

Wind River Watershed Restoration

U.S. Geological Survey Annual Report

April 2005 – March 2006

by:

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Introduction

This report summarizes work completed by U.S. Geological Survey's Columbia River Research Laboratory (USGS-CRRL) in the Wind River subbasin during the period April 2005 through March 2006 under Bonneville Power Administration (BPA) contract 22095. During this period, we collected temperature, flow, and habitat data to characterize habitat condition and variation within and among tributaries and mainstem sections in the Wind River subbasin. We also conducted electrofishing and snorkeling surveys to determine juvenile salmonid populations within select study areas throughout the subbasin. Portions of this work were completed with additional funding from U.S. Fish and Wildlife Service (USFWS) and the Lower Columbia Fish Enhancement Group (LCFEG).

A statement of work (SOW) was submitted to BPA in March 2005 that outlined work to be performed by USGS-CRRL. The SOW was organized by work elements, with each describing a research task. This report summarizes the progress completed under each work element.

Work elements

A: 157. Collect/Generate/Validate Field and Lab Data

Title: Assess fish populations in selected streams
Description: Assess population change, abundance, density, and other life-history characteristics for juvenile steelhead and other salmonids in selected stream sections.

During summer 2005, CRRL personnel conducted pass-removal electrofishing on 11 stream sections to estimate populations of juvenile steelhead/rainbow trout *Oncorhynchus mykiss*, hereafter referred to as steelhead, brook trout *Salvelinus fontinalis*, and Chinook salmon *O. tshawytscha* (Tables 1 to 7). Many of these sites have been sampled multiple times since 1997. At all sites, juvenile steelhead were tagged with Passive Integrated Transponder (PIT) tags, which uniquely identify individuals, enabling growth and life-history data to be collected. All PIT tagging followed the procedures and guidelines outlined by Columbia Basin Fish and Wildlife Authority (1999). Six of the sample sites (Trapper Creek

control and treatment, Martha Creek control and treatment, and Cedar Creek control and treatment) were done in concert with a project funded by Lower Columbia Fish Enhancement Group to evaluate nutrient addition by use of carcass analogs. At these six sites we conducted electrofishing, under stratified systematic sampling, using the removal method, to assess population abundance, density, and biomass. Habitat units were divided into strata (e.g., pools, glides, riffles, and side channels) and a systematic sample were shocked. Two or more electrofishing passes were made following removal-depletion methodology (Zippin 1956; Bohlin et al. 1982; White et al. 1982). The field guides of Connolly (1996) were used to determine the number of passes necessary to insure a controlled level of precision in the population estimate ($CV < 25\%$ for age-0 salmonids and $CV < 12.5\%$ for age-1 or older salmonids) was achieved within each sampling unit for each species and age group. These methods were chosen to minimize the number of units sampled and the number of passes per unit.

Additional electrofishing occurred throughout spring, summer, and fall to recapture PIT-tagged fish and record growth and movement data. Population data from these efforts will be compared with past values and related to adult and smolt data collected by Washington Department of Fish and Wildlife (WDFW).

Electrofishing and PIT tagging was also conducted in the Little Wind River, though population estimate data were not attempted. At an additional three sites in the mainstem of the Wind River between river kilometer (rkm) 24.0 and 31.5 we electrofished in August and September to PIT tag juvenile steelhead and juvenile Chinook salmon. This effort was partially funded by USFWS to investigate interactions of wild steelhead with a wild spawned hatchery-origin Chinook population.

To gather additional data for the steelhead and Chinook interactions study, we snorkeled the mainstem Wind River between rkm 24.0 and 40.5 (Tables 1 and 2). We performed a stratified-systematic survey following the first phase methodology of the basinwide visual estimation technique (Hankin and Reeves 1988; Dolloff et al. 1993), where we measured all habit units within a stream section but snorkeled a subsample of units within

each strata (pools, glides, riffles, and side channels). We counted age-0 and age-1 or older steelhead and juvenile Chinook. The reach from rkm 35.3 to 40.5 has been snorkeled each year since 2000, the reach from rkm 26.0 to 30.0 has been snorkeled since 2004, and the reach from rkm 24.0 to 26.0 was snorkeled for the first time in 2005. Population estimates for each reach (Tables 8 and 9) were generated by expanding fish densities, by unit type, to the unsampled unit areas (Hankin and Reeves 1988; Dolloff et al. 1993). These data will allow an investigation of whether changes in Chinook populations are affecting populations of steelhead.

We also snorkeled five 100-m sites throughout the length of Trout Creek (Table 10), four of which have been sampled each year since 1998, one since 1999. These data from both the mainstem Wind and Trout Creek will contribute to long-term monitoring and limiting factors analysis.

B: 158. Mark/Tag Animals

Title: PIT tag juvenile steelhead and other salmonids

Description: About 3,000 juvenile steelhead and other salmonids collected during population assessments will be PIT tagged.

During 2005, we PIT tagged 2,244 juvenile steelhead (FL 70 mm or longer) through instream electrofishing efforts throughout the Wind River subbasin (Table 11). In the mainstem Wind River above rkm 24.0, we tagged 317 juvenile Chinook (FL 65 mm or longer) and an additional 5 juvenile Chinook in Trapper Creek. In the Little Wind River we also tagged 33 juvenile coho salmon (FL 65 mm or longer).

We also tagged steelhead parr at the four smolt traps operated by WDFW in the Wind River subbasin (Table 12). The smolt traps were operated from early April 2005 through June 2005. During this time, we tagged 1,270 parr collected in the smolt traps.

C: 159. Submit/Acquire Data

Title: Submit PIT-tag data to PTAGIS database

Description: Submittal of PIT-tag data to the regional PTAGIS database maintained by PSMFC.

All PIT-tagging and recapture data were entered, proofed and submitted to the PTAGIS database.

D: 157. Collect/Generate/Validate Field and Lab Data

Title: Describe physical habitat conditions

Description: Thermal, flow, and habitat conditions will be surveyed in select stream sections based on where fish assessment work is conducted.

During 2005, we maintained thermographs at 33 sites in the Wind River subbasin (Table 13). These thermographs were in the stream all year and were downloaded during both spring and fall. An additional nine thermographs were deployed by Underwood Conservation District from May through September (Table 14). Data from these were incorporated in the USGS database of stream temperatures in the Wind River subbasin. Mean, minimum, and maximum temperatures during July, August, and September at each site are presented in Table 15.

Flow measurements were taken at eight locations throughout the subbasin (Table 16). We measured flow at each site about every two weeks from June through October to record base flow.

E: 162. Analyze/Interpret Data

Title: Analyze and interpret data

Description: Data from Work Elements A to D will be integrated with data from past years (1998 to 2004) in multiple analyses in support of producing a Technical Report.

All data from 2005 have been entered into electronic format, proofed, and added to appropriate databases for integration and analysis. We have begun analysis and writing on several topics for the planned Technical Report. Data collected during 2005 will contribute to a technical report chapter on interactions between introduced Chinook salmon and wild steelhead.

F: 141. Produce Status Report

Title: Quarterly status reports via PISCES
Description: Submit a quarterly status report to BPA via PISCES, indicating the status of each milestone.

Status reports were submitted via PISCES for 2005 activities.

G: 132. Produce Annual Report

Title: 2004 Annual Report
Description: Provide 2004 Annual Report summarizing fish assessment work conducted in 2003 and 2004.

The Annual Report for 2004 has been written and is in the USGS internal peer review process as of this writing. A courtesy copy of the report has been submitted to our COTR while the peer review and editing process are completed.

H: 183. Produce/Submit Scientific Findings Report

Title: Technical Report
Description: A Technical Report will be provided in lieu of a 2005 Annual Report. This report will draw upon data collected since 1998 and other data available to provide an in depth analysis of fish distribution, assemblage, trends in abundance and limits to production in the Wind River subbasin.

A Technical Report is in progress. As discussed with the COTR, the report will contain two chapters on the following subjects:

- 1) Ecological interactions between hatchery and wild fish in the Wind River, WA
- 2) Bioenergetics modeling to assess the energetic cost of Hemlock Dam on the growth potential of juvenile steelhead.

The technical report will not replace the 2005 Annual Report as originally planned. This document is the 2005 Annual Report.

I: 99. Outreach and Education

Title: Meetings for coordination and presentations to public.

Description: Participate in Watershed Council meetings, serve on its Technical Committee, and present findings to public and scientific groups.

All Technical Advisory Committee meetings were attended by USGS personnel, and most of the Watershed Council meetings were attended by USGS personnel. A display on USGS work in the Wind River was presented at the USFWS's Carson National Fish Hatchery open house event in June 2005.

J: 165. Produce Environmental Compliance Documentation

Title: Obtain fish sampling permits.

Description: Submit applications for permits and supply annual collection reports to permitting agency.

Federal and state permits were obtained for 2005 sampling, and all collection reports were submitted to National Oceanic and Atmospheric Agency, National Marine Fisheries Service and to WDFW.

K: 119. Manage and Administer Projects

Title: Develop SOW and other documents for FY06 funded contract performance period.

Description: Develop SOW and other documents for FY06 funded performance period.

Documents for FY2006 were submitted and accepted in March 2006.

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Table 1. Surveys conducted from 1997 to 2000 by the USGS-CRRL using snorkeling or the removal method with electrofishing within the Wind River subbasin. Sites are listed from upstream to downstream within a watershed relative to the mainstem.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)				Year snorkeled (Yes/No)			
			1997	1998	1999	2000	1997	1998	1999	2000
Upper Wind										
Wind R. – ab. Paradise Cr.	40.0	3.8	N	N	N	Y	N	N	N	Y
Paradise Cr. – lower ^b	0 (at mouth)	0.5	N	N	Y	Y	N	Y	N	N
Paradise Cr. – middle	1.3	0.8	N	N	N	N	N	N	N	Y
Paradise Cr. – upper	2.6	0.7	N	N	N	N	N	N	N	Y
Wind R – mining reach	35.4	4.6	N	N	N	N	N	N	N	Y
Falls Cr. – lower	0 (at mouth)	0.8	N	N	N	N	N	N	N	Y
Falls Cr. – upper	1.6	0.5	N	N	N	N	N	N	N	Y
Ninemile Cr.	1.5	0.8	N	N	N	N	N	N	N	Y
Dry Cr. – lower	3.4	0.5	N	N	N	Y	N	N	N	N
Dry Cr. – middle	4.5	0.7	N	N	N	N	N	N	N	Y
Dry Cr. – upper	5.9	0.6	N	N	N	N	N	N	N	Y
Big Hollow Cr. ^b	0 (at mouth)	0.5	N	Y	N	N	N	N	N	N
Trapper Cr. – lower	0 (at mouth)	1.0	N	N	N	N	N	Y	N	Y
Trapper Cr. – middle1	2.9	0.6	N	N	N	Y	N	N	N	N
Trapper Cr. – middle2	3.7	0.8	N	N	N	N	N	N	N	Y
Trapper Cr. – upper	4.8	0.6	N	N	N	N	N	N	N	Y
Wind R – (Trapper-Falls Cr.)	30.0	5.4	N	N	N	N	N	N	N	Y

Continued.

Table 1. Continued.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)				Year snorkeled (Yes/No)			
			1997	1998	1999	2000	1997	1998	1999	2000
Trout Creek										
Trout Cr. – upper	0 (at mouth)	0.5	Y	N	N	N	N	N	N	N
Trout Cr. – Reach 7	14.0	1.0	N	N	N	N	N	N	N	N
Crater Cr. – middle	0.5	0.5	N	N	N	N	N	N	N	N
Crater Cr. ^b	0 (at mouth)	0.5	Y	Y	Y	Y	N	N	N	Y
Trout Cr. – Reach 6	12.5	2.9	N	N	N	N	N	N	Y	N
Trout Cr. – 33 bridge ^b	14.0	0.1	Y	Y	Y	Y	N	N	N	N
Compass Cr. ^b	0 (at mouth)	0.5	N	N	N	N	N	N	N	N
East Fork Trout Cr.	0 (at mouth)	0.4	N	N	N	N	N	N	N	N
Layout Cr. – upper	2.3	0.5	N	N	N	N	N	N	N	N
Layout Cr.	0 (at mouth)	1.0	N	N	Y	N	N	N	N	Y
Trout Cr. – 43 bridge	11.0	0.1	N	Y	N	Y	N	N	N	Y
Trout Cr. – Reach 5	9.4	3.5	N	N	N	N	N	N	N	N
Planting Cr. ^b	0 (at mouth)	0.5	Y	N	N	N	N	N	N	N
Trout Cr. – at Planting Cr.	9.7	0.1	N	N	N	N	N	Y	Y	Y
Trout Cr. – Reach 4	7.3	2.8	N	N	N	N	N	N	N	N
Trout Cr. – Canyon	9.0	0.1	N	N	N	N	N	N	Y	Y
Trout Cr. – PCT Bridge	8.0	0.1	N	N	N	N	N	Y	Y	Y
Trout Cr. – Reach 3	6.7	0.6	N	N	N	N	N	N	N	N
Trout Cr. – Reach 2	5.7	1.0	N	N	N	N	N	N	N	N
Trout Cr. – bl. Smolt Trap	6.0	0.1	N	N	N	N	N	Y	Y	Y
Trout Cr. – All Reaches	5.7	12.1	N	N	N	N	N	N	N	N
Martha Cr. ^b	0.9	0.4	Y	Y	N	N	N	N	N	N

Continued.

Table 1. Continued.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)				Year snorkeled (Yes/No)			
			1997	1998	1999	2000	1997	1998	1999	2000
Panther Creek										
Mouse Cr. ^b	0 (at mouth)	0.5	N	N	N	N	N	N	N	N
Eightmile Cr. – upper	0.7	0.5	N	Y	N	N	N	N	N	N
Eightmile Cr. – lower	0 (at mouth)	0.6	Y	Y	N	N	N	N	N	N
Cedar Cr.	1.0	0.6	N	N	N	N	N	N	N	N

^a Electrofishing sampling conducted during August through mid-October – except Dry Creek in 2001.

^b Locations sampled in 1984 by Crawford et al. (1985).

Table 2. Surveys conducted from 2001 to 2005 by the USGS-CRRL using snorkeling or the removal method with electrofishing within the Wind River subbasin. Sites are listed from upstream to downstream within a watershed relative to the mainstem.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)					Year snorkeled (Yes/No)				
			2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Upper Wind												
Wind R. – ab. Paradise Cr.	40.0	3.8	N	Y	N	N	N	N	N	N	Y	Y
Paradise Cr. – lower ^b	0 (at mouth)	0.5	N	Y	Y	N	N	N	N	Y	N	N
Paradise Cr. – middle	1.3	0.8	N	N	N	N	N	N	N	Y	N	N
Paradise Cr. – upper	2.6	0.7	N	N	N	N	N	N	N	Y	N	N
Wind R – mining reach	35.4	4.6	N	N	N	N	N	N	Y	Y	Y	Y
Falls Cr. – lower	0 (at mouth)	0.8	N	N	N	N	N	N	N	Y	N	N
Falls Cr. – upper	1.6	0.5	N	N	N	N	N	N	N	Y	N	N
Ninemile Cr.	1.5	0.8	N	Y	N	N	N	N	N	N	N	N
Dry Cr. – lower	3.4	0.5	Y	Y	Y	N	N	N	N	N	N	N
Dry Cr. – middle	4.5	0.7	N	N	N	N	N	N	Y	Y	N	N
Dry Cr. – upper	5.9	0.6	N	N	N	N	N	N	N	Y	N	N
Big Hollow Cr. ^b	0 (at mouth)	0.5	N	N	N	N	N	N	N	N	N	N
Trapper Cr. – lower	0 (at mouth)	1.0	N	N	N	N	N	N	N	Y	N	N
Trapper Cr. – middle1	2.9	0.6	N	Y	N	N	Y	N	N	N	N	N
Trapper Cr. – middle2	3.7	0.8	N	N	N	N	Y	N	N	N	N	N
Trapper Cr. – upper	4.8	0.6	N	N	N	N	N	N	N	N	N	N
Wind R – (Trapper-Falls Cr.)	30.0	5.4	N	N	N	N	N	N	N	Y	N	Y
Wind River – bl. smolt trap	28.0	2.0	N	N	N	N	N	N	N	N	N	Y
Wind River – ab. Beaver camp	26.0	2.0	N	N	N	N	N	N	N	N	N	Y
Wind River – bl. Beaver camp	25.0	1.0	N	N	N	N	N	N	N	N	N	Y

Continued.

Table 2. Continued.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)					Year snorkeled (Yes/No)				
			2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Trout Creek												
Trout Cr. – upper	0 (at mouth)	0.5	Y	N	N	N	N	N	N	N	N	N
Trout Cr. – Reach 7	14.0	1.0	N	N	N	N	N	N	Y	N	N	N
Crater Cr. – middle	0.5	0.5	N	N	N	N	N	N	Y	N	N	N
Crater Cr. ^b	0 (at mouth)	0.5	Y	Y	Y	N	Y	N	N	N	N	N
Trout Cr. – Reach 6	12.5	2.9	N	N	N	N	N	N	Y	Y	N	N
Trout Cr. – MS33 bridge ^b	14.0	0.1	Y	Y	Y	N	Y	N	N	N	N	N
Compass Cr. ^b	0 (at mouth)	0.5	Y	N	N	N	N	N	N	N	N	N
East Fork Trout Cr.	0 (at mouth)	0.4	Y	N	N	N	N	N	N	N	N	N
Layout Cr. – upper	2.3	0.5	Y	N	N	N	N	N	N	N	N	N
Layout Cr.	0 (at mouth)	1.0	Y	Y	N	N	N	N	N	N	N	N
Trout Cr. – MS43 bridge	11.0	0.1	Y	Y	Y	N	Y	Y	Y	N	Y	Y
Trout Cr. – Reach 5	9.4	3.5	N	N	N	N	N	N	Y	N	N	N
Planting Cr. ^b	0 (at mouth)	0.5	Y	Y	N	N	N	N	N	N	N	N
Trout Cr. – at Planting Cr.	9.7	0.1	N	N	N	N	N	N	Y	Y	Y	Y
Trout Cr. – Reach 4	7.3	2.8	N	N	N	N	N	N	Y	N	N	N
Trout Cr. – Canyon	9.0	0.1	N	N	N	N	N	N	Y	Y	Y	Y
Trout Cr. – PCT Bridge	8.0	0.1	N	N	N	N	N	N	Y	Y	Y	Y
Trout Cr. – Reach 3	6.7	0.6	N	N	N	N	N	N	Y	N	N	N
Trout Cr. – Reach 2	2.7	1.0	N	N	N	N	N	N	Y	N	N	N
Trout Cr. – bl. Smolt Trap	3.0	0.1	N	N	N	N	N	N	Y	Y	Y	Y
Trout Cr. – All Reaches	2.7	12.1	N	N	N	N	N	N	Y	N	N	N
Martha Cr. – upper	2.0	0.5	N	N	N	Y	Y	N	N	N	N	N
Martha Cr. ^b - lower	0.9	0.5	N	N	N	Y	Y	N	N	N	N	N

Continued.

Table 2. Continued.

Watershed Subwatershed Subdrainage	Start point distance from mouth (km)	Length of section (km)	Year electrofished ^a (Yes/No)					Year snorkeled (Yes/No)				
			2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Panther Creek												
Mouse Cr. ^b	0 (at mouth)	0.5	N	N	N	N	N	N	N	N	N	N
Eightmile Cr. – upper	0.7	0.5	N	N	N	N	Y	N	N	N	N	N
Eightmile Cr. – lower	0 (at mouth)	0.6	N	N	N	N	Y	N	N	N	N	N
Cedar Cr. – upper	2.0	0.5	N	N	N	Y	Y	N	N	N	N	N
Cedar Cr. – lower	1.0	0.5	N	N	N	Y	Y	N	N	N	N	N

^a Electrofishing sampling conducted during August through mid-October – except Dry Creek in 2001.

^b Locations sampled in 1984 by Crawford et al. (1985).

Table 3. Assemblages of fish species observed in streams of the Wind River subbasin during electrofishing and snorkeling surveys, 1996 to 2005. Watersheds and streams are listed in an upstream to downstream pattern. P = present, A = absent.

Watershed			Steelhead/ rainbow trout	Brook trout ^a	Chinook salmon ^a	Shorthead sculpin	Mountain whitefish
Subwatershed Stream	Stream code						
Upper Wind River							
Wind R – ab. Para. Cr.	UMIN		P	P	P	P	A
Paradise Cr. – upper	UPAR		P	A	A	A	A
Paradise Cr. – middle	MPAR		P	A	A	A	A
Paradise Cr. – lower ^b	PARA		P	P	P	P	A
Wind R – mine reach	MINE		P	P	P	P	A
Wind R. – (Falls - mine)	UWFM						
Falls Cr. – upper	UFAL		P	P	P	A	A
Falls Cr. – lower	LFAL		P	P	P	A	A
Ninemile Cr.	NINE		P	A	A	P	A
Dry Cr. – upper	UDRY		P	A	A	P	A
Dry Cr. – middle	MDRY		P	A	A	P	A
Dry Cr. – lower	DRYC		P	A	A	P	A
Big Hollow Cr. ^b	BIGH		P	A	A	P	A
Trapper Cr. – upper	UTRA		P	A	A	P	A
Trapper Cr. – middle 1	TRAP		P	P	P	P	A
Trapper Cr. – middle 2	MTRA		P	A	A	P	A
Trapper Cr. – lower	LTRA		P	A	P	P	A
Wind R. – (Trapper – Falls)	UWTF		P	P	P	P	A
Wind R. – (Beaver – Trap.)	MWBT		P	P	P	P	P
Panther Creek							
Mouse Cr. ^b	MOUS		P	A	A	A	A
Eightmile Cr. – upper	UEIG		P	A	A	P	A
Eightmile Cr. – lower	LEIG		P	A	A	P	A
Cedar Cr. – upper ^c	UCED		P	A	A	P	A
Cedar Cr. – lower	CEDA		P	A	A	P	A

Continued.

Table 3. Continued.

Watershed Subwatershed Stream	Stream code	Steelhead/ rainbow trout	Brook trout ^a	Chinook salmon ^a	Shorthead sculpin	Mountain whitefish
Trout Creek						
Trout Cr. – upper	UTRO	P	P	A	A	A
Trout Cr. – Reach 7 ^d	MTR7	P	P	A	A	A
Crater Cr. – middle	MCRA	P	P	A	A	A
Crater Cr. ^b	CRAT	P	P	A	A	A
Trout Cr. – Reach 6 ^d	MTR6	P	P	A	A	A
Trout Cr. – 33 bridge ^b	MS33	P	P	A	A	A
Compass Cr. ^b	COMP	P	P	A	A	A
East Fork Trout Cr.	EFTR	P	P	A	A	A
Layout Cr. – upper	ULAY	P	P	A	A	A
Layout Cr.	LAYO	P	P	A	A	A
Trout Cr. – 43 bridge	MS43	P	P	A	A	A
Trout Cr. – Reach 5 ^d	MTR5	P	P	A	A	A
Planting Cr. ^b	PLAN	P	P	A	A	A
Trout Cr. – at Planting Cr	MTPL	P	P	A	A	A
Trout Cr. – Reach 4 ^d	MTR4	P	P	A	A	A
Trout Cr. – Canyon	TCAN	P	P	A	P	A
Trout Cr. – PCT Bridge	PCTB	P	P	A	A	A
Trout Cr. – Reach 3 ^d	MTR3	P	P	A	A	A
Trout Cr. – Reach 2 ^d	MTR2	P	P	A	A	A
Trout Cr. – Smolt Trap	LTRT	P	P	A	P	A
Martha Creek – upper ^c	UMAR	P	A	A	A	A
Martha Creek – lower ^b	MART	P	A	A	A	A

^a These species are considered nonnative to the Wind River subbasin above Shipherd Falls.

^b Locations sampled in 1984 by Crawford et al (1985) as well as by USGS-CRRL during 1996 to 2004.

^c Site added in 2004.

^d Reaches were defined by Cochran (1995).

Table 4. Estimates of populations from electrofishing surveys for two age classes of juvenile steelhead (STH)/rainbow trout (RBT) in three subwatersheds of the Wind River subbasin, summer 2005. Sites are listed from upstream to downstream within a subwatershed relative to the mainstem stream.

Subwatershed Stream	Code	River kilometers		Age-0 STH/RBT						Age-1 or older STH/RBT						
		Start	End	Total	SE ^a	CV ^b	no./m	no./m ²	no./m ³	Total	SE	CV	no./m	no./m ²	no./m ³	
Upper Wind R.																
Trapper Cr. - control	UTRA	3.9	4.4	295	85.2	28.9	0.511	0.105	0.364	270	42.9	15.9	0.468	0.096	0.333	
Trapper Cr. - treatment	LTRA	2.9	3.4	580	57.2	9.8	1.041	0.807	0.414	231	14.9	6.5	0.414	0.078	0.321	
Trout Cr.																
Crater R.	CRAT	0.0	0.5	399	46.5	11.7	0.821	0.216	0.894	93	8.3	8.9	0.192	0.050	0.209	
MS33 bridge	MS33	14.0	14.1	60	3.9	7.0	0.545	0.059	0.256	72	3.0	4.0	0.655	0.070	0.307	
MS43 bridge	MS43	11.0	11.1	170	2.9	2.0	1.189	0.111	0.456	37	1.6	4.0	0.259	0.024	0.098	
Martha Cr. - control	UMAR	2.0	2.5	138	29.0	21.0	0.284	0.080	0.431	333	52.3	15.4	0.682	0.194	1.037	
Martha Cr. - treatment	LMAR	1.0	1.5	166	28.6	17.2	0.325	0.088	0.417	218	24.2	11.1	0.427	0.115	0.547	
Panther Cr.																
Eightmile Cr. - upper	UEIG	0.6	1.1	1,277	179.1	14.0	2.843	0.830	4.855	293	47.2	16.1	0.652	0.190	1.113	
Eightmile Cr. -Lower	LEIG	0.0	0.5	1,325	143.5	10.8	2.343	0.850	6.232	240	29.0	12.0	0.425	0.154	1.130	
Cedar Cr. - control	UCED	2.2	2.7	357	46.6	13.1	0.736	0.207	0.761	206	22.5	10.9	0.425	0.120	0.439	
Cedar Cr. - treatment	LCED	1.2	1.7	443	59.1	13.3	0.087	0.212	1.199	258	16.8	6.5	0.508	0.124	0.698	

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 5. Estimates of biomass (g) from electrofishing surveys for two age classes of juvenile steelhead (STH)/rainbow trout (RBT) in three subwatersheds of the Wind River subbasin, summer 2005. Sites are listed from upstream to downstream within a subwatershed relative to the mainstem stream.

Subwatershed Stream	Code	River kilometers		Age-0 STH/RBT						Age-1 or older STH/RBT					
		Start	End	Biomass	SE ^a	CV ^b	g/m	g/m ²	g/m ³	Biomass	SE	CV	g/m	g/m ²	g/m ³
Upper Wind R.															
Trapper Cr. - control	UTRA	3.9	4.4	810	229.1	28.3	1.402	0.287	1.000	6,949	982.6	14.1	12.034	2.463	8.571
Trapper Cr. -treatment	LTRA	2.9	3.4	1,472	154.0	10.5	2.639	0.500	2.045	5,069	213.0	4.2	9.090	1.724	7.044
Trout Cr.															
Crater Cr.	CRAT	0.0	0.5	310	34.0	11.0	0.637	0.167	0.694	1,778	176.7	9.9	3.655	0.960	3.983
MS33 bridge	MS33	14.0	14.1	110	---	---	0.995	0.107	0.467	907	---	---	8.249	0.886	3.871
MS43 bridge	MS43	11.0	11.1	1,037	---	---	7.251	0.678	2.760	1,321	---	---	9.239	0.863	3.517
Martha Cr. - control	UMAR	2.0	2.5	171	43.1	25.2	0.350	0.100	0.532	5,292	626.4	11.8	10.847	3.078	16.493
Martha Cr. - treatment	LMAR	1.0	1.5	248	42.5	17.2	0.485	0.131	0.621	4,975	551.5	11.1	9.744	2.631	12.478
Panther Cr.															
Eightmile Cr. -upper	UEIG	0.6	1.1	2,728	380.1	13.9	6.075	1.773	10.376	3,125	489.1	15.6	6.960	2.031	11.886
Eightmile Cr. -Lower	LEIG	0.0	0.5	2,639	273.5	10.4	4.667	1.693	12.411	2,668	324.7	12.2	4.718	1.712	12.547
Cedar Cr. - control	UCED	2.2	2.7	1,256	146.8	11.7	2.591	0.728	2.678	3,098	348.7	11.3	6.391	1.797	6.605
Cedar Cr. - treatment	LCED	1.2	1.7	922	151.6	16.4	1.814	0.441	2.496	3,115	199.9	6.4	6.127	1.491	8.430

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 6. Estimates of populations from electrofishing surveys for two age classes of juvenile brook trout (BRK) in Trout Creek, a subwatershed of the Wind River subbasin, summer 2005. Sites are listed from upstream to downstream within a subwatershed relative to the mainstem stream.

Subwatershed Stream	Code	River kilometers		Age-0 BRK						Age-1 or older BRK					
		Start	End	Total	SE ^a	CV ^b	no./m	no./m ²	no./m ³	Total	SE	CV	no./m	no./m ²	no./m ³
Trout Creek															
MS33 bridge	MS33	14.0	14.1	8	2.1	26.0	0.073	0.008	0.034	2	0.0	0.0	0.018	0.002	0.009
MS43 bridge	MS43	11.0	11.1	6	5.9	99.0	0.042	0.004	0.016	1	0.0	0.0	0.007	0.001	0.003

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 7. Estimates of biomass (g) from electrofishing surveys for two age classes of juvenile brook trout (BRK) in Trout Creek, a subwatershed of the Wind River subbasin, summer 2005. Sites are listed from upstream to downstream within a subwatershed relative to the mainstem stream.

Subwatershed Stream	Code	River kilometers		Age-0 BRK						Age-1 or older BRK					
		Start	End	Biomass	SE ^a	CV ^b	g/m	g/m ²	g./m ³	Biomass	SE ^a	CV ^b	g/m	g/m ²	g/m ³
Trout Creek															
MS33 bridge	MS33	14.0	14.1	27	---	---	0.243	0.026	0.114	91	---	---	0.826	0.089	0.388
MS43 bridge	MS43	11.0	11.1	43	---	---	0.299	0.028	0.114	26	---	---	0.178	0.017	0.068

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 8. Estimates of populations from expanded, direct snorkeler counts of two age classes of juvenile steelhead (STH)/rainbow trout (RBT) in the upper mainstem Wind River, summer 2005. Sites are listed from upstream to downstream.

Subwatershed Site (rkm)	Code	River kilometers snorkeled		Age-0 STH/RBT					Age-1 or older STH/RBT				
		Start	End	Total	SE ^a	CV ^b	no./m	no./m ²	Total	SE	CV	no./m	no./m ²
Upper Wind River^f													
Upper Mine (40.0-44.0)	UMIN	40.0	41.0	356	69.7	19.7	0.7302	0.0898	127	20.7	16.3	0.2605	0.0321
Mine reach (35.4-40.0)	MINE	35.4	40.0	4,274	555.8	13.0	1.4070	0.1324	1,594	188.8	11.8	0.5246	0.0494
Falls Cr. - Mine reach (35.0-35.4)	UWFM	35.0	35.4	95	24.6	25.8	0.2446	0.0315	65	8.5	13.2	0.1658	0.0214
Trapper Cr. – Falls Cr. (30.0-35.0)	UWTF	30.0	35.0	1,023	93.8	9.2	0.1914	0.0178	772	92.8	12.0	0.1444	0.0135
Beaver Camp – Trap. Cr. (26.0-30.0)	MWBT	26.0	30.0	728	152.5	21.0	0.1875	0.0099	1,694	961.1	56.7	0.4365	0.0232
below Beaver Camp (24.6-26.0)	MWBB	24.6	26.0	719	38.7	5.4	0.5372	0.0309	413	44.2	10.7	0.3086	0.0178

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 9. Estimates of populations from expanded direct snorkeler counts of juvenile Chinook salmon in the upper mainstem Wind River, summer 2005. Sites are listed from upstream to downstream.

Subwatershed Site (rkm)	Code	River kilometers snorkeled		juvenile Chinook				
		Start	End	Total	SE ^a	CV ^b	no./m	no./m ²
Upper Wind River								
Upper Mine (40.0-44.0)	UMIN	40.0	41.0	0	---	---	0.0	0.0
Mine reach (35.4-40.0)	MINE	35.4	40.0	164	50.7	30.9	0.0540	0.0051
Falls Cr.-Mine reach (35.4-40.0)	MWFM	35.0	35.4	13	8.4	63.2	0.0343	0.0044
Trapper Cr. – Falls Cr. (30.0-35.0)	MWTF	30.0	35.0	110	37.3	34.1	0.0205	0.0019
Beaver Camp – Trap. Cr. (26.0-30.0)	MWBT	26.0	30.0	3,783	2,356.3	62.3	0.9747	0.0517
below Beaver Camp (24.6-26.0)	MWBB	24.6	26.0	1,324	545.0	41.2	0.9895	0.0570

^aSE = standard error.

^bCV = coefficient of variation = (SE/total fish)*100.

Table 10. Estimates of populations from direct snorkel counts of two age classes of juvenile steelhead/rainbow trout (STH/RBT) in five 100-m sites in mainstem Trout Creek, summer 2005. Site are listed from upstream to downstream.

Subwatershed Site (rkm)	Code	River kilometers snorkeled		Age-0 STH/RBT					Age-1 or older STH/RBT				
		Start	End	Total	SE ^a	CV ^b	no./m	no./m ²	Total	SE	CV	no./m	no./m ²
Trout Creek^c													
43 Bridge (11.0-11.1)	MS43	11.0	11.1	80	--	--	0.7900	0.0800	28	--	--	0.2700	0.0300
Planting Creek (9.0-9.1)	PLAN	9.0	9.1	65	--	--	0.7500	0.0800	32	--	--	0.3700	0.0400
Canyon (7.0-7.1)	TCAN	7.0	7.1	182	--	--	1.7300	0.1600	113	--	--	1.0700	0.1000
PCT Bridge (5.0-5.1)	PCTB	5.0	5.1	67	--	--	0.7000	0.0600	100	--	--	1.0400	0.0800
Smolt Trap (3.0-3.1)	LTRT	3.0	3.1	89	--	--	0.4400	0.0500	83	--	--	0.4100	0.0400

^a SE = standard error.

^b CV = coefficient of variation = (SE/total fish)*100.

Table 11. Number of juvenile steelhead/rainbow trout, captured and PIT tagged in the Wind River subbasin from 1999 to 2005 by stream section and year. Watersheds and streams are listed in an upstream to downstream pattern within a watershed.

Watershed Stream reach or section	Number of PIT tags deployed ^a						
	1999	2000	2001	2002	2003	2004	2005
Upper Wind River							
Wind River – ab. Paradise Cr.	0	36	15	119	43	0	0
Paradise Creek	68	85	17	49	129	15	0
Wind River - mining reach	59	61	36	0	115	0	0
Dry Creek - lower	44	115	142	220	170	7	0
Trapper Creek	0	101	30	132	0	0	440
Ninemile	0	0	0	123	0	0	0
Subtotal	171	398	240	644	457	22	440
Trout Creek							
Trout Creek - upper	0	0	14	0	0	0	0
Crater Creek - lower	27	24	49	88	135	3	51
Trout Creek – 33 bridge	18	26	18	50	52	0	15
Compass Creek - lower	0	0	71	4	99	15	0
East Fork Trout Creek - lower	0	0	7	0	0	0	17
Layout Creek - upper	0	0	127	5	133	25	0
Layout Creek - lower	69	89	36	126	67	0	4
Trout Creek – 43 bridge	0	46	116	49	132	0	25
Trout Creek mainstem – ab. PCT	---	---	---	---	---	21	0
Trout Creek mainstem – bl. PCT	---	---	---	---	---	18	0
Trout Creek mainstem – ab. Hemlock lake	---	---	---	---	---	137	0
Trout Creek mainstem – fish weir ^b	---	---	---	---	---	426	0
Trout Creek mainstem – in Hemlock lake ^c	---	---	---	---	---	75	0
Trout Creek mainstem – bl. Hemlock lake	---	---	---	---	---	80	0
Planting Creek - lower	0	0	90	4	58	3	0
Martha Creek – upper	---	---	---	---	---	310	251
Martha Creek – lower	0	114	0	88	121	389	173
Subtotal	114	299	528	420	797	1,502	536

Continued.

Table 11. Continued.

Watershed Stream reach or section	Number of PIT tags deployed ^a						
	1999	2000	2001	2002	2003	2004	2005
Wind River							
Wind River - canyon	0	0	12	0	0	0	0
Wind River – ab. Smolt trap	---	---	---	---	---	28	74
Wind River – bl. Smolt trap	---	---	---	---	---	5	0
Wind River – ab. Beaver campground	---	---	---	---	---	393	53
Wind River – bl. Beaver campground	---	---	---	---	---	17	91
Subtotal	0	0	12	0	0	443	218
Panther Creek							
Mouse Creek	0	0	0	0	74	0	0
Upper Panther	0	0	0	0	1	0	0
Eightmile Creek - upper	0	0	23	2	0	0	193
Eightmile Creek - lower	0	0	20	6	84	27	142
Cedar Creek – upper	--	--	--	--	--	340	321
Cedar Creek – lower	0	0	0	0	111	327	394
Subtotal	0	0	43	8	271	694	1050
Total	285	697	823	1,072	1,525	2,661	2,244

^a 400 kHz tags used in 1999. 134.2 kHz tags used otherwise.

^b Fish weir operated in lower Trout Creek, just above Hemlock from 7/20/04 to 8/24/04.

^c These fish were captured by hook and line.

Table 12. Number of steelhead/rainbow trout parr PIT tagged at each of four smolt traps within the Wind River subbasin during April through July 2000 to 2005. Readings are from a hand-held Global Positioning System (GPS) using North American Datum 1927. Steelhead parr 75 mm or larger were tagged three days each week throughout the period listed.

Smolt Trap	GPS Reading		2005 Tagging dates; (Number of tagging days)	Number of 134.2 kHz PIT tags deployed					
	North	West		2000	2001	2002	2003	2004	2005
Upper Wind	45° 52.501'	121° 58.629'	2 May 2005 – 3 July 2005 (27)	547	290	316	626	569	752
Trout Creek	45° 48.241'	121° 56.330'	2 May 2005 – 9 June 2005 (17)	125	19	317	210	498	93
Panther Creek	RNO ^a		2 May 2005 – 3 July 2005 (27)	92	26	312	322	515	425
Lower Wind	RNT ^b			0	0	0	50	7	00
Total				764	335	945	1,208	1,589	1,270

^a RNO = Reading not obtainable by GPS because of basin topography.

^b RNT = Reading not taken.

Table 13. Locations and dates of operation of thermographs maintained by U.S. Geological Survey's Columbia River Research Laboratory. Sites are listed from upstream to downstream within a watershed. Coordinates were obtained from a hand-held Global Positioning System using North American Datum 1927. The word "present" indicates that the thermograph was recording data as of November 2005.

Watershed Subwatershed Subdrainage	Coordinates		Elevation (ft)	Distance upstream from mouth (km)	Date start (mm/yy)	Date end (mm/yy)
	North	West				
Trout Creek						
Trout Cr. -upper Crater Cr.	45° 50.798'	122° 01.962'	1,920	15.2	12/96	present
	45° 50.769'	122° 01.997'	1,920	0.1	12/96	present
Trout Cr. - 33 bridge Compass Cr.	45° 50.727'	122° 01.987'	1,900	14.4	12/96	present
	45° 50.427'	122° 02.051'	1,900	0.2	12/96	present
East Fork Trout Cr.	RNO ^a		1,860	0.2	05/99	present
Trout Cr. - upper OG ^b Layout Cr. - upper	45° 49.867'	122° 01.428'	1,835	12.2	11/97	present
	RNO		1,930	2.9	05/99	present
Layout Cr. ^c Layout Cr. (BLAY) ^c	45° 49.776'	122° 01.525'	1,830	0.6	11/97	present
	RNO		1,810	0.1	07/04	present
Trout Cr. - lower OG	45° 49.656'	122° 01.278'	1,810	11.6	11/97	present
Trout Cr. - 43 bridge Planting Cr.	45° 49.320'	122° 00.894'	1,805	11.0	08/97	present
	45° 48.972'	121° 59.436'	1,730	0.2	07/97	present
Trout Cr. - ab. Hemlock	RNO		1,120	3.0	11/97	present
Trout Cr. - bl. Hemlock	45° 48.126'	121° 55.810'	1,080	2.0	10/98	present
Martha Cr. - CMCW Martha Cr. - upper	RNO		1,150	2.0	07/04	present
	RNO		1,130	1.8	05/99	present
Martha Cr. - lower	45° 47.737'	121° 55.342'	1,080	1.0	10/97	present

Continued.

Table 13. Continued.

Watershed Subwatershed Subdrainage	Coordinates		Elevation (ft)	Distance upstream from mouth (km)	Date start (mm/yy)	Date end (mm/yy)
	North	West				
Upper Wind River						
Wind R. - ab. Paradise Cr.	45° 57.047'	121° 55.815'	1,560	40.9	07/00	present
Paradise Cr.	45° 57.149'	121° 56.400'	1,550	1.0	10/98	present
Wind R. - lower mining	45° 54.793'	121° 56.926'	1,360	36.5	07/00	present
Wind R. - bl. mining			1,350	35.5	07/02	present
Falls Cr.	45° 54.486'	121° 56.844'	1,340	0.1	07/00	present
Ninemile Cr.	45° 53.651'	121° 56.752'	1,300	0.2	06/00	present
Dry Cr. - 1	45° 54.127'	121° 57.874'	1,190	1.5	05/99	06/00
Dry Cr. - 2		RNO	1,250	3.3	06/00	present
Trapper Cr. - upper		RNO	1,520	2.5	05/05	present
Trapper Cr. - lower	45° 53.431'	122° 00.593'	1,360	1.5	10/98	present
Wind R. - bl. Trapper Cr.	45° 52.501'	121° 58.629'	1,090	30.0	10/98	present
Panther Creek						
Panther Cr. - upper	45° 50.573'	121° 51.567'	1,070	12.0	10/98	present
Eightmile Cr. - upper		RNO	1,090	0.6	07/97	present
Eightmile Cr. - lower	45° 50.393'	121° 52.069'	1,030	0.2	07/97	present
Cedar Cr. - upper		RNO	1,140	2.3	06/04	present
Cedar Cr. - lower	45° 48.176'	121° 51.404'	940	1.2	05/97	present
Panther Cr. - lower		RNO	730	4.0	07/97	present

^a RNO = Reading not obtainable.

^b OG = Restored old-growth channel.

^c During winter 03-04, Trout Creek reconnected with the old-growth channel at the mouth of Layout Creek. This caused the bottom of Layout Creek to extend approximately 600m further downstream. A new thermograph was installed (BLAY) 150m above new confluence.

Table 14. Locations and dates of operation of thermographs deployed and maintained by the Underwood Conservation District within the Wind River subbasin during summer 1999 to 2005. Sites are listed from upstream to downstream within a subbasin. No GPS readings are available at the time of writing.

Watershed					
Subwatershed	Elevation	Distance upstream	Date	Date	
Subdrainage	(ft)	from mouth	start	end	
		(km)	(mm/yy)	(mm/yy)	
Upper Wind River					
Wind R. – blw. Falls Cr.	1,250	33.5	6/99	10/99	
			6/00	11/00	
			6/01	11/01	
			5/02	9/02	
			5/03	11/03	
			5/04	10/04	
			5/05	10/05	
Trapper Cr. at mouth ^{a, b}	1,135	0.3	6/99	10/99	
			6/00	11/00	
			6/01	11/01	
			5/02	9/02	
			5/03	10/03	
			5/05	10/05	
Middle Wind River					
Wind R. – at Beaver Cr. Camp Gr.	1,030	26.0	7/02	9/02	
			5/03	8/03	
			5/04	11/04	
			5/05	10/05	
Wind R. – at Pacific Crest Trail ^c	910	22.0	7/02	9/02	
			5/03	8/03	
			5/04	10/04	
Wind R. – at Stabler Bridge ^c	890	18.5	6/99	10/99	
			6/00	11/00	
			6/01	11/01	
			5/02	9/02	
			5/03	11/03	
			6/04	10/04	
Trout Creek					
Trout Cr. – blw. Martha Cr. ^c	865	0.2	6/99	10/99	
			6/00	11/00	
			6/01	11/01	
			5/02	9/02	
			6/04	10/04	

Continued.

Table 14. Continued.

Watershed Subwatershed Subdrainage	Elevation (ft)	Distance upstream from mouth (km)	Date start (mm/yy)	Date end (mm/yy)
Lower Wind River				
Bear Cr.	317	2.4	6/99	10/99
			6/00	11/00
			6/01	11/01
			5/02	9/02
			5/02	12/03
			5/04	10/04
			5/05	10/05
Little Wind River ^{b,c}	85	0.2	6/99	10/99
			6/00	11/00
			6/01	11/01
			5/02	9/02
			5/03	11/03
Lower Wind River ^c	80	1.5	6/99	10/99
			6/00	11/00
			6/01	11/01
			5/02	9/02
			5/03	11/03
			5/04	11/04

^a No data from 07/06/02 – 07/30/02 because of logger air exposure.

^b No data in 2004 due to thermograph loss.

^c No data in 2005 due to thermograph loss.

Table 15. Mean, minimum, and maximum water temperature recorded at sites within the Wind River subbasin during summer 2005. Data are from Onset Corporation's StowAway Thermographs, which recorded water temperature every two hours. Sites are listed from upstream to downstream within a subbasin.

Watershed Subwatershed Subdrainage	Minimum (°C)			Mean (°C)			Maximum (°C)		
	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.
Trout Creek									
Trout Cr. - upper	5.3	5.1	4.3	6.4	6.5	5.91	8.1	8.1	7.8
Crater Cr.- site 2	9.6	11.3	6.9	13.0	14.0	10.4	16.7	16.5	14.0
Trout Cr. - 33 bridge	6.4	6.0	4.5	7.9	7.5	6.5	9.7	9.4	9.7
Compass Cr	8.9	11.2	7.2	11.6	12.9	10.0	14.3	14.4	12.7
East Fork Trout Cr.	10.5	9.9	4.9	14.8	13.9	9.5	19.2	18.5	14.7
Trout Cr. - upper OG ^a	7.5	7.3	4.8	10.5	10.5	8.2	15.5	15.4	13.3
Layout Cr. - upper	8.1	9.4	6.7	10.8	12.1	10.0	15.0	16.7	14.2
Layout Cr. - lower	9.2	11.5	7.6	12.9	14.3	11.3	17.3	17.5	15.2
Layout Cr. (BLAY)	8.7	11.8	7.9	13.4	15.3	11.8	19.5	19.8	17.3
Trout Cr. - lower OG	7.2	7.4	4.7	10.4	10.5	8.2	15.0	15.0	12.8
Trout Cr. - 43 bridge	8.1	9.6	6.5	12.0	12.8	9.7	16.8	16.3	13.1
Planting Cr.	9.6	11.0	6.2	13.1	14.0	10.1	16.5	16.8	14.0
Trout Cr. - ab. Hemlock	11.2	12.4	7.5	15.8	16.6	11.8	21.2	21.3	17.1
Trout Cr. - blw. Hemlock	---	---	---	---	---	---	---	---	---
Martha Cr. - (CMCW) ^b	9.9	11.3	8.1	12.7	13.7	10.9	16.6	16.6	14.4
Martha Cr. - upper	10.9	13.3	9.9	13.8	15.1	12.5	16.9	17.4	16.2
Martha Cr. - lower	10.4	12.2	8.3	14.4	15.7	12.1	20.0	19.8	16.9
Trout Cr. - at mouth ^c	---	---	---	---	---	---	---	---	---

Continued.

Table 15. Continued.

Watershed Subwatershed Subdrainage	Minimum (°C)			Mean (°C)			Maximum (°C)		
	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.
Upper Wind River									
Wind R. - ab. Paradise Cr.	9.9	---	---	12.7	---	---	18.0	---	---
Paradise Cr.	9.6	11.2	8.9	12.1	12.7	10.7	14.6	14.6	12.9
Wind R. - lower Mine Reach	8.2	9.2	9.6	9.2	10.1	10.2	11.3	11.2	11.3
Wind R. - blw. Mine Reach	10.6	12.6	10.5	13.3	14.3	12.4	15.9	16.1	14.7
Wind R. - blw. Falls Cr. ^c	9.0	10.2	6.6	12.7	13.0	9.8	15.6	15.6	12.9
Falls Cr.	8.5	9.3	5.2	12.3	12.3	8.7	15.2	14.8	12.4
Ninemile Cr.	9.6	11.5	9.2	11.5	12.4	10.7	13.2	13.4	12.1
Dry Cr.	10.8	11.2	6.4	15.2	15.5	11.4	21.3	21.8	17.2
Trapper Cr. - upper ^d	9.9	11.6	8.5	12.3	12.3	10.7	15.1	15.1	13.3
Trapper Cr. - lower	10.1	12.1	9.3	12.0	13.1	11.1	14.0	14.3	12.9
Trapper Cr. at mouth ^c	10.5	12.6	9.4	13.3	14.5	11.7	16.8	16.8	14.4
Wind R. - blw. Trapper Cr.	9.8	11.5	7.6	13.0	14.3	11.2	16.8	17.4	16.7
Middle Wind River									
Wind R. - at Beaver Cr. CG. ^c	8.7	9.3	7.6	11.1	11.3	9.7	14.6	14.6	13.0
Wind R. - at Pacific Crest Tr. ^c	---	---	---	---	---	---	---	---	---
Wind R. - at Stabler Bridge ^c	---	---	---	---	---	---	---	---	---
Lower Wind River									
Bear Cr. ^c	11.3	12.5	9.1	14.2	14.9	12.2	17.7	17.9	15.5
Little Wind River ^c	---	---	---	---	---	---	---	---	---
Lower Wind River site ^c	---	---	---	---	---	---	---	---	---

Continued.

Table 15. Continued.

Watershed Subwatershed Subdrainage	Minimum (°C)			Mean (°C)			Maximum (°C)		
	July	Aug.	Sept.	July	Aug.	Sept.	July	Aug.	Sept.
Panther Creek									
Panther Cr. - upper	6.7	6.4	5.2	8.1	7.9	6.7	10.0	9.8	8.6
Eightmile Cr. - upper	11.2	12.7	9.8	13.1	13.8	11.6	15.0	15.2	13.3
Eightmile Cr. - lower	11.0	12.3	9.2	13.9	14.5	12.1	17.3	17.1	15.5
Cedar Cr. - upper ^b	10.0	10.9	8.9	12.1	12.5	10.8	14.6	14.4	13.0
Cedar Cr. - lower	10.1	11.3	8.5	12.5	13.0	10.8	15.4	15.4	13.6
Panther Cr. - lower	7.9	7.8	5.6	10.9	10.8	8.7	14.9	14.7	12.3

^a OG = Restored old-growth channel.

^b Site added in 2004.

^c Thermographs deployed and maintained by Underwood Conservation District during summer 2005.

^d Site added in 2005.

Table 16. Flow measurement locations within the Wind River subbasin, 1996 to 2005. Coordinates are from a hand-held Global Positioning System (GPS) using North American Datum 1927. Sites are listed from upstream to downstream within a subbasin.

Watershed Subwatershed	GPS reading		Elevation (ft)	Distance upstream of mouth (km)	Year sampled ^a									
	North	West			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Upper Wind River^b														
Wind R. – ab. Paradise Cr.	45° 57.047'	121° 55.815'	1,560	40.6	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Paradise Cr.	45° 56.951'	121° 56.957'	1,550	0.5	No	No	Yes							
Falls Cr.	45° 54.534'	121° 56.772'	1,340	0.1	No	No	No	No	Yes	Yes	Yes	No	No	No
Ninemile Cr.	45° 53.651'	121° 56.752'	1,300	0.2	No	No	No	No	Yes	Yes	Yes	No	No	No
Dry Cr. – upper	RNO ^c		1,190	1.5	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Dry Cr. – lower	45° 54.127'	121° 57.874'	1,120	0.1	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Trapper Cr.	45° 52.761'	121° 58.849'	1,120	0.1	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Wind R. – bl. Trapper Cr.	45° 52.581'	121° 58.682'	1,090	30.3	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Trout Creek^d														
Trout Cr. – upper	45° 50.794'	122° 01.961'	1,920	15.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Crater Cr.	45° 50.779'	122° 01.036'	1,920	0.1	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Trout Cr. – 33 bridge	RNT ^e		1,920	14.0	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Compass Cr.	45° 50.427'	122° 02.051'	1,900	0.2	No	No	No	No	No	Yes	No	No	No	No
East Fork Trout Cr.	RNO		1,860	0.2	No	No	No	No	No	Yes	No	No	No	No
Layout Cr. – upper	RNO		1,940	2.5	No	No	Yes	Yes	No	Yes	No	No	No	No
Layout Cr. – lower	45° 49.776'	122° 01.525'	1,830	0.1	No	No	No	Yes	Yes	Yes	No	No	No	No
Trout Cr. – 43 bridge	45° 49.434'	122° 00.978'	1,805	11.3	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Planting Cr.	45° 48.972'	121° 59.436'	1,730	0.1	No	Yes	Yes	No	No	Yes	No	No	No	No
Trout Cr. – lower	RNO		1,120	3.0	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Martha Cr.-lower	45° 47.767'	121° 55.255'	1,070	1.0	No	Yes	Yes	Yes	No	No	No	No	No	Yes
Panther Creek														
Mouse Cr.	RNO		1,080	0.1	Yes	No								
Eightmile Cr. – lower	45° 50.393'	121° 52.069'	1,020	0.1	No	Yes	Yes	No						
Cedar Cr.	45° 48.176'	121° 51.404'	940	1.2	Yes	Yes	No	Yes						
Panther Cr. – lower	RNO		1,010	4.0	Yes	No								

^a Flows generally taken at regular intervals of time, about every two weeks, from June through October.

^b In addition, a flow reading was taken on the mainstem Wind River above Paradise Cr. and below Trapper Cr. on 10/6/99.

^c RNO = Reading not obtainable by GPS because of topography of basin.

^d Trout Cr. flows in 2000 were measured once, on 10/13/00.

^e RNT = Reading not taken.