LOWER PRIEST RIVER INSTREAM FLOW STUDY

by

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ABSTRACT

In 1991, Idaho Department of Fish and Game contracted with the Idaho Department of Water Resources to conduct an assessment of fish habitat needs in Priest River downstream of Outlet Dam. The purpose of the assessment was to recommend a minimum instream flow for fish habitat. Data were collected at three sites and were analyzed using the computer-based Physical Habitat Simulation System (PHABSIM) programs. The recommended minimum rearing flow for adult and juvenile cutthroat trout and adult rainbow trout is 200 cfs, as measured at the Dickensheet gauge, from August 1 to October 31.

INTRODUCTION

In May 1990, Idaho Department of Water Resources (IDWR) published the Priest River Basin Component of the Comprehensive State Water Plan (Plan). The Plan contains a description of the water resources and economic, cultural, and natural resources in the basin. Additionally, the Plan describes the existing and planned uses of these resources and the goals, objectives, and recommendations relative to managing the water resources of the basin in the public interest.

Under the specific actions and recommendations of the Plan, IDWR was asked to conduct a study of management alternatives for the Priest Lake outlet structure (Outlet Dam) to define the optimum combination of benefits relative to hydropower, lake levels, and river flows. As part of this study, the Idaho Department of Fish and Game (IDFG) contracted with IDWR to conduct an assessment of the fish habitat needs in Priest River downstream from Outlet Dam to the confluence with the Pend Oreille River. The purpose of the assessment was to recommend a minimum instream flow for fish habitat needs.

TECHNIQUES USED

During the summer and fall of 1991, study sites were established at three locations on Priest River between Outlet Dam and McAbee Falls (Figure 1). Sites were selected to represent the river between Outlet Dam and the Upper West Branch Priest River; between the Upper West Branch Priest and East River; and between East River and McAbee Falls. We did not examine sites farther downstream as the habitat is largely similar to the latter site and the hand held equipment used was not suited for sampling the deeper water of the lower reaches.

At each study site, four transects were selected in representative habitat types (e.g. pools, rifles, runs, etc.). Measurements at each transect included water velocity and depth, water surface elevations, total stream and wetted stream width, distance between transects, and total study site length. Substrate was catagorized into descriptive classes (e.g. sand, gravel, cobble, etc.). Water velocity, depth, and stream width were measured to determine discharge and define stream habitat. Velocity and depth were determined with a Marsh-McBirney flow meter and standard wading rod. Stream widths, distance between transects, and total study site length were measured with a tape measurer. Water surface elevations were measured relative to a temporary benchmark and determined with a surveyor's level and stadia rod.

Three sets of depth and water velocity measurements were collected over a range of flows from 150 cfs to 800 cfs and used to establish a stage-discharge relationship for the model. The relationship was used to predict hydraulic changes in the stream at simulated discharges of 50 cfs to 1,250 cfs. These changes were related to fish habitat preference curves based on velocity and depth criteria (Figures 2, 3, 4, and 5) to estimate available habitat over the range of simulated flows. The preference curves used are based on Raleigh et al. (1984) and Bovee (1978). Cutthroat and rainbow trout were selected as the species to model. Cutthroat trout are native to the Priest River system and are a species of special concern in northern Idaho. Rainbow trout are stocked in the river to provide a put-and-take fishery.

The computer-based Physical Habitat Simulation System (PHABSIM) programs was used to model the relationship between discharge and available fish habitat. These programs are part of the Instream Flow Incremental Methodology (IFIM) developed by the Instream Flow Group, U.S. Fish and Wildlife Service, Ft. Collins, Colorado. The reader should consult Instream Flow papers no. 11 (Milhous et al. 1984) and no. 26 (Milhous et al. 1989) for a more in-depth discussion of the methodologies and programs.

RESULTS AND DISCUSSION

Because of difficulties in obtaining sufficient flow data to calibrate the model for the lower study sites, the results reported are only for the uppermost study site at the Dickensheet campground.

Total available habitat, based on velocity and depth preferences, for adult cutthroat trout peaks at a flow of approximately 400 cfs; for juvenile cutthroat, a flow of nearly 200 cfs provides the maximum available habitat (Figure 6). Available habitat for adult rainbow trout peaks at 400 cfs. Total available habitat was defined as the amount of habitat, in square feet per 1,000 linear feet of stream, that falls within the velocity and depth criteria for the species and life history stage of interest. Total available habitat as a percentage of gross stream area is shown in Table 1.

Based on availability of habitat, a flow of 200 cfs, as measured at the Dickensheet gauge from August 1 to October 31, is the recommended minimum rearing flow for adult and juvenile cutthroat trout and adult rainbow trout. At flows below 200 cfs, the amount of available habitat declines significantly for relatively small reductions in discharge. Conversely, at flows greater than 200 cfs, the amount of available habitat increases relatively little with large increases in flow. The 200 cfs recommendation is consistent with an earlier recommendation by Irizarry (1974).

It has been suggested that trout populations in the lower Priest River are limited by low summer flows and associated high water temperatures. It is reiterated that the recommended minimum flow of 200 cfs is based solely on depth and velocity preferences and does not include an evaluation of water temperature preferences for cutthroat

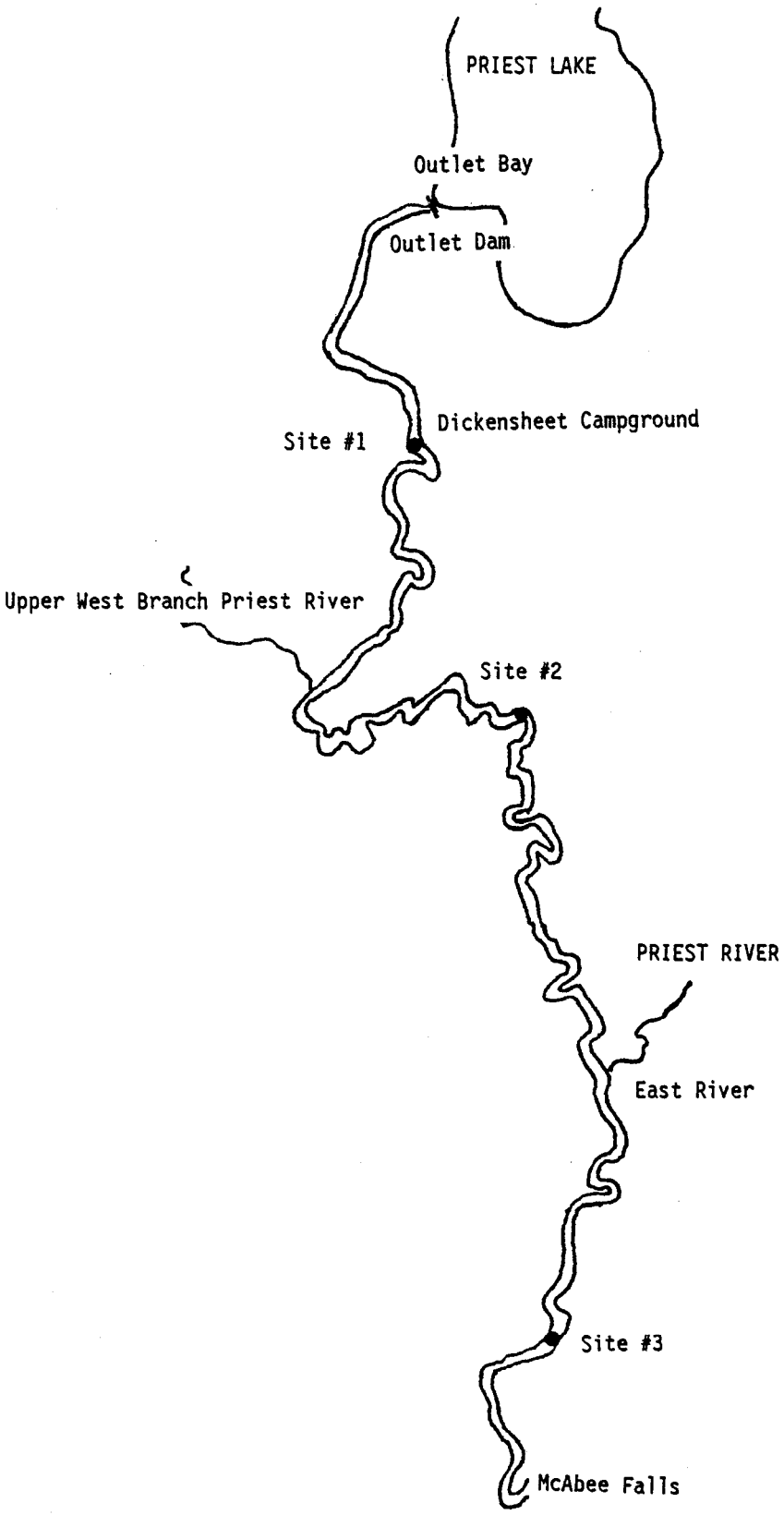

Figure 1. Location of study sites for instream flow study on Priest River, from Outlet Dam to McAbee Falls.

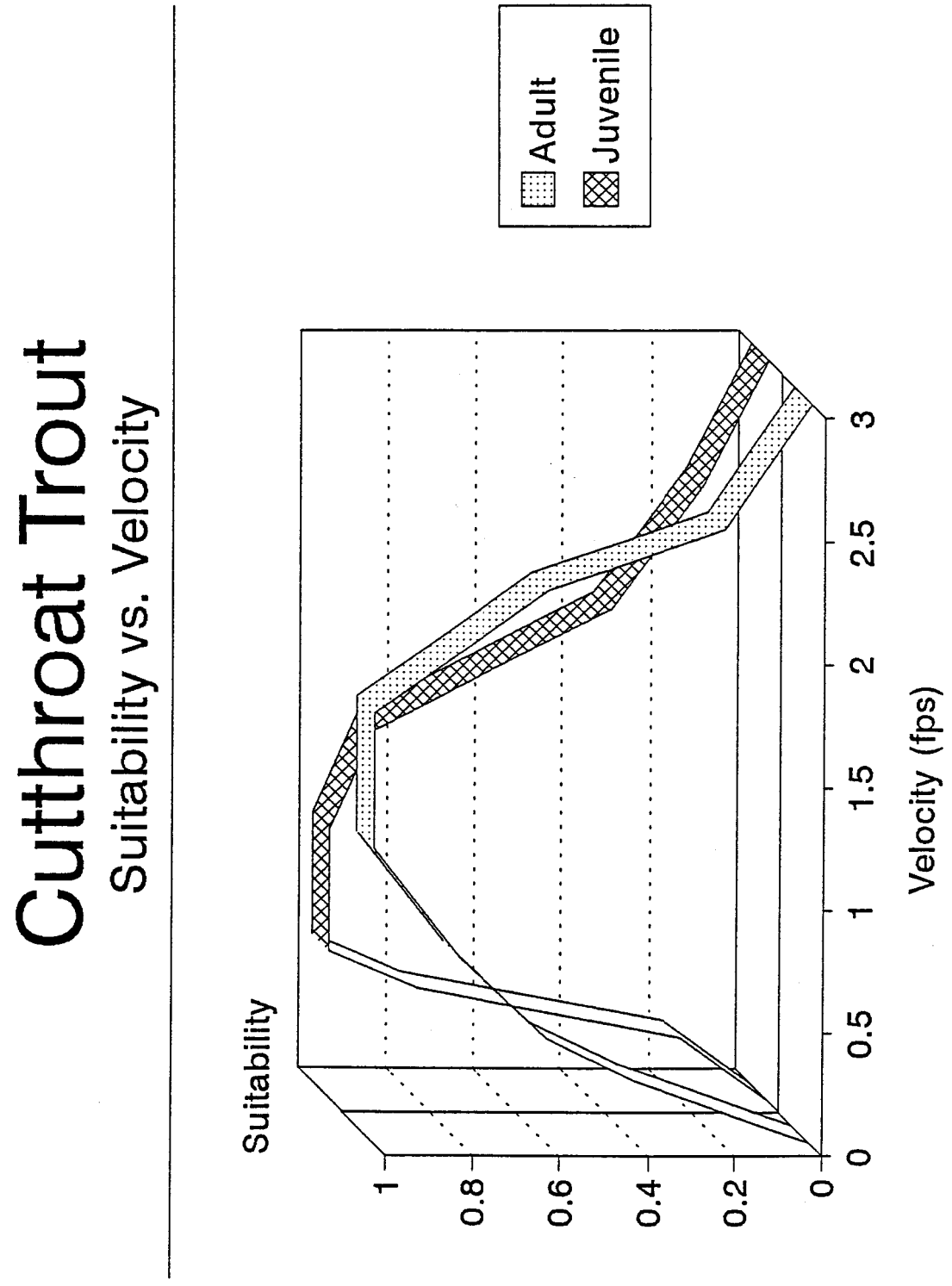

Figure 2. Suitability versus velocity, in feet per second, for adult and juvenile cutthroat trout (from Bovee, 1978).

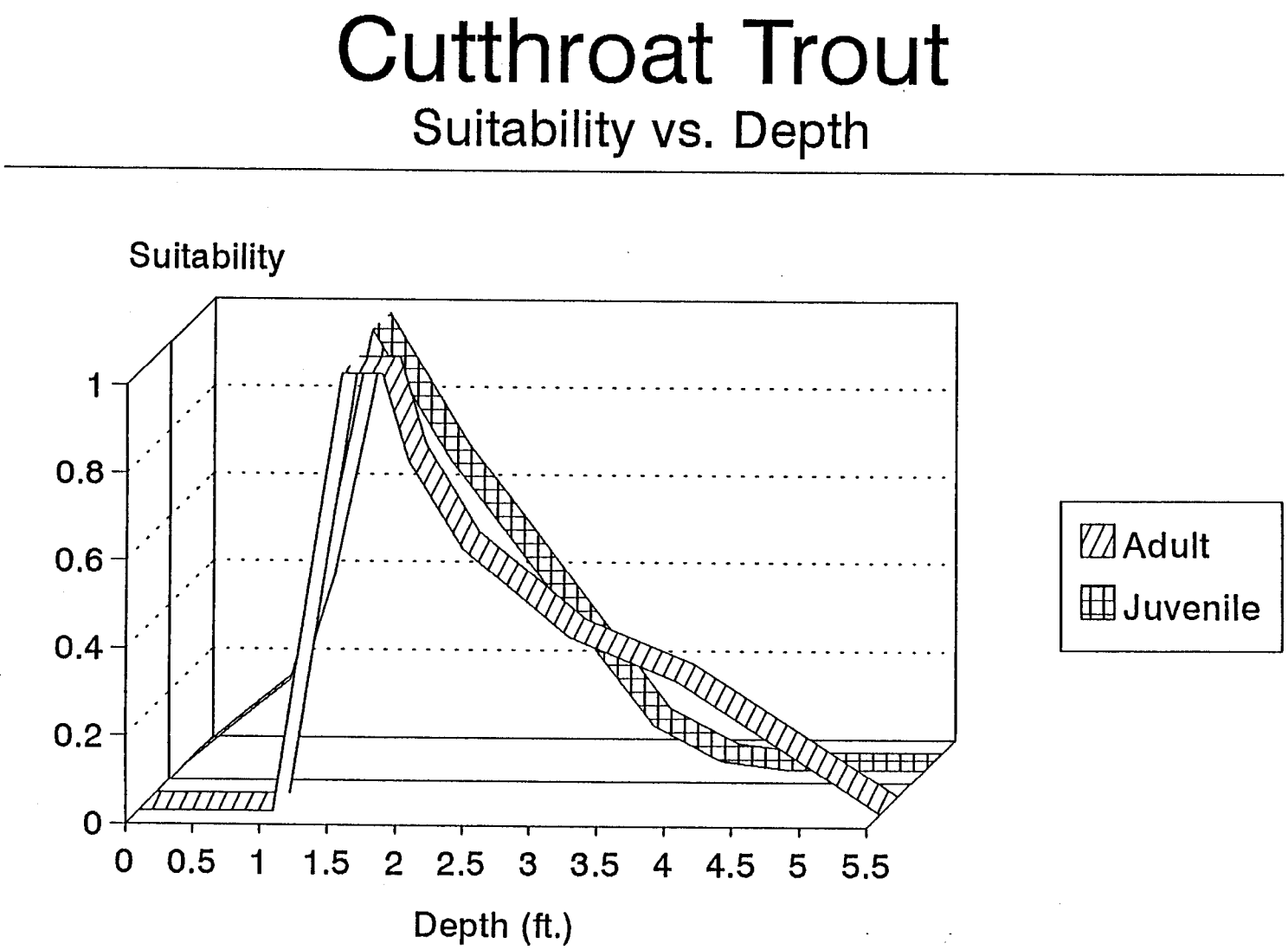

Figure 3. Suitability versus depth, in feet, for adult and juvenile cutthroat trout (from Bovee, 1978).

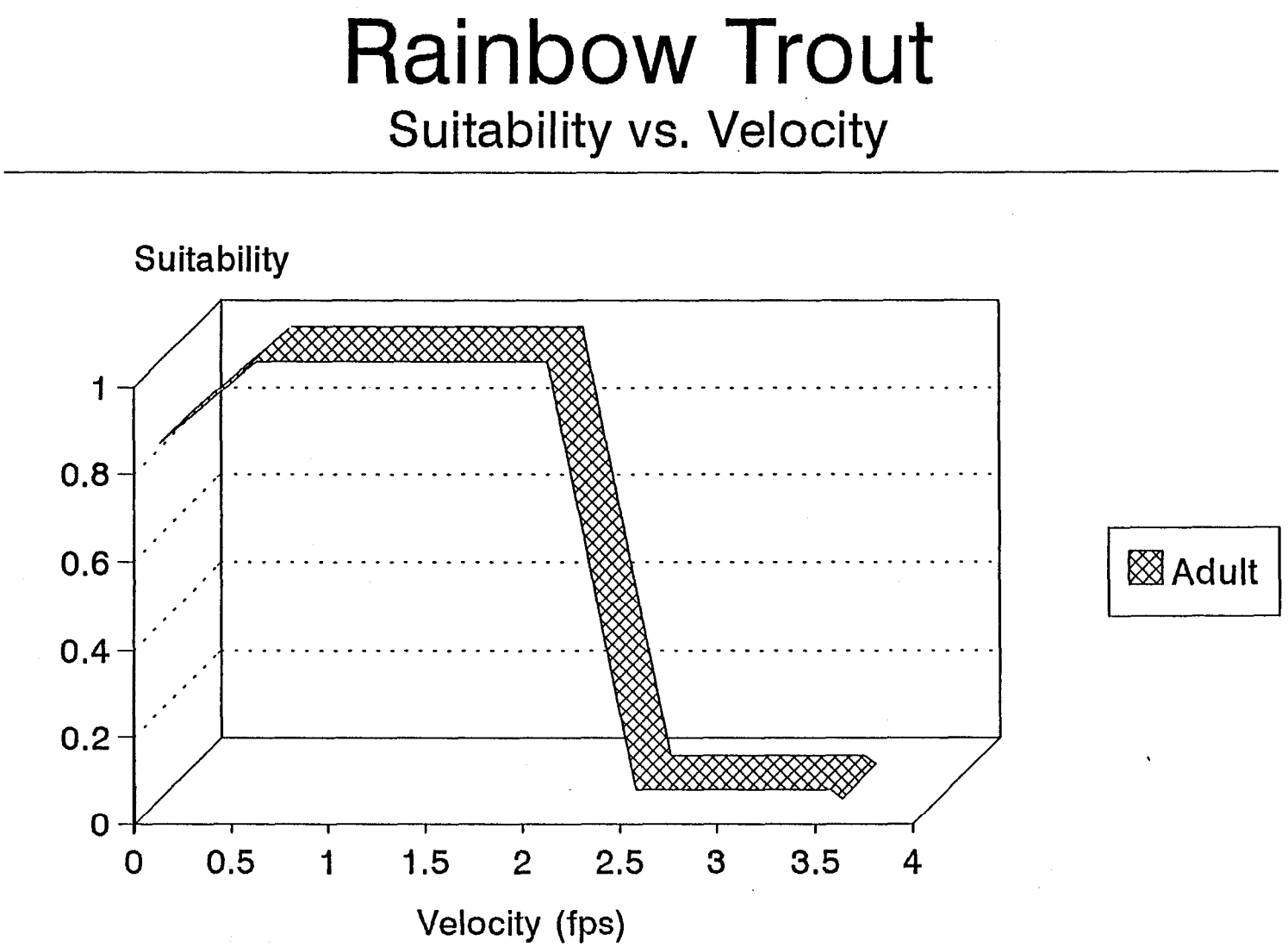

Figure 4. Suitability versus velocity, in feet per second, for rainbow trout (from Raleigh et al, 1989).

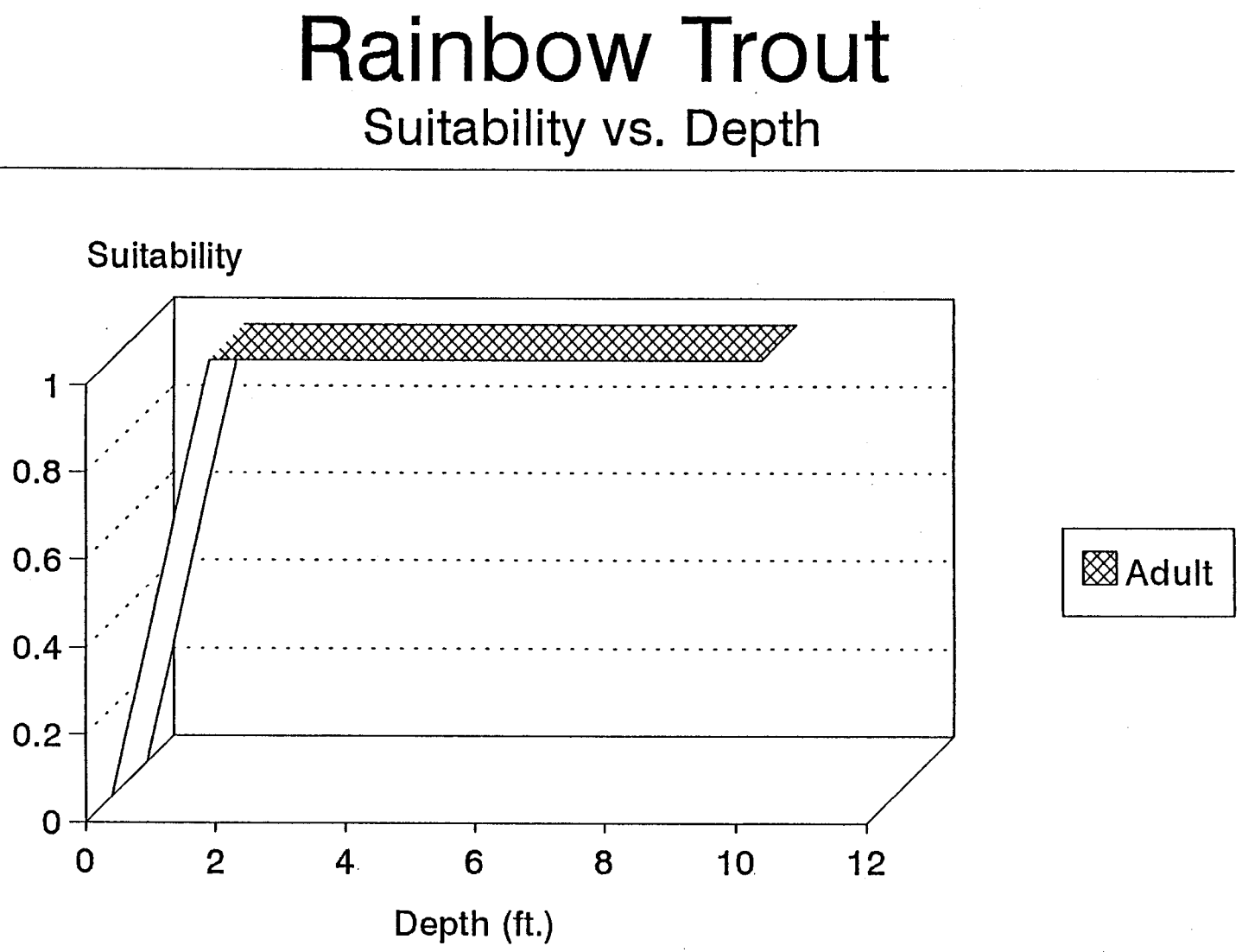

Figure 5. Suitability versus depth, in feet, for rainbow trout (from Raleigh et al., 1989).

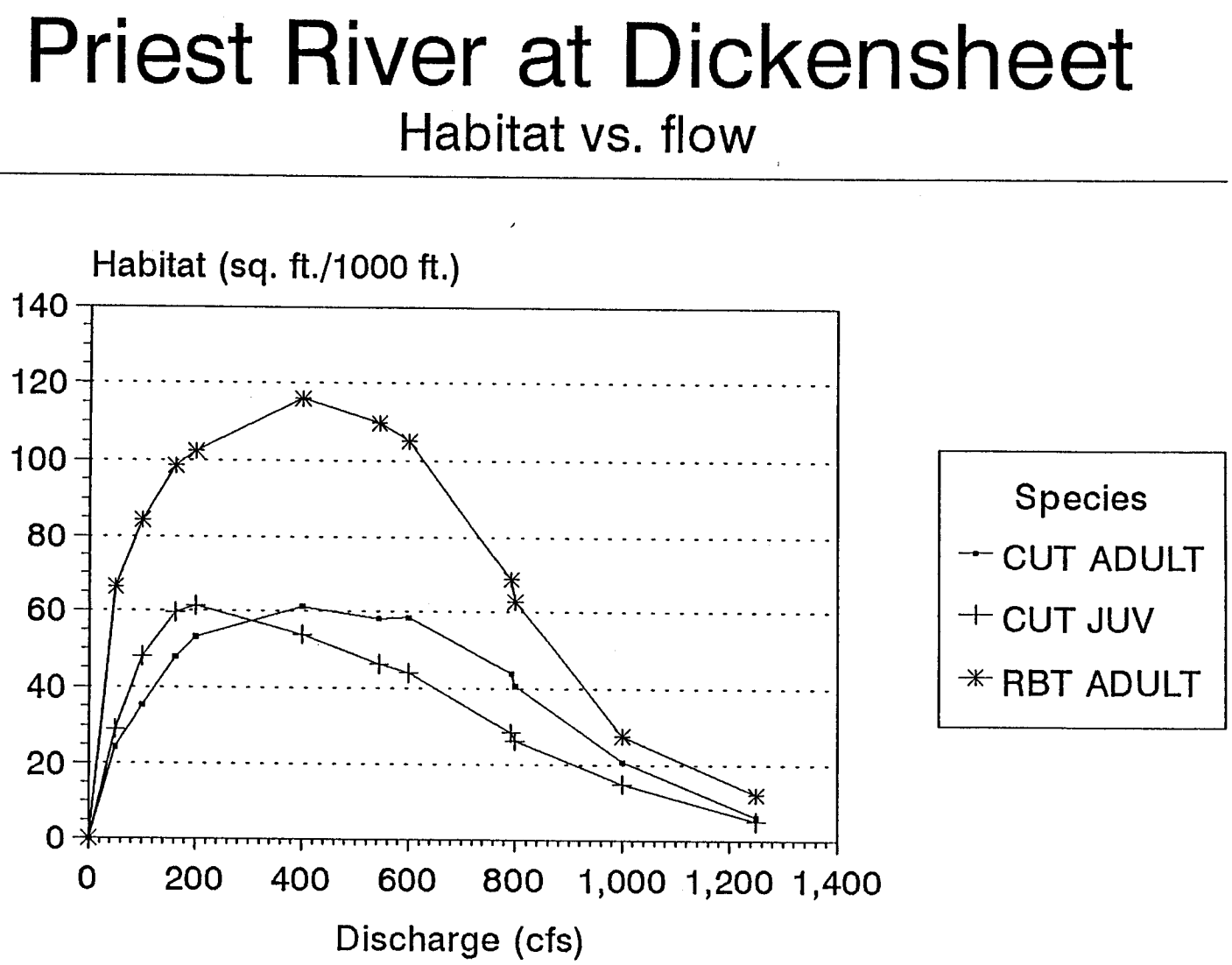

Figure 6. Available habitat versus discharge relationship, in thousand square feet per thousand linear feet, for adult and juvenile cutthroat trout and adult rainbow trout.

Table 1. Total available habitat as a percentage of gross area for adult and juvenile cutthroat trout and adult rainbow trout in the Priest River below Outlet Dam.

Discharge (cfs)	Gross Area (1,000 sq. ft.)	Available Habitat (% of gross area)		
		Adult Cutthroat	Juvenile Cutthroat	Adult Rainbow
50	101.2	24.0	28.6	65.5
100	112.3	31.5	42.7	75.2
162	120.8	39.6	49.4	81.6
200	123.6	43.0	49.7	82.8
400	132.6	46.2	40.7	87.5
544	134.7	43.2	34.3	81.5
600	135.9	43.0	32.3	77.3
793	138.0	31.8	20.6	49.8
800	136.8	29.7	19.3	45.9
1,000	139.1	15.0	10.8	19.9
1,250	137.8	4.8	3.8	8.9

and rainbow trout. Irizarry (1974) reported maximum water temperatures near the Dickensheet campground that routinely exceeded 70 degrees Fahrenheit during July, August and September. Nelson (IDFG, unpublished data, 1991) reported similarly high water temperatures throughout the lower Priest River drainage (Appendix A). Both rainbow and cutthroat trout can tolerate temperatures of 70 degrees or above for short time periods, but their preferred range of temperatures is the high fifties to low sixties.

The 200 cfs flow recommendation provides a minimum quantity of habitat based on depth and velocity preferences only. Simply providing higher flows in the river may not resolve the problem of high water temperatures. Water flow through the Outlet Dam is composed of relatively warm surface water flowing out of Outlet Bay. In 1974, Irizarry reported temperatures at Outlet Dam often exceeded 65 degrees Fahrenheit during July and August. Recommending methods for providing cooler water to the river and evaluating the extent of the benefits of such an action are beyond the scope of this report.

LITERATURE CITED

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Irizarry, R.A., 1974. Priest River Fisheries Study. Idaho Department of Fish and Game. Job Performance Report. Project F-53-R-9. 35 PP.

Milhous,, R.T., M.A. Updike, and D.M. Schneider. 1989. Physical Habitat Simulation System Reference Manual-Version II. Instream Flow Information Paper No. 26. U.S. Fish and Wildlife Service. Biological Report. 89(16). v.p.

Milhous, R.T., D.L. Wegner, and T. Waddle. 1984. User's Guide to the Physical Habitat Simulation System (PHABSIM). Instream Flow Information Paper No. 11. U.S. Fish and Wildlife Service. FWS/OBS-81/43 Revised. 475 pp.

Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. Habitat suitability information: Rainbow trout, U.S. Fish and Wildlife Service. FWS/OBS/82/10.60. 64 pp.

APPENDIX A

Water and air temperatures (F°) collected by volunteers at selected sites along the Priest River between Cutlet Dam and Blue Creek.

- keep thermometer 2 minutes for air temp
- 1 minute for water temp

Lance Nelson, IFG
765-3111

- record 2 or 3 times weekly (once per week absolute minimum)
- at tributaries check above confluence, below confluence, and in tributary

448-2450

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer Maureen Heroux

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7-25 7:30 PM	71.4	67.1	West B	after Rains
" "	71.4	69.6	Priest R	" "
7-27 5:30 PM	73.4	68.2	W.B.	clear skies
" "	73.4	70.8	P.R.	" "
7-30 6:30 pm	81.0	71.6	W.B.	" "
" "	81.0	72.5	P.R.	
8-4 6:30 pm	88.3	73.6	WB.	" "
8-4 " "	"	74.8	P.R.	
8-7 12:00	87.2	72.8	W.B	
8-7 "	87.2	73.5	P.R.	
8-11 10:30 AM.	65.3	60.4	W.B.	" "
" "	"	65.5	P.R.	
8-14 5:00 pm	89.0	73.8	W.B.	
" "	"	74.1	P.R.	" "
8-18 4:00 pm	90.2	73.5	W.B.	
" "	"	74.6	P.R.	
8-25 3:00 pm	74.0	71.8	W.B.	
8-25 3:00	74.0	72.3	P.R.	" "
8-30 6:50 pm	72.3	68.9	P.R.	
8-30 "	"	68.2	W.B.	" "

additional comments.

- Keep Thermometer 2 minutes for air temp. Lance ... T65-3111.
1 minute for water temp.
- Record 2 or 3 times weekly (once per week absolute minimum)
at tributaries check above confluence, below confluence, and in tributary

LOWER PRIEST RIVER TEMPERATURES — 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer Maureen LeRoux

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
9-3 4:10 pm	73.9	Cold	P.R.	Clear Skies
9-3 4:10 pm	"	64.9	W.B.	" "
9-8 5:30 pm	59.4	58.3	WB	Cloudy
"	"	60.4	P-R	"

additional comments.

765-3111.

-keep thermometer 2 minutes for air temp.
-1 minute for water temp

record 2 or 3 times weekly (once per week absolute minimum)
at tributaries check above confluence, below confluence, and in tributary

LOWER PRIEST RIVER TEMPERATURES — 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and Binarch Creek

Observer Bruce Brockway

Date/Time	Air Temp	Water Temp	Location		Weather Conditions and Comments
July 16 - 11 AM	61	56	Binarch		Raining - no wind
July 19 - 10 AM	68.4	65.1	48.2 (up st)	49.6 (down)	Sunny - slight breeze
July 23 7:30 AM	58.5	65.1	47.8	50.5	" no wind
July 28 7:28 PM	65.1	64.3	49.8	54.0	Shade from sundown no wind cloud wisps river has dropped
July 30 10:20 AM	70.9	68.2	48	50.9	Sunny no wind
Aug 4 10:20 AM	69.3	69.3	47.7	48.7	" " "
Aug 9 4:00 PM	73.4	74.3	49.8	51.8	slight haze " "
Aug 12 4:00 PM	73	71.2	47.8	54.3	
Aug 19 4 PM	68.9	73.9	47.7	54.4	shaded bluesky no wind.
Aug 23 4 PM	73	71.2	47.8	54.3	slight breeze

additional comments.

PSWALS
USFS LOOKOUT

- keep thermometer 2 minutes for air temp.
1 minute for water temp
- record 2 or 3 times weekly (once per week absolute minimum)
at tributaries check above confluence, below confluence, and in tributary

'765-3111

LOWER PRIEST RIVER TEMPERATURES – 1991

Sample Sites: Outlet – upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer J.C. GINDRAUX, Outlet Dam

READINGS WITH DIGITAL THERMOMET

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7-17-91 4:45 PM	58.3	64.4	UPSTREAM OUTLET DAM	CLEAR SKY — NO WIND 1 IN. RAIN LAST 9/10 HRS
7-17-91 4:50 PM	58.3	64	DOWNSTREAM OUTLET DAM	" "
7-17-91 4:55 PM	57.6	62.4	LAMB CREEK ABOVE CONFLUENCE	" "
7-17-91 5:05	57.6	64.4	LAMB CREEK BELOW CONFLUENCE	" "
7-21-91 4:30 PM	84.2	66.2	UPSTREAM OUTLET DAM	NO WIND CLEAR! – SCATTERED CLOUD
7-21-91 4:38 PM	77.4	66	DOWNSTREAM OUTLET DAM	" " "
7-21-91 4:50 PM	75.4	63.7	LAMB CREEK ABOVE CONFLUENCE	" " "
7-21-91 5:00 PM	74.5	65.7	LAMB CREEK BELOW CONFLUENCE	" " "
7-24-91 5:20 PM	83.7	73.9	UPSTREAM OUTLET DAM	NO WIND BRIGHT CLOUDLESS
7-24-91 5:17 PM	79.7	73.9	DOWNSTREAM OUTLET DAM	" "
7-27-91 2:35 PM	74.8	67.6	LAMB CREEK ABOVE CONFLUENCE	9/10 CLOUD COVER 1.5 IN RAIN 7-25
7-27-91 2:40 PM	74.5	68.7	LAMB CREEK BELOW CONFLUENCE	" "
2-27-91 2:45 PM	74.9	68.7	UPSTREAM OUTLET DAM	" "
2-27-91 2:50 PM	75.9	68.5	DOWNSTREAM OUTLET DAM	" "
7-29-91 4:45 PM	78.8	70.3	OUTLET DAM UPSTREAM	CLEAR – BRIGHT SUN
7-29-91 4:50 PM	79.9	70.3	OUTLET DAM DOWNSTREAM	" "
7-29-91 4:55 PM	77.5	70.2	LAMB CREEK ABOVE CONFLUENCE	" "
7-29-91 5:10 PM	78.1	70.9	LAMB CREEK BELOW CONFLUENCE	" "
8-3-91 09:45 AM	70.5	68.5	OUTLET DAM UPSTREAM	1/3 IN RAIN ON 8-1 – CLEAR SKY BRIGHT SUN TODAY
8-3-91 09:55 AM	70	68	OUTLET DAM DOWNSTREAM	" "

additional comments. NUMEROUS RESIDENTS ALONG THE RIVER BEETWEEN THE LAKE AND DAM HAVE EXPRESSED EMOTIONAL OUTRAGE OVER FEAR OF THE RIVER BEING LOWERED TO BELOW BOATABLE DEPTH DURING SUMMER MONTHS.

NOTE: TEMPERATURES TAKEN ABOVE DAM ARE AT SURFACE OF WATER. TEMPERATURES BELOW DAM ARE IN WATER FROM RIVER BOTTOM UNDER GATES.

- keep thermometer 2 minutes for air temp.
1 minute for water temp.

Lance [illegible] 765-3111

- record 2 or 3 times weekly (once per week absolute minimum)
- at tributaries check above confluence, below confluence, and in tributary

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer J.C. GINDRAUX.

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
8-5-91 5:30 PM	74.5	72.	OUTLET DAM UPSTREAM	CLEAR BRIGHT SUN
8-5-91 5:38 PM	74.1	71.6	OUTLET DAM DOWNSTREAM	" " "
8-9-91 6:43 PM	76.5	74.1	OUTLET DAM UPSTREAM	CLEAR BRIGHT SUN
8-9-91 6:50 PM	75.9	73.9	OUTLET DAM DOWNSTREAM	" " "
8-12-91 08:10 AM	62.2	68.4	OUTLET DAM UPSTREAM	BROKEN CLOUD
8-12-91 08:20 AM	59.9	68.2	OUTLET DAM DOWNSTREAM	" "
8-15-91 6:35 PM	69.3	72.5	OUTLET DAM UPSTREAM	CLEAR NO CLOUD
8-15-91 6:45 PM	69.1	72	OUTLET DAM DOWNSTREAM	" " "
8-17-91 12:50 PM	81.3	72.3	OUTLET DAM UPSTREAM	CLEAR - BRIGHT SUN NO CLOAD
8-17-91 01:00 PM	82	72.3	OUTLET DAM DOWNSTREAM	" " " "
8-21-91 6:50 PM	72.3	73.6	OUTLET DAM UPSTREAM	CLEAR - NO CLOUD
8-21-91 7:05 PM	72.3	72.5	OUTLET DAM DOWNSTREAM	" " "
8-24-91 4:55 PM	76.5	70.3	OUTLET DAM UPSTREAM	HIGH THIN OVERCAST CLEAR - BRIGHT SUN
8-24-91 5:05 PM	77.5	70-	OUTLET DAM DOWNSTREAM	HIGH THIN OVERCAST & CLEAR - BRIGHT SUN
8-26-91 2:55 PM	72.5	68.5	OUTLET DAM UPSTREAM	HIGH THIN OVERCAST CLEAR -
8-26-91 3:05	73	68.4	OUTLET DAM DOWNSTREAM	HIGH THIN OVERCAST CLEAR
8-30-91 2:30 PM	83.5	70.3	OUTLET DAM UPSTREAM	.52 IN RAIN ON 8-28 CLEAR BRIGHT SUN
8-30-91 2:40 PM	85.8	70-	OUTLET DAM DOWNSTREAM	" " "
9-3-91 7:15 PM	57.9	67.1	OUTLET DAM UPSTREAM	CLOUDLESS CALM DAY
9-3-91 7:30 PM	57.7	66.4	OUTLET DAM DOWNSTREAM	" " "

additional comments. PROTRACTED NIGHT TEMPERAT HAVE BEEN CONSISTENTLY LOW - BETWEEN 45 - 55

-keep thermometer 2 minutes for air temp. Lance [illegible] 765-3111.
1 minute for water temp.

record 2 or 3 times weekly (once per week absolute minimum)
at tributaries check above confluence, below confluence, and in tributary

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer J.C. GINDRAUX

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
9-6-91 2:00 PM	81.7	68.4	OUTLET DAM UPSTREAM	CLEAR - BRIGHT SUN CLOUDLESS
9-6-91 2:10 PM	81.5	68.4	OUTLET DAM DOWNSTREAM	11 11
9-8-91 11:05 AM	58.1	64.9	OUTLET DAM UPSTREAM	9/10 CLOUD
9-8-91 11:15 AM	58.5	64.4	OUTLET DAM DOWNSTREAM	11
			OUTLET DAM UPSTREAM	
			OUTLET DAM DOWNSTREAM	
			OUTLET DAM UPSTREAM	
			OUTLET DAM DOWNSTREAM	
			OUTLET DAM UPSTREAM	
			OUTLET DAM DOWNSTREAM	
			OUTLET DAM UPSTREAM	
			OUTLET DAM DOWNSTREAM	

additional comments.

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer Amy West . Dickensheet Campground

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7/16 6:30 P	62	64		
7/26 5:00 p	74	68		sunny, just cleared off from previous storm
7/30 4:30 p	80	70		sunny
8/1 12:00 p	63	66	Gauge .8	cloudy
8/5 5:00 p	74	70		cloudy, partly sunny
8/9 5:45 p	84	73		sunny, hot day
8/15 5:30 p	75	72	.4	sunny
8/17 4:30 p	79	74	.4	partly cloudy - some thunder heads
8/21 5:00 p	83	74		sunny
8/26 4:30 p	75	70	.1 or less	sunny, partly cloudy
8/31 5:30 p	80	70		sunny
9/4 10:00 a	64	62		sunny
9/5 4:45 p	78	70		sunny

additional comments.

- keep thermometer 2 minutes for air temp.
- 1 minute for water temp.
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- at tributaries check above confluence, below confluence, and in tributary

Lance Nelson 765-3111

LOWER PRIEST RIVER TEMPERATURES – 1991

Sample Sites: Outlet – upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and near Blue Creek

Observer Mike Berry SEC 20 T57N R5W

	Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
FRI	19 July 91 10:00 AM	64	63		PARTLY SUNNY 42° ~~Low~~ @ 4:15 AM
TUE	23 July 91 2:30 PM	86	70		SUNNY + HOT 50° ~~Low~~ @ 4:30 AM LEVEL UP 6"
FRI	26 JULY 91 2:00 PM	65	65		CLOUDY LEVEL DOWN 6"
TUE	30 July 91 11:00 AM	72	67		CLEAR " SAME
SAT	3 Aug 91 3:00 PM	85	72		CLEAR " DOWN 12+"
TUE	6 Aug 91 ~~12:00 Noon~~	70	68		CLOUDY " SAME
WED	14 Aug 91 10:AM	63	63		CLEAR " "
SAT	17 Aug 91 2:30 PM	89	72		" + HOT " DOWN 6"
WED	21 aug 4:00 PM	89	71		" " "
SUN	1 Sept 11:00 AM	68	66		PARTLY CLOUDY " "
MON	9 Sept 7:00 PM	66	60		SUNNY (FROST LAST NITE) " 3"
SUN	15 SEPT 6:00 PM	63	61		" (FROZE H2O LAST NITE)

additional comments:

765-3111

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and

Observer Gordon West .

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7/14 9:30 am	63°	64°	McAbee Falls	mostly overcast
7/16 4:10 PM	61°	62°	M-Falls	overcast, light rain
7/20 10:00 am	66°	62°	"	sunny, clear
7/24 5:00 pm	86°	72°	"	sunny, clear
7/29 5:00 pm	81°	70°	"	sunny, clear
7/30 5:45 pm	79°	71°	"	sunny
8/1 4:00 pm	72°	70	"	sunny
8/7 6:00 pm	77°	73°	"	sunny, .35" rain previous night
8/8 10:00 am	74°	70°	"	sunny
8/10 1:00 PM	76°	70°	"	partly cloudy, .15" rain previous night
8/13 5:00 PM	63°	66°	"	mostly cloudy, occasional rain
8/15 7:00 PM	68°	70°	"	sunny
8/20 3:00 PM	87°	74°	"	sunny
8/26 7:00 PM	70°	66°	"	sunny (32° previous night)
8/29 6:00 PM	84°	69°	"	sunny
9/1 3:15 PM	70°	69°	"	mostly sunny
9/4 12:00 AM	68°	62°	"	sunny (frost)
9/9 11:00 AM	67°	53°	"	sunny
9/21 5:00 PM	70°	58°	"	sunny

additional comments.

LOWER PRIEST RIVER TEMPERATURES – 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and Big Creek

Observer Jim West .

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
3:30p 8-15-91	87°	64°	above	Sunny
	87°	60°	mouth	"
	87°	64°	below	"
2:50p 8-20-91	82°	73°	above	Sunny - breeze
	82°	64°	mouth	
	82°	70°	below	
4:20p 9-1-91	68°	70°	above	Partly cloudy - 5mph. wind
	68°	60°	mouth	" " " "
	68°	68°	below	" " " "
12:20p 9-10-91	68°	58°	above	Sunny
	68°	53°	mouth	"
	68°	58°	below	"

additional comments.

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and Big Creek

Observer _____.

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7/16/91 7:30 PM	61°	62°	above	raining
"	61°	63°	mouth	"
"	61°	61°	below	"
7/21/91 3:45 PM	79°	63°	above	partly cloudy
	79°	60°	mouth	"
	79°	63°	below	"
7/24/91 4:30 PM	82°	73°	above mouth	sunny
"	82°	63°	mouth	"
"	82°	73°	below	"
7/29/91 5:30	80°	70°	above	sunny
"	80°	60°	mouth	"
"	80°	70°	below	"
8-4-91 11:20A	80°	68°	above	sunny
"	80°	60°	mouth	"
"	80°	62°	below	"
8-8-91 11:00A	75°	71°	above	Sunny
"	75°	60°	mouth	"
"	75°	70°	below	"
8-11-91 3:05p	74°	70°	above	P+Ly. CLDY.
"	74°	60°	mouth	" "
"	74°	68°	below	" "

additional comments.

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and East River

Observer Jim West

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
2:30p 8-15-91	80°	66°	above	Sunny
"	80°	60°	mouth	"
"	80	66°	below	"
1:55p 8-20-91	87°	73°	above	Sunny
	87°	66°	mouth	"
	87°	72°	Below	"
3:45p 9-1-91	75°	67°	above	Partly Cloudy - 5mph wind
	75°	65°	mouth	" " " "
	75°	67°	below	" " " "
11:35A 9-10-91	68°	58°	above	Sunny
	68°	53°	mouth	"
	68°	58°	Below	"

additional comments.

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and East River

Observer _____

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
7/16/91 3:30 PM	61°	62°	above	raining
"	61°	54°	mouth	"
"	61°	62°	below	"
7/21/91 4:45 PM	77°	63°	above	partly cloudy
"	77°	63°	mouth	"
"	77°	63°	below	"
7/24/91 4:00 PM	88°	74°	above	sunny
"	88°	67°	mouth	"
"	88°	74°	below	"
7/29/91 5:00 PM	86°	71°	above	sunny
"	86°	66°	mouth	"
"	86°	71°	below	"
8-4-91 11:35A	80°	67°	above	Sunny
"	80°	63°	mouth	"
"	80°	67°	below	"
8-8-91 11:40 A	81°	70°	above	Sunny
"	81°	63°	mouth	"
"	81°	67°	below	"
8-11-91 1:10p	78°	69°	above	Sunny
"	78°	62°	mouth	"
"	78°	66°	below	"

additional comments.

LOWER PRIEST RIVER TEMPERATURES - 1991

Sample Sites: Outlet - upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and mouth of Upper West Branch

Observer Rhonda Thornton

Date/Time	Air Temp (Ethan)	Water Temp (Thornton)	Location	Weather Conditions and Comments
7/14 10:45	69	59	above	Windy
" "	64	60	mouth	
" "	64	59	100' below	
7/18 12:30	64	62	above	Partly cloudy and windy
" "	64	59	mouth	
" "	64	58	100' below	
7/21 5:15	79	64	above	cloudy and hot
" "	79	61	mouth	
" "	79	61	100' below	
7/25 12:00	62	64	above	cloudy and windy
" "	62	60	mouth	
" "	62	60	100' below	
7/28 10:10	75	63	above	clear and hot
" "	75	59	mouth	
" "	75	59	100' below	
8/1 3:05	78	71	above	Partly cloudy and hot
" "	78	64	mouth	water has gone down.
" "	78	65	100' below	
6/4 9:45	72	69	above	
" "	72	60	mouth	

additional comments.

LOWER PRIEST RIVER TEMPERATURES — 1991

Sample Sites: Outlet – upstream of dam and downstream of dam, Dickensheet, McAbee Falls, and mouth of Upper West Branch

Observer Rhonda Thornton + Ethan Thornton

Date/Time	Air Temp	Water Temp	Location	Weather Conditions and Comments
8/4 9:45	72	60	100' below	
8/7 2:05	82	74	above	
" 2:10	82	68	mouth	
" 2:15	82	68	100' below	
8/11 2:35	75	72	above	
" 2:30	75	64	mouth	
" 2:25	75	64	100' below	
8/14 3:55	76	72	above	
" 3:50	76	63	mouth	
" 3:45	76	64	100' below	
8/18 10:10	76	70	above	
" 10:05	76	62	mouth	
" 10:00	76	64	100' below	
8/25 10:15	67	64	above	
" 10:10	67	58	mouth	
" 10:05	67	58	100' below	
9/7 9:85	56	60	above	
" 8:55	56	52	mouth	
" 8:45	56	54	100' below	

additional comments.