Brief Assessments of Salmonids and Their Habitats in George, Tenmile and Couse creeks in Asotin County, 2000

By

Washington Department of FISH and WILDLIFE

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529 W Main St
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For

Asotin Conservation District - Clarkston, Washington
Contract # 33012159

December 2001

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Acknowledgments

Many people contributed to this project. First, we would like to thank the Asotin Conservation District (ACD) for the opportunity to conduct this project, and for helping to develop the partnership between the Washington Department of Fish and Wildlife (WDFW) and ACD. A special thanks to Brad Johnson, ACD, for all of his assistance.

This project could not have progressed without the approval of landowners in granting access to their lands. We sincerely appreciate their interest and cooperation. All of the landowners we met during our sampling efforts were friendly, helpful, and genuinely interested in what we were doing. We thank all of them for their kindness.

We appreciate the assistance from the WDFW Snake River Lab, especially for the use of their four wheeler during electrofishing in the summer. Thanks to other WDFW personnel that provided valuable assistance. Arthur Curry, Kristen Lyonnaise, Jeff McCowan, Bart Hunking, and Lacey Gallaher assisted with data collection and data entry.

Brad Johnson and John Whalen reviewed a draft of this report.

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Introduction

In March 2000, the Washington Department of Fish and Wildlife (WDFW), in a cooperative effort with the Asotin Conservation District (ACD), planned a baseline monitoring project for George and Tenmile Creeks in Asotin County. The partners agreed that WDFW would also survey Couse Creek, if there was enough time. Tenmile and Couse creeks are tributaries of the Snake River, upstream from the town of Asotin, Washington, and George Creek is a tributary of Asotin Creek, also a Snake River tributary.

In the early 1990s, George Creek was specifically excluded from the Asotin Creek Model Watershed Project Master Plan because of lack of knowledge about the drainage and perceptions of poor habitat and lack of use by spring chinook salmon. Summer steelhead have been presumed by WDFW to be using George, Tenmile and Couse creeks and their major tributaries for spawning and rearing, but no data existed to verify their distribution or abundance. Snake River summer steelhead (*Oncorhynchus mykiss*) were listed as "threatened" under the Endangered Species Act in August 1997.

WDFW began the project in April 2000 in George Creek, Tenmile Creek, Couse Creek, and their major tributaries to collect baseline fish and habitat data. The specific objectives were to perform baseline monitoring for salmonids, by 1) conducting steelhead spawning surveys and summer electrofishing surveys to determine distribution and relative abundance in the drainages, 2) deploying and recovering temperature data loggers, and 3) collecting periodic measurements of stream flows during spring, summer, and fall months.

Information collected during this project will be valuable for management decisions for those drainages and possibly to generate habitat restoration projects to enhance the existing salmonid populations. The information collected will soon be used in watershed planning and salmonid management. Current needs for this information include the legislatively required Limiting Factors Report for WRIA 35 (Snake R. Basin) due in 2001, or early 2002, and the Northwest Power Planning Council (NPPC) and Columbia Basin Fish and Wildlife Authority's (CBFWA) required Subbasin Summaries (due in April 2001). Information from this survey will be used in the Snake River Fishery Management and Evaluation Plan (FMEP) that will be completed by WDFW within the next month or two and submitted as required by NMFS. The WDFW's Salmonid Stock Inventory (SaSI) and Salmon and steelhead Inventory and Assessment Program (SSHIAP) will incorporate this information into their fish stock and habitat assessements within the next year or so.

Study Purpose and Objectives

The purpose of the study is to assess salmonid distribution, relative abundance, and some general habitat conditions in George Creek (tributary to Asotin Creek), Tenmile and Couse creeks (Snake River tributaries) and their major tributaries in Asotin County, where those data are currently lacking.

Specific Objectives and Tasks

Deploy constant recording temperature data loggers in selected streams to record water temperatures for evaluation of salmonid passage and rearing conditions.

Conduct steelhead/rainbow trout spawning surveys to determine spawn timing and distribution, and to establish an index of relative abundance.

Conduct manual stream discharge measurements to provide discharge data for study streams.

Conduct electrofishing surveys to determine salmonid distribution and relative abundance during summer low flows.

Collect genetic samples from salmonids.

Methods

Study Area

The study area encompasses selected streams in eastern Asotin county in southeast Washington (Figure 1). Tenmile Creek, George Creek, Pintler Creek, and Couse Creek and their tributaries were the main focus for this year. Couse Creek had a lower priority for evaluation and was included only when there was time.

Figure 1. Asotin County located in the southeast corner of Washington State.

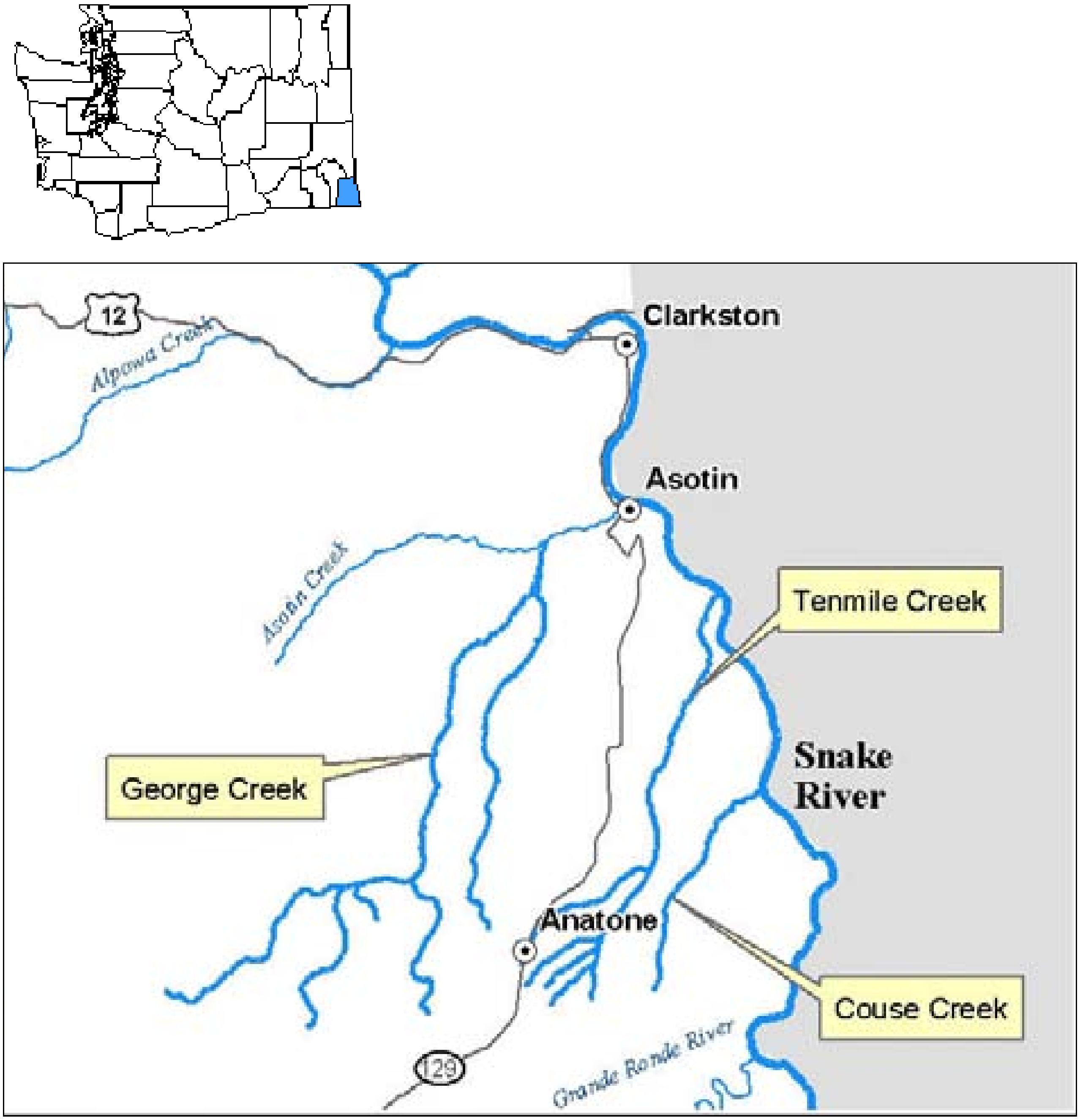

Figure 1. Asotin County located in the southeast corner of Washington State.

Stream Reaches and Site Selection
Representative reaches were identified based on general physical characteristics and accessibility. Physical characteristics included: slope, width, depth, and cover for salmonids. Access was dependant on landowner permission as most of the streams are in private ownership. Therefore, it was necessary to obtain permission from landowners to access potential sites, and several stream reaches were difficult to access due to their remoteness and deep canyon terrain. Larger streams such as George Creek were stratified into upper, middle and lower reaches with study sites selected within each reach. Study site locations are listed from upstream to downstream, including stream reach, site number, township-range-section-1/4 section-1/16 section, river mile, type of data collection, and comments (Appendix A).

River miles from the mouth of each stream were determined by measuring US Geological Service topographic maps (1:24000) with a map wheel. These locations should be considered approximate due to the limited precision of this method.

Electrofishing sites were selected randomly from access areas. Selections of the top and bottom net locations were also randomized. Site lengths were variable depending on conditions.

Habitat Assessment

Stream Flows

Stream discharges were taken using standard manual flow measurement protocol (Armour and Platts 1983) using a Swoffer model 2100 flow meter. Discharge was calculated in cubic feet per second (cfs) using a Quattro Pro spreadsheet macro.

Stream Temperatures

We used two methods to collect water temperature data. Water temperature (^{0}F) was measured at each site using standard field thermometers. Manual temperatures were taken during all data collecting efforts. The second method of collection involved the use of temperature data loggers (Onset Corporation, Tidbit Temp Data Logger), which were set to continuously measure water temperatures in F at 30 minute intervals at selected locations of each study stream. Data were downloaded from the loggers via an Optic Stowaway Shuttle. Raw data was converted to daily maximum, minimum, and mean temperatures using Onset Boxcar 4.0 software. This data was moved to Quattro Pro spreadsheets for preparation of temperature charts.

Limiting Factor Identification

One of the study goals was to identify obvious limiting factors for salmonids in the study area. Field personnel noted the presence of physical barriers to salmonid migration, spawning, and rearing. Physiological barriers to salmonid passage and survival in the form of excessive temperatures, inadequate flows, and degraded habitats were identified by WDFW personnel while in the field or by examining recorded data from temperature loggers or our electrofishing sampling.

Fish Stock Assessment

Adult Distribution and Abundance (Spawning Surveys)

Surveyors typically walked downstream and visually identified spawning fish or redds (nests). Redds were characterized by an area of clean gravel with a large depression and mound. Each redd observed was assigned a two-part identification (ID) code representing the survey number and the redd number. A flag was hung in adjacent vegetation, and marked with an ID code, the date, and the surveyors initials, so the same redd would not be counted in subsequent surveys. Each redd was recorded in a notebook with the date, time, ID code, and a general description of the redd and its location. Counts were tallied for each designated stream reach. Stream reaches were designated as upper, middle, and lower reaches according to stream length, physical characteristics, and available access. Portions, or all of each stream reach were surveyed at least once to determine spawning distribution and relative abundance.

Juvenile Distribution and Abundance (Electrofishing Surveys)

A Smith-Root model 11A or 12B backpack electrofishing unit was used to collect fish at selected study sites. We used pulsed DC between 300-600 volts. Sites were delimited by block nets spanning the channel, placed approximately 30-40 m apart. Block nets prevent fish from entering or leaving the site, so that fish population estimates could be calculated (Platts et al. 1983). The operator generally worked from the upstream net down, covering the entire wetted width. A "pass" was completed when the operator reached the opposite block net. All quantitative sites received two sequential passes. Salmonids captured during pass one were held separately from those captured in pass two. A 60% reduction was required between the first and second passes for each salmonid species and age class. If the reduction was not met, a third pass was usually conducted. Fish were collected with dipnets and placed in buckets until they could be sampled. Collected fish were anesthetized with FINQUEL (MS-222, tricaine-methane-sulfonate), identified to species, weighed (g), and measured using fork length (mm).

Fork length data collected were used to create length-frequency histograms (Figure 2.). The histograms were used to determine age class (Mendel et al. 1999). These age class delineations were checked against ages determined from interpreting fish scales that were collected randomly during our electrofishing efforts. Age class groupings were specific for each stream reach. Salmonid population densities (number of fish/100m^2 surveyed) were calculated for each species and age class using removal-depletion software developed by the U.S. Forest Service (VanDeventer and Platts, 1983). The weights (g) were averaged per age class for each site. The average weight for each age class was multiplied by its density to calculate biomass (g/100m^2). We converted the density information to fish per mile for each stream reach to provide a rough estimate of the minimum population sizes of salmonids in each stream.

Non-salmonids were subsampled. We used a relative abundance scale of 0-4 based on the number of fish of that species we observed while collecting salmonid data. We took lengths (mm) and weights (g) for up to 10-20 individuals from each species identified at each site.

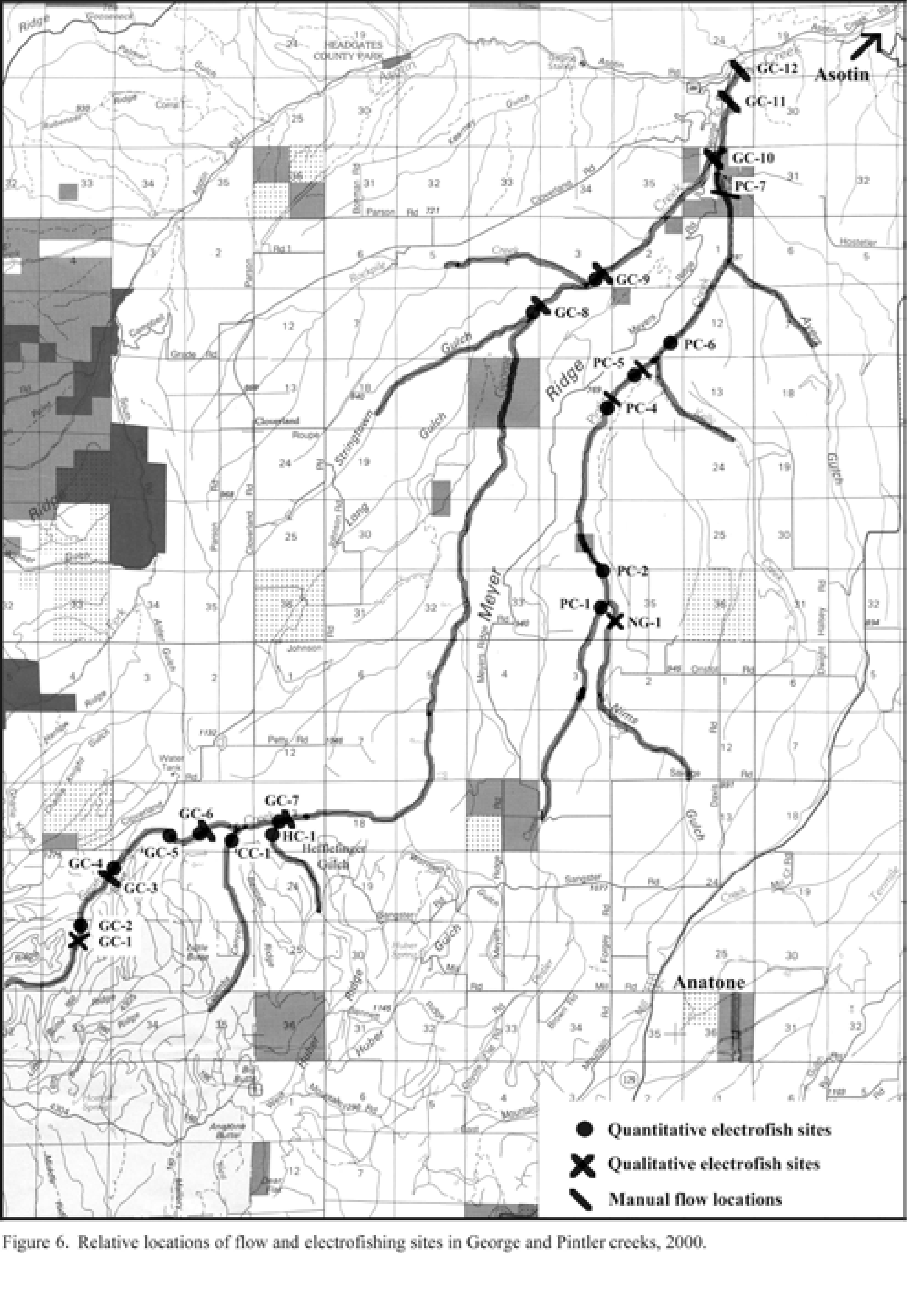

Figure 6. Relative locations of flow and electrofishing sites in George and Pintler creeks, 2000.

Site length, and at least five width transects, were measured and recorded for each site. The area sampled was determined by multiplying site length by the average site width. A brief description of riparian condition, bank stability, substrate, pool/riffle ratio, and the presence of large woody debris (LWD) was recorded at each electrofishing site.

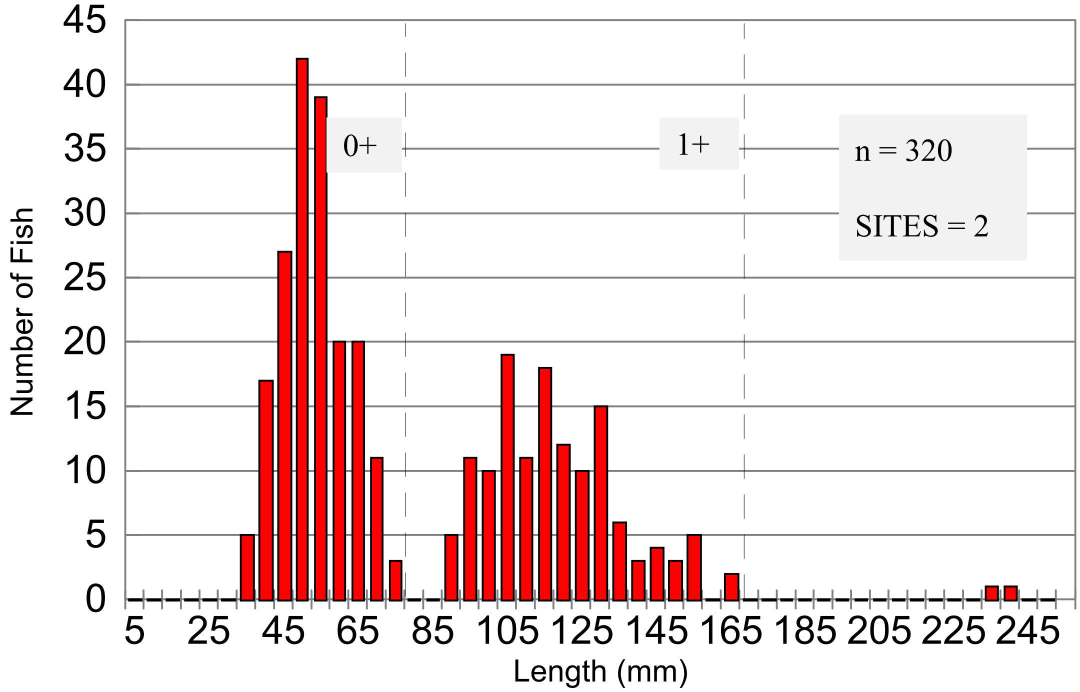

Figure 2. Length frequency and age class delineations for George Creek from Stringtown Gulch to Rockpile Gulch, 2000.

<u>Genetic Sampling</u>

Some adult steelhead were captured for genetic sampling during spawning surveys. Juvenile steelhead or rainbow/redband trout were collected for sampling during electrofishing. Fin clips were taken from live and dead salmonids to provide genetic data. Fin clips provide sufficient DNA material for genetic analysis without killing fish (Olsen et al. 1996), and fin clips are easily obtained and stored. A non-lethal method was preferred due to the current ESA listings for Snake River Steelhead.

Results and Discussion

Fish Stock Assessment

Steelhead spawning surveys were conducted from 12 April through 5 May, 2000, in George Creek, Pintler Creek, Tenmile Creek, Mill Creek and Couse Creek (including some of their tributaries) covering approximately 55 miles of potential spawning habitat. Most areas were walked only once because of the extent of the area to be covered, but a few small areas were walked twice during the spawning season. The total distance walked along streams, including the duplicate reaches surveyed, was 67 miles. In Tenmile Creek and its tributaries we observed 36 steelhead redds, 13 steelhead, and 4 steelhead carcasses (Table 1, Fig. 3). Limited surveys in Couse Creek produced 6 redds and 1 adult steelhead (Table 1 and Fig. 3). We observed a total of 29 steelhead redds and 17 adult steelhead in George Creek and its tributaries (Table 1, Fig. 4) even though approximately 4 miles of George Creek could not be accessed because of landowner restrictions and difficult terrain.

Electrofishing surveys were conducted in the July, 2000 to determine relative summer distribution and abundance of salmonids in the study area (Figs 5 & 6). Density and biomass estimates were compiled from quantitative elecrofishing sites (Tables 2 & 3). Cursory or qualitative electrofishing was conducted to quickly sample other areas when quantitative methods were not practical (Appendix B). Rainbow/steelhead were the only salmonid found in these streams during the summer of 2000. Most rainbow/steelhead trout were 30-90 mm age 0+ (young-of-the-year) and age 1+ (yearlings or older), but a few larger and older fish (8 in or 200 mm) were observed (up to 12 in or 350 mm). Rough estimates of salmonid populations available in stream reaches, calculated from quantitative electrofishing data, ranged from 1,606 to 5,221 fish per mile (Table 4).

Non-salmonids were documented from observations during spawning and electrofishing surveys (Appendix C). Speckled dace were common or abundant in most areas except in the upper portions of Tenmile and George creeks, and upper George Creek tributaries. Suckers and sculpins had more limited distributions.

Genetic samples were taken from eight adults during spawning surveys, two of which were of hatchery origin (Table 5). Twenty-five juveniles were also sampled for DNA analysis.

Table 1. Steelhead spawning survey summary for Tenmile Creek, Couse Creek, and George Creek and their tributaries in Asotin Co., WA., 2000.

Stream date	Survey	Stream section	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead	Comments
TenmileCreek								
04/21	1	River mile 8.6 to river mile 15.0	6.4	7	1.1	0	3	23 RBT redds, 3 dead STH wild -&(520 mm), 2 % (560, 650 mm).
04/27	1	River mile 0.0 to river mile 0.5	0.5	0	0	0	0	1st left tributary - appeared to be unlikely spawning habitat.
05/03	1	River mile 0.0 to river mile 0.5	0.5	0	0	0	0	2nd left tributary - appeared to be unlikely spawning habitat.
04/13	1	River mile 6.6 to river mile 8.6	2.0	2	1	4	0	4 STH unknown origin.
04/13	1	River mile 1.5 to river mile 6.6	5.1	24	5.7	6	0	4 STH unknown origin, Hatchery % (610 mm), Wild % (585 mm).
04/12	1	River mile1.0 to river mile 1.5	0.5	2	4.0	0	0	
04/12	1	River mile 0.1 to river mile 1.0	0.9	1	2.0	1	0	Unknown % STH (. 600mm)
		Total	**15.9**	**36**	**2.3**	**11**	**3**	
Mill Creek								
04/27	1	River mile 2.8 to river mile 5.0	2.2	0	0	0	0	
04/12	1	River mile 4.5 to river mile 5.0	0.5	0	0	0	0	Poor visibility.
04/21	1	River mile 0.0 to river mile 2.8	2.8	0	0	2	1	2 STH unknown origin, dead wild % (622 mm) - Poor visibilty.
		Total	**5.5**	**0**	**0**	**2**	**1**	
Couse Creek								
05/03	1	River mile 3.2 to river mile 5.5	2.3	2	0.9	0	0	Wild STH & (560 mm), spent. 6 RBT redds.
04/12	1	River mile 2.6 to river mile 3.2	0.8	1	1.3	0	0	2 RBT redds.
04/12	1	River mile 1.6 to river mile 2.6	1.0	0	0	0	0	
04/12	1	River mile 0.9 to river mile 1.6	0.7	1	1.4	1	0	
04/12	1	River mile 0.1 to river mile 0.9	0.8	2	2.5	0	0	Wild STH % (584 mm).
		Total	**5.6**	**6**	**1.1**	**1**	**0**	
George Creek								
05/02	1	River mile 17.4 to river mile 18.5	0.6	0	0	0	0	
05/02	1	River mile 15.1 to river mile 17.4	2.3	1	0.4	0	0	2 RBT redds.
05/08	1	River mile 13.0 to river mile 15.1	1.9	2	1.1	1	0	Unknown STH (. 635 mm).
05/08	1	River mile 10.0 to river mile 13.0	3.0	10	3.3	0	0	
04/27	1	River mile 4.2 to river mile 6.0	2.5	3	1.2	2	0	2 Unknown STH (1 %).
04/27	1	River mile 1.5 to river mile 4.0	2.5	5	2.0	5	0	4 Unknown STH, hatchery % (610 mm).
04/26	1	River mile 0.0 to river mile 1.5	1.5	0	0	0	0	
05/08	2	River mile 0.0 to river mile 1.5	1.5	0	0	0	0	
		Total	**15.8**	**21**	**1.3**	**8**	**0**	

Table 1. (Cont'd) Steelhead spawning survey summary for Tenmile Creek, Couse Creek, and George Creek and their tributaries in Asotin Co., WA. 2000.

Stream/ date	Survey	Stream section	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead	Comments
Hefflefinger Creek								
05/08	1	River mile 0.0 to river mile 0.3	0.3	0	0	0	0	
		Total	**0.3**	**0**	**0**	**0**	**0**	
Coombs Creek								
04/12	1	River mile 0.0 to river mile 0.3	0.3	2	6.7	0	0	
		Total	**0.3**	**2**	**6.7**	**0**	**0**	
Pintler Creek								
04/26	1	River mile 2.5 to river mile 11.3	8.8	0	0	3	0	12 RBT redds, 2 unknown STH (wild), 1 unknown STH.
04/26	1	River mile 0.0 to river mile 2.5	2.5	1	0.4	3	0	1 unknown STH, 2 Wild STH % (623 mm & 560 mm).
05/09	2	River mile 2.5 to river mile 11.3	8.8	4	0.5	3	0	1 unknown STH (wild), 1 unknown STH, Wild &(533.4 mm).
05/09	2	River mile 0.0 to river mile 2.5	2.5	1	0.4	0	0	2 RBT redds, stream dries up near mouth.
		Total	**11.3**	**6**	**0.5**	**9**	**0**	

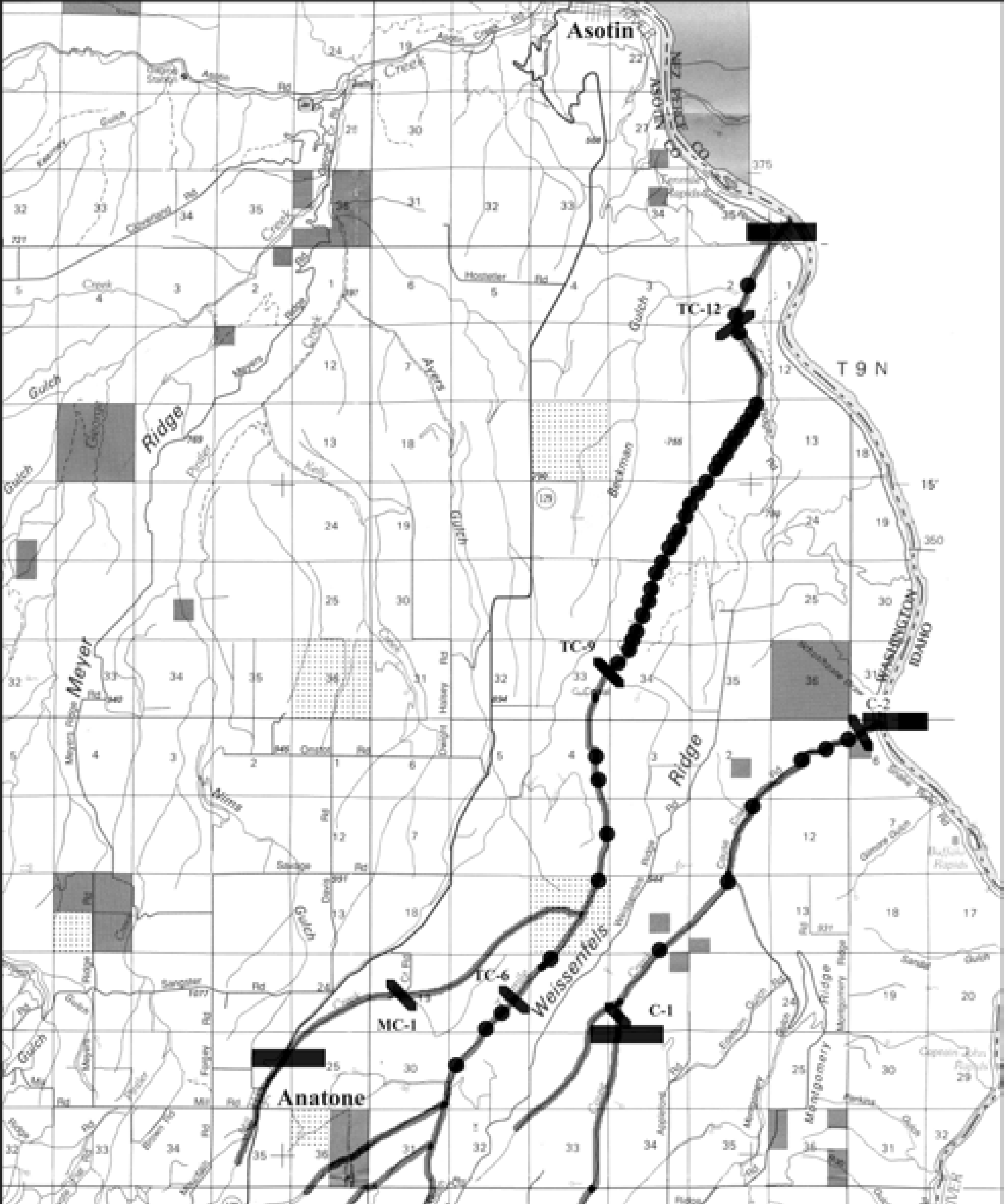

Figure 3. Relative locations of temperature loggers and steelhead redds found in Tenmile and Couse creeks, 2000.

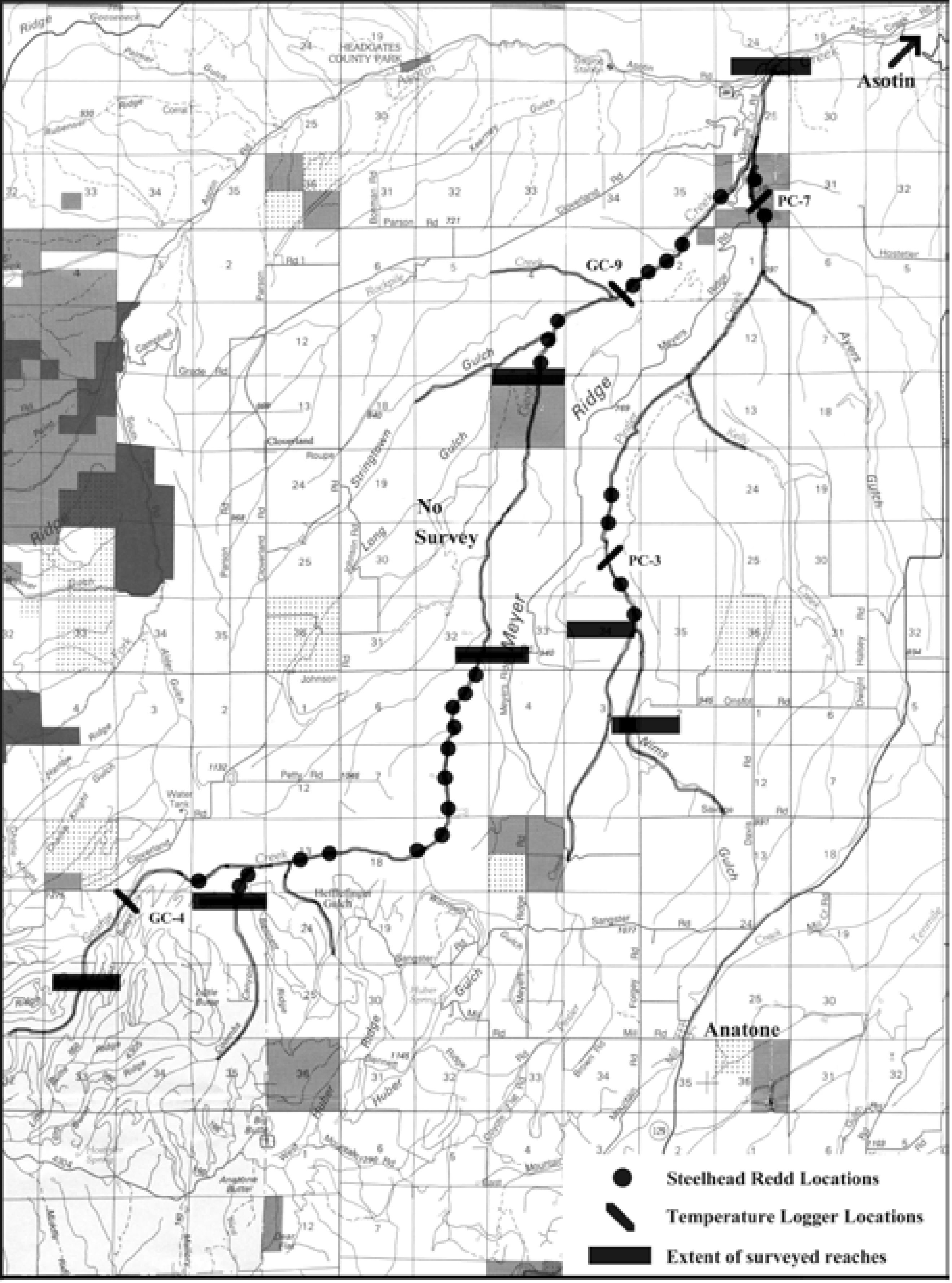

Figure 4. Relative locations of temperature loggers and steelhead redds found in George and Pintler creeks, 2000.

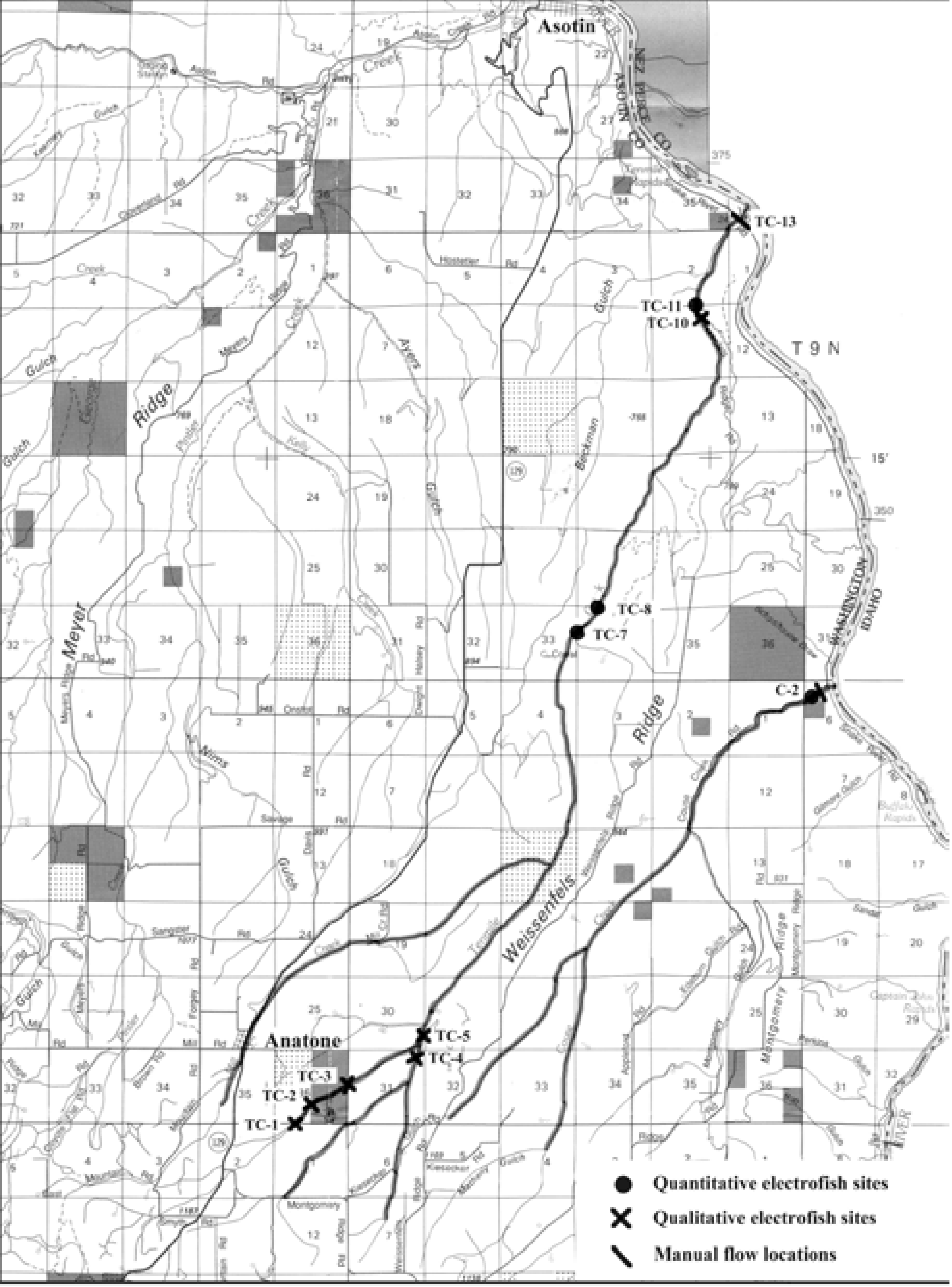

Figure 5. Relative locations of flow and electrofishing sites in Tenmile and Couse creeks, 2000.

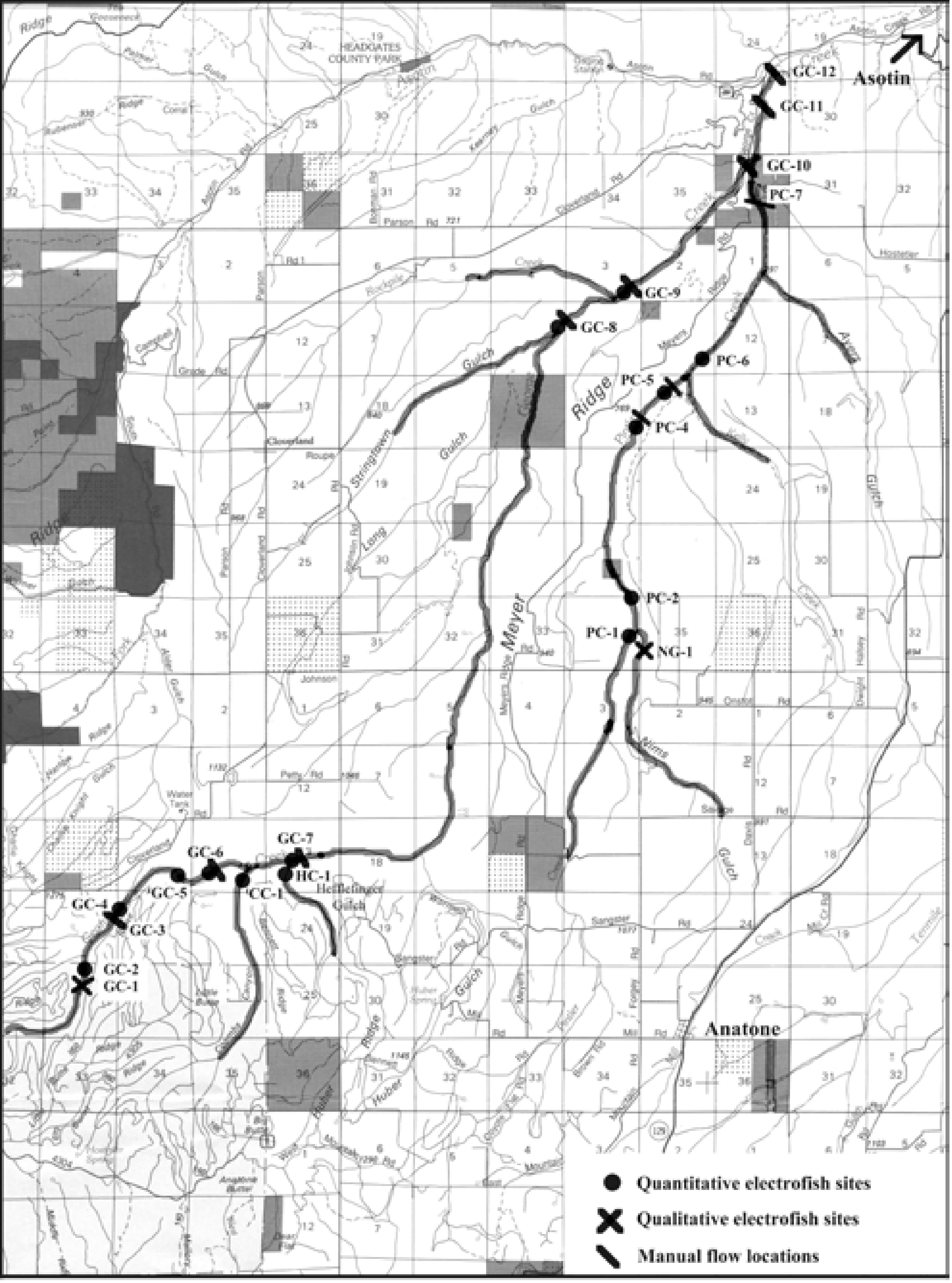

Figure 6. Relative locations of flow and electrofishing sites in George and Pintler creeks, 2000.

Table 2. Densities (# of fish/100m^2) of salmonids from electrofishing sites in George Creek, Pintler Creek, Tenmile Creek, Couse Creek, and their tributaries. Sites are listed in order from upstream to downstream.

Stream	Date	Site Length	Mean Width	Area	Rainbow/steelhead Densities (#/100 m^2)			
					Age/size			
Site Name	(mm/dd)	(m)	(m)	(m^2)	0+	1+	$ 8 in	Total
Tenmile Creek								
TC-7	07/27	58.8	3.9	229.3	25.3	52.8	1.7	79.8
TC-8	07/27	30.7	3.0	92.1	43.4	56.5	5.4	105.3
TC-11	07/27	30.6	2.5	76.5	52.3	31.4	0.0	83.7
Couse Creek								
C-2	07/26	31.0	2.5	77.5	31.0	9.0	0.0	40.0
George Creek								
GC-2	07/25	36.8	2.5	92.0	6.5[a]	31.5	0.0	38.0
GC-3	07/25	33.0	3.3	108.9	16.5	15.6[a]	0.0	32.1
GC-5	07/25	35.2	2.7	95.0	14.7	28.4	0.0	43.1
GC-6	07/25	45.7	3.0	137.1	8.8	14.6	0.0	23.4
GC-7	07/25	25.0	3.0	75.0	33.3	68.0	4.0	105.3
GC-8	07/26	52.8	2.9	153.1	20.2[a]	38.5	1.3	60.0
GC-9	07/26	61.7	4.2	259.1	61.8	29.7	0.0	91.5
Pintler Creek								
PC1	07/24	45.0	2.0	90.0	18.9	32.2	2.2	53.3
PC2	07/24	45.0	2.7	121.5	36.2	16.5	4.9	57.6
PC4	07/24	36.0	2.6	93.6	47.0[a]	20.3	5.3	72.6
PC5	07/24	30.0	2.3	69.0	59.4	55.1	0.0	114.5
PC6	07/24	23.2	2.5	58.0	12.1	36.2	5.2	53.5
Coombs Creek								
CC1	07/25	30.0	2.2	66.0	65.2	27.3	0.0	92.5
Heffelfinger Creek								
HC1	07/25	53.0	2.0	106.0	51.9	20.8	0.0	72.7

[a] Calculated using the sum of the passes due to poor reduction between successive passes, minimum estimates only.

Table 3. Biomass (g/100m^2) and condition factor of salmonids from electrofishing sites in George Creek, Pintler Creek, Tenmile Creek, Couse Creek, and their tributaries. Sites are listed in order from upstream to downstream.

Stream	Date	Site Length	Mean Width	Area	Rainbow/steelhead Densities (g/100 m^2) Age/size			
Site Name	(mm/dd)	(m)	(m)	(m^2)	0+	1+	> 8 in	Total
Tenmile Creek								
TC-7	07/27	58.8	3.9	229.3	62.0	1284.6	160.5	1507.1
TC-8	07/27	30.7	3.0	92.1	106.3	1374.6	509.9	1990.8
TC-11	07/27	30.6	2.5	76.5	128.1	764.0	0	892.1
			Condition Factor		**1.21**	**1.19**	**0.89**	
Couse Creek								
C-2	07/26	31.0	2.5	77.5	120.9	249.3	0	370.2
			Condition Factor		**1.22**	**1.13**		
George Creek								
GC-2	07/25	36.8	2.5	92.0	13.8[a]	582.1	0	595.9
GC-3	07/25	33.0	3.3	108.9	35.0	288.3[a]	0	323.3
GC-5	07/25	35.2	2.7	95.0	31.2	524.8	0	556.0
GC-6	07/25	45.7	3.0	137.1	18.7	269.8	0	288.5
GC-7	07/25	25.0	3.0	75.0	70.6	1256.6	540.8	1868.0
GC-8	07/26	52.8	2.9	153.1	42.8[a]	711.5	175.8	930.1
GC-9	07/26	61.7	4.2	259.1	131.0	548.9	0	679.9
			Condition Factor		**1.11**	**1.12**	**1.13**	
Pintler Creek								
PC1	07/24	45.0	2.0	90.0	41.2	1275.1	307.1	1623.4
PC2	07/24	45.0	2.7	121.5	78.9	653.4	684.0	1416.3
PC4	07/24	36.0	2.6	93.6	99.6[a]	803.9	739.9	1643.4
PC5	07/24	30.0	2.3	69.0	125.9	2182.0	0	2307.9
PC6	07/24	23.2	2.5	58.0	26.4	1433.5	725.9	2185.8
			Condition Factor		**1.14**	**1.04**	**0.98**	
Coombs Creek								
CC1	07/25	30.0	2.2	66.0	58.0	466.8	0	524.8
			Condition Factor		**1.01**	**1.08**		
Heffelfinger Ck								
HC1	07/25	53.0	2.0	106.0	93.4	295.4	0	397.7
			Condition Factor		**1.23**	**1.14**		

[a] Calculated using the sum of the passes due to poor reduction between successive passes, minimum estimates only.

Table 4. Rough population partial estimates for rainbow/steelhead trout in George, Pintler, Tenmile, and Couse Creeks and their tributaries, 2000.

Stream		Reach/Location	Rivermile (RM)	Total (mi)	# sites (n)	Mean width & length (m)	Estimated # fish/ mi 0+	1+	$ 8"	Total Popul./reach
George Creek	#1	8U.S. F.S. line to Trent Grade culvert	16.8-18.8	2.0	2	2.9/ 34.9	537	1099	0	**3,272**
George Creek	#2	Trent Grade to 9 Heffelfinger Creek	13.2-16.8	3.6	3	2.9/35.3	886	1726	61	**9,623**
George Creek	#3	Wormell Gulch to 8 Stringtown	8.0-13.2	5.2	0	0.0	Restricted access - no sample taken			
George Creek	#4	8 Stringtown to Meyers Ridge Rd Br	2.7-8.0	5.3	2	3.6/57.3	2375	1976	38	**23,261**
George Creek	#5	Meyers Ridge Rd Br. to mouth	0.0-2.7	2.7	0	0.0	Qualitative sample taken			
Heffelfinger Ck	#1	jeep trail crossing to mouth	0.0-1.5	1.5	1	2.0/53.0	1670	548	0	**3,327**
Coombs Creek	#1	0.5 mi 9 Lost Cabin Ridge to mouth	0.0-3.0	3.0	1	2.2/30.0	2308	966	0	**9,822**
							George Creek total			**49,305**
Pintler Creek	#1	.5 mi 8 Nimms Ck to 1.7 mi 8 Kelly Ck	6.1-8.3	2.2	2	2.35/45.0	1040	922	136	**4,616**
Pintler Creek	#2	1.7 mi 8 Kelly Ck to 350 m. 9 Kelly Ck	3.4-6.1	2.7	3	2.46/29.7	1563	1472	138	**8,567**
Pintler Creek	#3	350 m. 9 Kelly Ck to mouth	0.0-3.4	3.4	0	0.0	Stream mostly dry - no sample taken			
							Pintler total			**13,183**
Tenmile Creek	#1	Harben Grade Rd to 3rd left spring trib	13.0-15.0	2.0	0	0.0	Qualitative sample taken			
Tenmile Creek	#2	3rd left spring trib to spring gulch	6.0-13.0	7.0	0	0.0	Stream partially dry - no sample taken			
Tenmile Creek	#3	Spring gulch to 8 Ausman Ranch	4.0-6.0	2.0	2	3.5/44.8	1937	3081	203	**10,442**
Tenmile Creek	#4	8 Ausman Ranch to bottom of grade	1.9-4.0	2.1	0	0.0	Stream Dry - no sample taken			
Tenmile Creek	#5	Bottom Weissenfels Rd grade to mouth	0.0-1.9	1.9	1	2.5/30.6	2103	1263	0	**6,395**
							Tenmile total			**16,837**
Couse Creek	#1	1.5 mi 8 mouth to mouth	0.0-1.5	1.5	1	2.5/31.0	1245	361	0	**2,409**

Ave. m^2 habitat per reach × Ave. Density (# fish/100m^2) ÷ # miles per reach = # fish per mile

Example: George Creek #1 [(2.0 mi = 3.218 k = 3218 m) × (ave. width) 2.9 m] or 9332 m^2 × 11.5 (0+)/ 100 m^2
= 1073 (0+) ÷ 2.0 mi.
= 537 (0+) / mi.

8 = above, 9 = below

Table 5. Genetic tissue sample (DNA) summary for George, Tenmile, and Couse Creeks and their tributaries, 2000.

Stream	Date	Location	Species	origin	sex[a]	length (mm)
George Creek	7/25/00	Above USFS line	RBT/SH	W	J	107
			RBT/SH	W	J	43
			RBT/SH	W	J	41
			RBT/SH	W	J	92
George Creek	7/26/00	Below Rockpile Gulch	RBT/SH	W	J	57
			RBT/SH	W	J	46
			RBT/SH	W	J	62
			RBT/SH	W	J	127
			RBT/SH	W	J	57
			RBT/SH	W	J	50
			RBT/SH	W	J	108
			RBT/SH	W	J	94
			RBT/SH	W	J	67
			RBT/SH	W	J	90
			RBT/SH	W	J	53
			RBT/SH	W	J	49
			RBT/SH	W	J	51
			RBT/SH	W	J	52
			RBT/SH	W	J	40
			RBT/SH	W	J	37
			RBT/SH	W	J	49
			RBT/SH	W	J	109
George Creek	4/26/00	. River mile 1.0	SH	H	M	605
Pintler Creek	7/24/00	Above Kelly Gulch	RBT/SH	W	J	64
			RBT/SH	W	J	165
			RBT/SH	W	J	56
Pintler Creek	4/26/00	At Ayers Gulch	SH	W	M	615
	4/26/00	0.2 mi. below Ayers Gulch	SH	W	M	560
Tenmile Creek	4/13/00	. River mile 5.5	SH	H	M	607
	4/13/00	. River mile 2.0	SH	W	M	595
Mill Creek	4/21/00	. River mile 0.3	SH	W	M	615
Couse Creek	4/12/00	. River mile 1.1	SH	W	M	595
	5/03/00	. River mile 3.2	SH	W	F	575

[a] J= juvenile, M= male adult, F= female adult

Habitat Assessment

Temperature loggers were deployed in the spring during our spawning surveys and they were recovered during the summer and fall, 2000 (Figs. 3 & 4). All average temperatures recorded were generally within reasonable physiological limits (65-70 F) for rainbow/steelhead trout (Bjornn and Reiser, 1991). However, several of the sites had maximum daily temperatures that were marginal for salmonids during summer and early fall months (Appendix D).

Stream flow measurements were taken during the course of our sampling efforts from spring to fall, 2000 (Figs. 5 & 6, Appendix E). Stream flows were generally very low in the summer for all study areas and some reaches were dry or contained isolated pools of water during the summer. In May, a wild female steelhead was found stranded in a pool in Couse Creek by a long downstream portion of the stream that was already dry. Low flows in some streams created barriers for migration during summer months for juvenile and sub-adult salmonids. High densities of rainbow/steelhead trout were observed confined to isolated pools during summer months.

Most streams had fair to poor bank stability and riparian vegetation in some areas. Some bank damage can be attributed to livestock use, yet most was probably caused by recent flooding. Poor riparian areas also create a lack of large woody debris (LWD). Areas with good riparian vegetation ordinarily had good bank stability, more LWD, and more diverse stream habitat. Areas without riparian vegetation tended to have fewer pools because of the lack of stable banks and LWD. Sediment was deposited on the substrate of most stream reaches and created generally fair to poor habitat conditions.

Stream Profiles

<u>Tenmile Creek</u>

Spawning surveys on Tenmile Creek were conducted from Kiesecker Gulch Road down to the Snake River Road Bridge (16.9 mi.). The surveys were conducted on April 12th, 13th, 21st, and 27th, and May 3rd (Table 1.). The upper stream is considerably braided and consists of small riffles with mostly plunge and lateral scour pools. The upper tributaries of Tenmile creek had good riparian vegetation comprised of hawthorn, cottonwood, willows, and conifer. The main creek had some areas with riparian vegetation, and large areas with no streamside vegetation had severe scour and deposition from floods. The bank stability, types of pools, and amount of woody debris were generally dependent on the presence of riparian vegetation. Tenmile Creek had moderate sedimentation throughout the stream and was very turbid around Mill Creek during our spawning surveys. A stream discharge of 10.6 cfs was measured on April 13th in Tenmile creek above the Snake River Rd Bridge (Appendix E). Average temperatures for Tenmile Creek remained below 70 F for the 2000 season. We deployed a temperature logger for mid-Tenmile Creek (TC-9), but the logger was found dry during the summer. The data collected from the logger is not reported because we were unable to determine when the logger was no longer submerged.

Multiple age classes of rainbow trout were observed in the main tributary running through Harben Grade. Twenty-three rainbow trout redds were counted on April 21st, which confirms the presence of resident rainbow (possibly redband) trout (Table 1). This count is extremely conservative because at the time many redds in progress were not considered in our total. Thirty-six steelhead redds were found in the comprehensive survey of Tenmile Creek (Table 1, Fig 3). The uppermost redd was found just below the spring tributary (third tributary on the left bank-facing downstream), and the lowest redd was found 500 ft below the first bridge on Weissenfels Ridge Rd. The greatest concentration of redds (24) were observed from just above Swanks' property down to where Weissenfels Rd turns up and away from the creek. Sixteen adult steelhead were observed: 3 wild males, 1 wild female, 1 hatchery male, 1 unknown male, and eight unknown adult steelhead (Table 1).

Electrofishing surveys were conducted on Tenmile Creek on July 26th, and 27th. Quantitative electrofishing was not possible in the upper areas of Tenmile creek because of very low stream flows. Instead, because the fish were concentrated primarily in the pools, we chose a qualitative method in order to cover more area. We found 115 rainbow trout of multiple age classes from about 750 ft above the second left tributary down to the spring tributary (third left) (Appendix B). Sixteen age 0+ rainbow trout were observed in the intake stream to Weissenfels pond, which may indicate some natural production above, or from, the pond (Appendix B). Only one rainbow (128 mm) was found in the pond outlet stream, but only 180 ft were surveyed. The stream had very little water with just a few pools directly below the pond, and the single fish was found in a pool. The middle section of Tenmile Creek dried up and recharged at about RM 6.75. We electrofished two sites here and captured 272 rainbow/steelhead trout (Fig. 4). Almost 34% of the trout captured were age 0+, and a little over 3% were 8 inches or greater in size (Table 2). Somewhere between RM 2 and RM 4 Tenmile Creek became dry, water flows resumed just above RM 2 and continued down to the mouth. We conducted one quantitative electrofishing survey about 0.1 mile below where the stream recharges. Over 60% of the rainbows captured there were age 0+, and no rainbow trout of 8 in or larger were found. A qualitative site was conducted 200 yards above the quantitative site in this section of the stream. We captured 47 rainbow trout from multiple age classes (Appendix B).

Mill Creek

Steelhead spawning surveys were conducted on Mill Creek from Anatone to Tenmile Creek on April 12th, 21st, and 27th. The creek, near Anatone, had mostly tall grass with an occasional hawthorn. About a mile downstream from Anatone the hawthorn was very thick, almost impossible to walk through in parts. Riparian woody vegetation was fair in the canyon from approximately one and a half miles downstream from Anatone to the mouth. Riparian vegetation consisted of hawthorns, tall grass, and occasional conifers. Bank stability was fair to poor throughout Mill Creek. The creek has moderate to heavy sedimentation, and water visibility was poor during our surveys because of water turbidity. The stream has a steep gradient consisting mainly of small riffles and plunge pools. Stream temperatures during the surveys were in the mid to low 50 ^{o} F range. We noted a water diversion that may be unscreened at Anatone and several culverts in town with poor passage conditions.

No redds were found during our surveys, although poor water visibility made redd identification difficult. Two adult steelhead were observed together in the tailout of a pool approximately 2.0 miles below Anatone, one was identified as wild and the other could not be identified. Another steelhead, a 24.5 inch (wild) male, was found dead upstream from Tenmile Creek (Table 1). Genetic samples were taken from the dead steelhead.

A temperature logger was located near Mill Creek Road about 2 miles below Anatone, and although it was in a puddle of water on July 27th, the rest of the stream in that section was dry (Fig. 3). We did not survey below Mill Creek Road so we do not know if the lower portion of Mill Creek remains wet in some areas.

Couse Creek

A spawning survey was conducted on Couse Creek, from the bridge at the Snake River Rd. up to the second bridge (3.2 mi.), and from the second bridge up to the forks (2.3 mi.), on April 12th and May 3rd respectively (Table 1, Fig. 5). The riparian vegetation was rated good from the Snake River Rd. upstream about 1.5-2.0 miles, above that the stream channel was wide and unstable and the riparian vegetation was rated fair to poor. Some areas had very little or no vegetation, probably caused by the 1996-97 floods. Bank stability was generally fair throughout the drainage, although there were some areas that were good and others that were poor. The stream consisted of riffles with small plunge and lateral scour pools. The availability of instream large woody debris (LWD) was dependent on the presence of riparian woody vegetation, because the woody debris only seemed to become lodged in the channel when streamside vegetation was present. Sediment was common throughout Couse Creek. A stream discharge of 3.6 cfs was measured on April 13th about 0.2 mi. above the mouth (Appendix E, Fig. 5). Water temperatures in April and May ranged between the mid 50's F and 60's F (Appendix D).

Multiple age classes of rainbow trout/ steelhead were observed in the creek. Eight rainbow trout redds were observed, which confirms the presence of resident rainbow. One wild male steelhead (584 mm) and one wild female steelhead (560 mm) were observed. The wild female SH was found about three and a half miles above the mouth. She was spawned out, and stranded in a pool upstream from a large dry section of the creek. Six steelhead redds were found, four below the top bridge and two above it. The uppermost redd was approximately four miles above the mouth (Fig. 3).

On July 26th we conducted an electrofishing survey on Couse Creek at one site approximately 0.2 miles from the mouth (Fig. 4). Couse Creek was dry from about 1.5 miles above the mouth to about 0.5 miles above the top bridge. The upstream area had portions of the stream where the channel was dry or nearly dry. Most fish in the upper section were concentrated in pools. The lower section where we electrofished had good flows. Stream discharge was measured about 0.2 miles above the mouth at 1.6 cfs on July 27th, and again at 0.9 cfs on October 10th (Appendix E, Fig. 5). Two to three age classes of rainbow/steelhead trout were captured during our electrofishing efforts. Almost 78% of the rainbow captured were age 0+, and no rainbow trout 8 in. were found (Table 2). The only other species found during electrofishing were speckled dace (Appendix C).

George Creek

Steelhead spawning surveys in George Creek were conducted from just upstream of the Forest Service boundary to 3 miles below Wormell Gulch (7.8 mi.), and from ½ mile above Stringtown Gulch to the mouth of George Creek (8.0 mi.). The spawning surveys were conducted between April 26th and May 8th , 2000 (Table 1.). No surveys were conducted in the middle section of George Creek from approximately river mile (RM) 6 to RM 11 due to restricted access (Fig. 4).

George Creek from the Forest service line to below Wormell Gulch had good riparian buffers, good bank stability and many small debris jams. The riparian from Stringtown Gulch down was sporadic with areas of good riparian and areas with limited riparian vegetation. Bank stability appeared to be dependent on the presence of riparian woody vegetation, areas without riparian trees and brush generally had poor bank stability. Overall, bank stability was fair to poor in this region. The stream consists of riffles with plunge and lateral scour pools. It has a good amount of woody debris (LWD) in areas with a riparian canopy, and very little LWD in areas with little or no riparian trees. George Creek generally had moderate sedimentation, with the heaviest sedimentation from Stringtown Gulch to the mouth. Water temperatures during the surveys ranged from 47 F - 55 F (Appendix D). Stream discharge measurements were taken above the culvert at Trent Grade; 13.0 cfs, ½ mile above Stringtown Gulch; 33.7 cfs, below the bridge on Meyers Ridge Rd; 22.1 cfs, and upstream from the mouth; 44.8 cfs (Appendix E, Fig. 6). We observed a potential passage problem with a perched culvert at the Trent Ridge road crossing and a small instream pond dug in the stream channel a short distance upstream. Both of these structures should be examined for passage enhancements.

Numerous rainbow trout and two rainbow trout redds were observed in George Creek above Heffelfinger Creek. Eight steelhead were seen during spawning surveys, one hatchery male, and seven others of unknown origin (Table 1). George Creek was larger and had more streamflow than the other creeks surveyed, this made fish identification more difficult. Twenty-one steelhead redds were observed in George Creek, thirteen redds in the upper sections, and eight redds in the lower sections (Table 1, Fig.4). Two steelhead redds were found in the bottom 1/4 mile of Coombs creek. No steelhead redds were documented above Trent Grade (Although, 1 possible redd was observed above Trent Grade.), in the bottom 1/4 mile of Heffelfinger Creek, or from Meyers Ridge Rd bridge down to the mouth. Suckers were also observed spawning in George Creek from about Wormel Gulch down to the mouth (Appendix C).

On July 25th and 26th, 2000, we conducted electrofishing surveys in George, Coombs, and Hefflefinger creeks. Nine sites electrofished in George, Coombs, and Hefflefinger produced 670 rainbow/steelhead representing 3-5 age classes (Fig. 2). In lower George Creek almost 58% of the rainbow/steelhead population captured were age 0+. Less than 1% were rainbow trout 8 inches or larger. In upper George Creek, 35% of the fish sampled were age 0+, and just over 1% were 8 in or larger. In Coombs and Heffelfinger Creeks we found approximately 77% of the fish sampled were age 0+, and no trout of 8 in or larger were collected (Table 2). However, In Hefflefinger Creek, numerous age 1+ trout up to 6-8 in were observed one mile upstream from George Creek in a small pool below a collapsed wooden bridge. During our electrofishing efforts, we collected rainbow trout that were brightly colored with yellow sides and a broad red stripe that appeared to potentially be resident redband rainbow trout. Stream discharge was measured on George creek in the summer at 0.2 miles below Rockpile Gulch; 0.6 cfs, above Trent Grade culvert; 1.0 cfs, 1.5 miles below the culvert; 1.19 cfs, and 300 feet below Hefflefinger Creek; 1.7 cfs (Appendix E, Fig. 6). Stream flow was not measured in Hefflefinger or Coombs during the summer, both were approximately 0.4 cfs (less than ½ of the flow observed during spawning surveys), and with Coombs having slightly greater flow than Hefflefinger Creek.

Pintler Creek

Pintler Creek was surveyed for spawning steelhead from Nimms Creek down to George Creek (8.6 mi.) on April 26th and May 9th, 2000 (Table 1). The riparian zone was in fair to poor condition, with young hawthorn, alder, cottonwood, and willow predominating. Some sections had good riparian vegetation with some relatively large trees and a narrow stable channel. Some other areas had no riparian vegetation and a wide unstable channel. These wide areas generally were dry in summer. Bank stability was fair to good in areas with established riparian vegetation, and generally poor in the absence of riparian vegetation. The stream consists of small riffles and plunge pools with a moderate to high gradient. The pools appeared to be established by large boulders, and trees or woody debri. Some pools were relatively large and deep (2-3 ft). Sedimentation was generally high throughout the Pintler Creek drainage with a fine silt layer covering most of the substrate. We electrofished in an upstream direction because of the turbidity we created by disturbing silt from the stream bottom. Water temperatures between April and May were mid to low 50 F (Appendix D). A stream discharge of 1.7 cubic ft per second (cfs) was taken on April 26th above Ayers Gulch (Appendix E).

Multiple age classes of rainbow trout were observed, some of which were greater than 12 inches. Some of the rainbows were seen actively spawning in the spring, which confirms the presence of a resident trout population. Twelve rainbow trout redds (nests) were found in Nimms Creek and Pintler Creek (Table 1). We observed six wild (naturally produced) steelhead and three steelhead of unknown origin during our surveys. Four steelhead redds were located above Kelly Gulch and two were found between Ayers Gulch and George Creek (Figure 4). The stream sections where redds were found remained wet during the summer, and the range of rainbow and steelhead redds overlapped. The reproductive and genetic association between resident rainbow trout and steelhead is not currently known. However, the possibility of genetic exchange does exist. Suckers were also observed spawning in Pintler Creek during our surveys in April and May (Appendix C).

On July 24th we conducted electrofishing sampling in Pintler Creek, two sites from above Nimms Creek to approximately 3/4 mile below the confluence of Nimms and Pintler, and three sites from ½ mile above Kelly Creek to Ayers Gulch (Appendix A). The headwaters of Pintler Creek were mostly dry with some wet spots, stream flows increased somewhere above Nimms Creek and flowed down to about 350 yards below Kelly Gulch where the stream went dry. Stream flows resumed just above Ayers Gulch for about ½ mile before the stream went dry again. Nimms Creek had very low flows, but we found two age classes and fair densities of rainbow trout in the pools in Nimms Creek (Appendix C). During our sampling of Pintler Creek we captured 293 rainbow/steelhead representing 3-5 age classes of rainbow/steelhead, these fish were found predominantly in pools. In Pintler Creek 51% of the trout sampled were age class 0+, and about 5% were fish of 8 in or larger (Table 2). Many adult and sub-adult trout had poor condition factors (Table 3) and were observed with large heads and thin bodies due to over-crowding and a shortage of food and cover. One fish of approximately 10 in was found shortly after it had died in a pool. The cause of death was not determined. During low summer flows Pintler Creek has heavy sedimentation that likely reduces interstitial spaces in the substrate and decreases available cover for juveniles and the abundance of aquatic insects. The other species found during our sampling were speckled dace, and suckers (Appendix C). We did not find sculpins, even though we found them in George Creek around its confluence with Pintler Creek. The wet section of stream from above Ayers Gulch to½ mile downstream was not sampled by electrofishing, but rainbow trout were observed in that area. Maximum water temperatures in that section remained below 65º F during the entire summer as these flows were from groundwater recharge near Ayers Gulch (Appendix D).

Recommendations

After examining the data and our sampling efforts from 2000 we recommend some additional data be collected within the next 1-2 years.

1. Conduct additional spawning and electrofishing surveys higher in George and Coombs creeks to determine fish distribution and relative abundance there. Also, examine flows and temperatures there in summer.
2. Establish index spawning survey areas in each stream and survey these areas twice each year for a few years.
3. Extend surveys or reexamine the upper portions of Couse, Tenmile and Mill Creek for fish use and habitat conditions.
4. Conduct additional summer surveys of stream habitat conditions to document the locations and extent of dewatered stream reaches or other barriers and other habitat conditions such as the extent of riparian vegetation and stream channel conditions. This could be a simple survey where, at a set interval (e.g. every 300 ft or every 5 minutes of hiking) certain conditions are measured or estimated, such as:
    - three stream widths about 15- 25 ft apart and 3 depth measurements per transect (at one fourth, one half, and three fourths of transect width)
    - maximum depth measurments per transect
    - riparian condition description and riparian width measurement, with photos
    - bank condition
    - pool/riffle ratio over a reach
    - pool quality ratings
    - substrate sizes and types
    - sediment estimates
5. Collect more steelhead samples from adults and juveniles to collect adequate samples for genetic analyses
6. Conduct further examination of fish that appear to be resident redband trout and try to determine a method to differentiate from steelhead.
7. Examine the streams for potential enhancement opportunities, such as:
    - bank or riparian restoration
    - increasing pool habitat and deposition of large woody debris
    - reducing sediment delivery to the streams
    - decreasing the intensity of runoff events
8. The stray rates and sources of hatchery fish into these basins should be examined and steelhead spawning escapement goals should be developed by WDFW and others.
9. These streams should be re-surveyed for fish distribution and relative abundance about every 3-5 years.

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Appendices A - F

Appendix A. Asotin area study sites, 2000.

Reach	Site #	RM[a]	Location (within sec. is listed as smallest qtr. sec of qtr. sec)	Sample Type[b]	Comments
George Ck	GC-1	18.7	T8N,R44E,Sec 28, NW1/4,NE1/4	Ql	~200 ft below previous site
	GC-2	18.6	T8N,R44,E,Sec 28, NW1/4,NE1/4	Qt	0.1 mi above FS line
	GC-3	17.6	T8N,R44E,Sec 22, NW1/4,NW1/4	Qt	100 yards above culvert
	GC-4	17.5	T8N,R44E,Sec 22, NW1/4,NW1/4	T,F	At culvert
	GC-5	16.5	T8N,R44E,Sec 15, SE1/4,SE1/4	Qt	0.9 mi below culvert
	GC-6	15.9	T8N,R44E,Sec 14, NE1/4,SW1/4	Qt,F	1.5 mi below culvert
	GC-7	14.9	T8N,R44E,Sec 13, NE1/4,SW1/4	Qt,F	Below Hefflefinger Gulch
	GC-8	5.5	T9N,R45E,Sec 9, NW1/4,SE1/4	Qt,F	Below Stringtown Gulch
	GC-9	4	T9N,R45E,Sec 3, SE1/4,SE1/4	Qt,F,T	Below Rockpile Gulch
	GC-10	1.5	T10N,R45E,Sec 36, NE1/4,NW1/4	F	Below Pintler Ck mouth
	GC-11	0.4	T10N,R45E,Sec 25, NW1/4,NE1/4	F	0.4 mi above Asotin mouth
	GC-12	0	T10N,R45E,Sec 24, SE1/4,SE1/4	F	Asotin/George Ck confluence
Coombs Ck	CC-1	0	T8N,R44E,Sec 14, NE1/4,SE1/4	Qt	250 ft above George
Hefflefinger Ck	HC-1	0	T8N,R44E,Sec 13,NE1/4,SW1/4	Qt	200 yards above George
Pintler Ck	PC-1	7.9	T9N,R45E,Sec 34, NE1/4,SE1/4	Qt	0.1 mi above Nims Gulch
	PC-2	7.4	T9N,R45E,Sec 34, SE1/4,NE1/4	Qt	0.5 mi below Nims Gulch
	PC-3	6.7	T9N,R45E,Sec 27, SW1/4,SE1/4	T	0.9 mi below Nims Gulch
	PC-4	4.5	T9N,R45E,Sec 15, NE1/4,SE1/4	Qt,F	Upper WDFW prop line
	PC-5	3.6	T9N,R45E,Sec 14, NW1/4,NE1/4	Qt,F	above Kelly Gulch
	PC-6	3.3	T9N,R45E,Sec 11, SE1/4,SE1/4	Qt	Below Kelly Gulch
	PC-7	0.4	T10N,R45E,Sec 36, SE1/4,NW1/4	F,T	0.5 mi above George Ck
Nims Creek	NC-1	0.2	T9N,R45E,Sec 35, NW1/4,SW1/4	Ql	0.2 mi above Pintler
Tenmile Ck	TC-1	14.8	T7N,R45E,Sec 1, NE1/4,NE1/4	Ql	Uppermost site
	TC-2	14.7	T7N,R46E,Sec 6, NW1/4,NW1/4	Ql	Above pond
	TC-3	14.6	T7N,R46E,Sec 31, SW1/4,SW1/4	Ql	Below pond
	TC-4	13.3	T8N,R46E,Sec 31, NE1/4,NE1/4	Ql	Above 2nd trib
	TC-5	13.1	T8N,R46E,Sec 30, SE1/4,SE1/4	Ql	2nd trib. to spring tributary
	TC-6	11.6	T8N,R46E,Sec 20, NE1/4,SE1/4	T	1.5 mi above Mill Ck mouth
	TC-7	6.8	T9N,R46E,Sec 33, SE1/4,NE1/4	T	3.5 mi below Mill Ck mouth
	TC-8	5.7	T9N,R46E,Sec 27, NE1/4,SW1/4	Qt	Above jeep trail
	TC-9	5.4	T9N,R46E,Sec 27, SE1/4,NW1/4	Qt	At Jeep trail
	TC-10	2.4	T9N,R46E,Sec 11,SE1/4,SE1/4	Ql	1.2 mi above 2nd bridge
	TC-11	2.3	T9N,R46E,Sec 11,NE1/4,SE1/4	Qt	1.1 mi above 2nd bridge
	TC-12	2.1	T9N,R46E,Sec 11,SE1/4,NE1/4	T	2nd bridge
	TC-13	0.2	T10N,R46E,Sec 36,SW1/4,SW1/4	F	Snake River Rd. Bridge
Mill Ck	MC-1	2.9	T8N,R46E,Sec 19, NE1/4,SW1/4	T	Mill Creek Rd. culvert
Couse Ck	CC-1	5.6	T8N,R46E,Sec 22, SW1/4,SW1/4	T	0.5 mi above Hoskins Gulch
	CC-2	0.1	T8N,R47E,Sec 6, NE1/4,NW1/4	Qt,T,F	0.1 above Snake R Rd

[a] River mile.
[b] Qt - Quantitative electrofishing (density estimates); Ql - Qualitative electrofishing; T - Temperature; F - Manual Flow.

Appendix B. Relative abundance for qualitative electrofishing sites, 2000.

Stream	Site	Approximate site length (m)	Relative abundance	Comments
George Creek	GC-1	65	many age 0+ & 1+ RBT's[a] found, RBT's common.	Moderate intensity survey, sampling mainly pools. Only RBT's found
Nimms Creek	NC-1	45	Five 1+ (115-165mm) and two $200mm[b] (206, 221mm) RBT's; dace-common, RBT's-uncommon.	Moderate intensity survey, sampling mainly pools.
Tenmile Creek	TC-1	30	No fish found.	Light intensity survey, sampling a few pools and riffles over several hundred yards.
Tenmile Creek	TC-2	60	Only one 128mm RBT found.	Sampled mainly pools for a short distance.
Tenmile Creek	TC-3	30	Sixteen 0+ RBT's (40-82mm), 1 age class of RBT found; RBT's common.	Intense survey. Very little flow and turbid. Only RBT's found.
Tenmile Creek	TC-4	250	Four 0+ (54-60mm), Thirty-one 1+ (110-192mm) & four $200mm (200-220mm) 3-4 age classes of RBT's; crayfish, RBT - uncommon; dace - common.	Intense survey. Fish concentrated in the pools. Low flow, less than 1 cfs; heavy sedimentation.
Tenmile Creek	TC-5	440	Eighteen 0+ (52-71 mm), fifty four 1+ (89-198mm), & two $200mm (208,210mm), 3-4 age classes of RBT's found.	Intense survey. Fish concentrated in the pools. Low flow, less than 1 cfs; heavy sedimentation.
Tenmile Creek	TC-10	100	Thirty-two 0+ (58-86 mm), fifteen 1+ (103-166mm) 2-3 age classes of RBT's found; sucker, dace - common, RBT - abundant	Moderate intensive qualitative survey. To determine relative number of age-classes for RBT's.

[a] RBT = Rainbow/steelhead trout
[b] 200mm = 7.9 inches

Appendix C. Non-salmonid species average abundance in specified reaches. Key: absent = 0; rare = 1; uncommon = 2; common = 3; abundant = 4; NA - data not available.

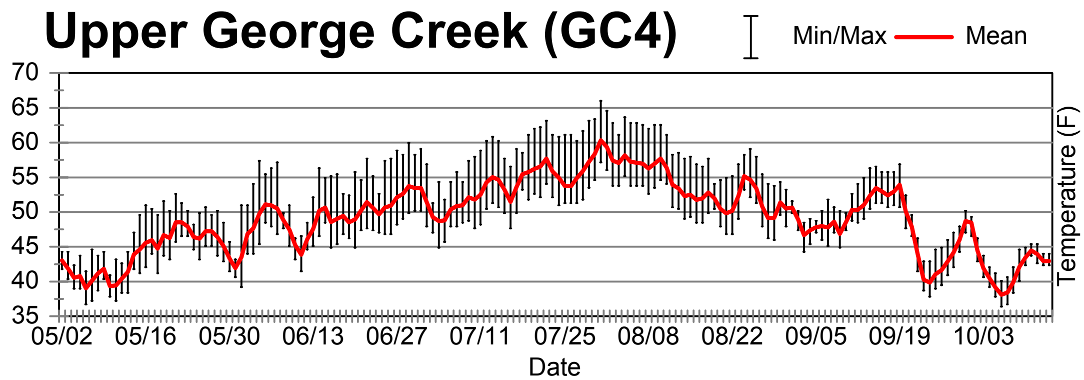
		Reach									
		Asotin Area Streams									
Species	George, above Coombs	George, below Coombs	Coombs Canyon	Hefflefinger Gulch	Lower George Ck	Nimms Ck	Upper Pintler	Lower Pintler	Upper Tenmile	Lower Tenmile	Couse Ck
Cyprinidae **Speckled dace** ***Rhinichtys osculus***	**0**	**3**	**0**	**0**	**3**	**3**	**3**	**4**	**1**	**3**	**3**
Catostomidae[a] **Suckers** ***Catostomus sp.***	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**3**	**0**
Cottidae **Piute sculpin** ***Cottus beldingi***	**0**	**3**	**2**	**4**	**3**	**0**	**0**	**0**	**0**	**2**	**0**
Crayfish[a] **Pacifastacus Spp.**	**3**	**2**	**0**	**3**	**2**	**0**	**3**	**2**	**1**	**2**	**0**

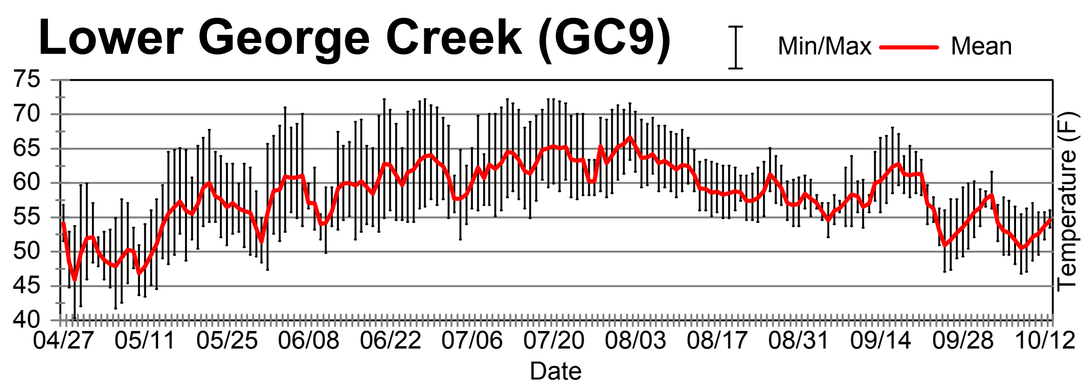
[a] **Noted by genus only, not identified by species.**

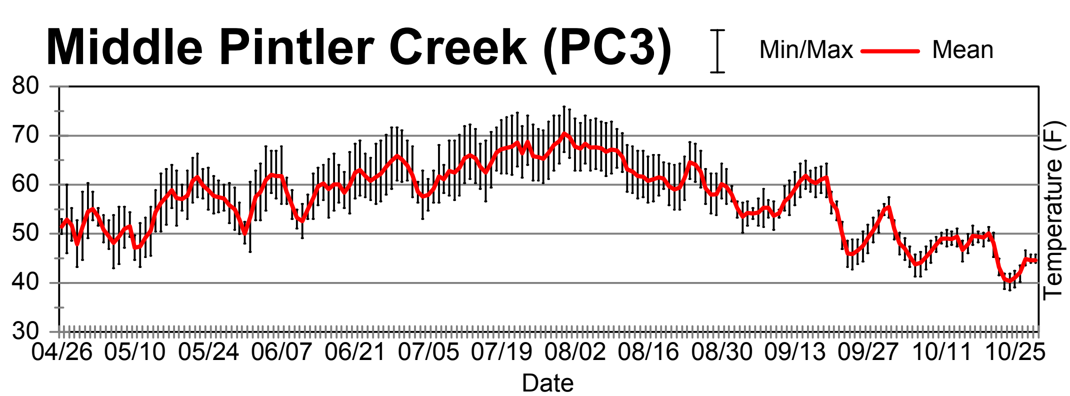
Categories of relative abundance.

Category	**Count (individuals seen)**	**Ranking Value (for averaging sites)**
Absent	**0**	**0**
Rare	**1-3**	**1**
Uncommon	**4-10**	**2**
Common	**11-100**	**3**
Abundant	**100+**	**4**

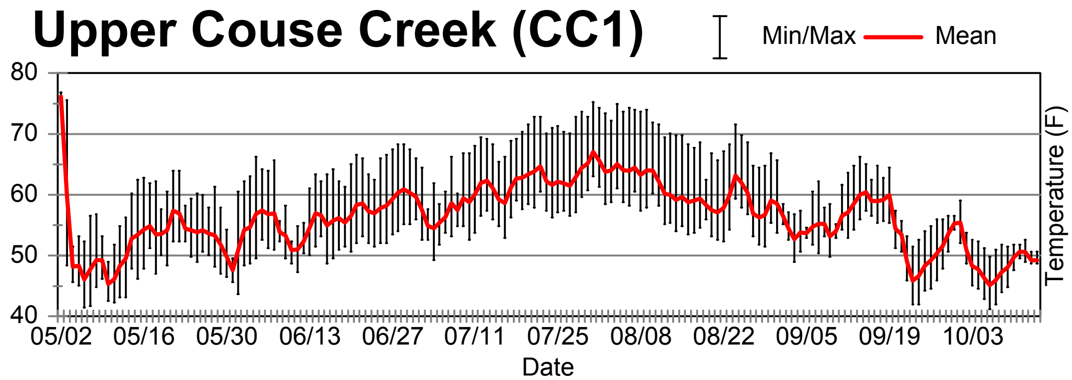
Appendix D. Stream temperature graphs (EF), 2000.

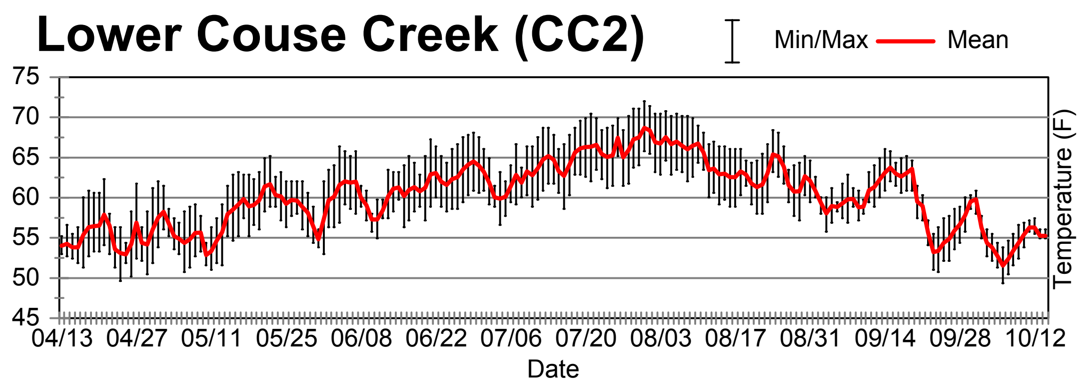


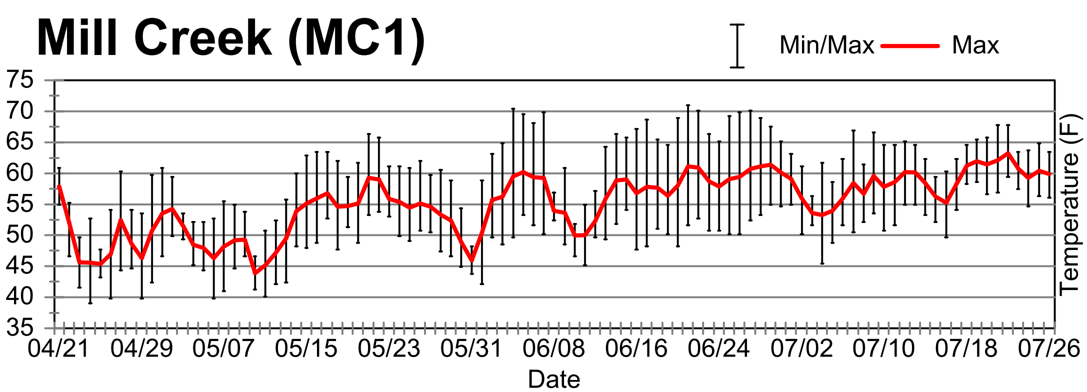




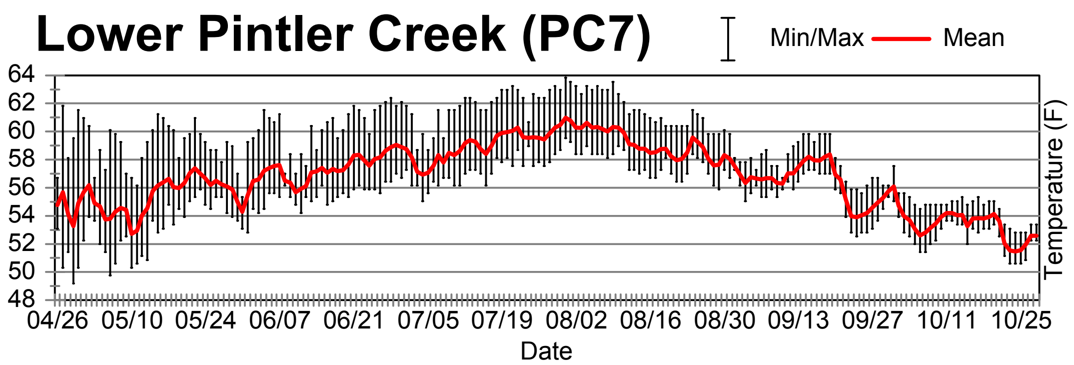
Appendix D. (Cont'd) Stream temperature graphs (EF), 2000.

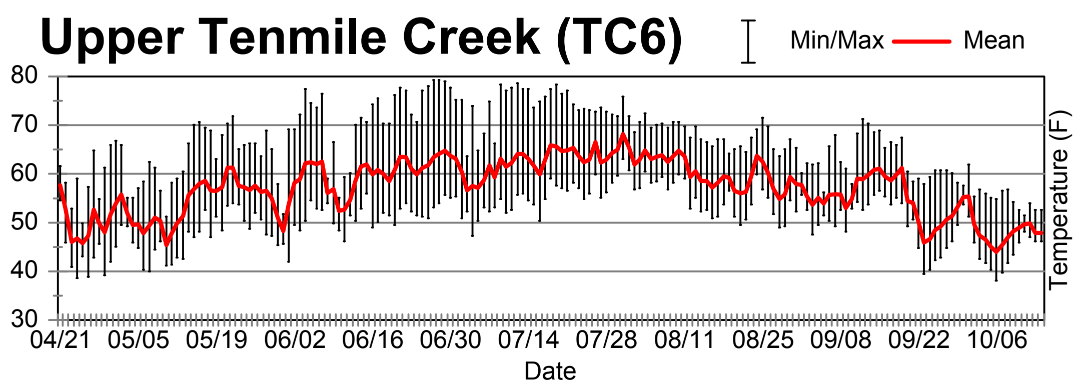


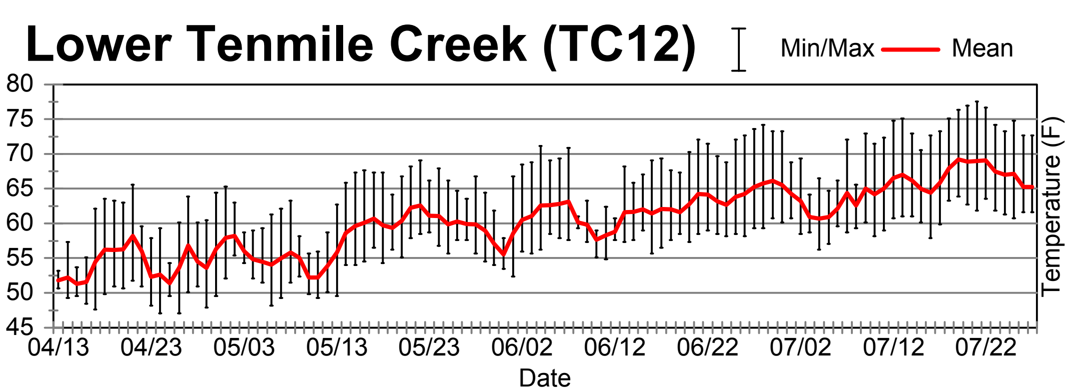




Appendix D. (Cont'd) Stream temperature graphs (EF), 2000.







Appendix E. Manual discharge (cfs) measurements in George Creek, Pintler Creek, Tenmile Creek, and Couse Creek, 2000.

Stream	Site	Date	cfs	Temp(F)	Time (hrs)	Comments
George Creek	GC-4	5/02	**12.9**	NA	13:55	Above Trent Grade culvert
		7/25	**0.97**	42E	10:00	
		10/13	**0.24**	44E	11:04	
George Creek	GC-6	7/25	**1.09**	43E	10:46	1.5 mi. below Trent Grade culvert
George Creek	GC-7	7/25	**1.72**	54E	16:05	Below Heffelfinger Creek
George Creek	GC-8	4/27	**33.7**	54E	14:50	Above Stringtown Gulch
George Creek	GC-9	7/26	**0.63**	71E	15:00	Below Rockpile Gulch
		10/13	**1.64**	56E	09:00	
George Creek	GC-10	5/08	**22.1**	61E	14:55	Above bridge @ mouth of Pintler Ck
George Creek	GC-11	4/21	**85.1**	54E	19:26	0.4 mi above mouth
George Creek	GC-12	4/26	**44.8**	55E	16:00	@ mouth
Pintler Creek	PC-4	7/24	**0.07**	72E	12:47	Upper end of public property line
Pintler Creek	PC-5	7/24	**0.24**	72E	14:42	Above Kelly Gulch
Pintler Creek	PC-7	4/26	**1.64**	58E	13:35	0.5 mi above George Creek
Tenmile Creek	TC-13	4/13	**10.6**	56E	07:00	1st bridge
Couse Creek	C-2	4/13	**3.63**	58E	06:41	0.2 mi above the mouth
		7/26	**1.59**	68E	15:50	
		10/13	**0.93**	51E	12:10	