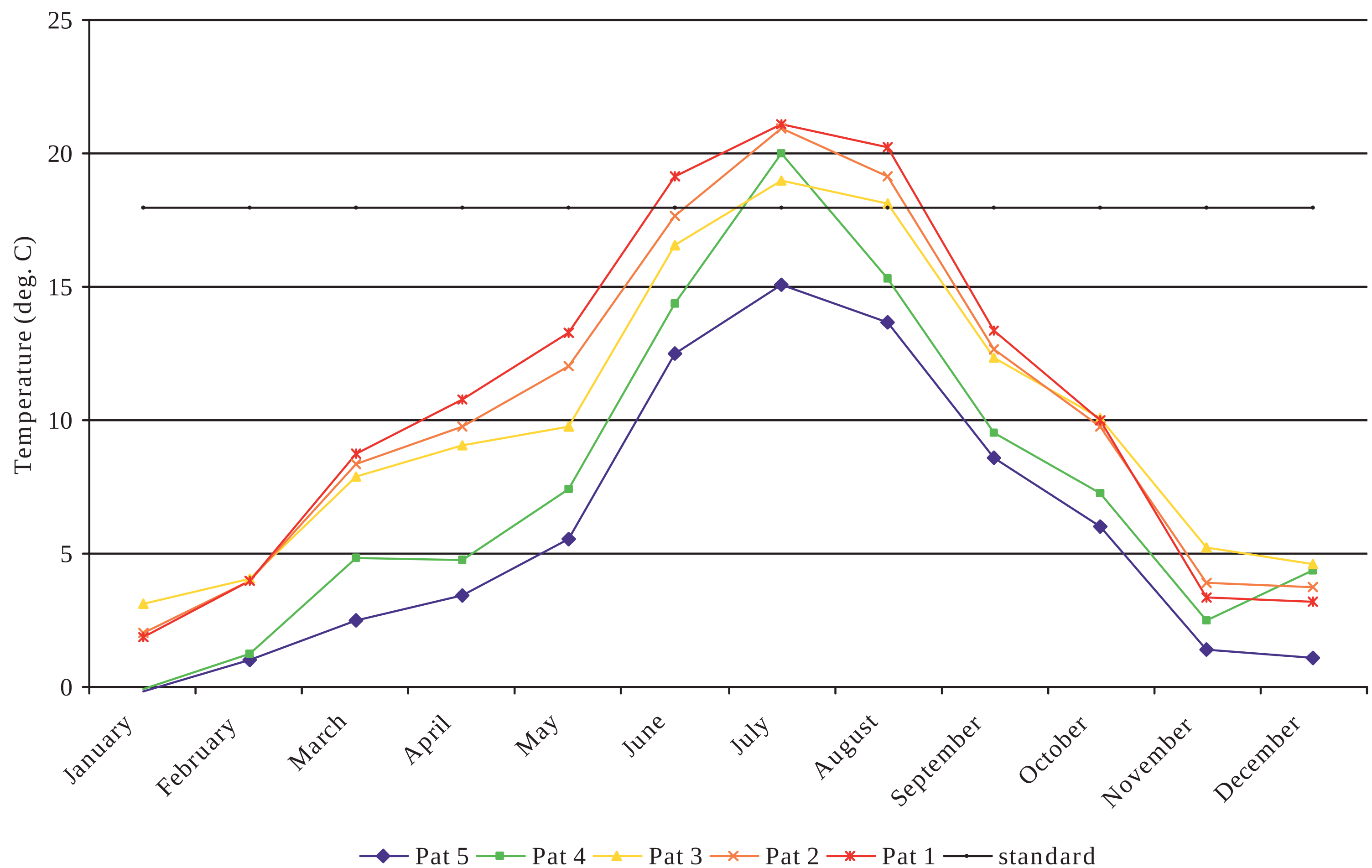

Figure 7 Average monthly stream temperatures at Pataha Creek monitoring sites (1999-2000)

4.2 Sediment

Total suspended solids (TSS) represent the total amount of solids in the water including suspended, dissolved, and organic solids. Since TSS represents the sum total of the non-water component of stream flow under normal conditions, the amount of TSS often correlates with other physical constituents found within the water column.

High sediment levels may lead to decreased health of aquatic systems both directly, and indirectly through habitat degradation. Sedimentation deposits can not only degrade habitat, but also act as a reservoir for nutrients, suspended solids, and fecal coliform bacteria. Water with high levels of suspended solids will also absorb more energy from the sun and warm faster than clear water.

Sediment levels were highest in May 2000 at the Pat-4 monitoring site (Figure 8). Monthly variation in sediment concentrations included high levels in spring, low levels in summer, and variable levels in winter and fall (Figure 9). No spatial trend in sediment concentrations was evident, although concentrations at sites Pat-4 and Pat-2 were significantly higher than those recorded at Pat-5.

Current sediment levels are much lower than those found in 1996/1997 (Table 4); however, there is inadequate data to determine whether or not the difference is significant.

Table 4 Historic and current (1999-2001) sediment in Pataha Creek (WDOE 2001)

	Historic Sediment (mg/L)	Current Sediment (mg/L)
10/6/96	4	1.73
11/3/96	15	1.15
12/1/96	56	22.90
1/12/97	31	8.19
2/2/97	1350	37.20
3/2/97	927	26.60
4/6/97	46	18.83
5/4/97	141	39.25
6/1/97	2300	19.15
7/6/97	9	2.80
8/3/97	15	1.00
9/7/97	31	1.79

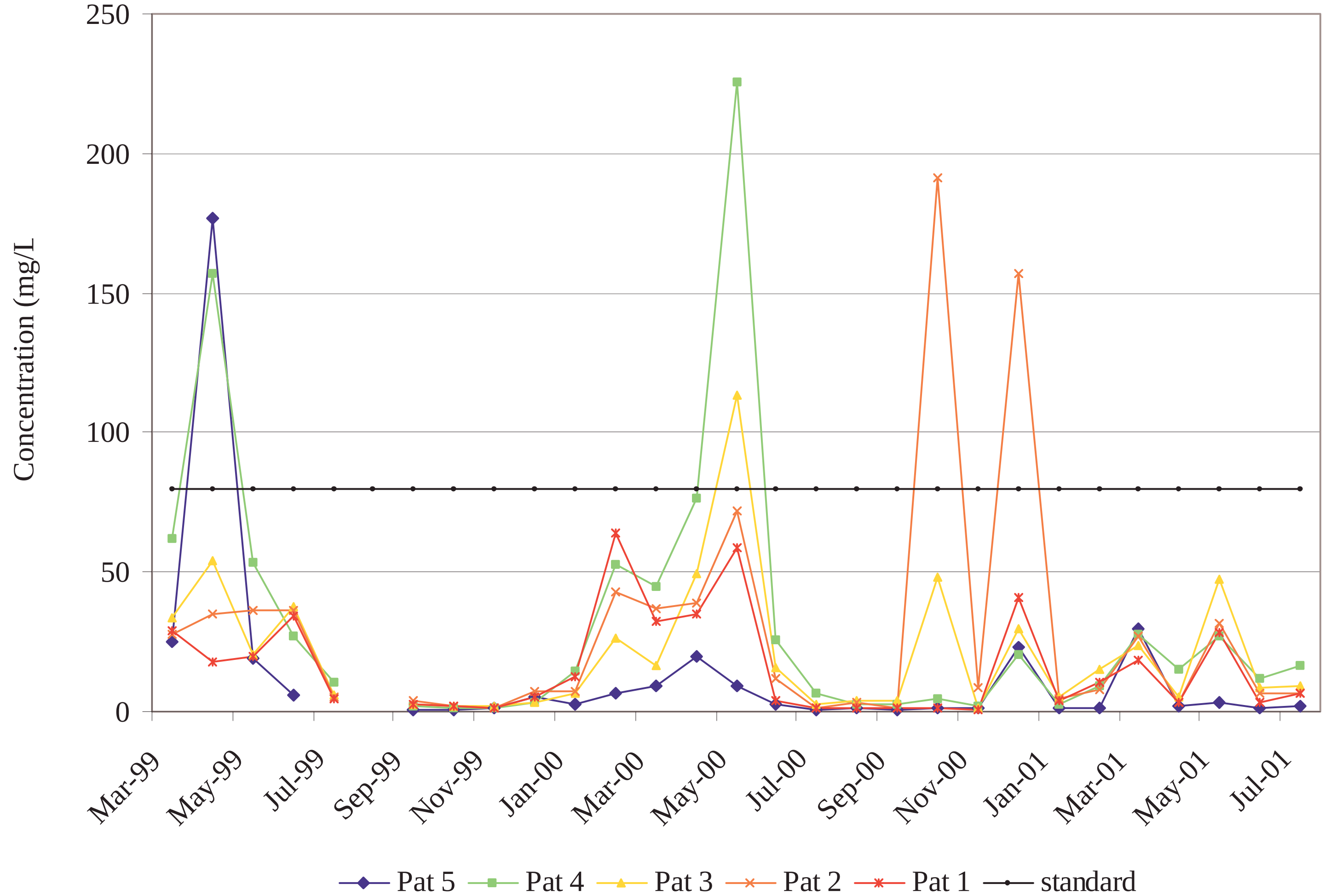

Figure 8 Average annual sediment concentrations in Pataha Creek (1999-2000)

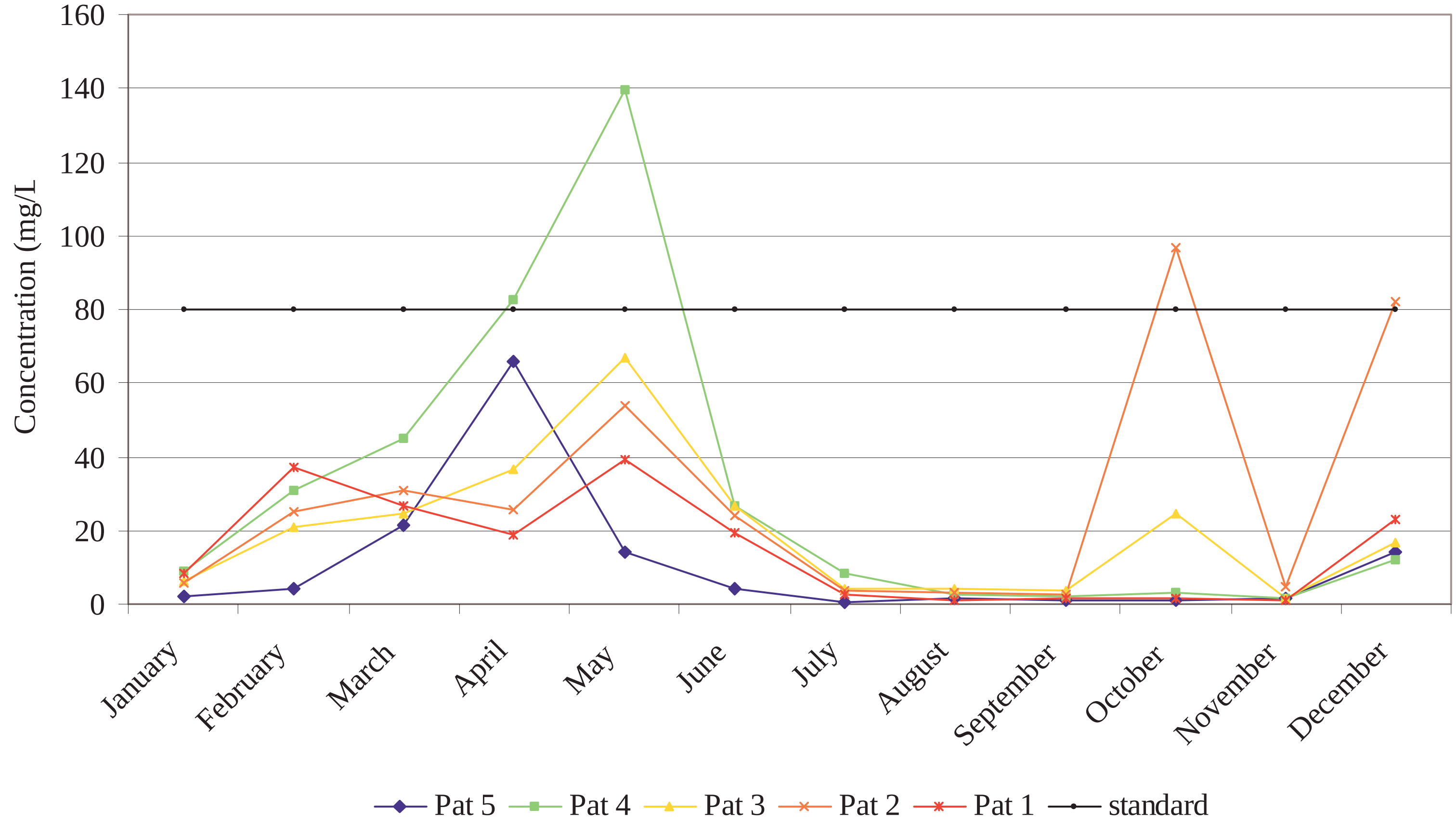

Figure 9 Mean monthly sediment concentrations in Pataha Creek (1999-2000)

4.3 Fecal Coliform

Fecal coliform bacteria are an indicator of the potential pathogenic bacteria living in the water. In stream environments, fecal coliform are able to survive and grow best in warm environments with high concentrations of nutrients and suspended solids.

Violations of state standards for fecal coliform occurred 10 months out of the year at one or more sites. All sites violated state standards June through August (Figure 10). Monthly geometric mean coliform levels exceeded 500 cfu/100 mL seven times (Figure 10).

Fecal coliform concentrations reached their highest level in 2000 (Figure 11). Concentrations were highest May through September (Figure 12). Average concentrations increased in the downstream direction, peaked at station Pat 3, and then decreased. No sites were statistically different from Pat 5 Historic and current fecal coliform concentrations are shown in Table 5.

Table 5 Historic and current (1999-2001) fecal coliform levels in Pataha Creek near the mouth (WDOE 2001).

	Historic Coliform (cfu/100mL)	Current Coliform (cfu/100mL)
10/6/96	61	138
11/3/96	57	43
12/1/96		162
1/12/97	60	26
2/2/97	85	57
3/2/97	700	133
4/6/97	14	98
5/4/97	250	350
6/1/97	7600	206
7/6/97	280	366
8/3/97	210	242
9/7/97	100	344

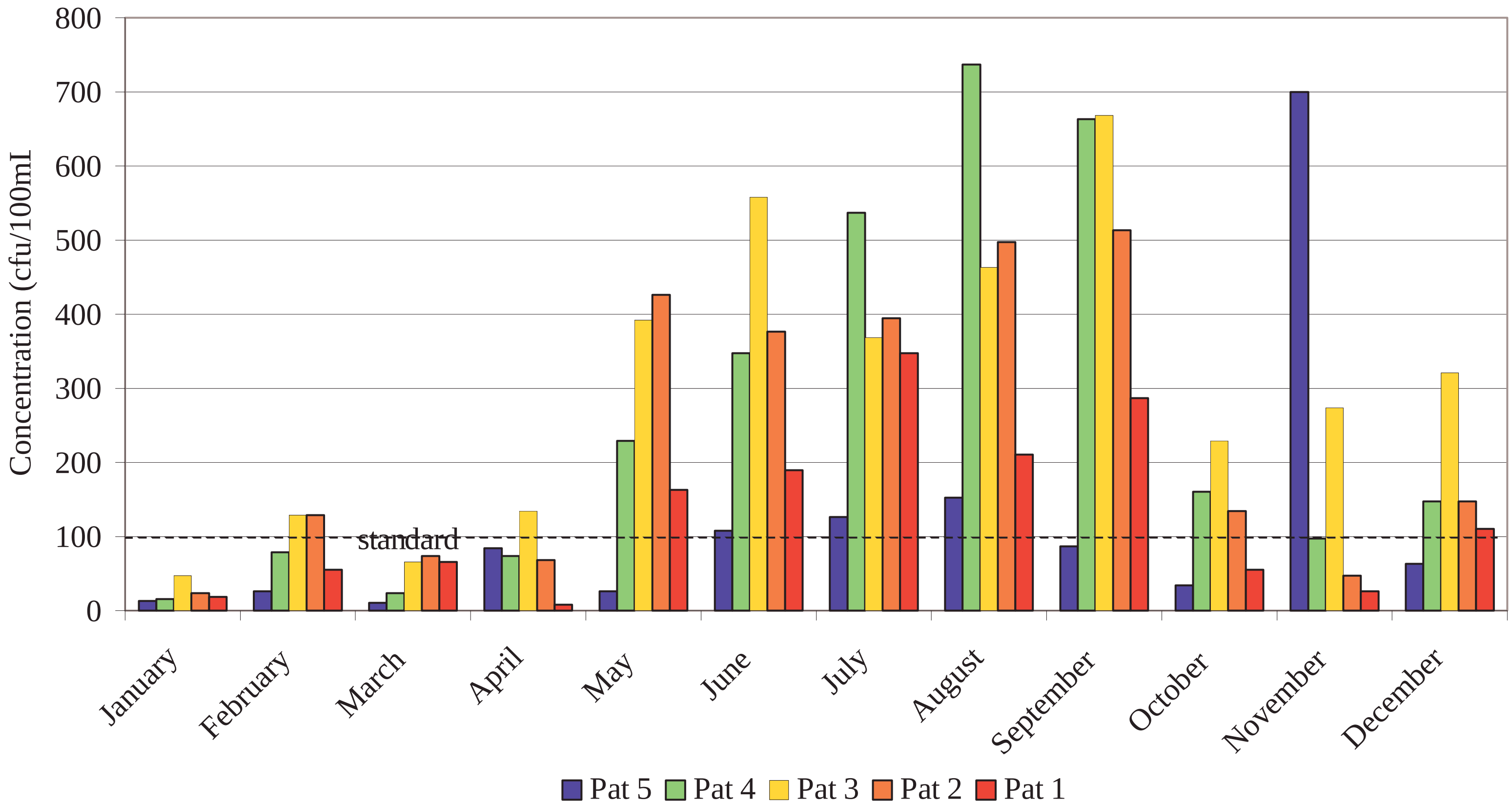

Figure 10 Fecal coliform monthly geometric mean

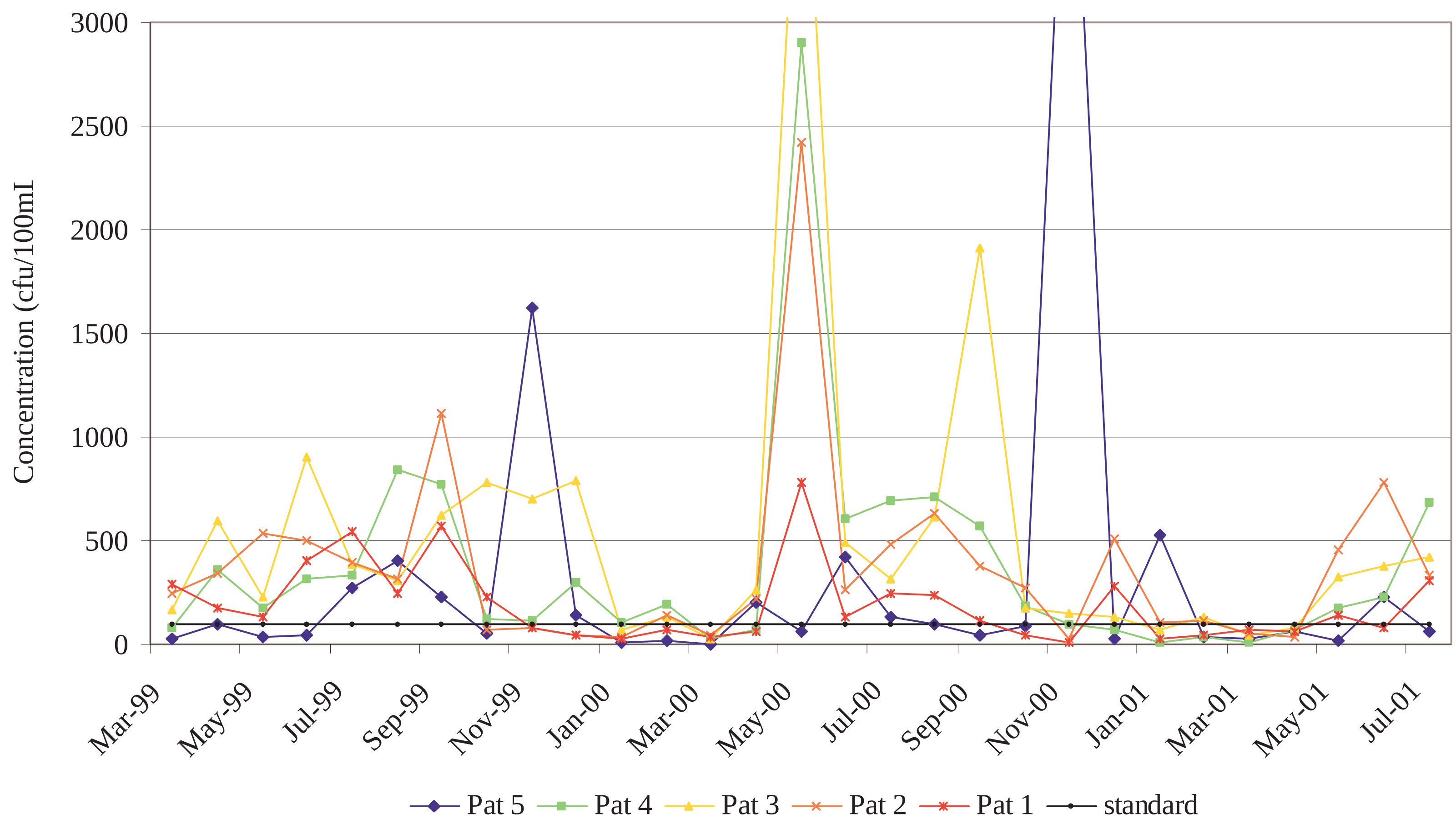

Figure 11 Mean annual coliform concentrations in Pataha Creek (1999-2000)

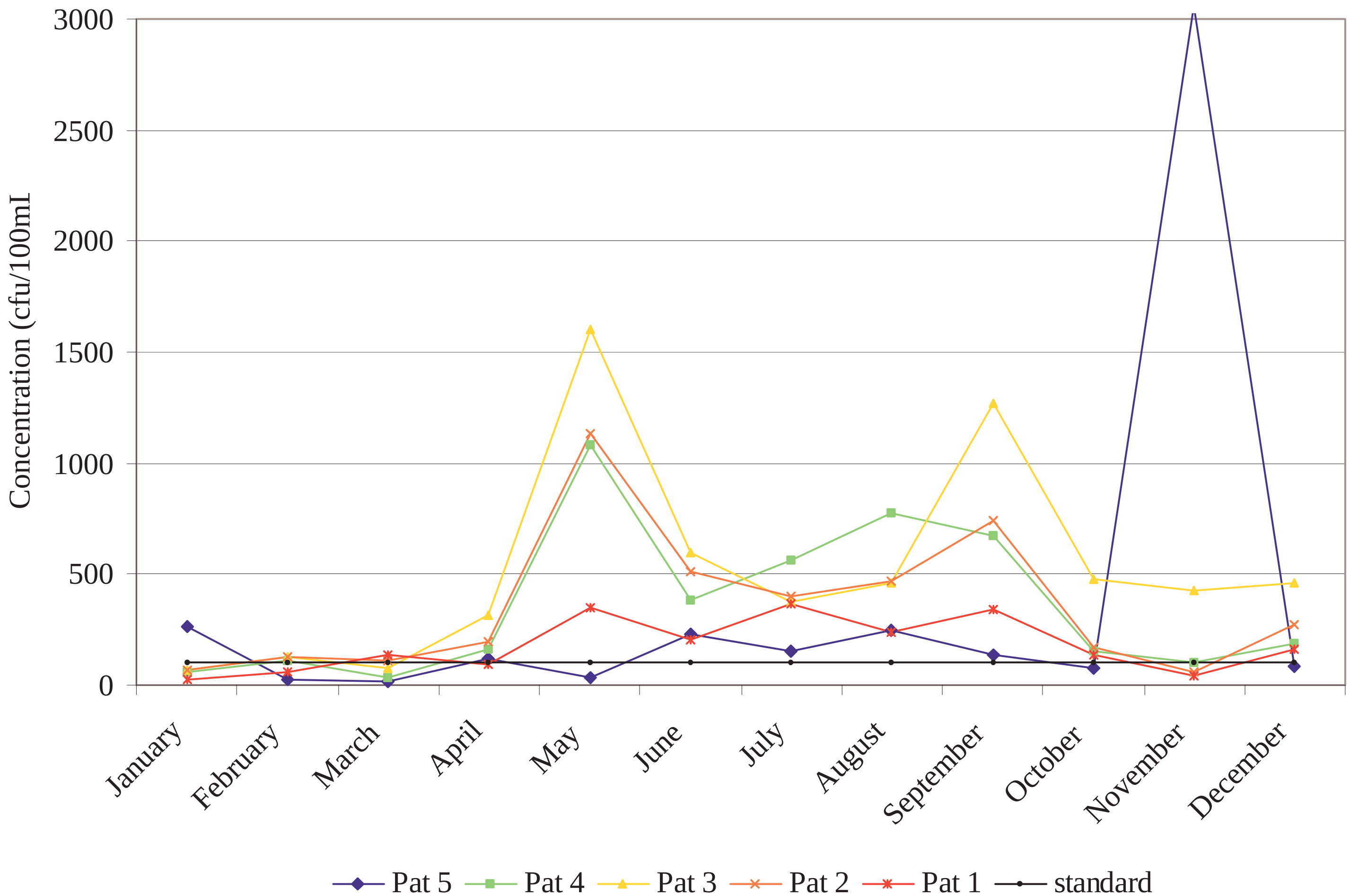

Figure 12 Average monthly coliform in Pataha Creek 1999-2000

4.4 Nutrients

Ammonia, nitrate, total Kjeldahl nitrogen (TKN), and total phosphorus were monitored between 1999 and 2001. Ammonia, in the ammonium (NH_4) form, is one of the few natural cations and therefore does not easily move through the soil. Ammonium is a weak acid, very volatile, and used as a fertilizer; however, ammonia must be converted into nitrate before it can be assimilated by most crops. Nitrate (NO_3^-) is the most oxidized nitrogen compound common to the environment. It is a component of many fertilizers and prone to leaching. TKN is the sum of organic nitrogen and ammonia. Organic nitrogen is most often found incorporated in proteins. When proteins are broken down into inorganic compounds, ammonia is the nitrogen species formed. Phosphorus, which is commonly applied as a fertilizer, is usually the limiting nutrient to microbial growth in aquatic systems. A highly eutrophied system may therefore indicate excessive amounts of phosphorus.

Too little data was collected to discuss any meaningful trends or relationships for any of the nutrient parameters; however, the results can provide a useful set of baseline data for future comparisons (Table 6).

Table 6 Baseline nutrient data for Pataha Creek 1999-2001

	Maximum	**Minimum**	**Average**
Ammonia	0.470	0.055	0.239
Nitrate	1.876	0.001	0.523
Total Kjeldahl Nitrogen	1.384	0.166	0.672
Organic Nitrogen	1.273	-0.304	0.433
Total Phosphorus	0.217	0.015	0.121

Nutrient data is presented graphically in Figure 13, Figure 14, Figure 15, Figure 16 and Figure 17.

4.5 Flow

Flow is perhaps the most important parameter measured as every other parameter is tied directly to the amount of flow. Low flow allows for more thermal fluctuation. High flow corresponds to more erosion and higher TSS values. More erosion can also transport fecal coliforms into the river. Nutrients can be leached and/or diluted by high flow events.

High flows occurred during winter and spring months, typically peaking in May, while low flows occurred during summer and fall months (Figure 18). Summer flows as low as 0.3 cfs was recorded (such low flows inhibit other water quality parameters and do not provide adequate habitat).

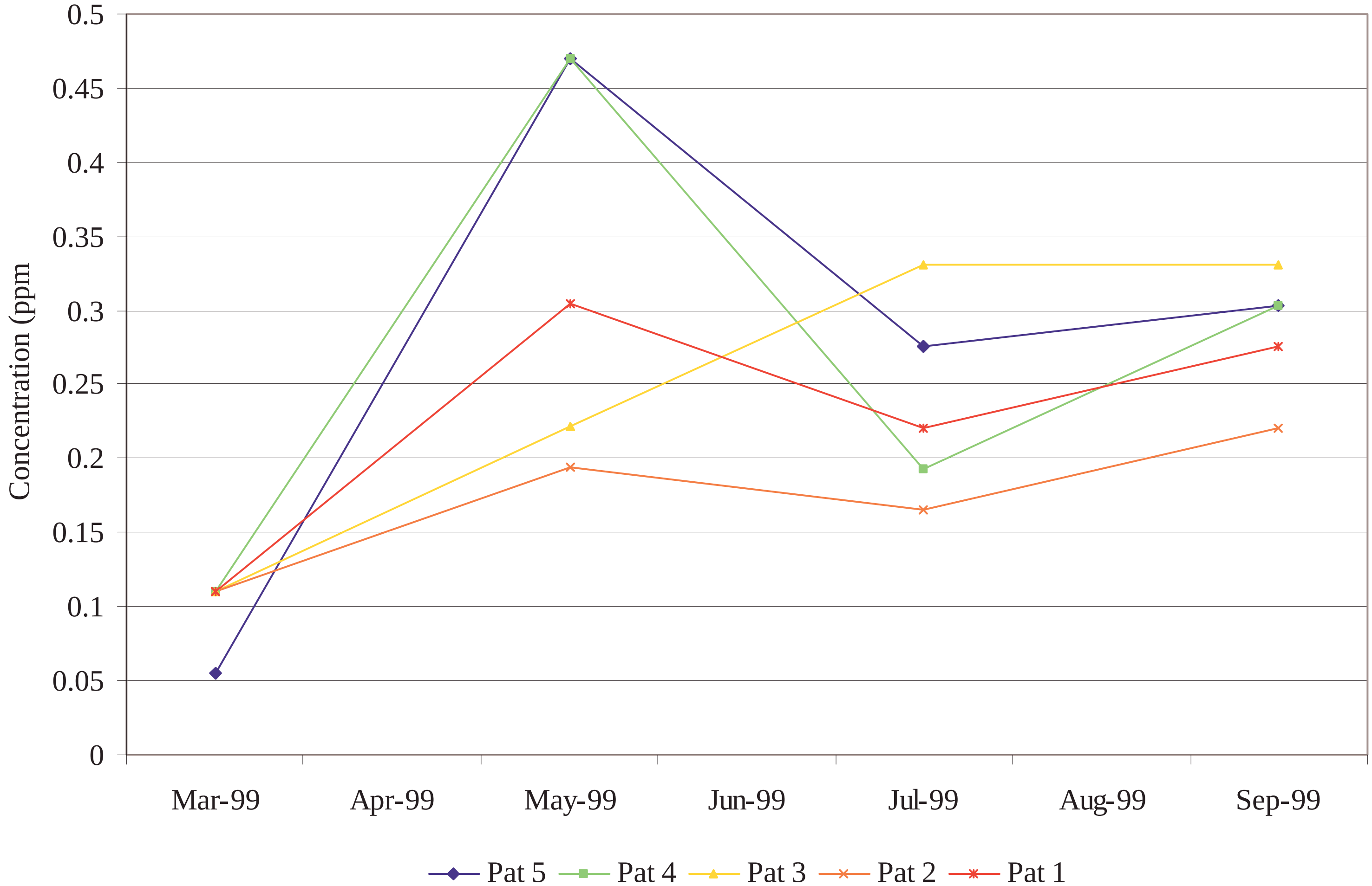

Figure 13 Average ammonia in Pataha Creek 1999-2000

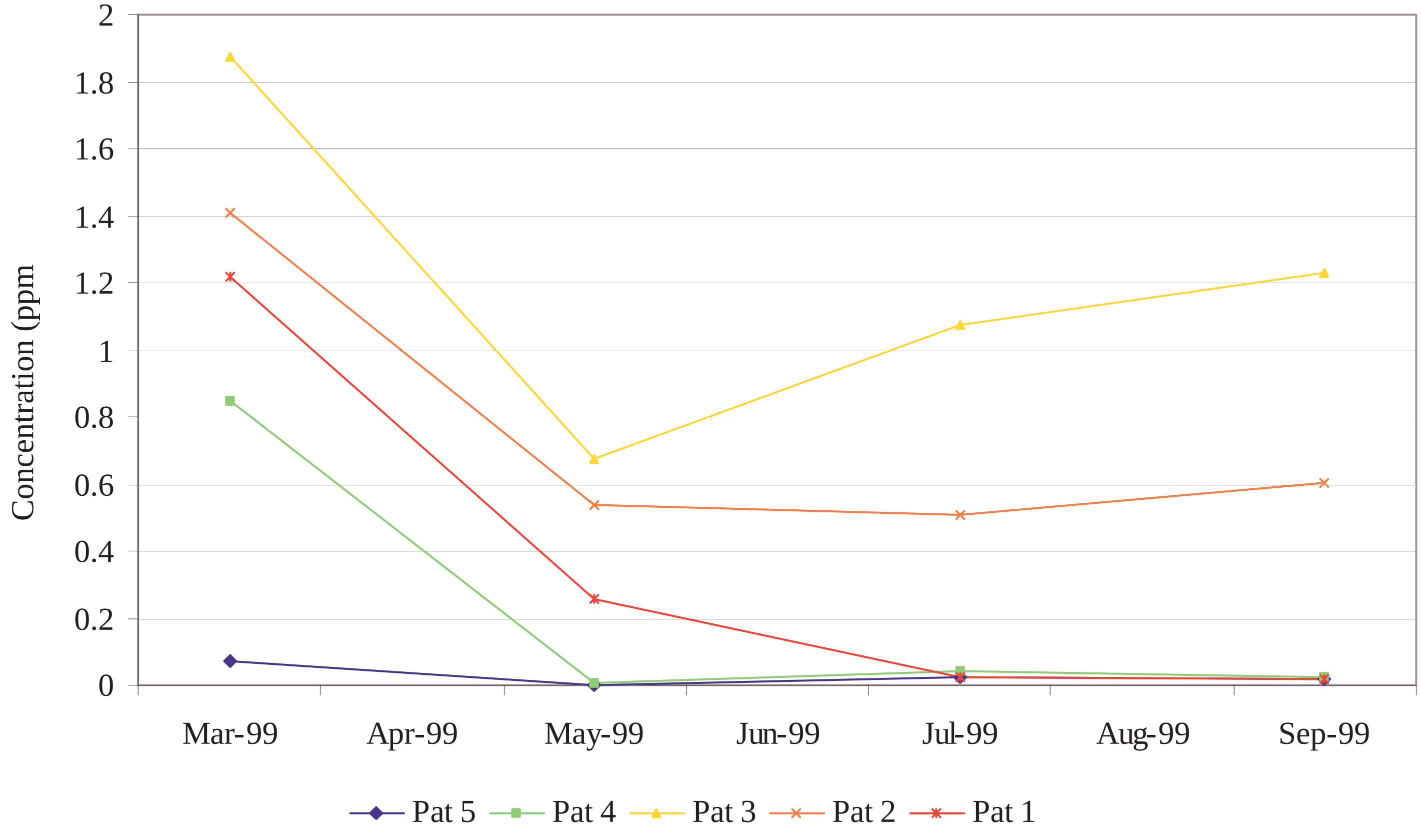

Figure 14 Average Nitrate in Pataha Creek 1999-2000

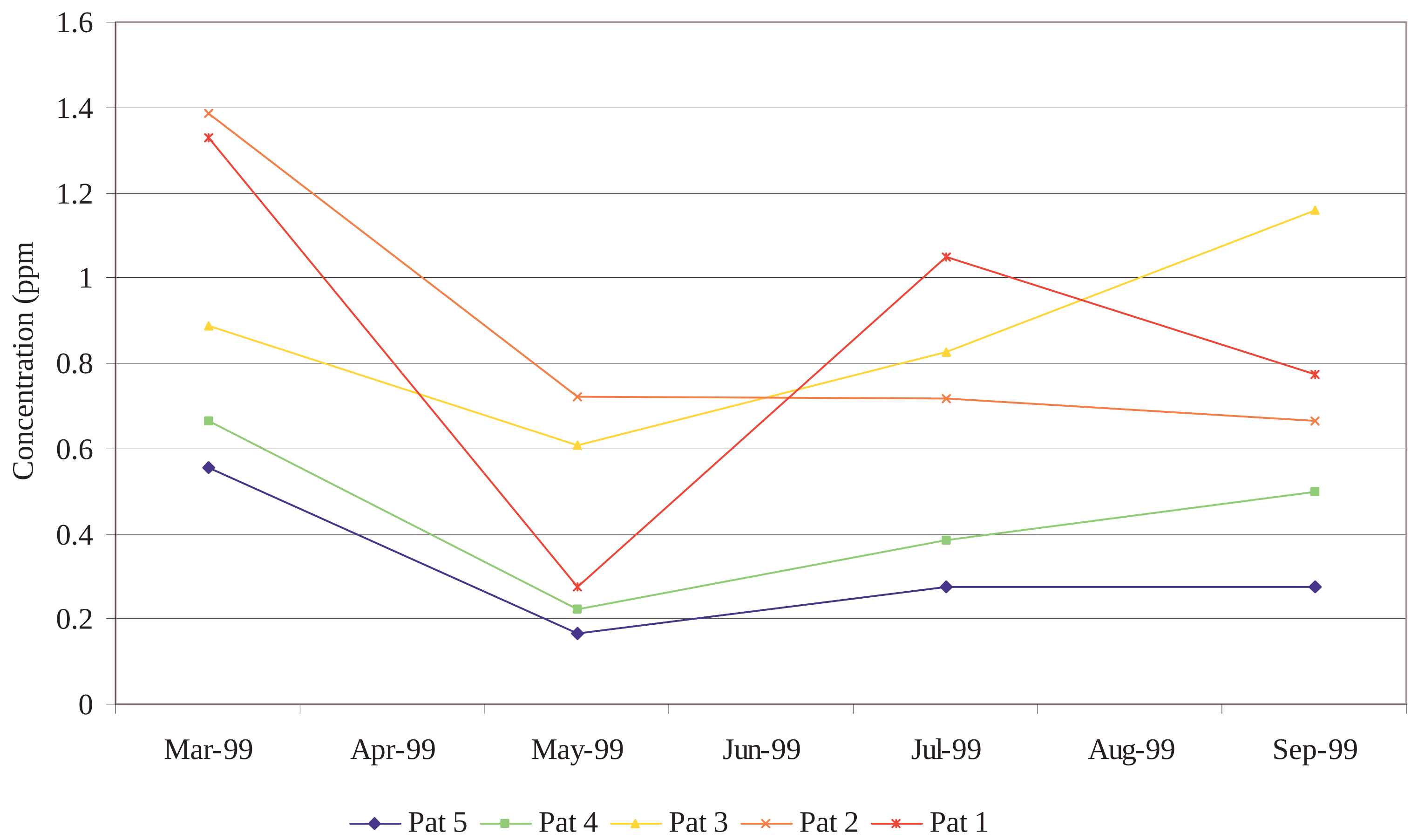

Figure 15 Average total kjeldahl nitrogen in Pataha Creek 1999-2000

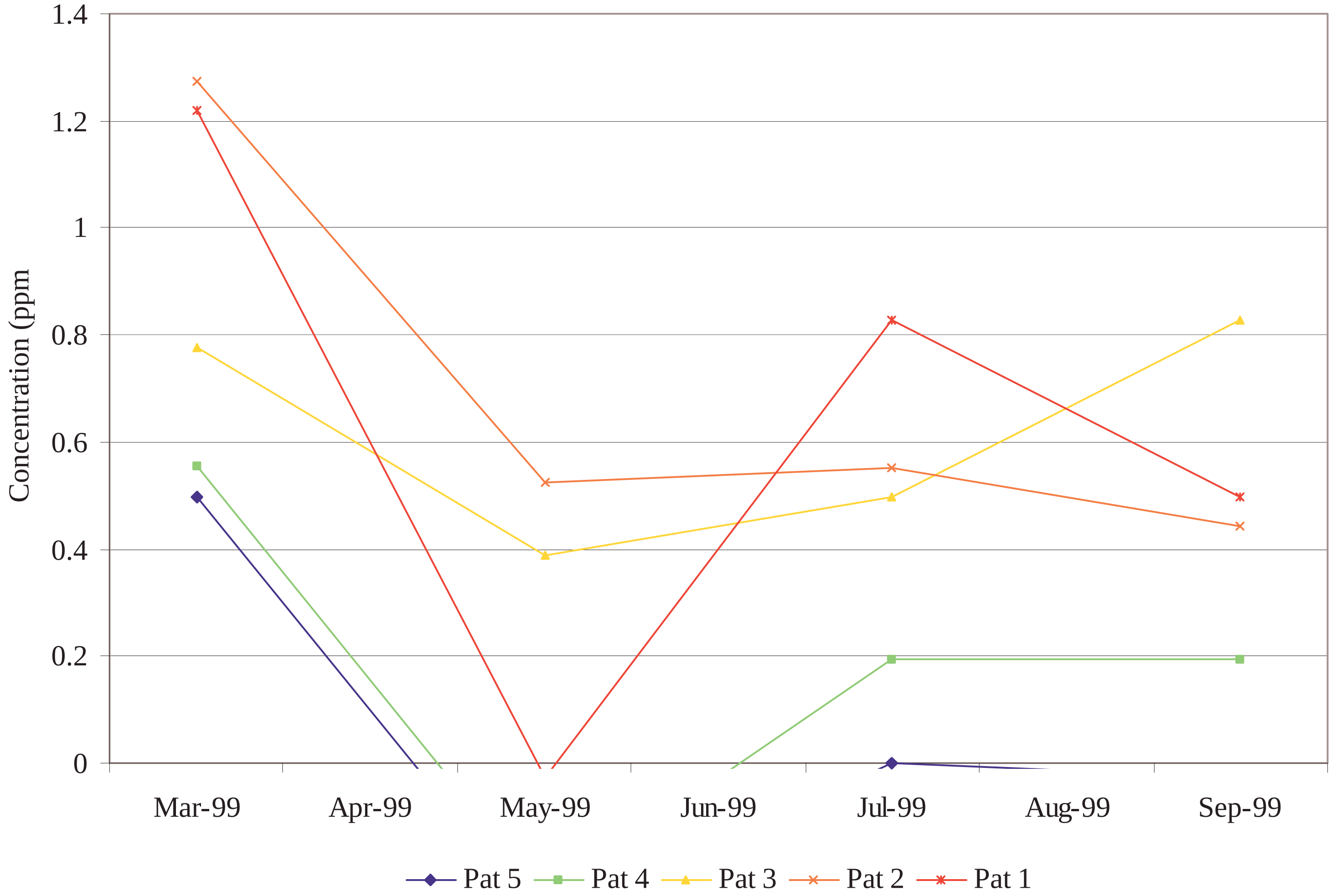

Figure 16 Average organic nitrogen in Pataha Creek 1999-2000

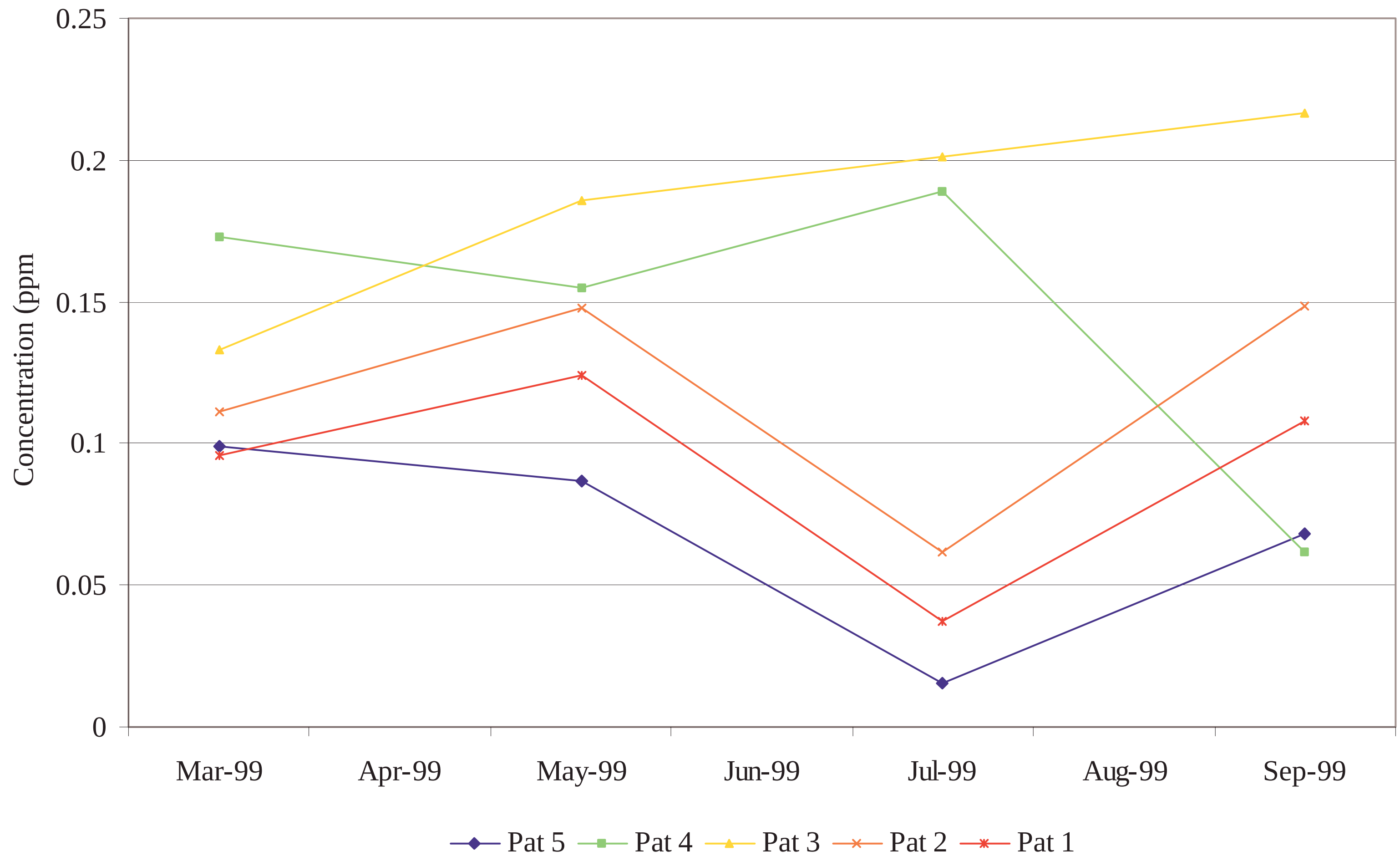

Figure 17 Average total phosphorus in Pataha Creek 1999-2000

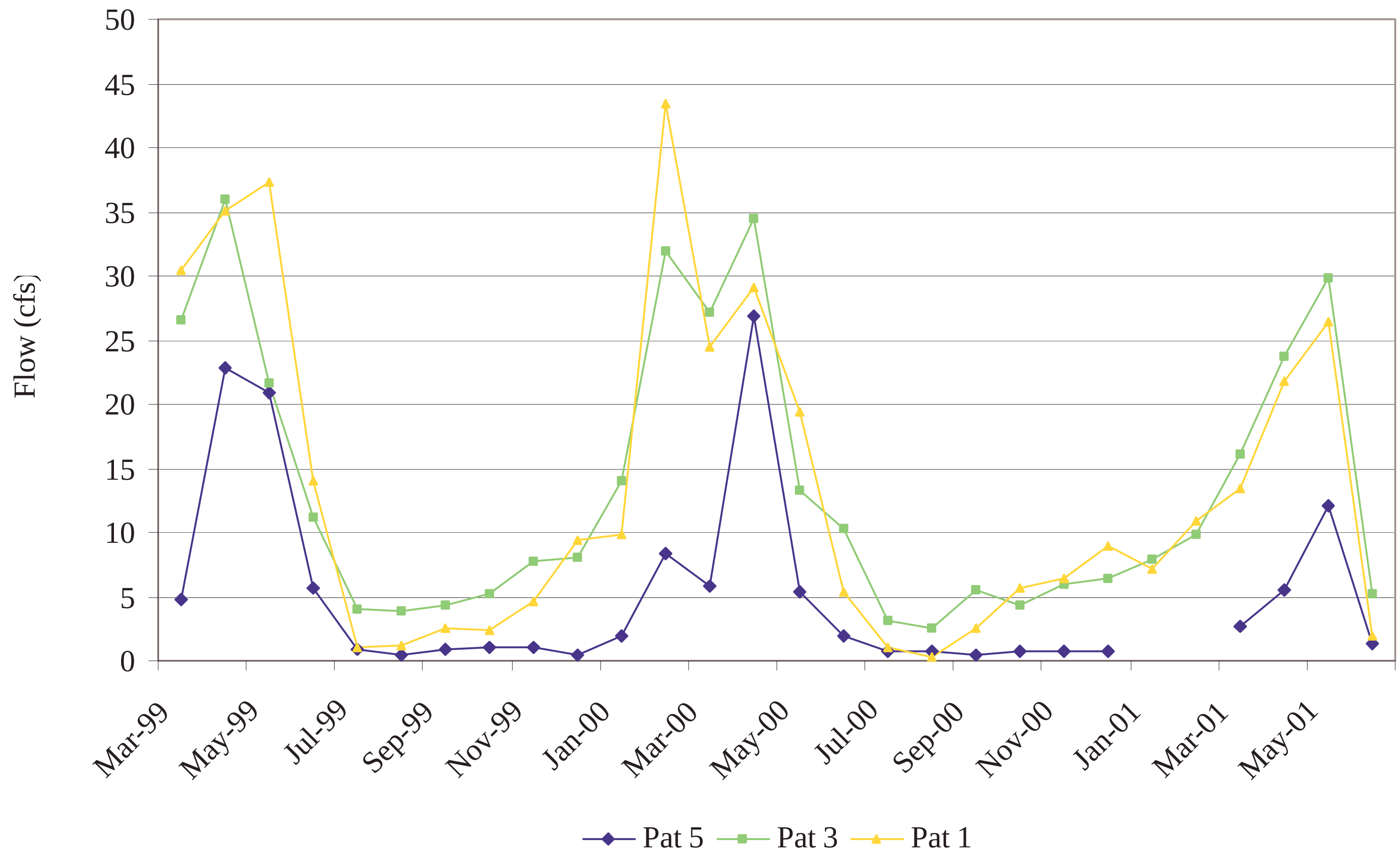

Figure 18 Average monthly flow in Pataha Creek 1999-2000

4.6 Storm Event

Only one storm event was recorded during the sampling period. Therefore, insufficient data exists to make solid comparisons with regular sampling; however, sediment, fecal coliform, and all nutrients (except nitrates) appear to be higher (Table 7).

Table 7 Storm event data from Pataha Creek

5/26/99*	Pat 5	Pat 4	Pat 3	Pat 2	Pat 1
Temperature (°C)	4.0	6.5	12.0	13.5	14.5
Sediment (mg/L)	88.4	276	164.5	188.5	138.5
Coliform (cfu/100mL)	20	940	NA	1100	2660
Ammonia (ppm)	0.249	0.498	0.304	0.387	0.636
Nitrate (ppm)	0.031	0.036	0.275	0.330	0.338
TKN (ppm)	0.276	0.940	1.548	1.880	1.438
TP (ppm)	0.130	0.371	0.418	0.093	0.433
Flow (cfs)	38.9		51.4		49.1

5.0 Conclusions

- All stations (except Pat 5) exceeded state criteria for temperature each summer.
- Temperature increased in the downstream direction during summer months.
- Sediment levels were highest in the spring.
- Monthly average TSS concentrations did not exceed the acute exposure standard; however, chronic exposure to moderate levels may be a problem.
- Sediment levels appear to be lower than those found in previous studies.
- State standards were violated 10 months out of the year due to high fecal coliform concentrations.
- Fecal Coliform concentrations were highest May-September.
- Fecal Coliform geometric means exceeded 500cfu/100mL seven times.
- Flows typically peaked in May and were highest in spring and winter months.

6.0 Recommendations

- A large amount of variability was found in fecal coliform levels; therefore, a study should be conducted to determine the exact source(s) of fecal coliform contamination.
- The largest increases in sediment concentrations occurred between sites Pat 5 and Pat 4. This reach of stream should be evaluated to find specific management practices that will reduce sediments in the streams.
- Temperatures steadily increase in the downstream direction; however it is not known whether this is due to in-stream warming or mixing with high temperature tributaries. The source of warming should be found and appropriate steps taken to reduce temperatures.

- Flow is an extremely important parameter and should be monitored at every site and during every sampling event.
- Enough storm events to provide statistical analysis should be recorded, or no storm event sampling should occur.
- Future studies should be designed in such a way to answer specific questions and provide information on which to make management decisions.

7.0 Report Conclusion

This report describes the activities and associated costs within the Pataha Creek Watershed from January 2000 through December of 2002. Some details of expenses may not be covered in individual project activities but are included in the overall cost table.

The Pomeroy Conservation District would like to thank the Bonneville Power Administration for the funding they provided. As the monitoring data shows, the habitat in the Pataha Watershed is being improved and the Pomeroy CD will continue its effort to enhance and restore habitat for the fish and wildlife within the watersheds boundaries.

8.0 References

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