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FISH & GAME DEPARTMENT

Joseph C. Greenley, Director

LAKE AND RESERVOIR INVESTIGATIONS

Job Performance Report

Project F-53-R-9

Job No. VIII-a. Priest River Fisheries Study

Period Covered: March1, 1973 to February 28, 1974

by

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May, 1974

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JOB PERFORMANCE REPORT

State of Idaho Name LAKE AND RESERVOIR INVESTIGATIONS

Project No. F-53-R-9 Title Priest River Fisheries Study

Job No. VIII-a

Period Covered: March 1, 1973 to February 28, 1974

ABSTRACT:

In 1973, a 2-year study was completed on the regulation of impounded waters at Priest Lake. An evaluation was conducted on the release of lake waters into lower Priest River. In addition, I related outflows and declining reservoir levels to the duration and peak of kokanee spawning in Priest Lake.

As dam boards are installed in late July, lake outflow is reduced. As flows receded from 2,970 cfs in June to 103 cfs in September, stream widths were reduced an average of 39%. The greatest decreases in stream widths occurred as flows declined from 190 to 103 cfs. The average stream depth dropped 15% with the nearly two-fold decrease in flow from 190 to 103 cfs.

Averages of minimum flows and monthly means since 1911, reflect declines in water flow from pre- to post-impoundment years. In the 39 years prior to impoundment, the lowest annual flows averaged 233 cfs with 74% of the flows occurring after October during cooler water flows. Since impoundment, the lowest annual flows averaged 118 cfs with 88% of the flows occurring prior to October during warmer water flows. In 1973, between July and September, water temperatures on lower Priest River reflected profiles similar to those of 1972 and 1956. Generally, minimum water temperatures ranged between 65 F and 72 F for 33 days (July 15 to August 16). Maximum water temperatures exceeded 65 F for 77 days (July 4 to September 18).

In 2 years, I have floated 28 miles of lower Priest River. I've found that floating the river by raft is difficult at flows less than 500 cfs. Some sections are easily, but slowly floated at 200 cfs, but floating the entire river would be unsuitable at flows of 100 cfs.

In assessing the fish stocks of lower Priest River, I found the availability of cutthroat low in August. Stocking of hatchery rainbow is adequate and satisfies localized angler pressure which concentrates at three points during August. White-fish are the only game fish found in number and nongame fish species are the most abundant throughout the river.

In 1973, kokanee spawning in Priest Lake occurred between October 21 and December 15 with the peak between November 13 and November 23. Kokanee selected the same spawning areas as in 1972, with the highest accumulative concentration of redds along the west shoreline. The fall release commenced on October 21 with the final 5 inches evacuated by March 15. Considering that kokanee spawned as early as October 21, the initial 2 feet of water were withdrawn from Priest Lake

during the spawning season. The final 5 inches were withdrawn during the egg incubation period.

In November, 1973, we measured 300 kokanee spawners from Priest Lake which averaged 11.4 inches in total length. Eight trophy-size kokanee (17 inches or longer) were observed in water deeper than 8 feet. The largest kokanee measured was a 22-inch male. Although a number of kokanee have attained trophy-size as a result of Mysis shrimp introductions, the average size of spawners has changed only slightly since 1955.

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RECOMMENDATIONS:

Amend Section 70-507 of the Idaho Code to allow maintenance of the Priest Lake water level at 2,438.3 instead of 2,438.0. This will allow sufficient impounded waters to be released to maintain a minimum flow of 200 cfs during the critical summer months of August and early September.

Install a telephone relay system to monitor Priest Lake outflow. A communications line can be established on existing telephone lines between the dam and the water recording gauge at the Dickensheet Campground. This will provide the dam operator with outflow data to adjust water releases and insure a minimum flow at all times.

Use public input to determine the end of the recreational season at Priest Lake. If dictates are such that the recreational season ends immediately after Labor Day, then drawdown should commence as early as possible to allow evacuation of lake waters by November 1, prior to the peak of kokanee spawning. Drawdown should be gradual (900 cfs) to provide a lowered velocity impact on the river.

Build and actively maintain a public, low-water ramp for season long use on Priest Lake even after drawdown commences. This will provide access to the lake for trout fishing in fall and winter.

The best approach in reducing sedimentation impacts on the river, aside from reducing fall discharge velocities, is to minimize man's impact on the surrounding land and watershed. Buffer strips should be established on the river and its tributaries to prevent exploitation and excessive use by timber and ranching interests. In addition, land values should be evaluated completely before new subdivisions are allowed to pox the watershed.

Lower Priest River is a scenic stream providing limited recreational use. Endemic fish stocks have declined with construction of the dam and loss of habitat, but fishery values may be re-established through careful planning and management. I recommend that lower Priest River be classified as either scenic or recreational when proper waterflow regimes are established.

OBJECTIVES:

To record water flow, temperature, and other water quality characteristics at selected intervals of Priest River and to relate these to fish populations in these areas.

To measure and describe the characteristics of the streambed and banks and erosion-siltation areas.

To measure and assess fish food abundance in selected stream sections and relate this to the abundance and well being of fish in these areas.

To provide a general assessment of the recreational access and sport fishery of Priest River for U. S. Forest Service and fisheries management personnel.

TECHNIQUES:

Cross Sections

Using stream transects established in 1972 (Irizarry 1973), field personnel measured stream widths at four stations (4, 7, 10 and 13) at a water flow of 103 cfs (Figure 1). I selected these stations because of favorable access to either bank during flows above 200 cfs. I standardized stream widths as the wetted area between stream banks. Information collected in 1973 was correlated with previous data to determine reduction in wetted area as flows subside from June to September. Width measurements were correlated with the flow gauge at Dickensheet Campground.

Stream Depth

We measured stream depths at 103 cfs at six stations (2, 3, 6, 7, 12 and 13) established in 1972. Areas selected for depth measurements at stations 7 and 13 were adjacent to our cross sections. Deep pools prevented depth measurements at stations 4 and 10. By stretching a marked nylon rope, I measured stream depths to the nearest 1/2 inch at 10-foot increments.

The information collected in 1973 was correlated with previous data to determine the amount of reduction in stream depth that occurrs as flows decline from 190 cfs to 103 cfs.

Temperature

We maintained three Moellar thermographs on lower Priest River between June and September. These stations were located at the dam, at Dickensheet Campground, and below the confluence of Saddle Creek. The latter two stations were established near permanent U. S. Geological Survey water recording gauges.

We recorded water temperatures from Taylor minimum-maximum thermometers placed in five streams tributary to lower Priest River. These thermometers were calibrated with pocket thermometers to + 1/2 degree. Field personnel checked the Taylor thermometers for deviation after each reading. We secured each minimum-maximum thermometer inside a 2-inch metal pipe anchored in the streambed to minimize vibrations and to provide shade in order to reduce sunlight exposure. Each thermometer was placed in 12 to 18 inches of water between 1/2 and 2 miles upstream from the stream's mouth at a convenient access.

Annual Flow Records

Information was recorded from U. S. Geological Survey Surface Flow Records of the Pacific Northwest and Idaho from 1911 to 1973.

Float Trips

Department personnel floated sections of lower Priest River in 12-ft. rubber boats to determine difficulties encountered in floating the river at selected flows.

Fish Species Composition

We used underwater observations and fishing gear during the float trips as

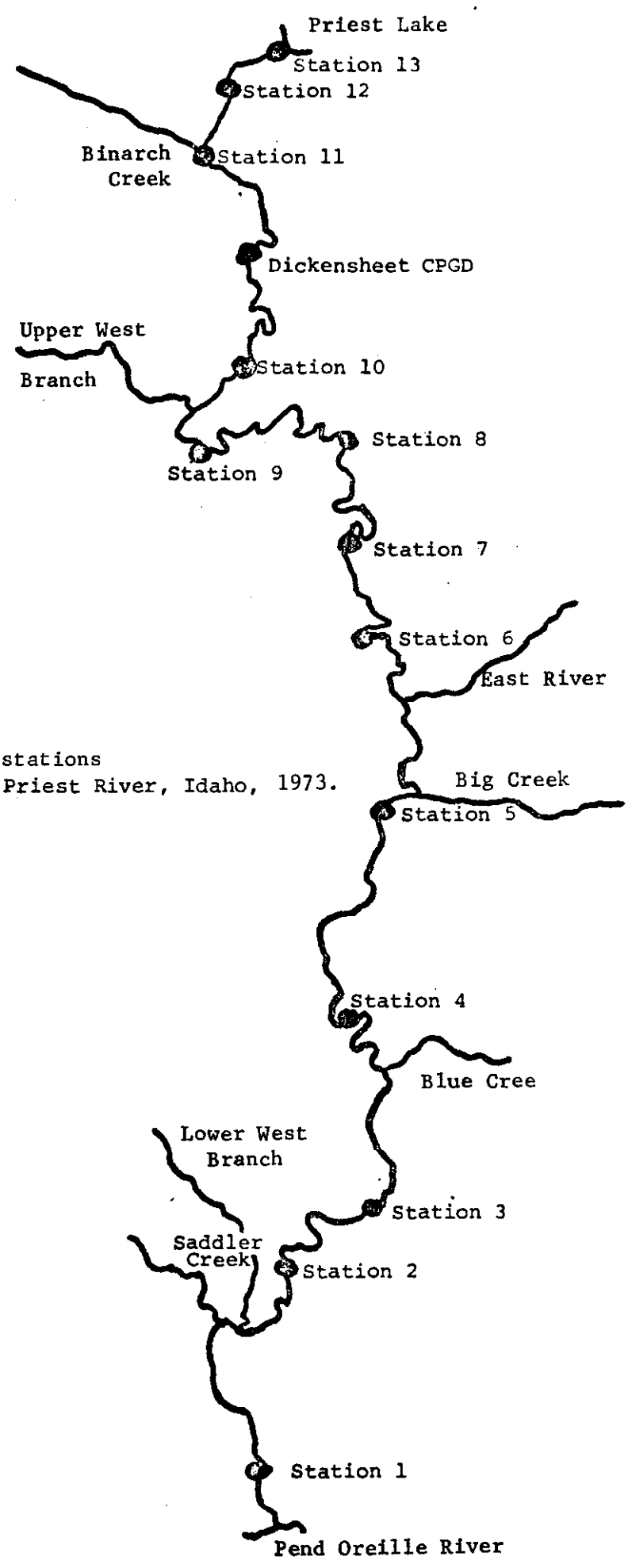

Figure 1. Field stations lower Priest River, Idaho, 1973.

sampling techniques to determine the relative abundance of game and rough fish populations.

Insects

Members of the U. S. Forest Service sponsored Youth Conservations Corps and Department personnel collected insect samples at selected sites on lower Priest River, Hughes Fork, and upper Priest River. We used barrel-samplers to collect aquatic insects which were preserved in 70% isopropyl alcohol.

Analysis of the insect samples will be completed by Dr. Janice M. Gillespie, entomologist, University of Idaho. Preliminary investigations indicate 90% of the samples were Trichoptera.

Kokanee Spawning

During November and December, Department personnel contacted local residents and visited lakeshore areas and tributary streams to record the location and abundance of kokanee spawners. Techniques used included foot surveys supplemented by aerial flights. I related outflows and declining reservoir levels to the duration and peak of spawning.

FINDINGS:

Cross-Sections

As spring flows receded on lower Priest River, the percent of wetted area or stream width is reduced (Table 1). Between June and September at stations 7, 10 and 13, nearly one-half of the stream's width was lost as flows subsided from 2,970 cfs to 103 cfs. At flows near 190 cfs, one-fifth of the width was lost at the same stations.

Not until flows lowered to 103 cfs did station 4 have a severe loss of one-fifth of the stream's width. Tributary inflows and channel conformation helped maintain higher water levels on the lower river channel down to flows of 190 cfs. Below that, a reduction in flow at the dam to 103 cfs severely effected stream widths at all monitoring stations.

Stream Depth

Stream depths were measured at six stations at flows of 190 and 103 cfs (Table 2). Footing difficulties were encountered at all stations at flows of 300 cfs or higher.

Stream depths at 190 cfs ranged between 12.1 and 25.6 inches with an average depth of 17.6 inches. At a 103 cfs flow, depths ranged between 9.0 and 26.1 inches, with an average depth of 15.0 inches.

The average stream depth dropped 15% with the nearly two-fold decrease in flow. Temperature

Priest River

Minimum water temperatures in 1973 from three thermographs averaged 54 F in

Table 1. Percent reduction of wetted area (stream width) by station, lower Priest River, Idaho, June to September, 1973.

Stream* flows	Station 4		Station 7		Station 10		Station 13	
	Width	% Reduction	Width	% Reduction	Width	% Reduction	Width	% Reduction
2,970	190	-	145	-	160	-	193	-
1,800	188	1	138	5	150	6	186	4
1,560	187	2	137	6	146	9	184	5
1,380	185	3	136	6	144	10	183	5
880	183	4	133	8	136	15	178	8
810	183	4	134	8	152	5	182	6
460	179	6	135	7	116	27	170	12
190	179	6	117	19	116	27	166	14
103	153	19	77	47	86	46	107	45

* The largest flow (2,970 cfs) occurred in June and the smallest (103 cfs) occurred in September. The remainder of the flows indicate the decreasing flow pattern as the summer progressed.

Table 2. Stream depth measurements by station, lower Priest River, Idaho. a/

Stations	190 cfs		103 cfs	
	Average depth (inches)	Average width (feet)	Average depth (inches)	Average width (feet)
2	21.3	118	26.1 b/	91
3	16.3	151	13.8	139
6	12.1	170	9.0	172
7	19.2	98	16.2	77
12	25.6	116	16.1	130 c/
13	14.9	154	14.8	107
Average depth	17.6		15.0	
Average width		34.5		119.3

a/ Measurements commenced at edge of wetted area.

b/ Deeper portion of pools measured in 1973.

c/ Large sandbar present in 1972 was washed out in 1973.

June, 63 F in July, 62 F in August, and 55 F in September (Appendix I). Generally, minimum water temperatures ranged between 65 and 72 F for the 33 days from July 15 to August 16.

Maximum water temperatures averaged 58 F in June, 69 F in July, 70 F in August, and 65 F in September (Appendix I). Generally, maximum water temperatures exceeded 65 F for the 77 days from July 4 to September 18.

Between July and September, water temperatures on lower Priest River reflected profiles similar to those of 1972 and 1956 (Table 3).

At Dickensheet, water temperature profiles in July showed little deviation from 1956 (Figure 2 and 3). However, in August and September, average minimum temperatures decreased from the 1972 and 1956 averaged. The lowered minimums resulted when reduced flows to 100 cfs provided only marginal cover over the temperature sensor. Consequently, the sensor was subjected to nightly decreases in air temperatures.

At Saddler Creek, water temperature profiles in August showed cooler average temperatures than in 1972 (Figures 4 and 5). The cooler temperatures recorded at the Saddler gauge were influenced by cold spring waters entering the river above the gauge at the time flows were lowering from 200 to 100 cfs.

At the Priest Lake Dam, water temperature profiles nearly paralleled 1972 averages (Figures 6 and 7). September averages in 1972 were cooler as a result of late summer rains which cooled the lake's surface waters.

For the second consecutive year, water temperature profiles nearly reflected air temperatures at the dam throughout the summer (Figures 6 and 7). Although cooling air temperatures in September, 1973 lowered minimum water temperatures
at the dam, no effect was noticed on maximum water temperatures. By late September, lowered air temperatures were instrumental in cooling river waters at all stations.

Tributaries

Minimum-maximum water temperatures were recorded for 12 days in five streams tributary to lower Priest River (Table 4).

Throughout the summer, minimum water temperatures in four streams averaged less than 50 F, but at Blue Creek the average minimum was 59 F. Daily temperatures at Binarch Creek did not exceed 52 F from June to September.

The number of days in which maximum water temperatures exceeded 65 F ranged from a low of four at Big Creek to a high of ten at East River. At Blue Creek the lowest maximum temperature recorded was 78 F.

By comparison, minimum water temperature averages in all the tributaries, except Blue Creek, were significantly cooler than those in lower Priest River. In three streams, maximum averages exceeded those of lower Priest River.

In summary, Big and Binarch creeks are the only two major tributaries that could cool waters in lower Priest River. However, both have low summer flows and cooling effects can be only localized near their confluences with the river.

Table 3. Monthly average of minimum and maximum water temperatures by year, lower Priest River, Idaho.

	Average minimum temperatures (F)		
Month	1973	1972	1956
June	54	--	--
July	63	--	65
August	62	65	64
September	55	55	59

	Average maximum temperatures (F)		
Month	1973	1972	1956
June	58	--	--
July	69	--	71
August	70	71	70
September	65	62	66

Figure 2. Minimum water temperatures (F) and monthly mean, Dickensheet, lower Priest River, Idaho, 1973, 1972 and 1956.

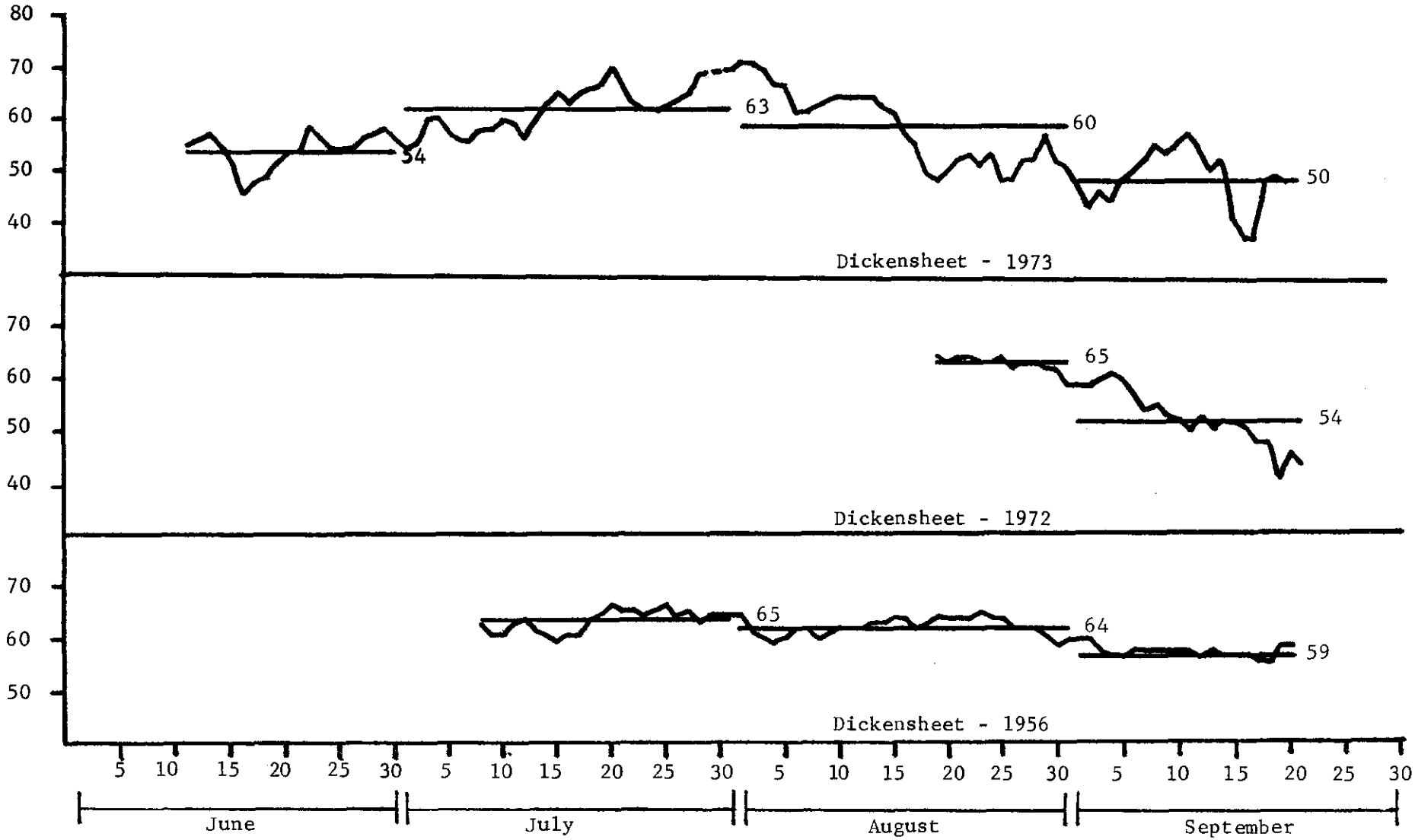

Figure 3. Maximum water temperatures (F) and monthly mean, Dickensheet, lower Priest River, Idaho, 1973, 1972 and 1956.

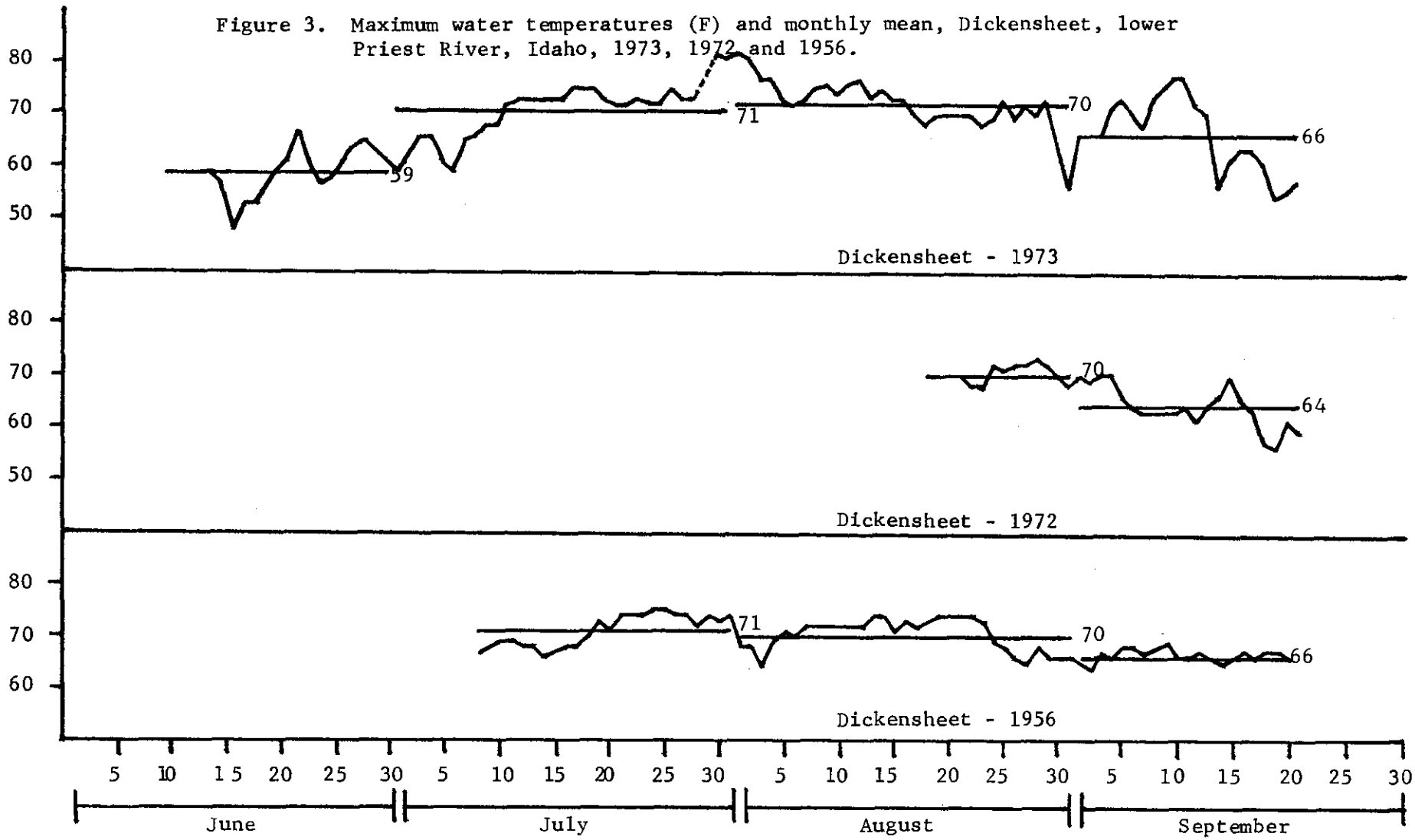

Figure 4. Minimum water temperatures (F) and monthly mean, Saddler Creek, lower Priest River, Idaho, 1973 and 1972.

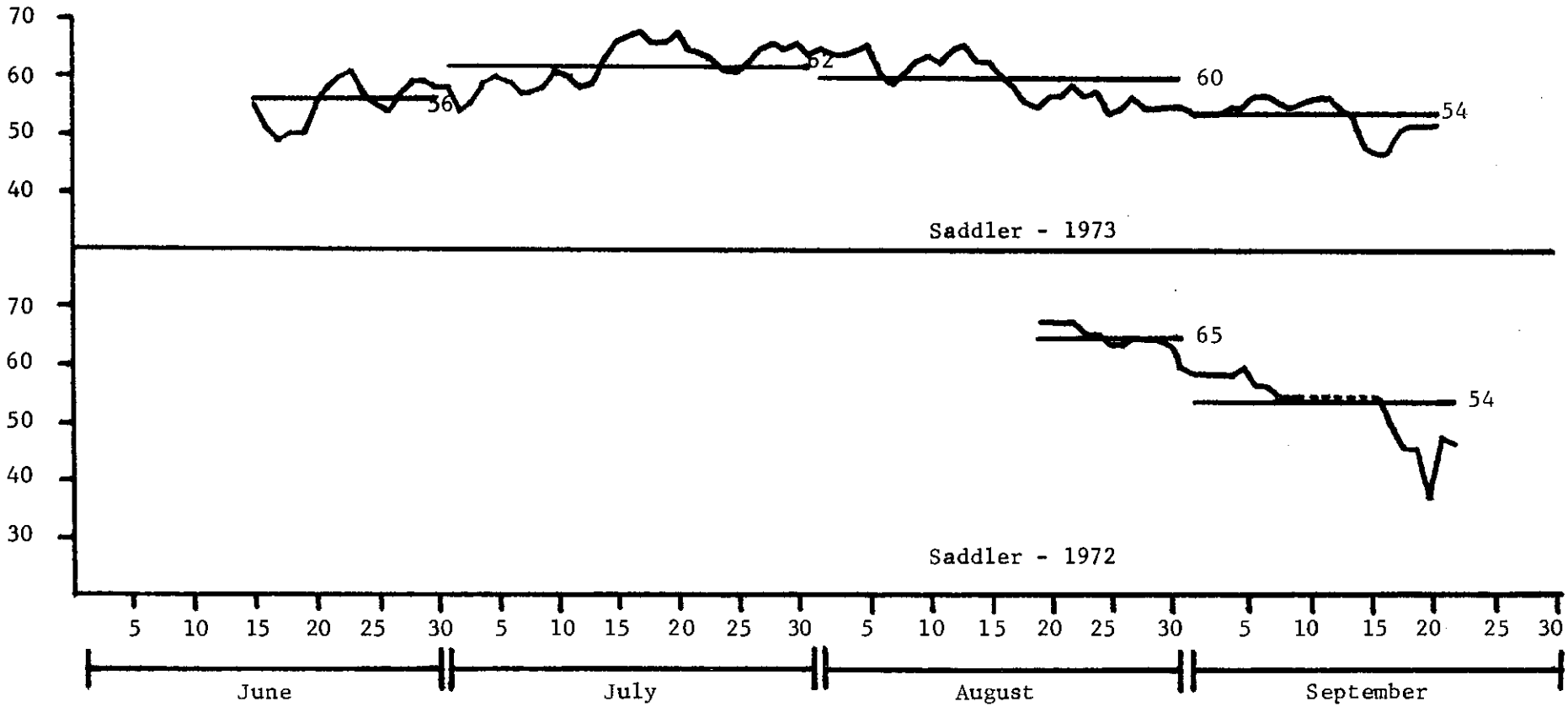

Figure 5. Maximum water temperatures (F) and monthly mean, Saddler Creek, lower Priest River, Idaho, 1973 and 1972.

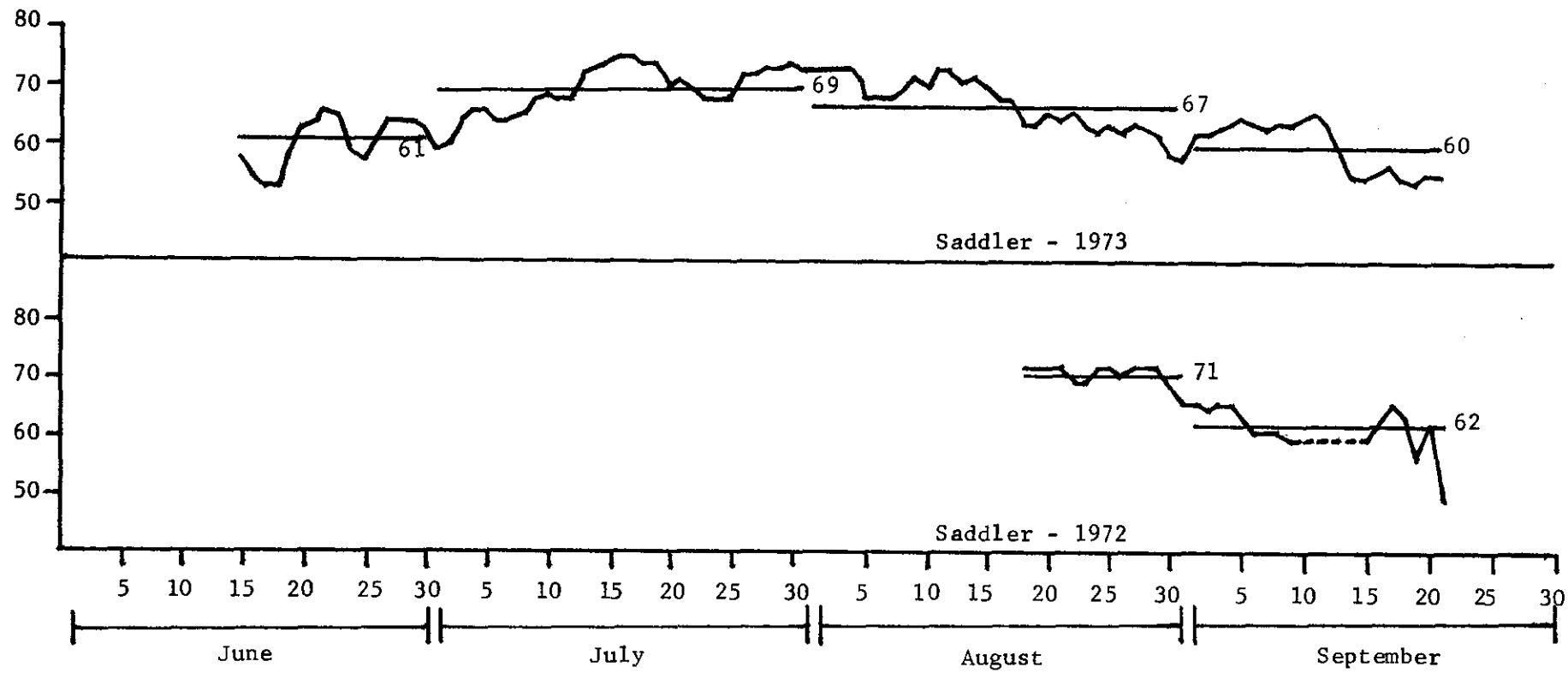

Figure 6. Minimum temperatures (F) and monthly mean, Priest Lake Dam, lower Priest River, Idaho, 1973 and 1972.

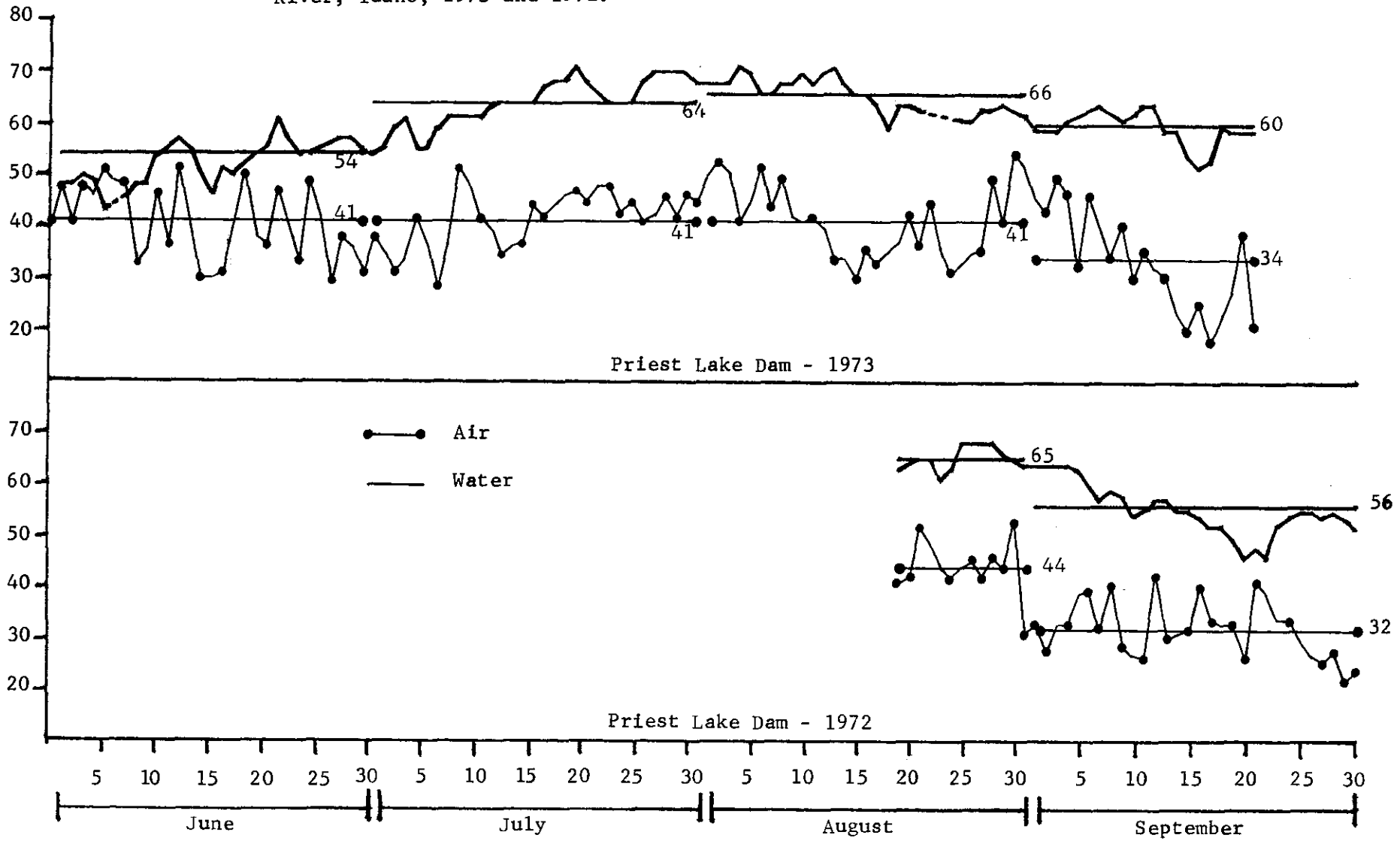

Figure 7. Maximum temperatures (F) and monthly mean, Priest Lake Dam, lower Priest River, Idaho, 1973 and 1972.

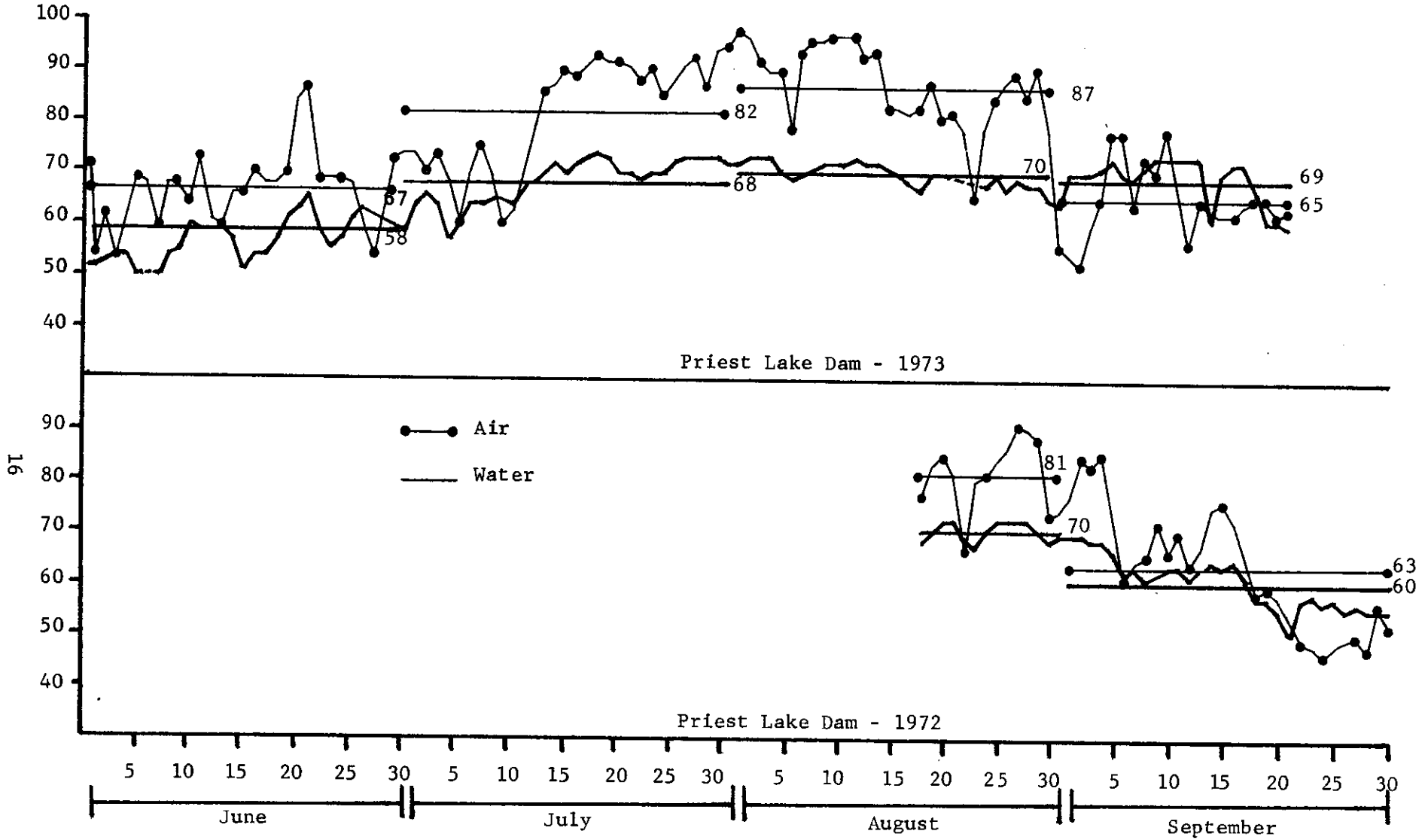

Table 4. Minimum-maximum water temperatures (F) of lower Priest River and tributaries, 1973.

	Lower Priest River			Tributaries				
Date	Dam Min - Max	Dickensheet Min - Max	Saddler Min - Max	Big Creek Min - Max	Binarch Creek Min - Max	Blue* Creek Min - Max	East River Min - Max	Upper West Branch Min - Max
6/15	50 - 57	51 - 57	55 - 58	42 - 61	43 - 49	55 - 87	43 - 76	46 - 64
6/22	61 - 66	59 - 68	60 - 66	40 - 64	49 - 52	50 - 89	40 - 70	42 - 59
6/29	57 - 61	59 - 63	59 - 64	48 - 60	48 - 48	69 - 79	45 - 72	52 - 64
Average	56 - 61	56 - 63	58 - 63	43 - 62	47 - 50	58 - 85	43 - 73	47 - 62
7/16	55 - 60	57 - 59	59 - 64	45 - 62	43 - 48	65 - 87	47 - 62	45 - 68
7/13	64 - 68	61 - 73	66 - 71	51 - 62	45 - 48	62 - 82	53 - 70	47 - 73
7/20	71 - 73	71 - 73	68 - 70	56 - 62	46 - 48	59 - 78	59 - 77	50 - 77
7/27	70 - 73	66 - 73	65 - 72	50 - 60	48 - 49	52 - 92	47 - 79	46 - 70
Average	65 - 69	64 - 70	65 - 69	51 - 62	46 - 48	60 - 85	52 - 72	47 - 72
8/ 3	68 - 73	71 - 77	64 - 73	54 - 64	50 - 50	60 - 94	50 - 86	50 - 77
8/10	70 - 72	66 - 74	64 - 70	50 - 66	48 - 48	---	48 - 84	45 - 78
8/17	64 - 68	57 - 70	59 - 68	49 - 65	42 - 49	---	50 - 82	60 - 72
8/24	63 - 68	55 - 69	58 - 63	54 - 65	46 - 46	---	45 - 69	58 - 77
8/31	62 - 64	53 - 56	55 - 58	53 - 66	44 - 52	---	46 - 63	44 - 76
Average	65 - 69	60 - 69	60 - 66	52 - 65	46 - 49	60 - 94	48 - 77	51 - 76
3-month average	63 - 67	61 - 68	61 - 66	49 - 63	46 - 49	59 - 86	48 - 74	49 - 71

*Thermometer removed owing to a minimal flow after August 3, 1974.

Annual Flow Records

Water storage at Priest Lake began on August 9, 1950. In the 39 years prior to impoundment, minimum flows averaged 372 cfs in August and 271 cfs in September. The lowest annual flows between 1911 and 1949 averaged 233 cfs with 74% of the lowest flows occurring after October during cooler water flows (Appendix II).

In the 24 years after impoundment, minimum flows averaged 165 cfs in August and 132 cfs in September. The lowest annual flows between 1950 and 1973 averaged 118 cfs with 88% of the lowest flows occurring prior to October, during warmer water flows.

Averages of monthly means also reflect declines in August and September from pre- to post-impoundment years. In addition, during 10 pre-impoundment years, when the lowest annual flows occurred in August and September, the monthly means averaged 383 cfs. Following impoundment, this declined to 222 cfs or a 42 % reduction in flow down the river.

Historical water records show then that impoundment of lake waters has caused an abnormal situation in the water regime of lower Priest River.

Float Trips

We floated the river between station 8 and station 7 on August 9, a distance of 4 miles, in 5 hours. The Dickensheet gauge recorded a 210 cfs flow. Cattle pollution was evident throughout this section. In addition, waste effluent was noticed entering the river from a residential homestead and barn. There were no problems encountered in floating this section of river at this flow.

On August 14, the river between station 6 and station 5 was floated a distance of 52 miles, in 4 hours. The Dickensheet gauge recorded 176 cfs flow. The distance was covered rapidly with fishing limited to deeper pools and the mouth of Big Creek. This is one of the most beautiful sections of the river and includes the East River and Big Creek confluences. This area was characterized by heavy beaver activity along the bank. Low water flows caused numerous scrapings and one brief hangup. The pleasure of floating this section would decrease substantially below 176 cfs.

We had made plans to float the river section between station 5 and station 4 on August 29, but by that time water flows had decreased to 100 cfs. Shore-line observations showed that floating would require lengthy portages.

In 2 years, I have floated 28 miles of lower Priest River. I've found that floating the river by raft is handicapped at flows less than 500 cfs. Although some sections are easily, but slowly floated at 200 cfs, shoreline observations showed that floating the entire river would be unsuitable at flows of 100 cfs.

Fish Species Composition

During our float trip of August 9, we caught only squawfish. No trout were hooked or observed. While snorkeling, we observed numerous suckers in deeper pools. Whitefish were seen in two pools with the largest concentration near the

mouth of a small creek entering at the base of Whitetail Butte. Water temperature at the commencement of the trip was 69 F and at the conclusion, 73 F.

On our second float trip, August 14, we caught no fish. Few fish were observed in this section. Only suckers were found in the deeper pools with fingerling squawfish inhabiting shoreline areas that were profuse with aquatic vegetation. No whitefish were observed. Water temperature at the commencement of the trip was 67 F and at the conclusion, 72 F.

During the 2 days, two men fished nearly 10 hours on 10 miles of stream to catch only two squawfish and no trout. In 2 years, during the middle of August, seven men have fished 31 hours on 28 miles of stream and caught 14 trout or 0.4 fish per hour. We averaged one trout every 2 miles.

I compared the upper end of the river (Station 5 to the Dickensheet Camp-ground) to the lower end (Station 4 to Station 2) in a general way and found that the upper end during August generally had:

a) less cutthroat caught or observed,
b) more hatchery rainbow caught or observed,
c) more whitefish observed,
d) less schools of redside shiners observed,
e) less schools of fingerling squawfish observed,
f) less adult squawfish caught, and
g) about equal numbers of suckers observed.

In August, then, the availability of cutthroat is low. Stocking of hatchery rainbow is adequate and satisfies localized angler pressure that concentrates at three points (at the dam, at Dickensheet, and at MacAbee Falls). Although white-fish are the only game fish found in number, nongame fish species are the most abundant throughout the river.

Kokanee Spawning

At Priest Lake, local resident at Hagman's Resort reported kokanee were actively "finning" on October 13. The first wave of spawners were observed along the shoreline at Hagman's Resort, Grandview Lodge, Granite Creek Marina, and Tillakum Resort on October 21. By October 27, many kokanee were actively spawning along the Priest Lake Shoreline.

On November 3, I checked for spawners at Priest Lake, primarily at four tributaries and seven lakeshore areas. I found no spawning activity in the tributaries (Two Mouth, Indian, Hunt, or Kalispell creeks). I found redds adjacent to the lake shore at Grandview Lodge, Granite Creek Marina, near the Hunt Creek mouth, Indian Creek Bay, Jim Low's Resort, and Ledgewood Bay. No activity or redds were observed at Huckleberry Bay.

On November 13, we commenced our kokanee spawner counts at Priest Lake (Table 5). Kokanee spawning occurred between October 21 and December 15 with the peak between November 13 and November 23. Spawner counts were not conducted after December 15 because of declining numbers and inclement weather.

Table 5. Number of spawning kokanee counted on the shoreline beaches of Priest Lake, Idaho, 1973.

Location	November		December		
	13	23	1	8	15
Hagman's Resort	2,000	1,500	975	125	52
Grandview Lodge	1,100	700	800	600	6
Granite Creek Resort	700	300	250	50	0
Ledgewood Bay	200	150	300	150	45
Tillakum Resort	1,500	750	250	40	0

During aerial observations on November 26, I found that kokanee selected the same spawning areas as they had in 1972. The highest single concentration of redds was at the Soldier Creek delta. The highest accumulative concentration of redds was on the west shoreline between Jim Low's Resort and Hagman's Resort. Although spawning redds were visible, overcast and slightly windy conditions prevented good observations of kokanee spawners.

In November 1973, we measured 300 kokanee spawners from Priest Lake which averaged 11.4 inches in total length. In addition, eight trophy-size kokanee (17 inches or larger) were observed in water deeper than eight feet. The largest kokanee measured was a 22-inch male.

Although a number of kokanee have attained trophy-size as a result of Mysis shrimp introductions, the average size of spawners has changed only slightly since 1955 (Table 6).

Dam boards were pulled on October 20, 1973 when the lake level was 2,438.12 feet above minimum pool (2,435.0 ft.). The last boards were removed on October 27 at a lake level of 2,437.33 (2.33 feet above minimum pool).

Between October 20 and October 29, the lake level dropped 1 foot with an average outflow of 2,157 cfs. Between October 29 and December 20, the second foot of water was evacuated. From December 20 to March 15, the lake level gradually declined to a low of 2,435.6 feet.

It took 10 days to lower the lake 1 foot, 53 days for the second foot and 86 days for the last 5 inches.

Considering that kokanee spawned as early as October 21, the initial 2 feet of water were withdrawn from Priest Lake during the spawning season. The final 5 inches were withdrawn during the egg incubation period.

Shoreline observations indicated egg losses at Indian Creek Bay, Grand-view Lodge and Granite Creek Marina. The magnitude of egg losses was not accessed.

DISCUSSION:

In summary, we have two major complications with the operation of the Priest Lake dam.

First, a minimum flow needs to be established before we can start manipulating endemic fish stocks or introduce a new fish species that will better adapt to present river conditions.

The complication is that under present legislative law (Section 70-507 of the Idaho Code) summer pool is not to exceed or be maintained at a level higher than 2,438.0 or 3 feet above minimum pool (2,435.0 feet). However, by raising and maintaining the lake at 2,438.3, an additional 3 to 4 inches higher, proper operations could release a 200 cfs flow constantly throughout the critical summer period to maintain a minimum flow down Priest River.

The second complication is the fall release of water for downstream power. Under present operation, the fall release occurs "after the close of the main

Table 6. Average kokanee size in inches at spawning time, Priest Lake, Idaho, 1953--present.

	Priest Lake					
Year	No. of females	Average length	No. of males	Average length	Total	Average length
		9.5		9.8		9.6
1953	186		152		338	
1954	40	9.9	52	10.2	92	10.1
1955	203	10.5	265	11.0	468	10.7
1956	84	11.4	132	11.8	216	11.6
1957	160	11.2	165	11.7	325	11.4
1958			-	---	---	---
1959	267	11.4	252	11.9	519	11.6
1960	78	11.5	76	12.0	154	11.7
1961	53	11.3	98	11.8	151	11.6
1962	112	10.9	64	11.4	176	11.1
1963	154	10.2	316	10.9	470	10.7
1964	186	10.4	249	10.9	435	10.7
1965	91	10.4	131	10.8	222	10.6
1966	48	11.1	70	11.6	118	11.4
1967	---	11.7	-	12.3	---	---
1968	---	---	---	---	---	---
1969	---	---	---	---	---	---
1970	---	---	---	---	---	---
1971	---	---	---	---	---	---
1972	---	---	---	---	---	---
1973	99	11.0	201	11.6	300	11.4

recreational season" which as yet is undefined. Some recreational interests on the lake claim the season ends during the third week of October, while others claim it ends immediately after Labor Day. With the drawdown schedule commencing so late in October, the chance of desiccating kokanee eggs implanted on the lake's shoreline is increased. In addition, the abrupt release of impounded waters in fall, peaking over 2,000 cfs, causes sand deposition on gravel beds.

Therefore, we need to initiate a public opinion poll or a public hearing to explain clearly, the complications and alternatives available regarding the operation of the dam and its effect on the fishery resources of the area.

Our best alternative, biologically speaking, is to commence a gradual water release in September to be concluded by November 1, prior to the peak of spawning. At least two-thirds of the impounded waters should be released by November 1. A gradual release of 900 cfs will also provide a lowered velocity impact on the river. However, an early drawdown would negate good access to Priest Lake and hinder, but not obstruct, boat passage to upper Priest Lake for trout anglers in the fall.

The lack of access to Priest Lake during low lake level can be eased with the addition of a well maintained, public low water ramp. Drawdown can then proceed on the lake without effecting access to the Priest Lake trout fisheries in the fall and early winter. This, however, does not improve boat passage to upper Priest Lake during low water. However, angler demand and use of upper Priest Lake is low in the fall and the problem is minimal since passage is adequate, but slow for outboard boats.

It must be noted that an earlier drawdown will subject resort operations to earlier closures and possible revenue losses.

LITERATURE CITED:

Irizarry, R. A. 1973. Lake and reservoir investigations. Federal Aid to Fisheries Project. Annual Completion Report. Job No. VIII-a. Idaho Fish and Game Department, 37pp.

APPENDIX I

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1973 Location Priest Lake Dam

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1											52	-	59	54	72	68	70	59						
2											52	48	64	55	73	68	70	59						
3											53	48	66	59	73	68	70	59						
4											54	50	64	61	73	71	71	61						
5											54	49	57	55	70	70	73	62						
6											50	43	60	55	69	66	70	63						
7											-	-	64	59	70	66	69	64						
8											50	46	64	61	71	68	71	62						
9											54	48	65	61	72	68	73	61						
10											55	48	65	61	72	70	73	62						
11											60	54	64	61	72	68	73	64						
12											59	55	68	63	73	70	73	64						
13											59	57	68	64	72	71	73	59						
14											59	55	70	64	72	68	61	59						
15											57	50	72	64	71	66	70	54						
16											51	46	70	64	70	66	72	52						
17											54	51	72	67	68	64	72	54						
18											54	50	73	68	67	59	67	60						
19											57	52	74	68	70	64	61	59						
20											61	54	73	71	70	64	61	59						
21											63	55	70	68	-	63	60	59						
22											66	61	70	66	-	-								
23											59	57	69	64	-	-								
24											55	54	70	64	68	-								
25											57	54	70	64	70	61								
26											61	55	72	68	67	61								
27											63	56	73	70	69	63								
28											62	57	73	70	68	63								
29											61	57	73	70	68	64								
30											60	55	73	70	65	63								
31													72	68	64	62								

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1973 Location Dickensheet Campground

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													59	55	82	72	66	49						
2													63	56	81	72	66	45						
3													66	61	77	71	66	48						
4													66	61	77	68	71	46						
5													61	58	73	68	73	50						
6													59	57	72	63	70	52						
7													65	57	73	63	68	54						
8													66	59	75	64	73	57						
9													68	59	76	65	75	55						
10													68	61	74	66	77	57						
11											59	55	72	60	76	66	77	59						
12											59	56	73	57	77	66	72	56						
13											59	57	73	61	73	66	70	52						
14											59	55	73	64	75	64	56	54						
15											57	51	73	66	73	63	61	43						
16											48	46	73	64	73	59	63	39						
17											53	48	75	66	70	57	63	39						
18											53	49	75	67	68	51	60	50						
19											56	52	75	68	70	50	54	51						
20											59	54	73	71	70	52	55	50						
21											61	54	72	67	70	54	57	50						
22											68	59	72	64	70	55								
23											61	57	73	63	68	53								
24											57	55	72	63	69	55								
25											58	55	72	64	73	50								
26											61	55	75	65	60	50								
27											64	57	73	66	72	54								
28											65	58	73	70	70	54								
29											63	59	-	-	73	59								
30											61	57	82	-	64	54								
31													81	71	56	53								

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1973 Location Saddler Creek

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													59	58	73	65	62	54						
2													60	54	73	64	62	54						
3													64	56	73	64	63	54						
4													66	59	73	65	64	55						
5													66	60	68	66	65	55						
6													64	59	68	61	64	57						
7													64	57	68	59	63	57						
8													65	57	70	61	64	56						
9													68	58	72	63	64	55						
10													69	61	70	64	65	56						
11													68	60	73	63	66	57						
12													68	58	73	65	64	57						
13													72	59	71	66	60	55						
14													73	63	72	63	55	54						
15											58	55	74	66	70	63	55	48						
16											55	51	75	67	68	61	56	47						
17											53	49	75	68	68	59	57	47						
18											53	50	74	66	64	56	55	51						
19											59	50	74	66	64	55	54	52						
20											63	55	70	68	66	57	55	52						
21											64	58	71	65	65	57	55	52						
22											66	60	69	64	66	59								
23											65	61	68	63	64	57								
24											59	57	68	61	63	58								
25											57	55	68	61	63	54								
26											61	54	72	63	63	55								
27											64	57	72	65	64	57								
28											64	59	73	66	63	55								
29											64	59	73	65	62	55								
30											63	58	74	66	59	55								
31													73	64	58	55								

IDAHO FISH AND GAME DEPARTMENT
Air Temperature Record

Stream _____ Year 1973 Location Priest Lake Ranger District

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1											72	41	74	38	98	50	54	46						
2											53	48	74	35	97	53	52	43						
3											62	41	70	31	92	51	60	50						
4											53	49	74	34	90	41	66	47						
5											62	46	69	42	90	45	78	32						
6											69	51	60	37	78	52	78	47						
7											68	49	69	28	94	44	64	40						
8											59	48	76	37	96	50	73	34						
9											68	33	70	52	96	42	70	41						
10											68	36	60	48	97	41	79	30						
11											64	47	63	42	97	42	67	36						
12											73	36	70	40	97	40	56	32						
13											61	52	79	34	93	34	65	31						
14											60	40	86	36	94	34	63	24						
15											66	30	87	37	83	30	62	20						
16											66	30	90	44	83	36	62	26						
17											70	31	89	42	82	33	64	19						
18											68	41	91	44	83	35	65	22						
19											68	51	93	46	88	37	65	28						
20											70	38	92	47	81	43	62	40						
21											84	36	92	45	82	36	63	21						
22											87	48	91	49	79	45	67	22						
23											69	55	88	48	65	36	73	24						
24											69	33	91	43	79	31	74	34						
25											69	49	85	45	85	33	58	38						
26											68	42	88	41	88	35	61	36						
27											60	29	91	42	90	36	48	35						
28											54	38	93	46	85	50	53	35						
29											64	36	87	42	91	41	43	28						
30											73	31	94	46	78	55	56	23						
31													95	45	56	52								
											1,997	1,235	2,531	1,285	2,687	1,283	1,368	709						
											=67	=41F	=82	=41F	=87F	=41F	=65F	(9/21/73) 34F						

Information received from Joe Hawley at Priest Lake Ranger District

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1972 Location Priest Lake Dam

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1																	69	64						
2																	69	64						
3																	68	64						
4																	68	64						
5																	66	63						
6																	61	60						
7																	63	57						
8																	61	59						
9																	62	58						
10																	63	54						
11																	63	55						
12																	61	57						
13																	63	57						
14																	64	55						
15																	63	55						
16																	64	54						
17																	61	52						
18															68	-	57	52						
19															70	63	57	50						
20															72	64	55	46						
21															72	65	50	48						
22															68	65	57	46						
23															67	61	58	52						
24															70	63	56	54						
25															72	68	57	55						
26															72	68	55	55						
27															72	68	56	54						
28															72	68	55	55						
29															70	66	55	54						
30															68	65	55	52						
31															69	64	-	-						

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1972 Location Dickensheet Campground

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1																	70	61						
2																	69	61						
3																	70	62						
4																	70	63						
5																	66	62						
6																	64	59						
7																	63	56						
8																	63	57						
9																	63	55						
10																	63	54						
11																	64	52						
12																	61	55						
13																	64	53						
14																	66	54						
15																	70	54						
16																	65	53						
17																	63	50						
18															70	-	57	50						
19															70	66	56	50						
20															70	65	61	43						
21															70	66	59	48						
22															68	66	-	46						
23															68	65								
24															72	65								
25															71	66								
26															72	64								
27															72	65								
28															73	65								
29															72	64								
30															70	64								
31															68	61								

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1972 Location Saddler Creek

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1																	66	59						
2																	65	59						
3																	66	59						
4																	66	59						
5																	64	60						
6																	61	57						
7																	61	57						
8																	61	55						
9																	60	55						
10																	-	-						
11																	-	-						
12																	-	-						
13																	-	-						
14																	-	-						
15																	60	-						
16																	63	55						
17																	66	50						
18															72	-	64	46						
19															72	68	57	46						
20															72	68	63	37						
21															72	68	50	48						
22															70	68	-	47						
23															70	66								
24															72	66								
25															72	64								
26															71	64								
27															72	65								
28															72	65								
29															72	65								
30															69	64								
31															66	60								

IDAHO FISH AND GAME DEPARTMENT
Air Temperature Record

Stream _____ Year 1972 Location Priest Lake Ranger District

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1													81	33	80	42	77	33						
2													80	29	72	43	84	28						
3													74	36	85	36	83	33						
4													83	33	85	40	85	33						
5													87	36	88	40	73	39						
6													87	46	92	37	60	40						
7													80	42	95	45	64	32						
8													68	48	95	47	65	41						
9													60	45	96	48	72	29						
10													64	34	91	40	66	27						
11													72	32	84	43	70	26						
12													66	52	86	40	63	43						
13													75	53	83	46	67	30						
14													76	42	87	38	75	31						
15													80	38	87	50	76	32						
16													80	41	73	50	72	41						
17													76	38	72	40	65	34						
18													74	43	77	35	58	33						
19													71	43	83	41	59	33						
20													72	35	85	42	57	26						
21													67	35	81	52	53	42						
22													73	37	66	49	49	39						
23													82	34	80	44	48	34						
24													82	43	81	42	46	34						
25													78	44	84	44	48	30						
26													83	35	86	45	49	27						
27													84	38	91	42	50	26						
28													87	40	90	46	47	28						
29													88	38	88	44	56	22						
30													90	37	73	54	52	24						
31													89	40	74	31								

IDAHO FISH AND GAME DEPARTMENT
Temperature Record

Stream Lower Priest River Year 1956 Location One-half mile above Dickensheet Campground

	January		February		March		April		May		June		July		August		September		October		November		December	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1															68	66	65	62						
2															68	63	64	62						
3															64	62	67	60						
4															69	61	66	59						
5															71	62	68	59						
6															70	64	68	60						
7															72	64	67	60						
8													67	64	72	62	68	60						
9													68	62	72	63	69	60						
10													69	62	72	64	66	60						
11													69	64	72	64	66	60						
12													68	65	72	64	67	59						
13													68	63	74	65	66	60						
14													66	62	74	65	65	59						
15													67	61	71	66	66	-						
16													68	62	73	66	67	59						
17													68	62	72	64	66	58						
18													70	65	73	65	67	58						
19													73	66	74	66	67	61						
20													71	68	74	66	64	61						
21													74	67	74	66								
22													74	67	74	66								
23													74	66	73	67								
24													75	67	69	66								
25													75	68	68	66								
26													74	66	66	64								
27													74	67	65	64								
28													72	65	68	64								
29													74	66	66	63								
30													73	66	66	61								
31													74	66	66	62								

APPENDIX II

Minimum flows with monthly means for August, September, and annually for Priest River near Coolin, Idaho, 1911-1973.

	August		September		Annual		
Year	Minimum flow	Monthly mean	Minimum flow	Monthly mean	Minimum flow	Monthly mean	Month
1911	588	831	509	572	344	398	
1912	548	786	520	604	425	474	Oct.
1913	578	833	458	514	385	451	Oct.
1914	385	628	280	380	280	380	Sept.
1915	408	596	308	332	280*	289	Oct.
1916	661	999	454	552	240*	246	Dec.
1917	418	621	261	330	172	184	Nov.
1918	538	656	334	434	334	434	Sept.
1919	382	569	222	304	188	209	Oct.
1920	395	560	342	485	288	303	Feb.
1921	421	571	259	308	236	263	Oct.
1922	358	451	248	323	229	270	Oct.
1923	444	585	247	325	216	234	Nov.
1924	280	331	170	214	170	214	Sept.
1925	276	415	185	210	143	158	Nov.
1926	207	242	265	330	207	242	Aug.
1927	440	564*	334	821	334	821	Sept.
1928	374	536	237	296	201	255	Dec.
1929	302	434	190	236	120	176	Dec.
1930	261	352	170	208	161	175	Oct.
1931	198	302	169	182	144	162	Oct.
1932	384	510	218	283	178	236	Oct.
1933	370	615	329	349	329	349	Sept.
1934	226	299	140	174	136	164	Oct.
1935	415	572	244	300	178	197	Nov.
1936	200	282	162	193	120	133	Nov.
1937	357	495	266	333	263	285	Oct.
1938	302	441	209	250	207	230	' Oct.
1939	252	398	187	210	167	183	Oct.
1940	202	278	200	213	197	219	Oct.
1941	341	425	336	528	336	528	Sept.
1942	512	837	323	388	276	302	Oct.
1943	422	578	242	303	227	255	Oct.
1944	200	274	156	176	156	176	Sept.
1945	290	420	224	254	209	228	Oct.
1946	449	558	335	407	248	306	Oct.
1947	330	430	305	433	305	433	Sept.
1948	526	774	300	400	230	294	Nov.
1949	280	405	218	258	218	258	Sept.
Average	372	524	271	344	233	-	-
			Water storage began August 9, 1950				
1950	146	459	146	197	142	401	Oct.
1951	38	146	107	369	38	146	Aug.
1952	72	207	74	86	72	207	Aug.
1953	430	476	39	155	39	155	Sept.

*Fragmentary

Minimum flows with monthly means for August, September, and annually for Priest River near Coolin, Idaho, 1911-1973 (cont'd).

	August		September		Annual		
Year	Minimum flow	Monthly mean	Minimum flow	Monthly mean	Minimum flow	Monthly mean	Month
1954	109	512	245	481	109	512	Aug.
1955	214	444	214	232	214	232	Sept.
1956	211	258	135	225	135	225	Sept.
1957	120	237	82	112	82	112	Sept.
1958	84	102	49	77	49	77	Sept.
1959	177	279	268	1,219	172	842	July
1960	189	290	174	391	174	391	Sept.
1961	164	259	153	178	153	178	Sept.
1962	189	269	136	235	136	235	Sept.
1963	174	239	172	181	154	500	Oct.
1964	313	348	192	275	192	275	Sept.
1965	381	419	190	265	190	265	Sept.
1966	94	148	104	136	104	136	Sept.
1967	76	183	69	72	68	911	Oct.
1968	143	393	131	530	131	530	Sept.
1969	142	275	128	175	128	175	Sept.
1970	103	257	82	91	82	91	Sept.
1971	101	205	114	291	101	205	Aug.
1972	183	476	94	214	94	214	Sept.
1973	98	159	75	84	75	84	Sept.
Average	165	293	132	261	118	-	-

Submitted by:

Richard A. Irizarry Fishery Research Biologist

Approved by:

IDAHO FISH AND GAME DEPARTMENT