FISHERY MANAGEMENT INVESTIGATIONS

FEDERAL AID IN FISH RESTORATION
1999 Job Performance Report
Program F-71-R-24

Steven M. Huffaker, Director

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
SOUTHWEST REGION (McCall) (Subprojects I-C, II-C, III-C, IV-C)

PROJECT I. SURVEYS AND INVENTORIES
- **Job a. McCall Subregion Mountain Lakes Investigations**
- **Job b-1. McCall Subregion Lowland Lakes Investigations**
- **Job b-2. Cascade Reservoir, Yellow Perch Investigations**
- **Job c. McCall Subregion Rivers and Streams Investigations**

PROJECT II. TECHNICAL GUIDANCE

PROJECT III. HABITAT MANAGEMENT

By

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IDFG 03-22
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1999 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject I-C: Southwest Region (McCall)

Job: a

Title: Mountain Lakes Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

Fish population status and/or physical habitat parameters were surveyed and stocking strategies were assessed on five mountain lakes in 1999.

Rainbow trout *Oncorhynchus mykiss* were collected from Crater Lake (07-447) and Fish Lake #3 (07-444). Cutthroat trout *O. clarki lewisi* were collected from Fish Lake #1 (07-440), Fish Lake # 3 (07-444) and Middle Lake (07-445). No fish were collected from Fish Lake #2 (07-443), however frogs and salamanders were thriving.

Authors:

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Fishery Biological Aide

Paul Janssen
Regional Fishery Biologist

OBJECTIVES

1. Evaluate fisheries management strategies in alpine lakes.

2. Identify problems and/or opportunities in lakes that currently are not being directly managed.

INTRODUCTION

The Idaho Department of Fish and Game (IDFG) conducts standard mountain lake surveys each year to evaluate and adjust the mountain lakes fish stocking program. We completed surveys on five lakes in 1999.

METHODS

We examined fish populations and habitats in each lake using the IDFG standard mountain lakes survey methods. We set gill nets (125-ft sinking) in the afternoon and pulled them the next morning. All fish collected were weighed to the nearest g and total length measured to the nearest mm.

RESULTS

In 1999 IDFG personnel collected fish population and habitat data from five mountain lakes which included Crater Lake (07-447), Fish Lakes #1 (07-440), #2 (07-443) and #3 (07-444), and Middle Lake (07-445). Fish were found in four of the five lakes surveyed. Results of fish sampling efforts are listed in Table 1. IDFG lake catalog identification numbers are referenced in parenthesis.

Crater Lake (07-447) supports a population of rainbow trout *Oncorhynchus mykiss.* One cutthroat *O. clarki lewisi* x rainbow trout hybrid and one westslope cutthroat trout were also collected. Crater Lake had been stocked in 1990, 1993 and 1996 with westslope cutthroat trout. Shallow ponds adjacent to the lake contained many western toad *Bufo boreas* tadpoles.

Sampling efforts revealed Fish Lake #1 (07-440) to have a cutthroat trout population. Anglers visiting the lake reported excellent fishing.

We collected no fish in Fish Lake #2 (07-443) which was last stocked in 1981. We found strong populations of Columbia spotted frogs *Rana luteiventris* and Idaho giant salamanders *Dicamptodon aterrimus*.

Fish Lake #3 (07-444) was stocked in 1990, 1993 and 1996 with cutthroat trout. Only one cutthroat trout was sampled in Fish Lake #3. A healthy rainbow trout population was present.

Middle Lake (07-445) supported a healthy population of cutthroat trout. Completed survey forms are presented in the appendices.

Table 1. Total number and average condition factors (Ktl) by length group of each species of fish sampled in mountain lakes in 1999.

Lake	Cat. no.	Species Ktl	Total length (inches)									
			4	5	6	7	8	9	10	11	12	13
Crater Lake	07-447	Rbt	1.00					1.00	1.00	3.00		
		Ktl	1.54					0.94	1.05	0.86		
		Cutt		1.00								
		Ktl		1.46								
		Rbt/Cut							1.00			
		Ktl							0.98			
Fish Lake #1	07-440	Cutt							4.00	1.00	1.00	1.00
		Ktl							0.90	0.90	1.00	0.80
Fish Lake #3	07-444	Rbt	1.00	1.00	7.00	5.00		4.00	1.00		1.00	
		Ktl	1.54	1.46	1.24	1.12		0.92	0.84		0.77	
		Cutt							1.00	2.00	1.00	
		Ktl							0.98	0.99	0.90	
Middle Lake	07-445	Cutt			1.00			1.00	3.00	2.00		
		Ktl			1.31			0.96	0.96	0.99		

RECOMMENDATIONS

1. Continue to monitor fish populations in high mountain lakes in the region and make appropriate management changes.

2. Continue working with the Payette National Forest personnel collecting baseline fisheries and habitat data in high mountain lakes.

APPENDICES

Appendix A. Fish Lake #1 survey form.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: Fish Lake #1 Date: 8/18/99
IDFG Catalog #: 07-440 EPA #:
Major Drainage: SFSR Minor Drainage: EFSFSR
County: Idaho Region: 3M
USFS Ranger District: Krassel Wilderness Area:
Section: 36 Township: 20N Range: 8E Elevation: 7800 Ft.

Physical:
Lake Type: 1 1. Cirque 2. Moraine 3. Slump 4. Caldera 5. Beaver
Total Surface Area: 0.1 ha
Depth Profile: 1
1. deep (75% of lake >6m deep)
2. moderate (50% of lake >6m deep)
3. shallow (25% of lake >6m deep)
Maximum Depth: 12m
Average Depth: m

Aspect: 2,3
1. Lake has north facing exposure
2. Lake has south facing exposure
3. Lake has east facing exposure
4. Lake has west facing exposure
5. Lake is exposed on all directions

Chemical:
Alkalinity: 0 mg/l pH: 6.8
Conductivity: 0omhos/cm^2 Temp (surface): 62.0 F
Secchi depth: . m Temp (bottom): . F

Spawning Potential:
Inlet(s): 0(number) Outlet(s): 0(number)
Length accessible for spawning: 0 m Length a accessible for spawning: 0 m
Inlet spawning suitability: 4 Outlet spawning suitability: 4
1. excellent (abundant)
2. adequate (enough to maintain suitable spawning populations)
3. fair (not enough to maintain population)
4. poor (not suitable for successful spawning)

Use:
Campsites: 5 (number) Fire Pits: 4 (number) Litter: L☒ M☐H☐
Trail around lake: ☐ complete ☒ partial ☐ none trampled: ☒Y☐N
Access: ☐ good trail ☐ poor trail ☒ cross country
Access directions: From trail off Missouri Ridge Road go to Fish Lake #3. Sidesaddle to the North from where trail meets lake. Hike over the saddle to Fish Lake #1.

Biological:
Zooplankton Composition and Density
Genera Identified % of sample Size Density(g/l)

Appendix A. Continued.

Insect Composition and Abundance:

Aquatic Genera	Relative Abundance	Terrestrial Genera	Relative Abundance
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐

Fish Survey:

Fisherman: (numbers) Hours Fished:
Fish Caught: Fish/hour: Abundance: L ☐M☐H☐

Length Frequency:

	Total Length (mm)								
Species	0-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
WCT						5	2		
Total						5	2		

Fish Condition:

	Total Length (mm)		Weight (g)		Condition (k or Wr)	
Species	Mean	Range	Mean	Range	Mean	Range
WCT	292	270-343	230	180-340	0.90	0.84-0.97

Stocking History:

Year	Species	Number	Comments
1996	WCT	700	
1993	WCT	700	
1990	WCT	700	

Comments:
Lots of Columbia spotted frogs and salamanders

Appendix B. Fish Lake #2 survey form.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: Fish Lake #2 Date: 8/18/99
IDFG Catalog #: 07-443 EPA #:
Major Drainage: SFSR Minor Drainage: EFSFSR
County: Idaho Region: 3M
USFS Ranger District: Krassel Wilderness Area:
Section: 35 Township: 20N Range: 8E Elevation: 7800 Ft.

Physical:
Lake Type: 2 1. Cirque 2. Moraine 3. Slump 4. Caldera 5. Beaver
Total Surface Area: 0.4 ha
Depth Profile: 2
1. deep (75% of lake >6m deep)
2. moderate (50% of lake >6m deep)
3. shallow (25% of lake >6m deep)
Maximum Depth: 10.7m
Average Depth: m

Aspect: 2,3
1. Lake has north facing exposure
2. Lake has south facing exposure
3. Lake has east facing exposure
4. Lake has west facing exposure
5. Lake is exposed on all directions

Chemical:
Alkalinity: 20 mg/l pH: 6.8
Conductivity: 10omhos/cm^2 Temp (surface): 59.0 F
Secchi depth: . m Temp (bottom): . F

Spawning Potential:
Inlet(s): 0(number) Outlet(s): 0(number)
Length accessible for spawning: 0 m Length a accessible for spawning: 0 m
Inlet spawning suitability: 4 Outlet spawning suitability: 4
5. excellent (abundant)
6. adequate (enough to maintain suitable spawning populations)
7. fair (not enough to maintain population)
8. poor (not suitable for successful spawning)

Use:
Campsites: 1 (number) Fire Pits: 1 (number) Litter: L☒ M☐H☐
Trail around lake: ☐ complete ☒ partial ☐ none trampled: ☒Y☐N
Access: ☐ good trail ☐ poor trail ☒ cross country
Access directions: Hike Northwest up and over ridge from Fish Lake #1.

Biological:
Zooplankton Composition and Density
Genera Identified % of sample Size Density(g/l)

Appendix B. Continued.

Insect Composition and Abundance:

Aquatic Genera	Relative Abundance	Terrestrial Genera	Relative Abundance
Beetles	L☐M☐H☒		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐

Fish Survey:

Fisherman: (numbers) Hours Fished:
Fish Caught: Fish/hour: Abundance: L ☐M☐H☐

Length Frequency:

Total Length (mm)

Species	0-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
0									
Total									

Fish Condition:

	Total Length (mm)		Weight (g)		Condition (k or Wr)	
Species	Mean	Range	Mean	Range	Mean	Range

Stocking History:

Year	Species	Number	Comments
1981			

Comments:
Lots of Columbia spotted frogs and salamanders

Appendix C. Fish Lake #3 survey form.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: Fish Lake #3 Date: 8/18/99
IDFG Catalog #: 07-444 EPA #:
Major Drainage: SFSR Minor Drainage: EFSFSR
County: Idaho Region: 3M
USFS Ranger District: Krassel Wilderness Area:
Section: 36 Township: 20N Range: 8E Elevation: 7800 Ft.

Physical:
Lake Type: 2 1. Cirque 2. Moraine 3. Slump 4. Caldera 5. Beaver
Total Surface Area: 3.0 ha
Depth Profile: 1
1. deep (75% of lake >6m deep)
2. moderate (50% of lake >6m deep)
3. shallow (25% of lake >6m deep)
Maximum Depth: 57m
Average Depth: m

Aspect: 1,3
1. Lake has north facing exposure
2. Lake has south facing exposure
3. Lake has east facing exposure
4. Lake has west facing exposure
5. Lake is exposed on all directions

Chemical:
Alkalinity: 20 mg/l pH: 6.8
Conductivity: 30omhos/cm^2 Temp (surface): 56.0 F
Secchi depth: . m Temp (bottom): . F

Spawning Potential:
Inlet(s): 2(number) Outlet(s): 1(number)
Length accessible for spawning: 3.0 m
Length a accessible for spawning: 0 m
Inlet spawning suitability: 4 Outlet spawning suitability: 4
9. excellent (abundant)
10. adequate (enough to maintain suitable spawning populations)
11. fair (not enough to maintain population)
12. poor (not suitable for successful spawning)

Use:
Campsites: 6 (number) Fire Pits: 6 (number) Litter: L☒ M☐H☐
Trail around lake: ☐ complete ☒ partial ☐ none trampled: ☒Y☐N
Access: ☒ good trail ☐ poor trail ☐ cross country
Access directions:Drive as far as possible up Missouri Ridge road. Road turns to trail. Follow the main trail up to Fish Lake #3.

Biological:
Zooplankton Composition and Density
Genera Identified % of sample Size Density(g/l)

Appendix C. Continued.

Insect Composition and Abundance:

Aquatic Genera	Relative Abundance	Terrestrial Genera	Relative Abundance
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐

Fish Survey:

Fisherman: (numbers) Hours Fished:
Fish Caught: Fish/hour: Abundance: L ☐M☐H☐

Length Frequency:

Total Length (mm)

Species	0-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
RBT			2	10	4	3	1		
WCT						3	1		
Total			2	10	4	6	2		

Fish Condition:

	Total Length (mm)		Weight (g)		Condition (k or Wr)	
Species	Mean	Range	Mean	Range	Mean	Range
RBT	197	125-315	90.5	30-240	1.13	1.77-1.54
WCT	294	278-322	245	210-300	0.96	0.90-1.03

Stocking History:

Year	Species	Number	Comments
1996	WCT	700	
1993	WCT	700	
1990	WCT	700	

Comments:

Appendix D. Middle Lake survey form.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: Middle Lake Date: 8/19/99
IDFG Catalog #: 07-445 EPA #:
Major Drainage: SFSR Minor Drainage: EFSFSR
County: Idaho Region: 3M
USFS Ranger District: Krassel Wilderness Area:
Section: 25 Township: 20N Range: 8E Elevation: 7840 Ft.

Physical:
Lake Type: 2 1. Cirque 2. Moraine 3. Slump 4. Caldera 5. Beaver
Total Surface Area: 2.4 ha
Depth Profile: 3
1. deep (75% of lake >6m deep)
2. moderate (50% of lake >6m deep)
3. shallow (25% of lake >6m deep)
Maximum Depth: m
Average Depth: m

Aspect: 1,2,3
1. Lake has north facing exposure
2. Lake has south facing exposure
3. Lake has east facing exposure
4. Lake has west facing exposure
5. Lake is exposed on all directions

Chemical:
Alkalinity: 0 mg/l pH: 6.8
Conductivity: 20omhos/cm^2 Temp (surface): 63.0 F
Secchi depth: . m Temp (bottom): . F

Spawning Potential:
Inlet(s): 1(number) Outlet(s): 1(number)
Length accessible for spawning: 0 m
Length a accessible for spawning: 100 m
Inlet spawning suitability: 4 Outlet spawning suitability: 3
13. excellent (abundant)
14. adequate (enough to maintain suitable spawning populations)
15. fair (not enough to maintain population)
16. poor (not suitable for successful spawning)

Use:
Campsites: 3 (number) Fire Pits: 3 (number) Litter: L☒ M☐H☐
Trail around lake: ☒ complete ☐ partial ☐ none trampled: ☒Y☐N
Access: ☐ good trail ☐ poor trail ☒ cross country
Access directions: Drive up Missouri Ridge road until you get to a 90 degree left corner with a high bank on the right. There should be a creek on the right side of the road. Follow this creek up to Middle
Lake.

Biological:
Zooplankton Composition and Density
Genera Identified % of sample Size Density(g/l)

Appendix D. Continued.

Insect Composition and Abundance:

Aquatic Genera	Relative Abundance	Terrestrial Genera	Relative Abundance
mosquitos	L☐M☐H☒		L☐M☐H☐
	L☐M☐H☐	Flies	L☐M☒H☐
	L☐M☐H☐	Bees	L☐M☒H☐

Fish Survey:

Fisherman: 2 (numbers) Hours Fished: 2
Fish Caught: 2 Fish/hour: 1.0 Abundance: L☒M☐H☐

Length Frequency:

	Total Length (mm)								
Species	0-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
WCT				1		6			
Total				1		6			

Fish Condition:

	Total Length (mm)		Weight (g)		Condition (k or Wr)	
Species	Mean	Range	Mean	Range	Mean	Range
WCT	256	175-290	174	70-240	1.02	0.90-1.31

Stocking History:

Year	Species	Number	Comments
1996	WCT	700	
1993	WCT	700	
1990	WCT	700	

Comments:
Wild? fingerling in lake and outlet.

Appendix E. Crater Lake survey form.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: Crater Lake Date: 8/17/99
IDFG Catalog #: 07-447 EPA #:
Major Drainage: SFSR Minor Drainage: EFSFSR
County: Idaho Region: 3M
USFS Ranger District: Krassel Wilderness Area:
Section: 25 Township: 20N Range: 8E Elevation: 7800 Ft.

Physical:
Lake Type: 1 1. Cirque 2. Moraine 3. Slump 4. Caldera 5. Beaver
Total Surface Area: 0.1 ha
Depth Profile: 1
1. deep (75% of lake >6m deep)
2. moderate (50% of lake >6m deep)
3. shallow (25% of lake >6m deep)
Maximum Depth: 14 m
Average Depth: m

Aspect: 1,2,3
1. Lake has north facing exposure
2. Lake has south facing exposure
3. Lake has east facing exposure
4. Lake has west facing exposure
5. Lake is exposed on all directions

Chemical:
Alkalinity: 0 mg/l
Conductivity: 10omhos/cm^2
Secchi depth: . m
. F
pH: 6.8
Temp (surface): 61.0 F
Temp (bottom):

Spawning Potential:
Inlet(s): 1(number)
Length accessible for spawning:
200 m
Inlet spawning suitability: 2

Outlet(s): 1(number)
Length a accessible for spawning:
0 m
Outlet spawning suitability: 4

17. excellent (abundant)
18. adequate (enough to maintain suitable spawning populations)
19. fair (not enough to maintain population)
20. poor (not suitable for successful spawning)

Use:
Campsites: 7 (number) Fire Pits: 9 (number) Litter: L☒ M☐H☐
Trail around lake: ☒ complete ☐ partial ☐ none trampled: ☒Y☐N
Access: ☒ good trail ☐ poor trail ☐ cross country
Access directions: Drive to end of Red Metals Mine road and look for trail on North side of creek. Trail follows creek up to lake.

Biological:
Zooplankton Composition and Density
Genera Identified % of sample Size Density(g/l)

Appendix E. Continued.

Insect Composition and Abundance:

Aquatic Genera	Relative Abundance	Terrestrial Genera	Relative Abundance
mosquitos	L☐M☐H☒		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐
	L☐M☐H☐		L☐M☐H☐

Fish Survey:

Fisherman: 2 (numbers) Hours Fished: 2
Fish Caught: 0 Fish/hour: 0 Abundance: L☒M☐H☐

Length Frequency:

	Total length (mm)								
Species	0-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
WCT			1						
RBT			1		1	3	1		
CTXRB						1			
Total			2		1	4	1		

Fish Condition:

	Total Length (mm)		Weight (g)		Condition (k or Wr)	
Species	Mean	Range	Mean	Range	Mean	Range
WCT	140	140	40	40	1.46	1.46
RBT	248	109-301	162	20-280	1.02	0.77-1.54
CTXRB		278		210		0.98

Stocking History:

Year	Species	Number	Comments
1996	WCT	700	
1993	WCT	700	
1990	WCT	700	

Comments:
Wild? fingerling in lake.

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project I: Surveys and Inventories | Subproject I-C: Southwest Region (McCall)

Job: b-1 | Title: Lowland Lakes Investigations

Contract Period : July 1, 1999 to June 30, 2000

ABSTRACT

We completed holiday shore angler and boat counts on Cascade Reservoir.

A standard lowland lake survey on C. Ben Ross Reservoir revealed that largemouth bass *Micropterus salmoides* were the most abundant fish in the reservoir in terms of biomass. Largemouth bass reached 12 inches in 3.5 years.

We completed a Memorial Day weekend creel survey on Horsethief Reservoir, which revealed that 4,756 angler hours were spent to catch 2,358 fish of which 58% were yellow perch *Perca flavescens* and 38% were rainbow trout *Oncorhynchus mykiss*. On October 26, 1999 we chemically renovated Horsethief Reservoir to eliminate the unwanted yellow perch population.

In Fish Lake we estimated there were 339 and 374 westslope cutthroat trout *Oncorhynchus clarki lewisi* less than and greater than 250 mm, respectively.

Authors:

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Don Anderson
Regional Fishery Manager

OBJECTIVES

To conduct investigations in lowland lakes and reservoirs to enhance, maintain and protect McCall area fisheries.

INTRODUCTION

Cascade Reservoir Angler Counts

The declining yellow perch *Perca flavescens* population in Cascade Reservoir is a concern because of its potential impact on angler participation in the economically important fishery.

C. Ben Ross Reservoir Lowland Lake Survey

C. Ben Ross Reservoir provides an important fishery for bass and other warmwater species. Periodic monitoring of the fishery is necessary to assure a long term, consistent fishery.

Horsethief Reservoir

We conducted a Memorial Day weekend creel survey on Saturday and Sunday of that weekend to continue our annual angler use trend work.

We chemically renovated Horsethief Reservoir on October 26, 1999 to eliminate an unwanted yellow perch population. Reasons and background for the treatment are given in the Application of Short-term Activity Exemption presented in Appendix A.

Fish Lake

Fish Lake is the westslope cutthroat trout *Oncorhynchus clarki lewisi* broodstock source for the IDFG. Wild and stocked juvenile fish grow and mature in the lake and ascend up Fish Lake Creek to spawn. Department McCall Fish Hatchery personnel operate a fish weir and holding facility on Fish Creek to capture and spawn these fish. The resulting eggs are taken back to the hatchery, cultured, and then stocked as fry/small fingerling into high mountain lakes across the state. Numbers of spawning cutthroat in Fish Lake in the past several years have not been adequate to meet the mountain lakes stocking requests. Therefore we completed a population estimate on Fish Lake in 1998 and again in 1999 to determine future spawning potential and needs for management changes for the lake.

METHODS

Cascade Reservoir Angler Counts

We completed angler counts on Memorial Day, July 4th, and Labor Day on Cascade Reservoir. We conducted counts using a fixed wing airplane at 1000, 1400 and 1800 hrs each day. All shore anglers and all fishing boats were counted.

C. Ben Ross Reservoir Lowland Lake Survey

We set two floating and two sinking, standard survey gill nets and two standard trap nets in C. Ben Ross Reservoir. We electrofished a total of one hour. Electrofishing sites were chosen at random, electrofishing for a total of 10 minutes per site and then moving to a new site. We completed dissolved oxygen and temperature profiles near the dam, measured surface pH, alkalinity and conductivity, and made a Secchi disk reading.

Horsethief Reservoir

We conducted the Memorial Day weekend creel survey on May 29 and 30, 1999. All shore, boat, and float tube anglers were counted four times a day at four-hour intervals beginning at 0700, with the last count at 1900 hours. Between counts as many anglers as possible were contacted to record number of anglers per party, number of hours fished, species and numbers of fish harvested.

Methods for the rotenone treatment are presented in the Application of Short-term Activity Exemption presented in Appendix A and in the Horsethief Reservoir Renovation Application Report presented in Appendix B.

Fish Lake

We utilized mark and recapture techniques to estimate the westslope cutthroat trout population in Fish Lake. Fish were collected on October 12, 1999 with boat electrofishing gear. All fish collected were examined for a caudal punch from the October 1998 population estimate work. All fish collected were tallied by lengths over and under 250 mm (spawners and immature fish).

RESULTS

Cascade Reservoir Angler Counts

We counted an average of 31.1 fishing boats and 27.2 shore anglers in 1999 (Table 1). No structured creel surveys were conducted this year. Yellow perch fishing on the reservoir was virtually non-existent, as the yellow perch population had remained at historic lows (see Cascade Reservoir section of report).

Table 1. Average boat and shore angler counts on Cascade Reservoir on three major holidays: Memorial Day, July 4th, and Labor Day, in 1982, 1991, 1992, and 1996 through 1999 with corresponding intensive creel survey angler hour estimates for 1982, 1991 and 1992.

	Holiday counts		Estimated angler hours (hours x 1,000)		
Year	Ave. # boats	Ave. # shore anglers	Boat anglers	Shore anglers	Total pressure[1]
1982	154.0	85.0	255.6	129.8	385.4
1991	41.5	32.0	135.2	102.0	237.2
1992	52.5	116.0	144.2	177.3	321.5
1996	35.0	27.0	NA	NA	NA
1997	36.5	19.0	NA	NA	NA
1998	58.0	39.5	NA	NA	NA
1999	27.2	31.1	NA	NA	NA

[1] Does not include ice fishing hours

C. Ben Ross Reservoir Lowland Lake Survey

We found that largemouth bass *Micropterus salmoides* and bluegill *Lepomis macrochirus* were the most abundant fish in C. Ben Ross Reservoir. (Table 2). Largemouth bass also dominated total biomass. We collected a total of 5 species of fish from C. Ben Ross Reservoir including bluegill, largemouth bass, black crappie *Pomoxis nigromaculatus*, white crappie *Pomoxis annularis* and largescale sucker *Catostomus macrocheilus*. Length frequencies of each gamefish species are presented in Table 3. We found largemouth bass growth rates to be excellent, reaching 12 inches in 3.5 years, similar to growth rates recorded in 1996 (Table 4). Growth rates of bluegill, white crappie and black crappie are given in Tables 5, 6, and 7.

Water temperatures on July 29 ranged from 12.5 to 21.5°C. Dissolved oxygen was 4.0 ppm or greater to a depth of 11 m, 3.0 ppm at 13.5 m, and 1.1 ppm at the bottom (15.9 m) (Table 8). Water surface pH, total alkalinity, and conductivity were 7.0, 40 ppm and 70 umHOS respectively. The Secchi disk was 1.3 m.

Table 2. Percent frequency and relative biomass of all species of fish collected July 27, 1999 in C. Ben Ross Reservoir (all gear types combined).

Species	# caught	% of catch	Total biomass (g)	% of total weight
Bluegill	213	62.1	1,685	5.6
Largemouth Bass	107	31.2	21,712	72.6
Black Crappie	15	4.4	1,978	6.6
White Crappie	5	1.4	1,060	3.5
Largescale sucker	3	0.9	3,480	11.6

Table 3. Number, weights and relative weights of largemouth bass, bluegill, black crappie and white crappie collected July 27, 1999 from C. Ben Ross Reservoir.

	Largemouth bass				Bluegill				Black crappie			
Total length	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
30	4	3.74	2	800.8					4	26.7	0.5	237.7
40	1	0.93	3	479.7	37	17.4	0.8	92.2	0			
50					70	32.9	1.25	68.7	0			
60	1	0.93	5	219.2	58	27.2	3	90.1	0	No Fish Sampled		
70					11	5.2	7	96.0	0			
80					3	1.4	10	92.8	0			
90					7	3.3	17.5	112.9	1	6.7	10	104.2
100	2	1.87	12.5	88.0	7	3.3	22	107.4	1	6.7	20	169.4
110	3	2.8	10	63.4	6	2.8	28.3	104.6	2	13.3	25	125.3
120					2	0.9	40	120.6	0			
130	7	6.54	35	115.4	4	1.9	50	94.9	1	6.7	30	97.9
140	10	9.35	40	112.2	3	1.4	60	102.2	0			
150	6	5.61	45	100.0	3	1.4	95	121.6	0			
160	8	7.48	60	104.6	1	0.5	100	104.9	0			
170	2	1.87	80	108.2	1	0.5	110	102.5	0			
180	3	2.8	100	119.3					0	No fish sampled		
190	3	2.8	103.3	105.4	White crappie				0			
200	4	3.74	123.3	107.3	1	20	110	96.3	0			
210	8	7.48	147.5	106.1	0				0			
220	3	2.8	160	102.4	1	20	160	101.4	1	6.7	140	83.6
230	1	0.93	180	104.0	0				0			
240	2	1.87	175	90.2	0				0			
250	1	0.93	210	94.5	0				1	6.7	220	82.5
260	1	0.93	240	88.7	3	60	263.3	96.7	2	13.3	280	91.0
270	3	2.8	323.3	110.1	0				0			
280	7	6.54	303.3	91.5	0				0			
290	9	8.41	360	96.1	0				0			
300	4	3.74	390	97.6	0				1	6.7	430	88.4

Table 3. Continued.

Total length	Largemouth bass				Bluegill				Black crappie			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
310	2	1.87	390	86.9								
320	0											
330	1	0.93	430	81.8								
340	2	1.87	490	81.7								
350	2	1.87	605	89.5								
360	1	0.93	630	90.8								
370	3	2.80	650	83.8								
380	1	0.93	800	96.2								
390	2	1.87	820	90.4								

Table 4. Average back-calculated lengths (mm) for each age class of largemouth bass collected from C. Ben Ross Reservoir on July 27, 1999.

			Back-calculation age					
Year class	Age	N	1	2	3	4	5	6
1998	1	18	126					
1997	2	12	97	160				
1996	3	17	101	192	274			
1995	4	6	106	216	301	346		
1994	5	2	136	230	298	340	359	
All classes			110	197	282	344	359	
N		55	55	37	25	8	2	

Table 5. Average back-calculated lengths (mm) for each age class of bluegill collected from C. Ben Ross Reservoir on July 27, 1999.

			Back-calculation age					
Year class	Age	N	1	2	3	4	5	6
1998	1	1	47					
1997	2	3	48	88				
1996	3	6	41	67	124			
All classes			43	74	124			
N		10	10	9	6			

Table 6. Average back-calculated lengths (mm) for each age class of white crappie collected from C. Ben Ross Reservoir on July 27, 1999.

			Back-calculation age					
Year class	Age	N	1	2	3	4	5	6
1998	1	0						
1997	2	2	63	172				
1996	3	3	64	150	239			
All classes			64	158	239			
N		5	5	5	3			

Table 7. Average back-calculated lengths (mm) for each age class of black crappie collected from C. Ben Ross Reservoir on July 27, 1999.

			Back-calculation age					
Year class	Age	N	1	2	3	4	5	6
1998	1	2	73					
1997	2	1	56	107				
1996	3	1	65	158	228			
1995	4	2	65	116	173	218		
1994	5	2	70	147	219	264	289	
All classes			67	132	202	241	289	
N		8	8	6	5	4	2	

Table 8. C. Ben Ross Reservoir dissolved oxygen (mg/l) and temperature profiles measured July 29, 1999.

Depth (m)	Temperature	DO (mg/l)
Surface	21.5	9.80
1.0	21.5	10.00
2.0	20.5	9.55
3.0	20.0	8.40
4.0	19.5	7.70
5.0	18.5	6.50
6.0	16.5	5.10
7.0	16.0	4.90
8.0	15.5	4.60
9.0	15.0	4.50
10.0	14.5	4.40
11.0	14.0	4.35
12.0	13.5	3.90
13.0	13.0	3.50
14.0	12.5	2.40
15.0	12.5	1.80
15.9	12.5	1.10

Horsethief Reservoir

On October 26, 1999 we chemically renovated Horsethief Reservoir. We estimated 4,756 angler hours were spent to catch 2,358 fish on May 29-30, 1999 (Table 9). The overall catch rate was 0.27 trout per hour. The catch composition was 58% yellow perch, 38%, rainbow trout *Oncorhynchus mykiss*, and 3.5% brown trout *Salmo trutta*. We noted that many small yellow perch were caught, but released due to their small size. Total angler hours were comprised of 85% shore anglers, 9% boat anglers and 6% float tube anglers.

Table 9. Estimates of total angling pressure, catch rates and harvest for Horsethief Reservoir from 1974 through 1988 and 1997 through 1999.

	Total estimated angling pressure				Estimated trout catch rate (fish/hr)					Estimated # of fish harvested				
Date	Shore	Boat	Tube	TOTAL	Shore	Boat	Tube	All	RBT	BRN	YP	CTT	BRK	TOTAL
1974	--	--	--	12,134.0	--	--	--	0.61	7,444	0	0	0	0	7,444
1975	--	--	--	7,786.0	--	--	--	0.40	3,137	0	0	0	8	3,145
1976	--	--	--	12,345.0	--	--	--	0.84	9,944	0	0	149	224	10,347
1977	--	--	--	7,443.0	--	--	--	0.64	4,620	0	0	148	51	4,819
1978	--	--	--	8,847.0	--	--	--	0.34	3,040	0	0	27	18	3,085
1979	--	--	--	5,876.0	0.480	0.21	1.53	0.41	1,909	0	0	329	197	2,435
1980	--	--	--	3,167.0	0.980	2.60	5.13	1.91	6,044	0	0	0	12	6,056
1981[a]	--	--	--	--	--	--	--	1.04	--	--	--	--	--	--
1982	--	--	--	8,688.0	0.520	0.77	1.17	0.62	4,759	0	0	142	167	5,068
1983	--	--	--	4,685.0	0.520	0.53	0.31	0.48	2,153	0	0	25	89	2,267
1984	--	--	--	3,477.0	0.120	0.87	0.68	0.40	1,379	0	0	0	1	1,380
1985	--	--	--	6,205.0	1.330	1.70	1.57	1.45	8,982	0	0	0	0	8,982
1986	--	--	--	7,940.0	0.780	0.90	0.50	0.79	6,271	0	0	0	1	6,272
1987	--	--	--	6,452.0	0.530	0.95	1.03	0.67	4,489	0	0	0	13	4,502
1988[b]	--	--	--	1,905.0	0.390	0.23	1.13	0.31	458	0	0	5	0	463
5/24/97	787.5	297.0	105.00	1,189.5	0.820	1.13	0.5	.87	1,022	12	0	0	0	1,034
5/25/97	859.5	334.5	57.45	1,251.0	0.350	1.17	0.8	.59	734	4	0	0	0	738
5/23/98	1,784.0	624.0	136.00	2,544.0	0.400	0.62	0.83	0.48	838	347	221	37	0	1,443
5/24/98	1,096.0	1,004.0	112.00	2,212.0	0.340	0.33	NA	0.32	312	388	0	6	0	706
5/29/99	1,532.0	220.0	108.00	1,860.0	0.240	0.38	0.28	0.26	432	52	242	0	0	725
5/30/99	1,532.0	100.0	108.00	1,740.0	0.245	0.13	0.80	0.28	458	31	1,144	0	0	1,633

[a] Only catch rate was calculated from a sample of anglers.
[b] Only one day of weekend was surveyed; first year of year-round fishing.

We found total fishing pressure between days was similar with 1,860 total hours spent on Saturday (5/29) and 1,740 total hours spent on Sunday (5/30). Trout harvest rates were similar for Sunday (0.28 f/h) and Saturday (0.26 f/h).

Results of the rotenone treatment are presented in the Horsethief Reservoir Renovation Application Report presented in Appendix B.

Fish Lake

We collected 91 westslope cutthroat trout on October 12, 1999. We found that the caudal fin clip made in 1998 was still very visible. Therefore, we used the 1998 marked fish as recaptures for the estimate. We found that 27 of the 91 fish collected were marked. Eleven of the 42 fish less than 250 mm and 16 of the 49 fish greater than 250 mm had marks. Assuming no loss of fish since 1998, the population estimate was 339 +/-161 and 374 +/-140 fish less than and greater than 250 mm.

RECOMMENDATIONS

1. Continue holiday angler counts on Cascade Reservoir to monitor angling pressure and harvest.

2. Continue Horsethief Reservoir creel surveys on Memorial Day weekend to monitor angling pressure and success and monitor yellow perch population.

APPENDICES

Appendix A. Application for short-term activity exemption.

APPLICATION FOR SHORT-TERM ACTIVITY EXEMPTION

Applicant: Idaho Department of Fish and Game (IDFG)

Contact Person Don Anderson, 634-8137

Body of Water: Horsethief Reservoir

Tributary To: Big Creek (North Fork Payette River)

Objective: To chemically eradicate stunted yellow perch and restock with rainbow trout

Date: October 13-20, 1999

Evidence of protection or promotion of public interest

Horsethief Reservoir is owned and operated by the Idaho Department of Fish and Game (IDFG). It was constructed in 1963 and is managed as a trout fishery. The reservoir is maintained at a full pool year around. At full pool the reservoir contains 4,900 acre-feet of water with a surface area of 270 acres. Rainbow trout and cutthroat x rainbow hybrids are stocked annually to maintain the trout fishery in Horsethief Reservoir.

Yellow perch were first reported in Horsethief Reservoir in 1981, the result of an illegal introduction. By 1983 they totally dominated the fishery and were then chemically eradicated with rotenone in the fall of 1983. Following treatment the reservoir was restocked with trout and trout fishing was again excellent until 1993.

In 1993, yellow perch were again reported being caught in Horsethief Reservoir. In 1994 the IDFG completed a fish survey on Horsethief Reservoir. We sampled 323 fish of four species. These included yellow perch, rainbow trout, brown trout and splake. Yellow perch, rainbow trout, brown trout and splake made up 88%, 8.5%, 2% and 1.5% respectively. Expressed as biomass, these same four species made up 51.5%, 29.6%, 12.8%, and 6% respectively. By 1995 yellow perch totally dominated the fishery and were again chemically removed in the fall of 1995.

Yellow perch were again documented in 1997 suggesting they were once again illegally introduced, or we were not 100% effective in our 1995 treatment. Anecdotal reports of illegal planting have been received on several occasions, and we believe this is the source of the current, yellow perch population. The current yellow perch population appears to be very similar to that observed in 1994, as described below.

Yellow perch ranged in length from 65 to 235 mm with the largest number of fish in the range of 65 to 90 mm. Fish aging demonstrated that three age classes of yellow perch had been collected. The strongest age class in numbers was age 0. From the aging, we could determine the presence of yellow perch was again the result of illegal introductions.

Appendix B. Horsethief Reservoir renovation.

HORSETHIEF RESERVOIR RENOVATION

Application Report

Idaho Department of Fish and Game personnel chemically eradicated Horsethief Reservoir on October 26, 1999. The personnel included:

- Don Anderson, Regional Fisheries Manager
- Paul Janssen, Regional Fisheries Biologist
- Kris Buelow, Fisheries Technician
- Laurie Hostettler, Fisheries Technician
- Steve Kammeyer, Fish Hatchery Superintendent I
- Joel Patterson, Fish Culturist
- Bill Hutchinson, State Fisheries Manager
- Bill Horton, Resident Fisheries Coordinator
- Dennis Hardy, Regional Wildlife Biologist
- John Johann, Valley County Weed Control Supervisor
- Vic Mason, Idaho Dept. Agriculture

We applied a total of 12.6 gallons of Nusyn-NoxFish, a 2 ½% rotenone solution, to the inlet, outlet, isolated ponds within the reservoir perimeter, and various seeps and springs.

In preparation of the treatment, fish salvage was authorized in early-September. The valve at the dam was opened September 24 and adjusted such that the stream channel below the dam was filled to bank full. The discharge was closely monitored and maintained at a constant release. The reservoir was completely drained by October 22, leaving only the Horsethief Creek channel, a shallow, two to three-acre pond and a few muddy seep areas. Several beaver dams were removed upstream from the reservoir to eliminate sanctuaries.

A fifteen-hour drip station was installed at the second culvert above the reservoir on Horsethief Creek. It was calibrated and adjusted to dispense 2.5 gallons of Nusyn-NoxFish to 5.5 cfs of flow over a 15-hour period to make a concentration of 1.5 ppm. Another drip station was installed on the small tributary that exits the small pond west of Florida Point. The drip stations were recharged to obtain treatment duration of 24 hours.

Four bladderbag-type hand sprayers were each loaded with 0.5 gallons of Nusyn-NoxFish and filled with water. Two people walked the Horsethief Creek channel from the drip station to the dam spraying the toxicant into isolated ponds, seep areas, and in-flowing springs. Two people used hand sprayers to apply Nusyn-NoxFish to a small inlet entering from the north and to the shallow, two to three-acre pond just west of “Florida Point.” All four converged to apply the chemical to the small, but filling, pond near the dam.

The outlet valve was closed prior to the toxicant reaching the dam. Many dead and dying fish were observed near the dam. We believe that nearly all of the fish left the reservoir during the draining process. Tens of thousands of small yellow perch were observed in the outlet below the dam. We applied 1 quart of Nusyn-NoxFish the outlet stream to eliminate the availability of live yellow perch for reintroduction to the reservoir. We believe we attained a total kill within the treatment area. Future treatments (if needed) should be accomplished in a similar manner to this treatment.

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject I-C: Southwest Region (McCall)

Job: b-2

Title: Lowland Lakes Investigations: Cascade Reservoir, Yellow Perch Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

Since 1995, the Cascade Reservoir yellow perch *Perca flavescens* numbers had dropped significantly. Work completed in 1998 revealed there had been no yellow perch recruitment since the early 1990s. We conducted studies in 1999 to track life histories and the fate of age-0 yellow perch. We also examined present water quality, historical water quality, plankton abundance, and benthic invertebrate abundance. Age-0 yellow perch densities increased significantly in 1999 with a 6.8-fold increase in trawl catch rates over 1998. Virtually all age 1 and age 2 yellow perch present in June had vanished by August. We documented gradual declines in age-0 yellow perch densities in 1999. None of the habitat and food parameters examined in 1999 explained the extremely high mortality rates of juvenile yellow perch observed in 1998 and early 1999.

Authors:

Paul Janssen
Regional Fishery Biologist

Don Anderson
Regional Fishery Manager

INTRODUCTION

The yellow perch *Perca flavescens* fishery in Cascade Reservoir was described and its decline documented by Janssen et al. (2000). Reasons for the decline remained unclear after the 1998 investigations, however suspected causes such as entrainment and emigration were believed to be symptoms of a large yellow perch population instead of the cause of the decline. We found that there had been virtually no survival of juvenile yellow perch since 1991. A large percent of the juvenile fish collected in 1998 appeared to be sick and in poor condition. The few adult fish that remained in the reservoir seemed to be in very good condition and symptom free. We collected several moribund and dead juvenile yellow perch in the trawl sampling in 1998. We found significant parasite loads on most yellow perch examined including one very prevalent parasite, an unidentified trematode metacercariae.

We focused work in 1999 on age-0 and age-1 yellow perch to determine when and why these fish die. Water quality and disease interactions appeared to have played a role in the yellow perch decline; therefore one of the major objectives of 1999 investigations focused on water quality in yellow perch habitat. Specific objectives of the 1999 investigations included:

OBJECTIVES

1. Continue to monitor the yellow perch population structure in the reservoir.
2. Monitor water quality throughout the year.
3. Make a positive identification of the trematode metacercariae that infected large numbers of yellow perch in 1998 and monitor infection rate in 1999. Test yellow perch for other diseases. Determine effects of trematode metacercariae on relative weights of age-0 fish.
4. Monitor extent and timing of yellow perch spawning in 1999.
5. Determine if and when the 1999 age class of yellow perch experiences significant mortalities and/or declines in condition in 1999.
6. Monitor food habits of young-of-year yellow perch through the fall of 1999.
7. Monitor and measure zooplankton and benthic organism abundance.

We received cooperative funding from the U.S. Bureau of Reclamation and Idaho Power Company to conduct these investigations.

METHODS

Objective 1

The lake was divided into four areas to help equally distribute sampling effort (Figure 1) (Anderson et al. 2001). An otter trawl was used to collect yellow perch as described in Anderson et al. 2001. We towed the net at a speed of 4.0 km/hour for 5 minutes at each transect (Nielson 1983). Seven of the trawling transects established in 1998 were selected from each of three areas. We sampled only four transects in the north area due to the abundance of underwater obstructions. We also set eight experimental gill nets in eight separate locations to help verify that trawl samples represented the yellow perch population. We set two sinking and

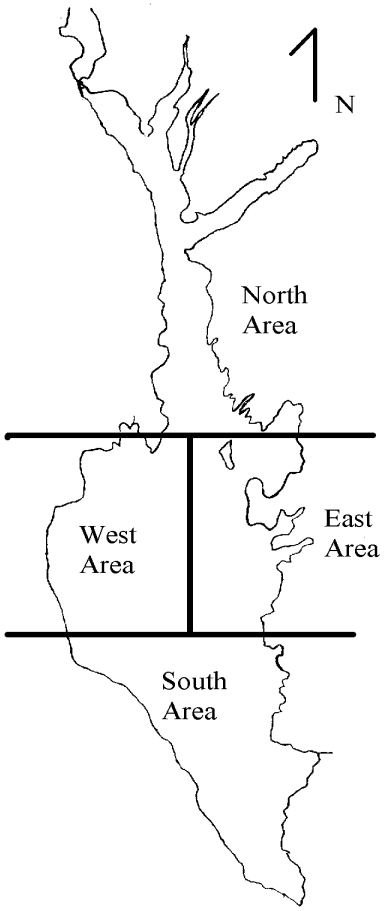

Figure 1. Fish sampling areas on Cascade Reservoir in 1999.

two floating gill nets on each of the two nights. The nets were set in the afternoon, fished all night and then pulled the next day. All yellow perch and trout species collected were weighed and measured for total length. All other species were counted and weighed.

We measured each yellow perch for total length and weighed each to the nearest 1/10 gram. All yellow perch were then preserved in a 60% ethanol solution for the food habit investigations. We collected scales from all yellow perch to verify ages.

Objective 2

We collected water samples monthly from three specific sites on the reservoir. The site furthest south, Cabarton, was located mid-lake and due west of the Cascade City Golf Course. The second site, Sugarloaf, was 200 yards due west of Sugarloaf Island and the third and furthest north site, Poison Creek, was located mid-lake and one mile south of the Poison Creek boat ramp.

We used a YSI Model 51 Dissolved Oxygen and Temperature Meter to measure dissolved oxygen (DO) and temperature at one-meter intervals from the surface to the bottom at each site.

We collected water samples using a Kemmerer water sampler from just off the bottom and at the depth where DO levels equaled 3.0 ppm. Current literature suggests that yellow perch will move out of and avoid areas with less than 3 mg/l dissolved oxygen (Suthers and Gee 1986). If DO levels never dropped to 3.0 ppm then the water was collected at a level equal to one-half the total depth. Each water sample was measured for pH. We sent water samples to the U.S. Bureau of Reclamation's regional lab where tests for nitrate + nitrite as N, total ammonia as N, and unionized ammonia as N, were completed.

Objective 3

We sent samples of yellow perch to the Idaho Department of Fish and Game Eagle Fish Health Laboratory to identify the parasitic trematode and to screen for other diseases.

Yellow perch collected in October were visually examined upon capture and rated as to light to moderate, moderate to heavy or without trematode loading. Relative weights were determined for all yellow perch examined.

Objective 4

We submerged 12 Christmas trees around the reservoir on May 10 to monitor for yellow perch spawn strands. A block of concrete was formed around the trunk of the tree to provide enough weight to sink and keep the tree in place. We placed trees at a depth equal to or slightly greater than the height of the tree. The trees were checked twice weekly until all eggs had hatched and no new eggs were found.

We placed a small sample of the first yellow perch eggs encountered at three of the trees into small-mesh live boxes and hung it from a branch on the submerged tree. We monitored egg development to determine hatching dates.

Objective 5

We used two, 500 micron, 0.5 m diameter x 1.85 m long, conical tow nets to monitor growth and abundance of young-of-year yellow perch after hatching. We connected one net to each side of the boat to get the nets out of propeller turbulence. We put out enough lead line to allow the top of the nets to drop just below the surface of the water at a boat speed of 1.3 m/second. We completed five night tows in each of the four areas weekly from June 7 through July 13, 1999. All fish and plankton collected were preserved. We sorted through the samples in the lab and picked out all fish, which we identified, counted, and measured for total length.

Objective 6

We assumed food habits of pelagic larval yellow perch to be 100% plankton. As larval fish began leaving the pelagic areas for littoral areas we used a small otter trawl with a 4.9 m foot-rope, 39 mm stretch mesh body and 6.5 mm mesh cod end to collect these fish. We sampled age-0 yellow perch in the littoral areas weekly until aquatic vegetation became too dense for the trawl. Additionally, we collected yearling yellow perch in June and age-0 yellow perch in August and October in the large otter trawl sampling for Objective 1.

Objective 7

Benthic samples were collected from two different transects and dates. One began at Sugarloaf Point (just west of Sugarloaf boat ramp), continuing due west to the west shoreline; and the other ran from east shore to west shore one mile south of Poison Creek boat ramp.

We collected bottom samples at every 5-foot bottom elevation contour for the entire width of the lake using a 6"x 6" Eckman dredge. We ran each sample through a 355-micron sieve to remove mud and silt. The remaining sample was then preserved. Each sample was sorted in the lab; organisms were separated and counted by family.

We monitored zooplankton quality and abundance using the Zooplankton Quality Index (ZQI) technique described by Teuscher (1999).

RESULTS

Objective 1

We completed 74 trawling transects in 1999, pulling the trawl for 369.5 minutes collecting 1,534 yellow perch. We averaged 1.7, 37.7 and 23 yellow perch per 5 minute transect in June, August and October respectively. Trawling transect locations utilized in 1999 were established in 1998 and are presented in Table 1. Length frequency data indicated that the June catch was virtually all one- and two-year-old fish (Figures 2-4). Age-0 fish dominated trawl catches in August and October indicating the loss of yearling yellow perch between June and August. Only eight yellow perch greater than 100 mm were collected in 1999. This contrasts to the average catch per trawling transect in 1986 and 1987 of 73 and 94.5 yellow perch with 74.5% and 95.7% being age-two and -three (Griswold and Bjornn 1989).

Yellow perch catch rates were highest in August and all but two yellow perch were aged as zeros. We collected significantly more fish (95% CI) in the east and west sections in October than in the other areas and months sampled (Table 2). Catches/trawl transect were widely variable in all months and areas. Trawling in the north area was difficult due to the large number of submerged stumps and resulted in fewer transects being completed.

We found relative weights for age-0 yellow perch below 90 during August and October (Tables 3-6). We collected too few fish in June to make condition calculations. We observed a general trend of lower relative weights with increasing length.

We set four experimental gill nets on July 12 and 15, 1999 and collected 414 fish. We caught only 6 yellow perch ranging 149-314 mm. We also collected 239 northern pikeminnow *Ptychocheilus oregonensis*, 124 largescale sucker *Catostomus macrocheilus*, 22 smallmouth bass *Micropterus dolomieu,* 12 hatchery reared rainbow trout *Oncorhynchus mykiss*, 5 mountain whitefish *Prosopium williamsoni*, 5 brown bullhead *Ameiurus nebulosus* and 1 pumpkinseed *Lepomis gibbosus*.

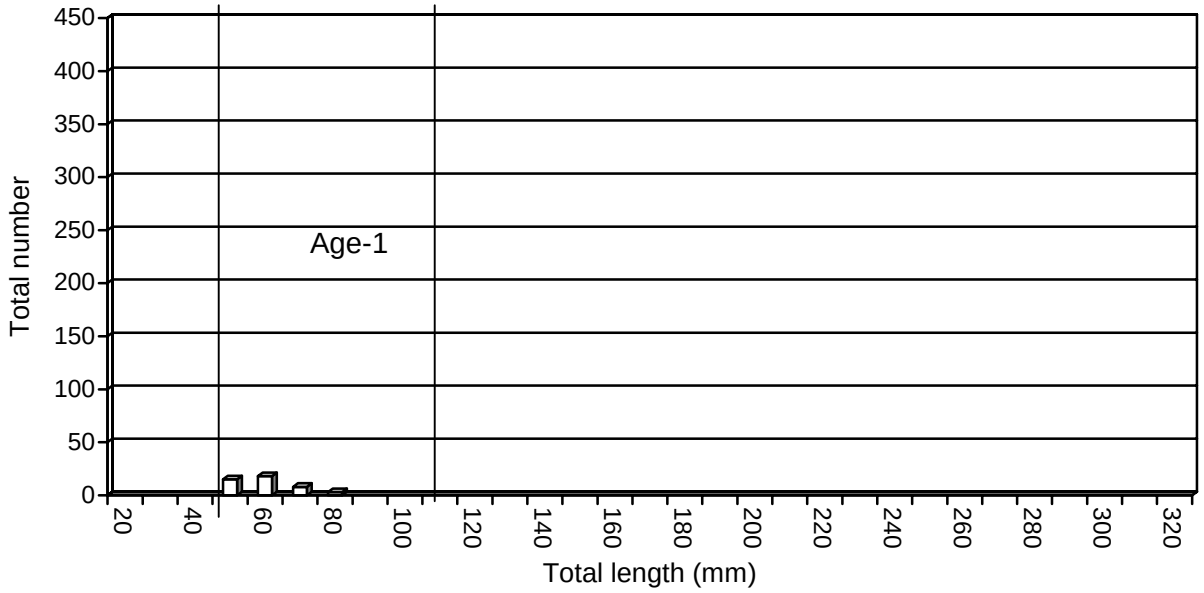

Figure 2. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in June 1999.

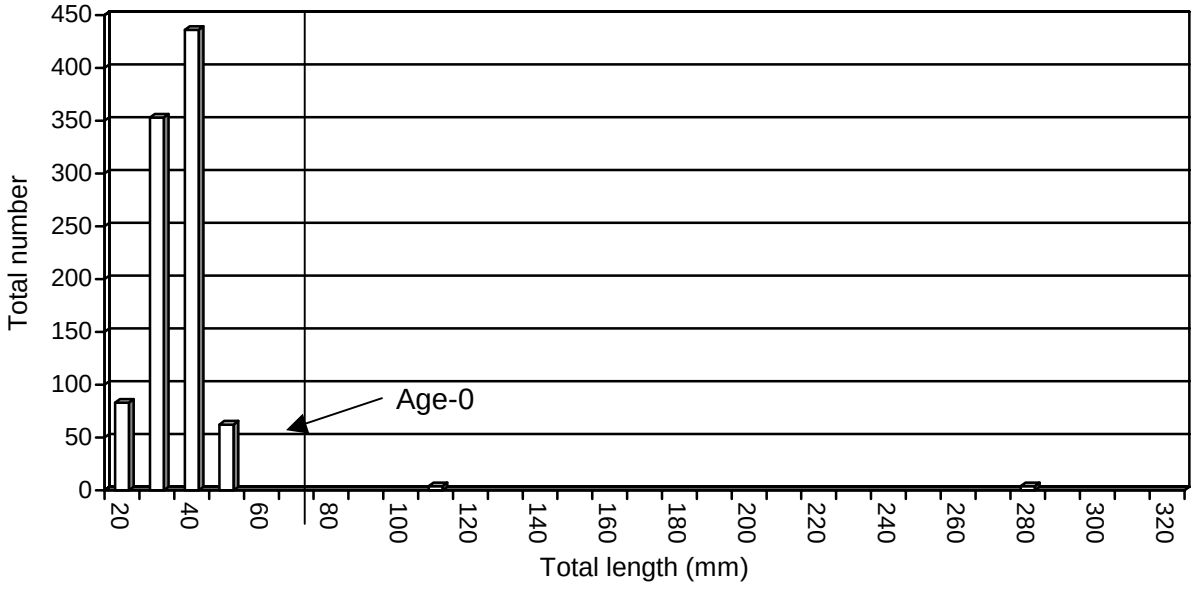

Figure 3. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in August 1999.

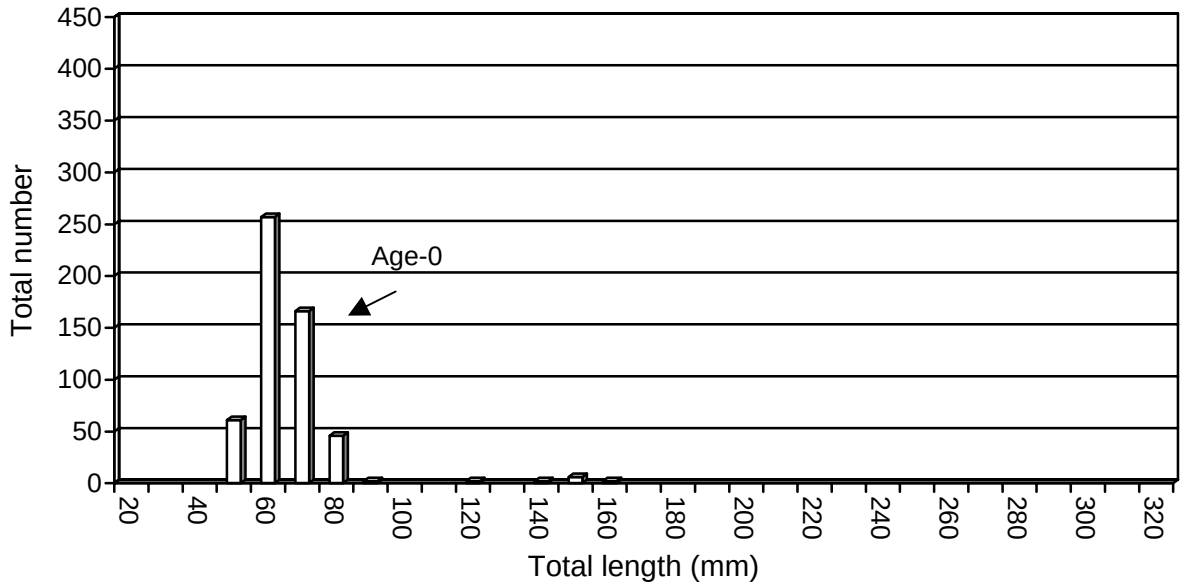

Figure 4. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in October 1999.

Table 1. UTM coordinates and boat heading of beginning locations of trawling transects utilized in 1999 in Cascade Reservoir (NAD 27 map Datum).

	NAD 27 coordinates				NAD 27 coordinates		
Transect name	UTM Easting	UTM Northing	Compass heading	Transect name	UTM Easting	UTM Northing	Compass heading
South Area (SS1)	0573829	4926265	0	East Area (ES1)	0574607	4937624	225
SS4	74879	27018	270	ES2	74132	34939	260
SS6	74460	28024	10	ES3	74396	35962	260
SS8	73348	28888	270	ES6	73190	38145	10
SS10	71531	30223	45	ES10	74213	36496	185
SS12	74649	32710	300	ES13	72708	39250	210
SS15	70263	32413	50	ES15	73310	37500	250
West Area (WS1)	71130	39887	220	North Area (NS1)	72767	40380	55
WS3	69023	38689	180	NS4	71034	40816	0
WS5	68528	37083	180	NS10	71539	49663	155
WS8	68392	35072	130	NS15	71000	49400	210
WS11	71246	37597	235				
WS14	71000	35000	45				
WS16	68500	34200	110				

Table 2. Mean catch of yellow perch with 95% confidence intervals (±) by section in June, August and October 1999.

Sample month	Mean catch rates (+/-95% CI) by area			
	South[1]	East[1]	West[1]	North[2]
June	.6 (.5)	4 (5.3)	.71 (1.4)	1.25 (2.4)
August	111 (148)	12 (18)	8 (15)	7 (13)
October	10 (12)	28 (15)	24 (19)	37 (82)

[1] Same 7 transects each sample period.
[2] Same 4 transects each sample period.

Table 3. Average relative weights of yellow perch by length group and month collected from the south section of Cascade Reservoir.

	Fish length groups (mm)			
Month	40	50	60	70
August	90.4	89.9		
October			80.1	82.6

Table 4. Average relative weights of yellow perch by length group and month collected from the north section of Cascade Reservoir.

	Fish length groups (mm)			
Month	40	50	60	70
August	80.4	83.6		
October		76.9	77.4	75.5

Table 5. Average relative weights of yellow perch by length group and month collected from the east section of Cascade Reservoir.

	Fish length groups (mm)			
Month	40	50	60	70
August	79.4	80.5		
October		82.9	79.3	72.3

Table 6. Average relative weights of yellow perch by length group and month collected from the west section of Cascade Reservoir.

	Fish length groups (mm)			
Month	40	50	60	70
August	81.8			
October		79.0	78.3	78.1

Objective 2

Each month we collected water samples and completed temperature and DO profiles of the water column at all three sites from April through October (Tables 7, 9 and 11). We also sampled in February and March at Poison Creek and in March at the Cabarton site. All February, March, and April samples were made through the ice.

The first time we observed a DO level below 3.0 ppm (other than just off the bottom) was on July 19 at Poison Creek, however they never dropped below 2.0 ppm for the entire year (Table 11). We found DO levels at the Cabarton site below 3.0 on August 19 but readings had recovered to greater than 3.0 ppm by the September 13 sample (Table 7). We found DO levels below 3.0 ppm at the Sugarloaf site on August 3; they had also recovered to greater than 3.0 ppm by September 13 (Table 9). Dissolved oxygen levels dropped below 1.0 ppm in the bottom 4 m at the August 16 and 30 sampling at Poison Creek (Table 11).

We found no water chemistry values that would seriously inhibit or stress yellow perch. All ammonia, nitrite, and nitrate levels were found to be low (Tables 8, 10 and 12).

Objective 3

The IDFG Eagle Fish Health Lab identified the trematode as *Neascus ellipticus*. Very little literature describing life histories of this parasite were available. However, Larson (1969) reported the same trematode in yellow perch in Minnesota lakes. Pathologists also found the parasites (frequency)*, Gyrodactylus* (7/10), *Ligula* (1/22), and *Trichodina* (4/10). Yellow perch were also examined for IHN, IPN, Furunculosis, and *Aeromonus sobria*. Only *Aeromonas* (12/20) was found.

The infestation rate of the trematode was relatively high with the majority of yellow perch having at least a minor load in June (Table 13). We found that infestation rates dropped from June to August because most of the fish collected in August were age-0. However, by October the average infestation rate was higher than that found in June.

We examined a total of 154 age-0 yellow perch for levels of trematode loading. We found 21 with no trematodes present, 97 with light to moderate loading, and 36 with a moderate to heavy loading. Average lengths for each group were 72 mm, 70mm, and 67 mm respectively with relative weights of 76.7, 77.3, and 79.36 respectively. Analysis of variance of relative weights of age-0 yellow perch between the three parasite loads was significant with a P-value of 0.415178. Since relative weights of yellow perch with heavy parasite loads were significantly higher than fish with no parasite load, this would indicate that levels of trematode loads had no negative effects on relative weights.

Table 7. Water column temperature and dissolved oxygen (DO) values measured at Cabarton sample site on Cascade Reservoir, 1999.

Date	Max. depth (m)	Depth (m) DO <5.0 ppm	Depth (m) DO <3.0 ppm	Depth (m) DO <1.0 ppm	Depth (m) DO =0 ppm	Temp @ DO <5.0 ppm	Temp @ DO <3.0 ppm
3/17/99	10.00	10.0	10.0	--	--	4.0	4.0
4/14/99	8.20	8.2	8.2	--	--	4.0	4.0
5/5/99	9.10	--	--	--	--	--	--
6/21/99	14.75	--	--	--	--	--	--
7/19/99	13.75	10.0	13.0	--	--	14.5	12.5
8/16/99	14.50	8.0	8.0	10.0	--	18.0	18.0
8/30/99	13.00	6.0	7.0	9.0	--	18.8	18.0
9/13/99	13.00	13.0	13.0	13.0	--	15.0	--
9/21/99	12.00	9.0	12.0	--	--	8.0	15.8
10/15/99	12.00	--	--	--	---	--	--

Table 8. Water chemistry values measured at the Cabarton sample site on Cascade Reservoir during 1999.

Date	Surface pH	Middle pH	Bottom pH	Surface conductivity	Bottom conductivity	Secchi (m)	Middle Nitrate + nitrite as N mg/l	Middle ammonia as N mg/l	Middle unionized ammonia as N mg/l	Middle BOD 5 day mg/l	Bottom nitrate + nitrite as N mg/l	Bottom ammonia as N mg/l	Bottom unionized ammonia as N mg/l	Bottom BOD 5 day mg/l
3/17/99	7.0	6.9	6.60	--	--	--	0.10	0.01	0.01	0.7	0.08	0.29	<0.01	2.6
4/14/99	--	7.0	6.60	--	--	--	0.03	0.02	<0.01	2.6	0.07	0.10	<0.01	3.3
5/5/99	--	--	6.75	--	--	--	--	--	--	--	0.02	0.06	<0.01	1.2
6/21/99	--	7.3	6.90	30	--	--	<0.01	0.01	<0.01	2.0	<0.01	0.03	<0.01	1.0
7/19/99	--	7.4	6.60	--	--	--	<0.01	0.01	<0.01	1.4	0.01	0.06	<0.01	0.9
8/16/99	--	6.8	6.90	30	--	4.0	<0.01	<0.01	<0.01	1.1	0.10	0.07	<0.01	1.4
8/30/99	--	--	--	--	--	4.0	--	--	--	--	--	--	--	--
9/21/99	--	--	6.80	30	30	2.5	--	--	--	--	<0.01	0.08	<0.01	1.1
10/15/99	--	--	6.90	--	30	--	--	--	--	--	--	--	--	--

Table 9. Water column temperature and dissolved oxygen (DO) values measured at the Sugarloaf Island sample site on Cascade Reservoir during 1999.

Date	Max. Depth (m)	Depth (m) DO <5.0 ppm	Depth (m) DO <3.0 ppm	Depth (m) DO <1.0 ppm	Depth (m) DO=0 ppm	Temp @ DO <5.0 ppm	Temp @ DO <3.0 ppm
4/14/99	7.60	6.00	7.00	--	--	3.00	3.40
5/5/99	8.50	--	--	--	--	--	--
6/21/99	11.75	--	--	--	--	--	--
7/13/99	13.50	9.00	--	--	--	13.60	--
7/19/99	12.25	7.00	12.25	--	--	15.00	12.00
8/3/99	11.90	9.00	9.00	11.90	--	15.50	15.50
8/16/99	11.90	10.00	10.00	11.00	--	15.50	15.50
8/30/99	11.50	10.00	11.00	--	--	18.00	17.00
9/13/99	10.75	--	--	--	--	--	--
9/21/99	10.25	10.25	--	--	--	15.90	--
9/28/99	10.20	--	--	--	--	--	--
10/15/99	10.00	--	--	--	--	--	--

Table 10. Water chemistry values measured at the Sugarloaf Island sample site on Cascade Reservoir during 1999.

Date	Middle pH	Bottom pH	Surface conductivity	Bottom conductivity	Secchi (m)	Middle Nitrate +nitrite as N mg/l	Middle ammonia as N mg/l	Middle unionized ammonia as N mg/l	Middle BOD 5 day mg/l	Bottom nitrate +nitrite as N mg/l	Bottom ammonia as N mg/l	Bottom unionized ammonia as N mg/l	Bottom BOD 5 day mg/l
4/14/99	6.8	6.60	--	--	--	0.06	0.04	<0.01	1.9	0.07	0.21	<0.01	3.2
5/5/99	--	6.75	--	--	--	--	--	--	--	0.03	0.02	<0.01	0.6
6/21/99	7.0	6.90	20	--	--	<0.01	0.05	<0.01	1.7	<0.01	0.02	<0.01	1.5
7/13/99	--	--	--	--	7.00	--	--	--	--	--	--	--	--
7/19/99	7.0	6.50	--	--	--	<0.01	0.01	<0.01	1.0	0.02	0.07	<0.01	0.9
8/3/99	--	--	--	--	3.75	--	--	--	--	--	--	--	--
8/16/99	6.9	6.80	30	--	3.00	<0.01	<0.01	<0.01	1.1	0.03	0.05	<0.01	0.9
8/30/99	--	--	--	--	3.00	--	--	--	--	--	--	--	--
9/21/99	--	6.80	30	30	3.50	--	--	--	--	<0.01	<0.01	<0.01	1.7
9/28/99	--	--	--	--	--	--	--	--	--	--	--	--	--
10/15/99	--	6.90	--	30	--	--	--	--	--	--	--	--	--

Table 11. Water column temperature and dissolved oxygen (DO) values measured at the Poison Creek sample site on Cascade Reservoir during 1999.

Date	Max. depth (m)	Depth (m) DO <5.0 ppm	Depth (m) DO <3.0 ppm	Depth (m) DO <1.0 ppm	Depth (m) DO=0 ppm	Temp @ DO <5.0 ppm	Temp @ DO <3.0 ppm
2/24/99	8.00	8.00	8.00	-	-	2.1	2.1
3/17/99	7.20	7.00	7.20	-	-	3.1	3.7
4/14/99	4.00	4.00	4.00	-	-	2.8	2.8
5/5/99	5.25	-	-	-	-	-	-
6/21/99	9.25	-	-	-	-	-	-
7/19/99	9.10	6.00	6.00	9.10	-	14.5	14.5
8/16/99	8.25	7.00	8.00	8.00	-	17.5	16
8/30/99	7.25	7.00	7.00	-	-	19.5	19.5
9/13/99	7.80	7.80	-	-	-	16.2	-
9/21/99	7.00	-	-	-	-	-	-
10/15/99	7.00	-	-	-	-	-	-

Table 12. Water chemistry values measured at the Poison Creek sample site on Cascade Reservoir during 1999.

Date	Surface pH	Middle pH	Bottom pH	Surface conductivity	Bottom conductivity	Secch i (m)	Middle nitrate + nitrite as N mg/l	Middle ammonia as N mg/l	Middle unionized ammonia as N mg/l	Middle BOD 5 Day mg/l	Bottom nitrate + nitrite as N mg/l	Bottom ammonia as N mg/l	Bottom unionized ammonia as N mg/l	Bottom BOD 5 Day mg/l
2/24/99	6.7	--	6.7	--	--	--	--	--	--	--	0.08	0.08	0.00241	1.1
3/17/99	6.8	--	6.6	--	--	--	--	--	--	--	0.1	0.1	<0.01000	1.7
4/14/99	6.9	6.7	6.7	--	--	--	0.04	0.03	<0.01	2.5	0.08	0.04	<0.01000	2.2
5/5/99	--	--	7.0	--	--	--	--	--	--	--	<0.01	0.01	<0.01000	0.8
6/21/99	--	8.2	7.8	20	--	--	<0.01	<0.01	<0.01	2.3	<0.01	<0.01	<0.01000	2.3
7/19/99	--	6.9	6.5	--	--	--	<0.01	<0.01	<0.01	0.9	<0.01	0.12	<0.01000	0.8
8/16/99	--	6.8	6.8	20	--	2.75	<0.01	0.01	<0.01	1.0	0.01	0.14	<0.01000	1.2
8/30/99	--	--	--	--	--	4.00	--	--	--	--	--		--	--
9/21/99	--	--	6.8	30	30	3.00	--	--	--	--	<0.01	0.13	<0.01000	1.2
10/15/99	--	--	6.7	--	45	--	--	--	--	--	--		--	--

Table 13. Percent of yellow perch collected in trawl infected with *Neascus elipticus* by section and month in 1999.

	June		August		October	
Section	% with	% without	% with	% without	% with	% without
North	80.0	20.0	48.0	52.0	83.0	17.0
South	100.0	0.0	48.0	52.0	98.0	2.0
East	65.5	34.5	48.0	52.0	94.0	6.0
West	60.0	40.0	5.0	95.0	90.0	10.0

Objective 4

We found spawn strands on eight of the 12 trees on May 17 (Figure 5). The number of trees with egg strands dropped off to five on May 21, four on May 24 and to zero on June 4.

A small sample of eggs was placed in live cages on May 17. The eggs had eyed by May 27 and hatched by June 1. We observed no eggs on three of the 12 trees.

We observed a decline in the number of egg strands on each tree during the time of egg development. This was probably a result of predation on eggs by other fish. We observed sculpin around the trees, and sculpin actually found a way into one of our egg-containing live cages, consuming all eggs in the cage.

Objective 5

We began larval yellow perch sampling on June 7 collecting three yellow perch in the north section, eight in the west section, four in the south section and zero in the east section (Tables 14-17). Larval yellow perch collections peaked June 16 when we averaged 4.85 yellow perch per tow. We collected no larval yellow perch after June 16. We collected yellow perch that ranged from 7 to 13 mm. We also collected one larval northern pikeminnow on July 13.

Objective 6

We examined fish stomachs from June 15 through October 7, 1999. We found plankton to be the most common food item for age-0 yellow perch in all but three sample dates and locations (Figures 6-9). Chironomids became increasingly more common in stomachs later in the year and plankton occurrence decreased. We observed an increase of 20-40% empty stomachs from late August into October when the last sample was taken. We found 0-40% of yearling yellow perch collected in June to have empty stomachs. We also found a high occurrence of plankton in juvenile yellow perch stomachs collected in the south and west sections in June.

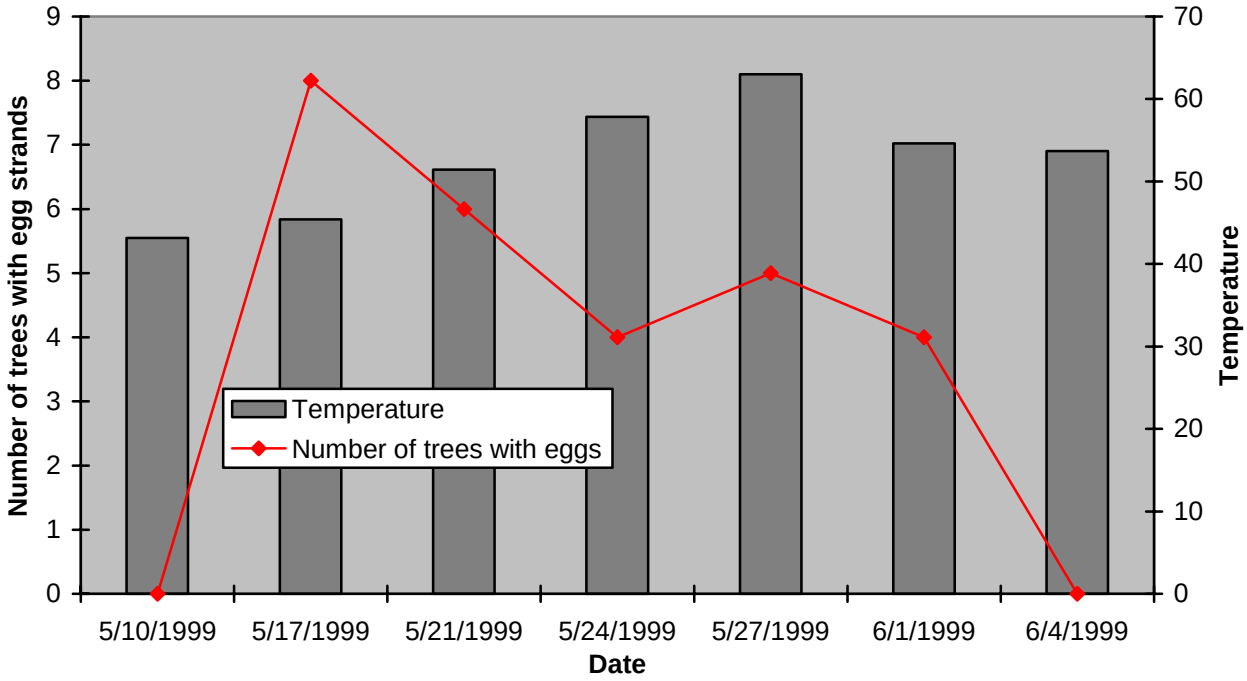

Figure 5. Surface water temperature and number of trees (out of 12) with yellow perch egg strands by date in Cascade Reservoir in 1999.

Table 14. Numbers of larval yellow perch collected in larval net tows from the south section of Cascade Reservoir in 1999.

Date	# tows	# yellow perch	Average # per tow	Average length (mm)
6/10/99	4	4	1.0	8.25
6/16/99	5	2	0.4	11.00
6/30/99	5	0	0.0	--

Table 15. Numbers of larval yellow perch collected in larval net tows from the east section of Cascade Reservoir in 1999.

Date	# tows	# yellow perch	Average # per tow	Average length (mm)
6/7/99	5	0	0.0	--
6/16/99	5	47	9.4	9.9
6/29/99	5	0	0.0	--
7/13/99	5	0	0.0	--

Table 16. Numbers of larval yellow perch collected in larval net tows from the west section of Cascade Reservoir in 1999.

Date	# tows	# yellow perch	Average # per tow	Average length (mm)
6/10/99	3	8	2.7	9.0
6/16/99	5	47	9.4	10.5
6/29/99	5	0	0.0	--
7/13/99	5	0	0.0	--

Table 17. Numbers of larval yellow perch collected in larval net tows from the north section of Cascade Reservoir in 1999.

Date	# tows	# yellow perch	Average # per tow	Average length (mm)
6/7/99	5	3	0.6	8.3
6/16/99	5	1	0.2	7
6/29/99	5	0	0	--
7/13/99	5	0	0	--

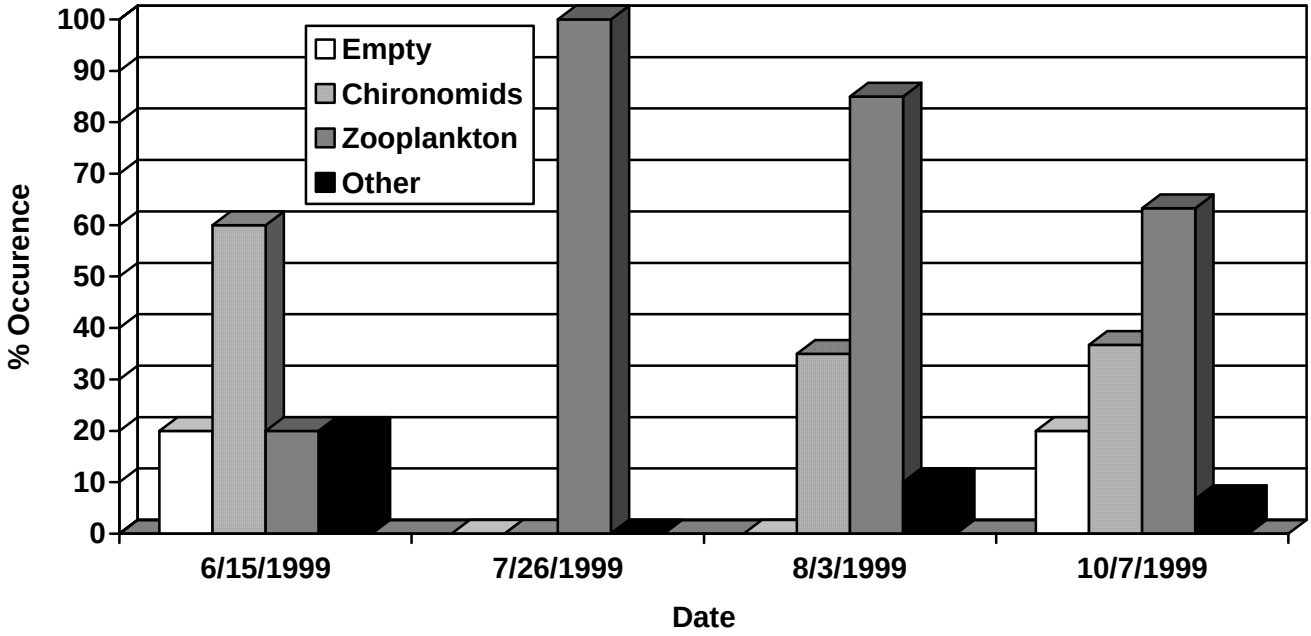

Figure 6. Percent occurrence of food items found in juvenile yellow perch stomachs by date collected from the north section of Cascade Reservoir in 1999.

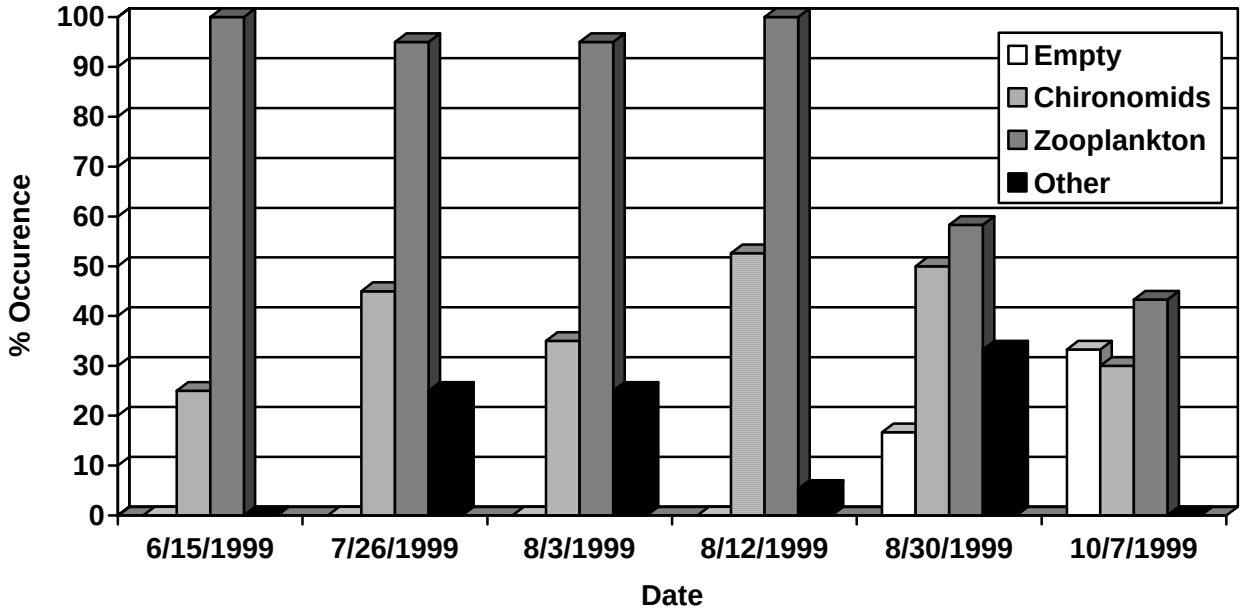

Figure 7. Percent occurrence of food items found in yellow perch stomachs by date collected from the south section of Cascade Reservoir in 1999.

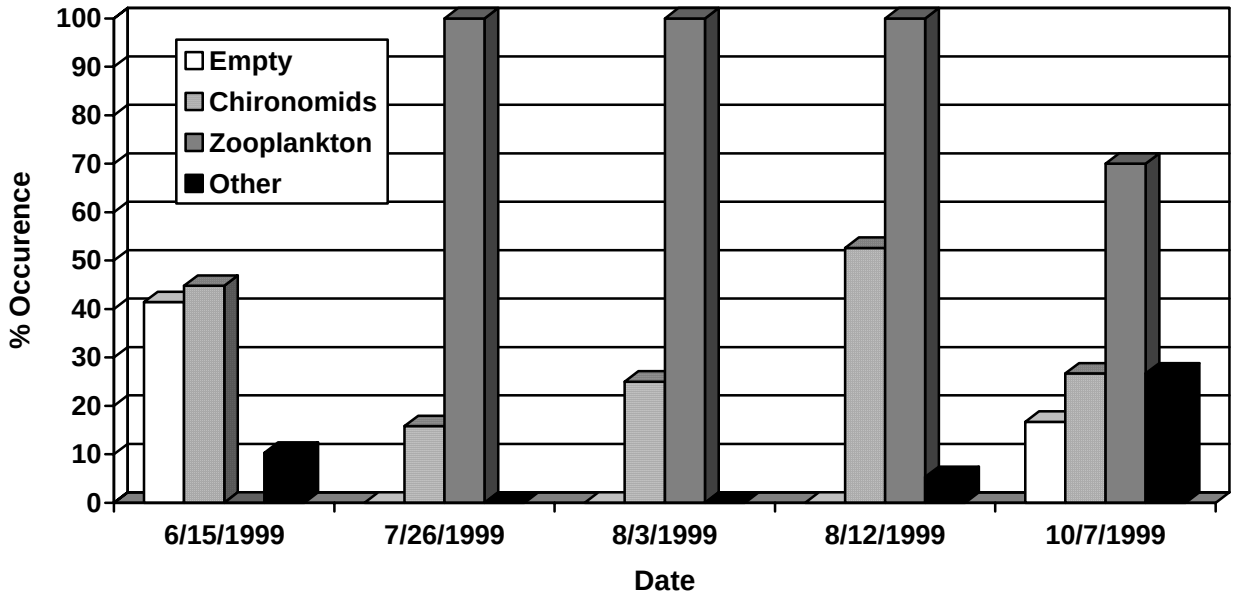

Figure 8. Percent occurrence of food items found in juvenile yellow perch stomachs collected by date from the east section of Cascade Reservoir in 1999.

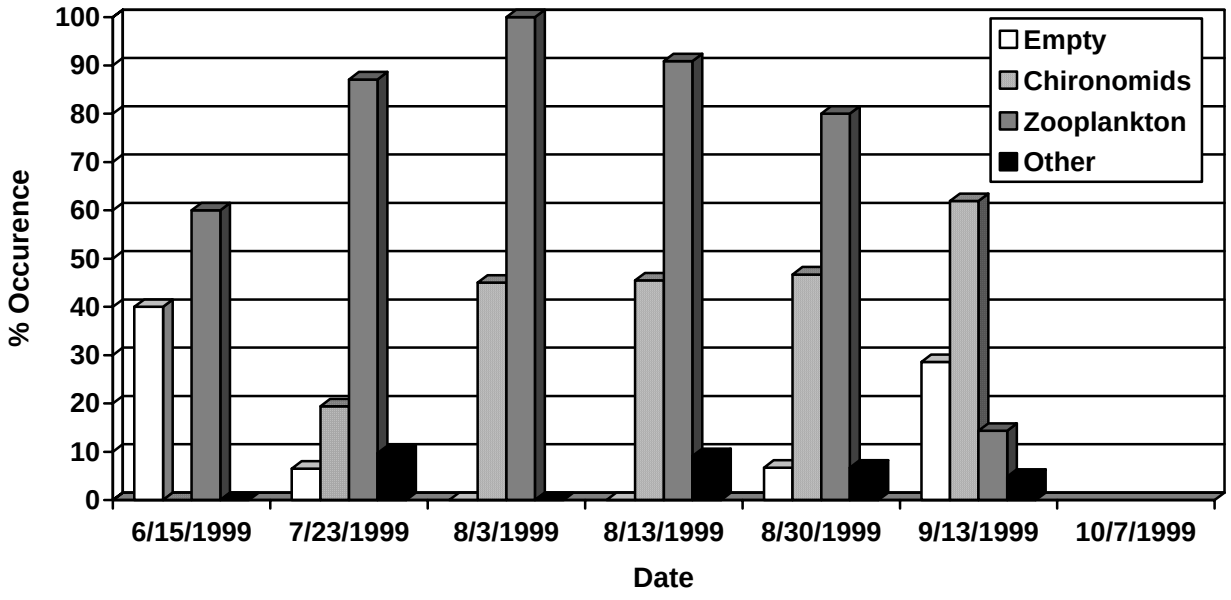

Figure 9. Percent occurrence of food items found in juvenile yellow perch stomachs by date collected from the west section of Cascade Reservoir in 1999.

Objective 7

We collected benthic samples June 2 and August 9, before and after strong lake temperature and dissolved oxygen stratification. We found oligochaetes to be the most abundant benthic organism; however, due to their small size we were not able to enumerate oligochaetes. Oligochaetes are rarely seen in Lake Erie, Ohio yellow perch stomachs and therefore are not considered important food items even though they have been very abundant at times (Jeff Tyson, Ohio Division of Wildlife, personal communication). Other major families of benthic organisms collected included chironomids, leaches, clams and snails. We found chironomids to be the most abundant organisms counted at most sample sites (Figures 10-15). Most sites contained less than 1,000 specific organisms/m^2. We collected few organisms below the 4,790-foot elevation and few above the 4,815-foot elevation at the Sugarloaf and Cabarton transects. We found that 54%, 75%, and 81% of the Cabarton, Sugarloaf, and Poison Creek transects respectively were in the 4,790 to 4,815-foot elevation range.

We monitored the Zooplankton Quality Index (ZQI) bimonthly beginning in May and continuing into November. We recorded three peaks in the ZQI, one in late June/early July, one in mid-September and one in mid- to late-October (Figure 16). The Poison Creek ZQI remained low until a mid-October peak. We recorded low ZQI values at all three sites in July and August.

DISCUSSION

Causes of the severe decline of yellow perch numbers in Cascade Reservoir remain unclear. None of the data collected in 1999 pointed to a specific habitat problem. Obviously the problem was lake-wide and not just in isolated areas. We found that age-0 yellow perch numbers recovered somewhat in 1999 with a 6.8-fold increase in October trawl catch rates over 1998 (23 vs. 3.4 yellow perch/trawl transect). However, there were still some indications of problems. We observed that the small, yearling age class of yellow perch sampled in June 1999 had virtually vanished by August (Figures 17-18). We saw the identical occurrence in 1998 when the small, yearling age class of yellow perch sampled in June 1998 had virtually vanished by August (Figures 19-20). There was no growth of juvenile fish and a small decline in numbers in 1998 between June and August (Figures 19-20). We did not observe problems with water quality or chemistry in terms of yellow perch survival between June and August.

We observed low densities of both benthic organisms and zooplankton during different times and in different areas of the lake in 1999. Whiteside et al. (1985) and Keast (1977) both reported that age-0 and juvenile yellow perch diets included both zooplankton and substrate dwelling organisms. In addition, they suggested that these food items were utilized more in order of availability than fish preference. As yellow perch moved into littoral areas from limnetic areas, age-0 yellow perch gradually shifted from zooplankton to substrate dwelling organisms. Hayes and Taylor (1992) reported a shift in yellow perch diets from chironomids to zooplankton as chironomid densities dropped due to white sucker predation. He noted only relatively small declines in yellow perch growth and population size structure with the change in diet and did not see any associated mortality. We observed that plankton levels peaked in late June and benthic organism sampling indicated increasing numbers from June to August. We also observed good survival and growth of age-0 yellow perch from June through October.

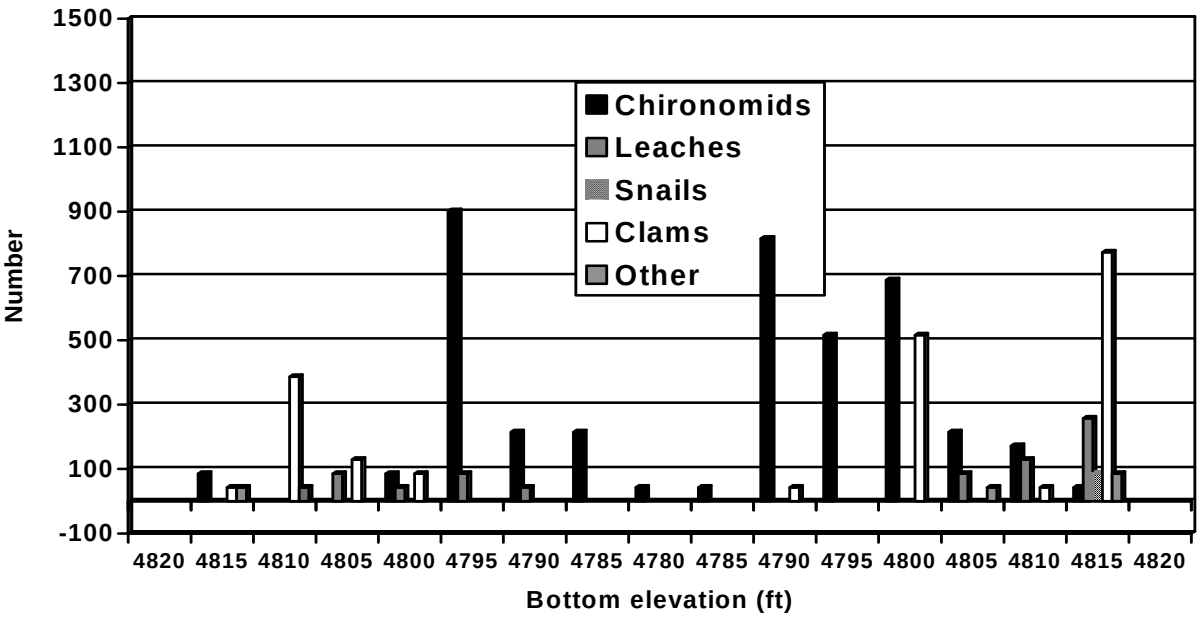

Figure 10. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at the Cabarton transect on June 2, 1999.

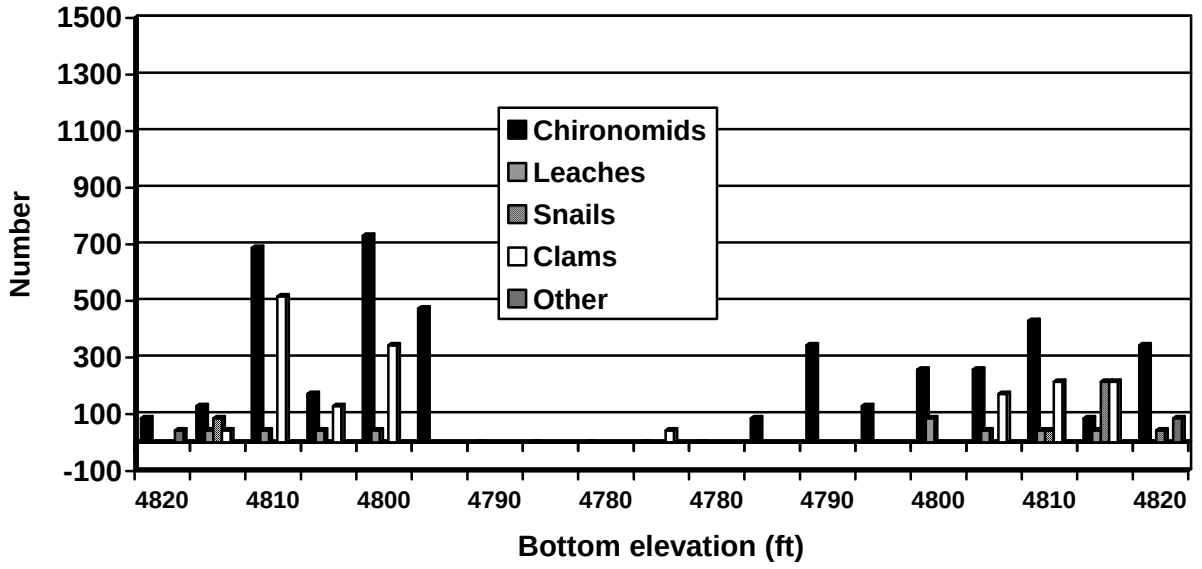

Figure 11. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at the Cabarton transect on August 9, 1999.

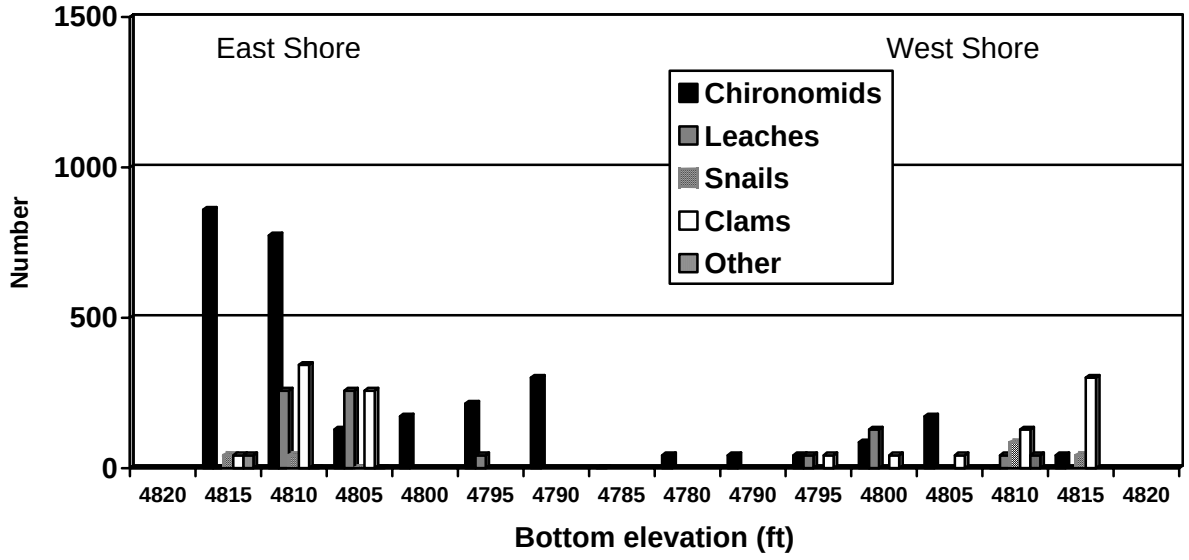

Figure 12. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at the Sugarloaf Island transect on June 2, 1999.

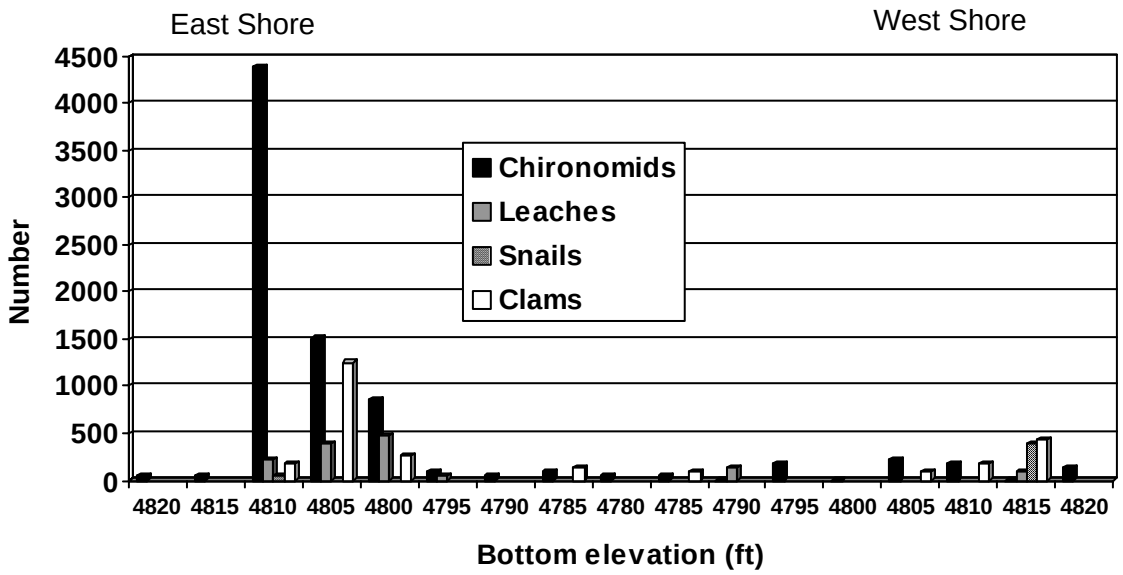

Figure 13. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at the Sugarloaf Island transect on August 9, 1999.

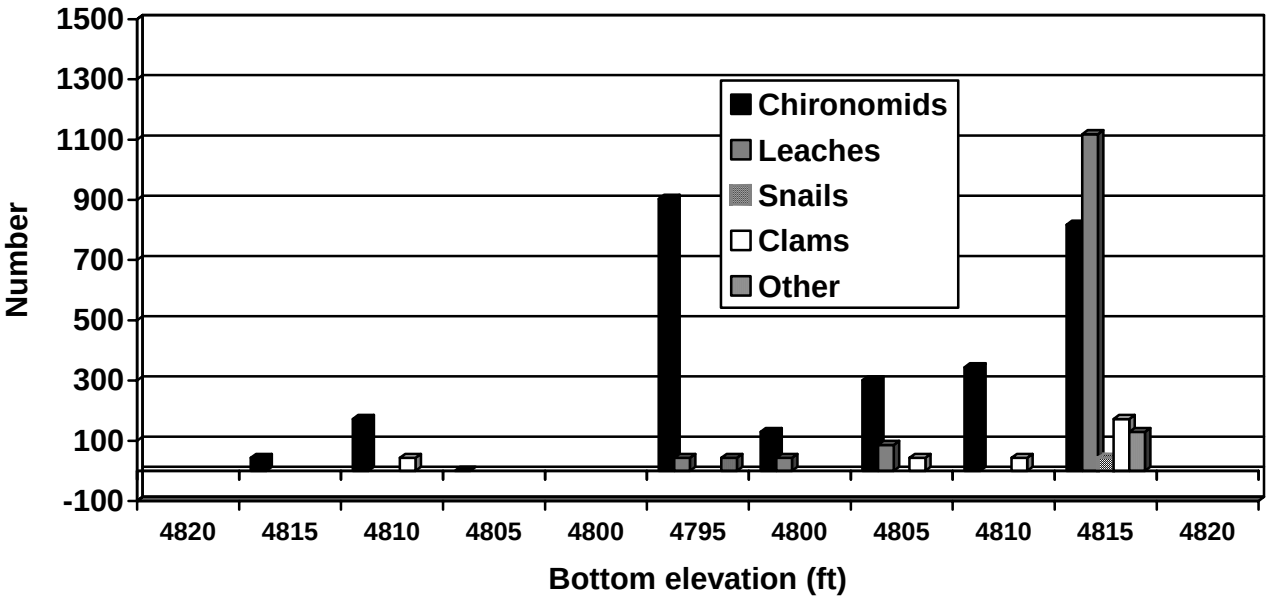

Figure 14. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at Poison Creek transect on June 2, 1999.

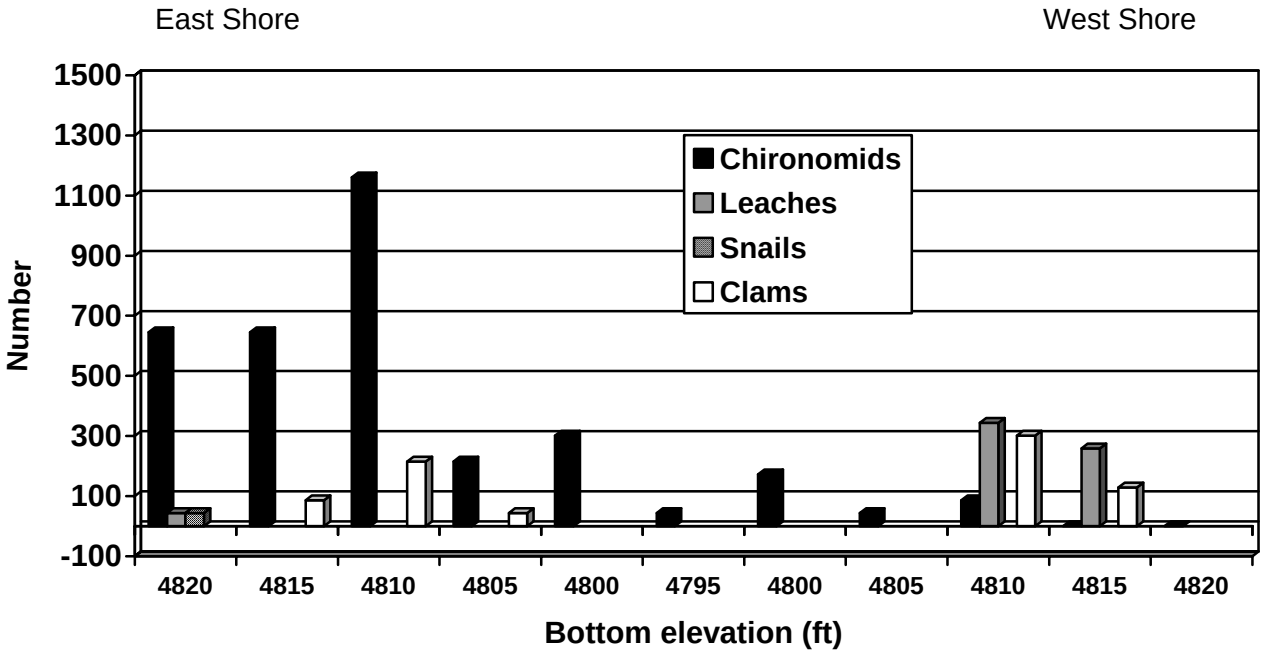

Figure 15. Number of benthic organisms/m^2 by family collected in Cascade Reservoir at the Poison Creek transect on August 9, 1999.

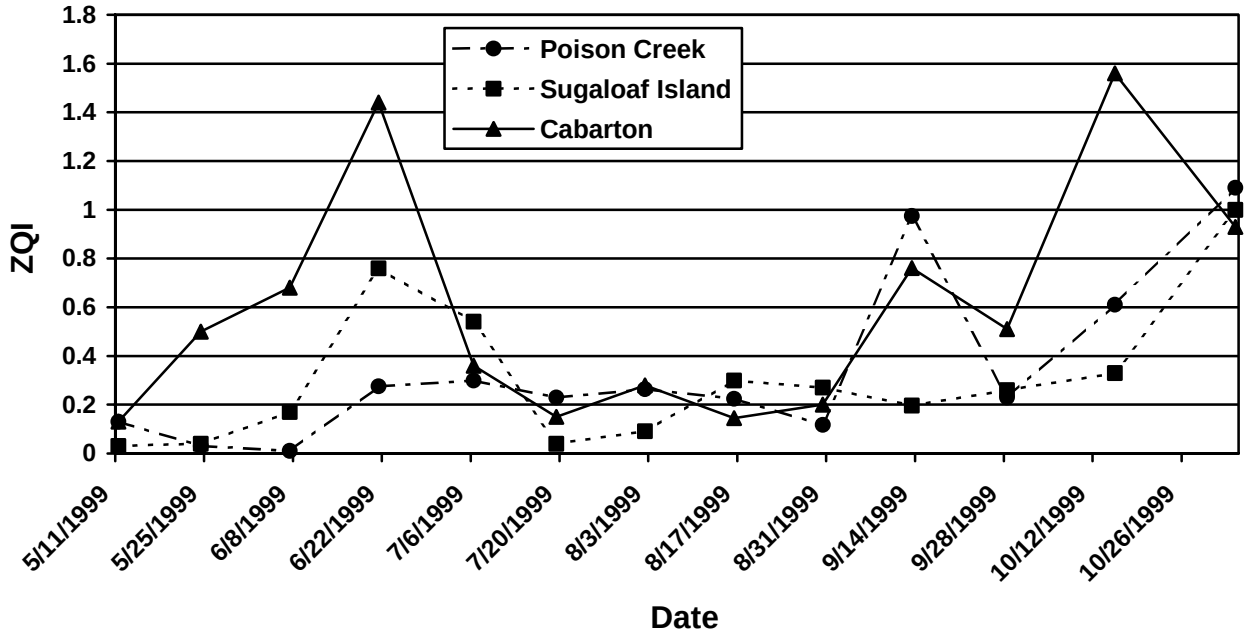

Figure 16. Zooplankton quality index measured in Cascade Reservoir from May 11, 1999 through November 11, 1999.

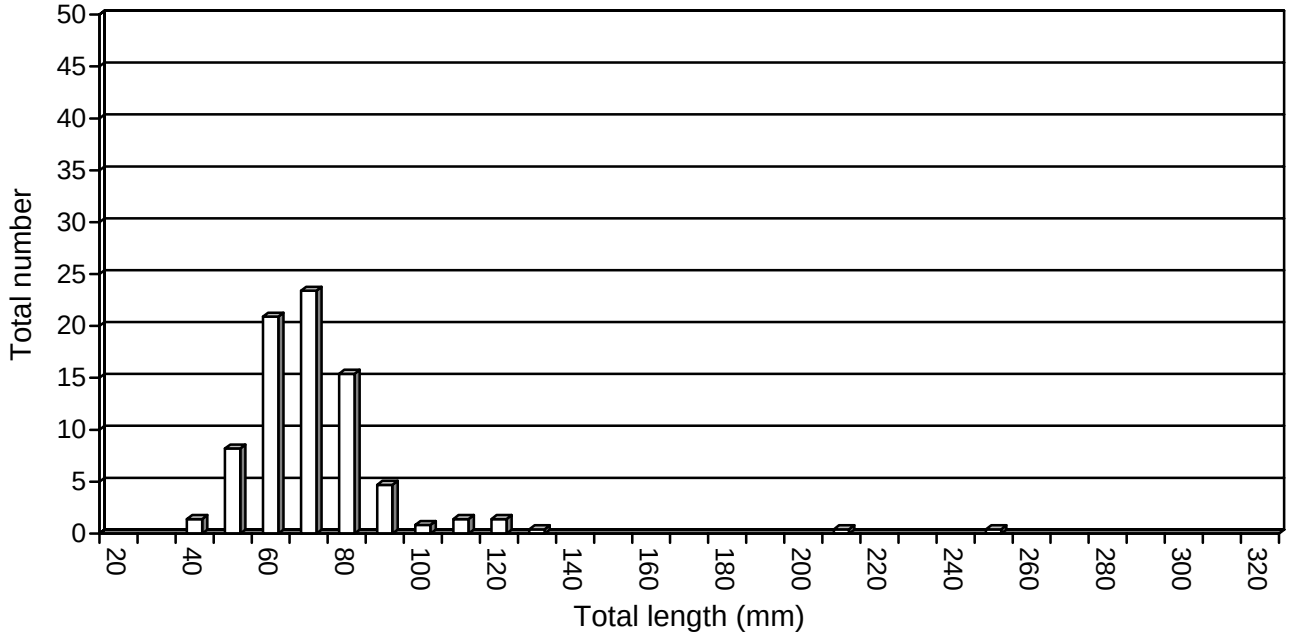

Figure 17. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in October 1998.

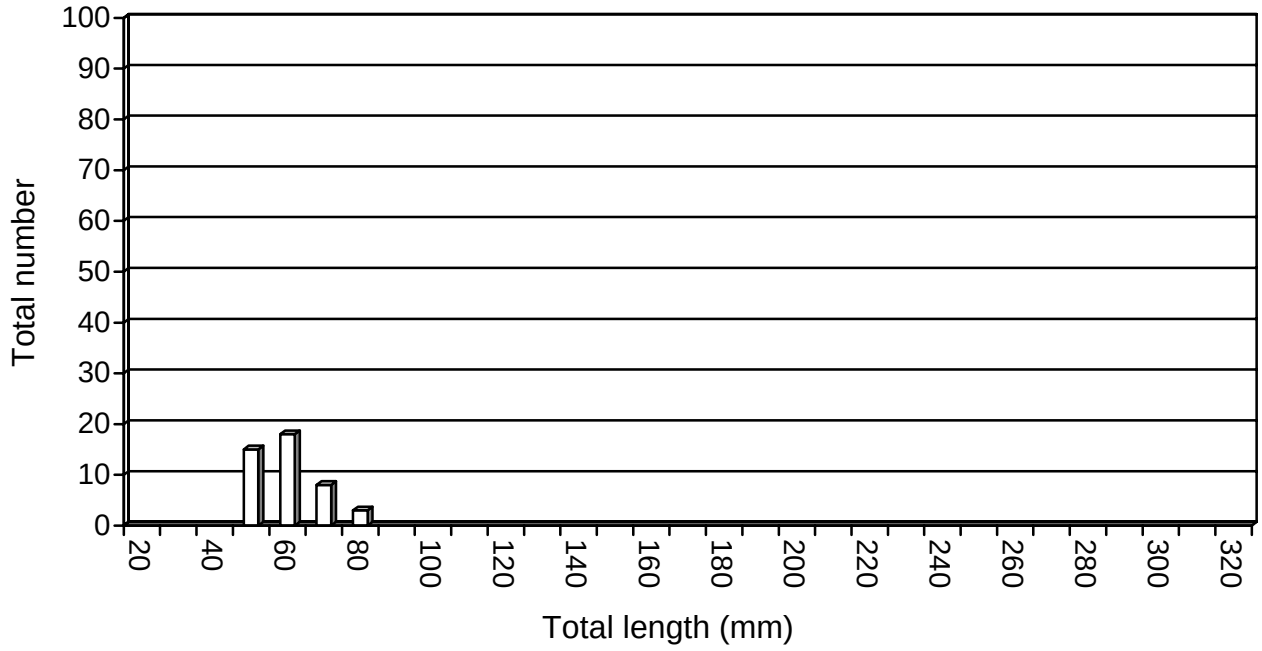

Figure 18. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir on June 1999.

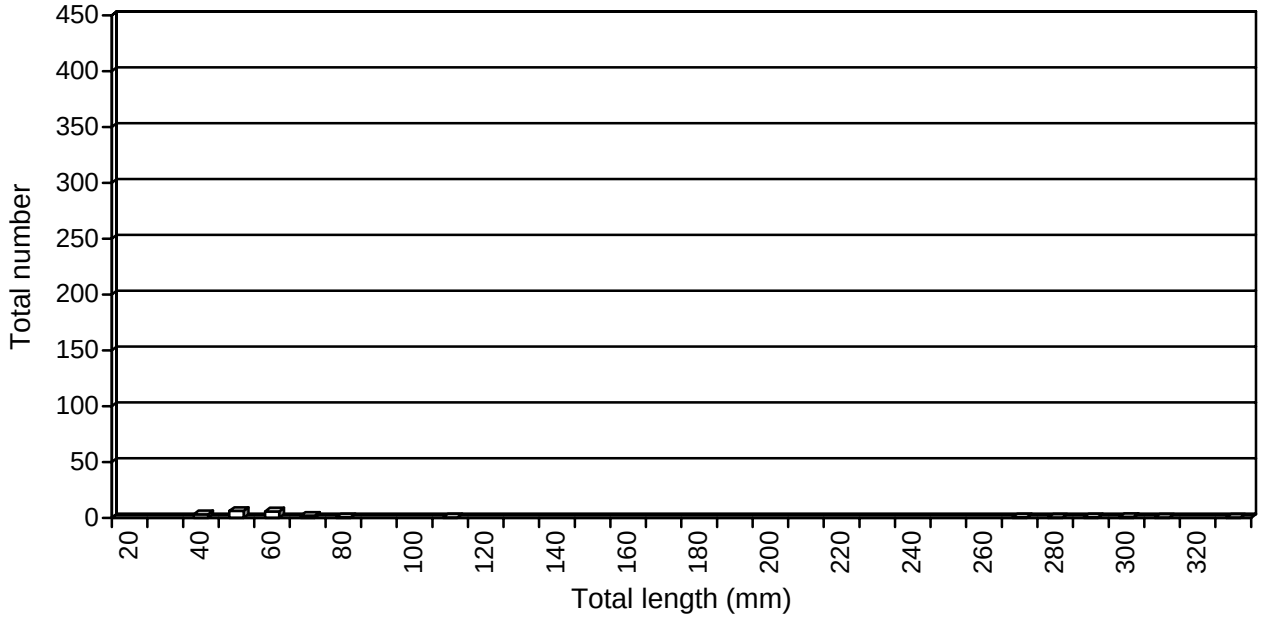

Figure 19. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in June 1998.

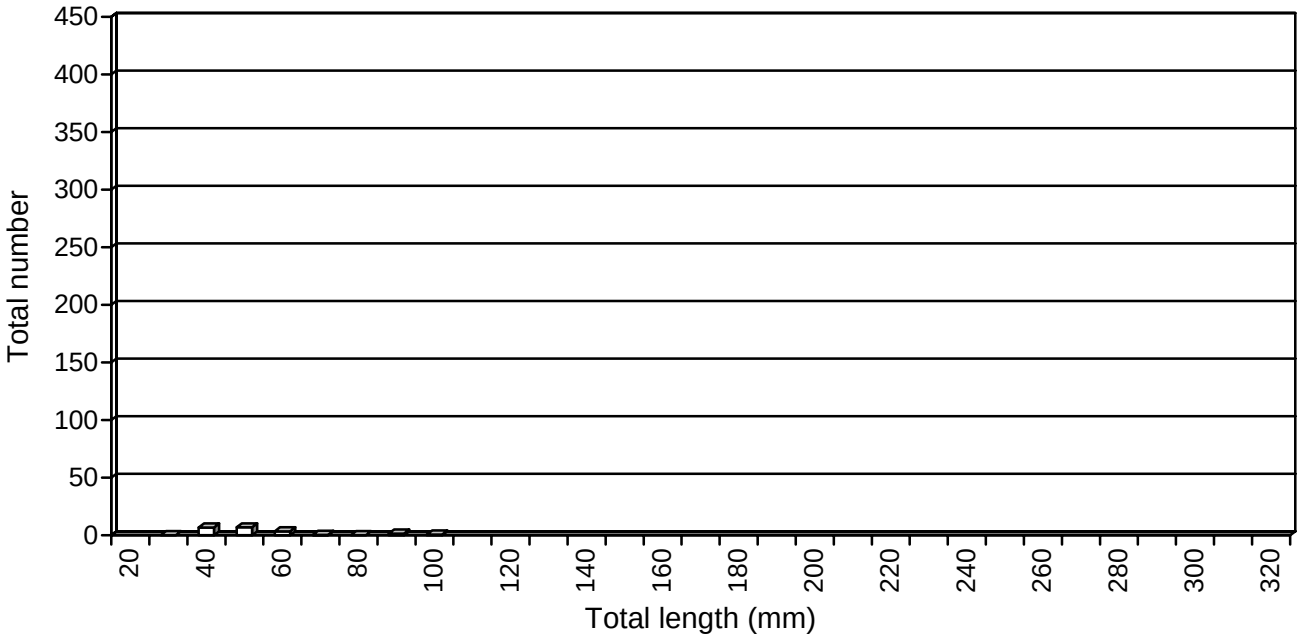

Figure 20. Length frequencies (CPUE) of yellow perch collected with a bottom trawl from Cascade Reservoir in August 1998.

We found average total lengths of yellow perch in October 1998 and 1999 to be 65.5 and 67.6 mm. Griswold (1989) reported similar sizes with back-calculated average total lengths of age-1 fish of 70 mm in 1986 and 1987. Bagenal and Tesch (1978) suggested that because yellow perch initially maximize growth in length and later growth in weight, a coefficient of body condition, which relates growth in length to weight, is a more appropriate parameter for judging the health of larval and juvenile yellow perch. We found somewhat low relative weights in August (average=80-90) between all four sample areas and had declined even further by October (average=72–83). We found the Fulton condition factor in 1999 for yellow perch 39-79 mm in August and October to average 0.84 and 0.85. Griswold (1989) reported average Fulton condition factors for Cascade Reservoir yellow perch 39–79 mm of 0.88 and 0.98 in 1986 and 1987.

The extensive trematode *Neascus ellipticus* infection of yellow perch did not appear to be a direct cause of mortality in 1999. We examined the impacts of the trematode infestation on relative weights of juvenile yellow perch and found no difference between heavily infected, lightly infected, and non-infected yellow perch. We noted that the tapeworm *Ligula spp.*, which infected approximately one of 20 fish, appeared to have severe impacts on fish health and condition.

Historic dissolved oxygen levels, chlorophyll A, and ortho phosphate, presented in Figures 21-23, do not reveal any significant trend changes that would explain the total loss of yellow perch. One event of note, however, was in 1994 when we saw dissolved oxygen values drop below 1.0 ppm in 45% of the water column in 1994. This event resulted in a virtually total, reservoir-wide trout and salmon kill with some dead suckers, northern pikeminnow and yellow perch observed as well.

While many of the above parameters show areas of concern, none of them seem to be severe enough or extensive enough to explain the high yellow perch mortalities seen throughout the reservoir. All of the above measured habitat parameters are within the ranges to support yellow perch. Cascade Reservoir is a large body of water covering 28,000 acres. We would not expect habitat problems to be consistent in all areas of the lake. Problems such as low dissolved oxygen are more prevalent and likely to occur in some areas of the lake than others. Therefore, if habitat problems were the cause of yellow perch declines we would expect to find good numbers of yellow perch in some areas and low numbers in other areas but this is not the case.

It appears that the cause of the severe decline may have corrected itself in 1999, evidenced by large increases in numbers of age-0 yellow perch.

Predation of juvenile yellow perch by northern pikeminnow may be playing a significant role in preventing the recovery of yellow perch. We hypothesize that predation explains why the small number of juvenile yellow perch observed in June had virtually disappeared by August. As noted in the above report, northern pikeminnow were the most abundant fish species present in terms of numbers and biomass. We propose to shift focus of the study to further investigate the predator/prey relationships of these two species.

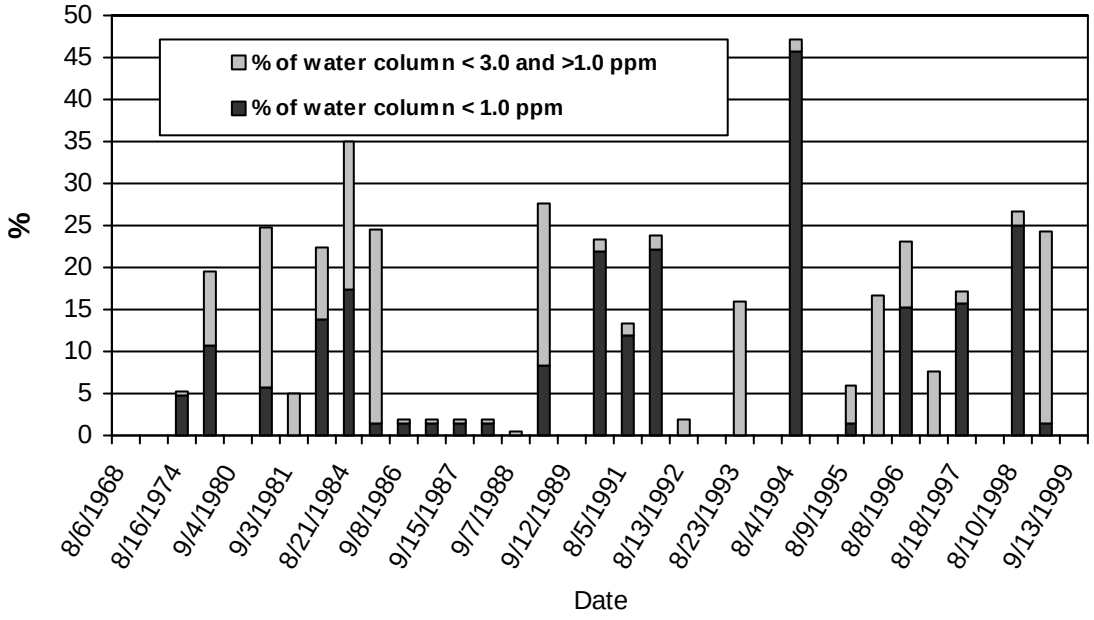

Figure 21. Percent of water column below 3.0 ppm dissolved oxygen content at the Sugarloaf Island sample site during August and September 1968-1999 (unpublished U.S. Bureau of Reclamation, Idaho Department of Health/Division of Environmental Quality, and IDFG data).

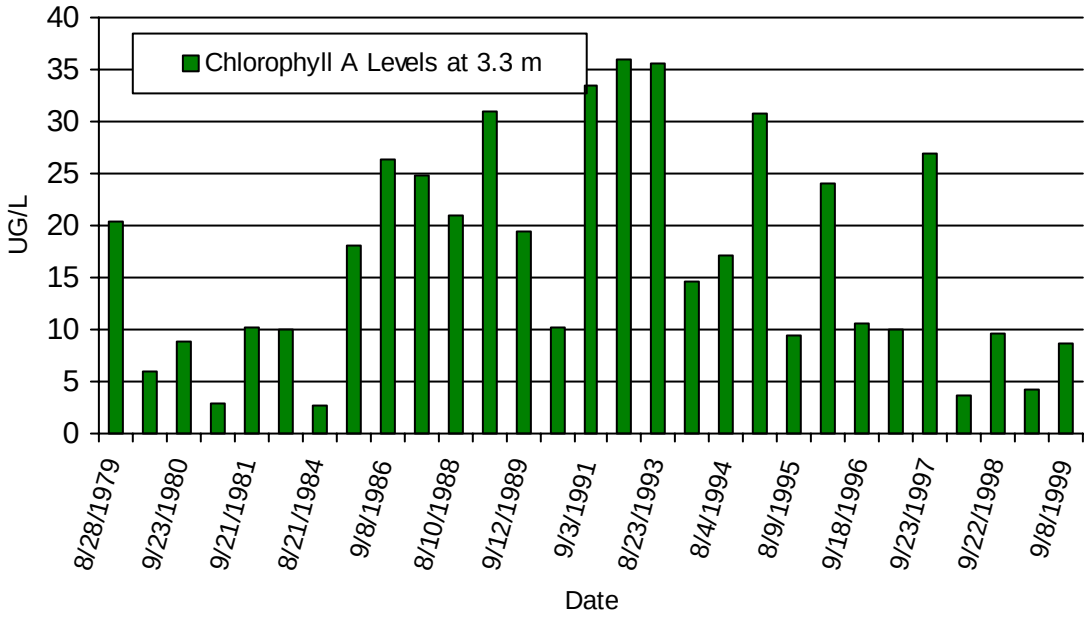

Figure 22. Chlorophyll A levels measured at 3.3 m at the Sugarloaf Island sample site during August and September 1979-1999 (unpublished U.S. Bureau of Reclamation data).

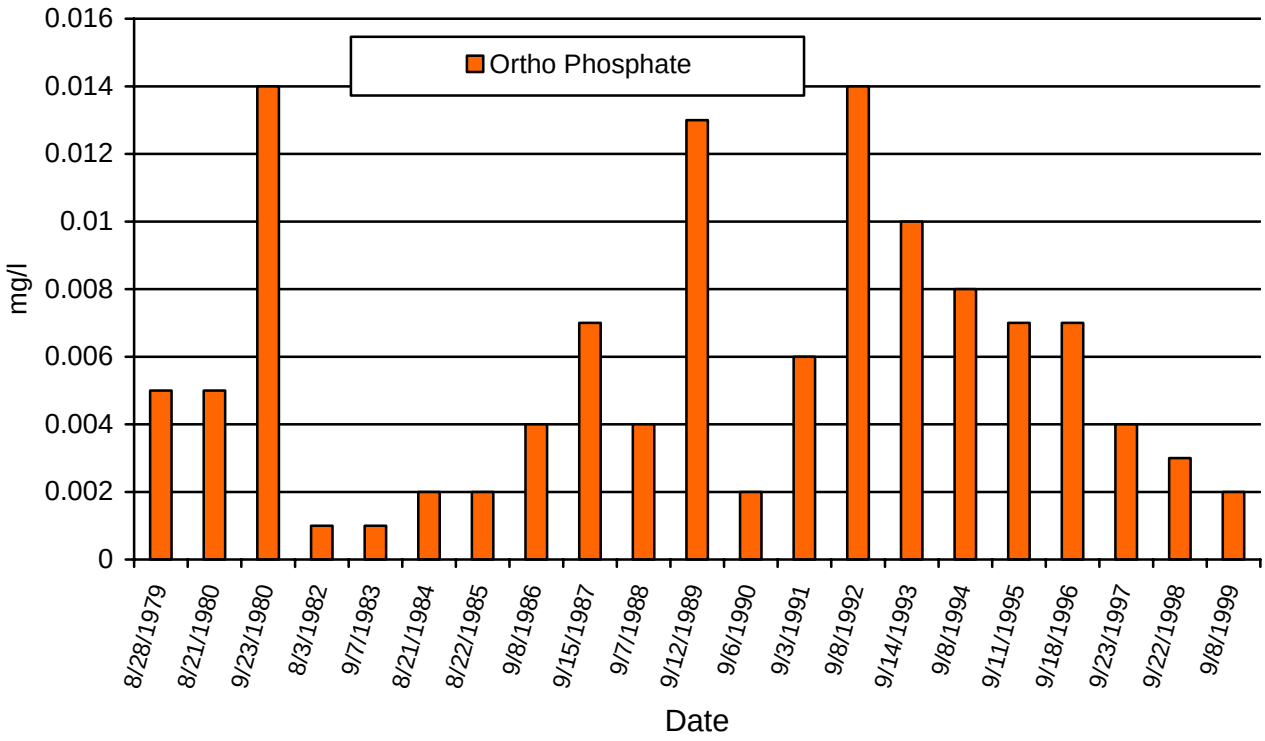

Figure 23. Ortho phosphate levels measured at 3.3 m at the Sugarloaf Island sample site during August and September 1974-1999 (unpublished U.S. Bureau of Reclamation data).

RECOMMENDATIONS

Further work is needed to determine if the reasons for the demise of yellow perch in Cascade Reservoir have corrected themselves and to examine the effects of northern pikeminnow predation on yellow perch recovery:

1. Continue the trawl transects established in 1998 and 1999 to monitor fate of 1999 age class.
2. Closely monitor the fate of juvenile, 1999 age class of yellow perch between June and August of 2000.
3. Examine predation potential of northern pikeminnow and birds.
4. If crash is detected between June and August, be prepared to look at specific parameters as findings indicate (this could include predation, water chemistry, disease screening, food availability, etc.).

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1999 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject I-C: Southwest Region (McCall)

Job: c

Title: Rivers and Streams Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

Temperature recorders monitored the upper Little Salmon River drainage throughout the summer. Mean daily temperatures peaked at 22°C in late July. The highest daily temperature recorded was 26.3°C. The highest minimum daily temperature was one occurrence of 19.1°C. Summer river temperatures were noticeably lower than in 1998.

A single temperature recorder in the North Fork of the Payette River, just below the confluence with Fisher Creek at the USGS gauge, recorded temperatures throughout the summer. Average daily temperatures remained below 18.8°C. The highest maximum daily temperature recorded was 22.4°C. The highest minimum daily temperature recorded was 16.2°C.

Wapiti Meadows Ranch Outfitters guided anglers in a three-mile section of the South Fork Salmon River below the confluence with the Secesh River. All fishing was catch-and-release. Steelhead/redband trout *Oncorhynchus mykiss gairdneri*, cutthroat trout *O. clarki*, and chinook salmon *O. tschawytscha* yearlings were reported in the catch. Catch rate for all species combined was 1.6 fish/hr.

Angling was done by Idaho Department of Fish and Game personnel on the lower eight miles of Big Creek, from Taylor Ranch to its confluence with the Middle Fork Salmon River. All fishing was catch-and-release. Steelhead\redband trout and cutthroat trout were caught. Bull trout *Salvelinus confluentus*, mountain whitefish *Prosopium williamsoni*, and juvenile chinook salmon were observed during snorkel surveys, but none were captured during angling. Total daily catch rates for August 2 and 3 were 4.8 fish/h and 9.03 fish/h, respectively.

We estimated the 1999 kokanee *O. nerka kennerlyi* spawning run in the North Fork Payette River above Payette Lake to be 26,971 fish with a total biomass of 4,963 kg.

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OBJECTIVES

The objective of this project is to maintain information for fishery management of rivers and streams.

INTRODUCTION

Temperature Monitoring in the Upper Little Salmon River and the Upper North Fork Payette River

The Upper Little Salmon River drainage is the focus of ongoing riparian habitat improvement projects and some improvements in agricultural land use practices. Debate has risen regarding what specific factors limit salmonid populations within the drainage. The effect of high summer water temperature as a factor limiting salmonid abundance and distribution in the drainage is unknown. Monitoring began in 1994.

During 1996, instream flows were modeled in the North Fork Payette River from Upper Payette Lake downstream to Box Creek. Results of that study were used to develop a summer instream flow recommendation to provide habitat for trout *Oncorhynchus mykiss* and kokanee salmon *O. nerka kennerlyi* (Payette Lake Technical Advisory Committee 1997, Big Payette Lake Water Quality Council 1998). Water temperatures are to be monitored as part of the evaluation of the anticipated minimum instream flow water right.

South Fork Salmon River Guided Fishery

Wapiti Meadows Ranch has guided catch-and-release fishing since 1994 on a section of the South Fork Salmon River from Hamilton Creek to Threemile Creek, downriver from the confluence with the Secesh River. This section of river has been managed as a catch-and-release fishery since 1988. The outfitter is required to report effort and catch. Use of outfitter's records will allow us to track trends within this fishery.

Big Creek Angling Survey

Big Creek is an important fishery for westslope cutthroat trout and bull trout and has been managed with special regulations since 1982. A monitoring effort was undertaken to assess the fishery in the lower reach of Big Creek.

North Fork Payette River above Payette Lake

The spawning run of kokanee salmon in the North Fork Payette River (NFPR) from Payette Lake has been counted since 1988 to assess spawning escapement and to serve as a method of validating kokanee population/density estimates and survival estimates from trawling (Janssen et al. 2000d). We completed the count again in 1999.

METHODS

Temperature Monitoring in the Upper Little Salmon River and the Upper North Fork Payette River

Three Hobo temperature recorders (Onset model HTI –5 to +35°C) monitored water temperature continuously, recording a temperature every 2.4 hours from July 14 through September 26, 1999 (Figure 1). The upstream recorder, Station 1, was placed under the bridge on Hubbard Lane, approximately 500 m upstream from the irrigation diversion. Station 2 was approximately 50 m downstream from Meadow Creek subdivision bridge, adjacent to Highway 95 road mile 163.4, at 45° N Latitude. The third recorder was placed in Mud Creek, a headwater tributary to the Little Salmon River, immediately below the confluence with Little Mud Creek, under the Highway 95 bridge.

A recorder was placed in the upper North Fork Payette River, downstream from Fisher Creek, at the USGS gauging station, from July 14 through September 20.

All recorders were in waterproof Onset model containers and secured by cable to a cinder block. The cinder block was placed in the stream and cabled to the shore. Recorders were checked biweekly or monthly.

South Fork Salmon River Guided Fishery

We provided Wapiti Meadows Ranch with angler diaries made specifically for monitoring this fishery. Guides were asked to have clients record hours fished, species caught, and fish length to the nearest inch. Space was provided for comments, and anglers had the opportunity to have his or her diary returned after analysis.

Big Creek Angling Survey

Idaho Department of Fish and Game personnel conducted catch-and-release fly-fishing on Big Creek from Taylor Ranch downstream to the confluence with Middle Fork Salmon River. This was done concurrently with snorkeling surveys and provided a good evaluation of the fishery in the lower reach of Big Creek. A four-person crew flew to Taylor Ranch to conduct annual fish surveys for the General Parr Monitoring project. Time between surveys was used to

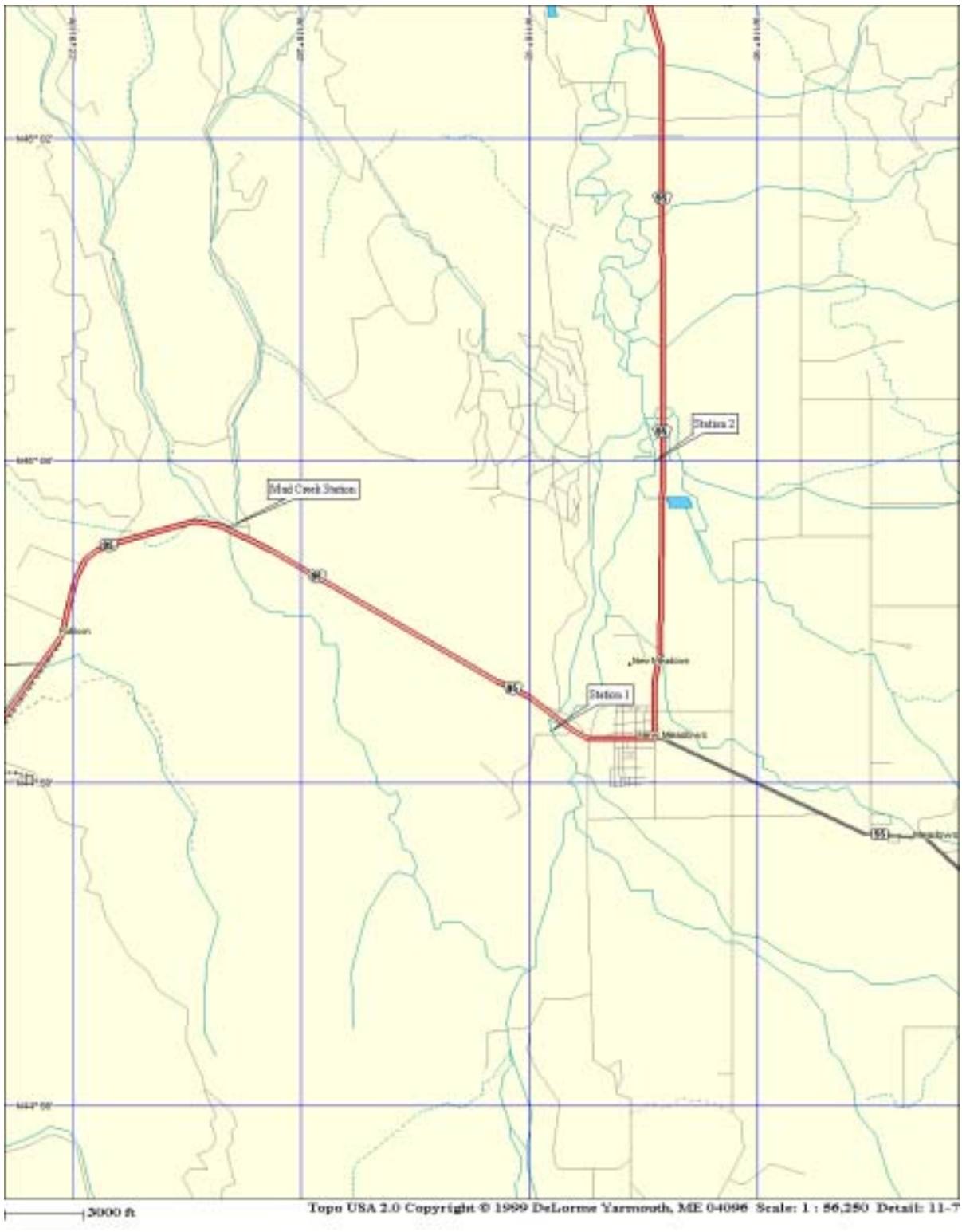

Figure 1. Location of temperature recorders in the Little Salmon River drainage, Idaho, 1999.

fly fish. On the first day only 1.25 hours before dark were fished. Angling the second day started at noon and continued after dark, until approximately 10:00 p.m. Pools, runs, and pocket water habitats were all fished. Cutthroat trout *Oncorhynchus clarki* and steelhead/redband trout were targeted by our angling technique. Fish were measured to the nearest inch and recorded in angler diaries.

North Fork Payette River above Payette Lake

We conducted kokanee spawner counts by walking the entire stretch of river utilized by spawning kokanee and counting all live spawners. We walked the stream every 3-4 days during the run until spawner numbers dropped significantly. Multiplying the largest daily count by 1.73 gave the total spawning run estimate (Frost and Bennett 1994).

RESULTS

Temperature Monitoring In The Upper Little Salmon River and Upper North Fork Payette River

In the Little Salmon River, average daily temperature for July ranged 17.8°C-22.7°C (Figure 2; Appendix A). Average daily temperatures for August ranged 15.1°C-20.9°C. For September, average daily temperatures ranged 10.7°C-15.4°C. Maximum temperature exceeded 20°C for >6 hours on 42 of 74 days at Station 1 and on 40 of 74 days at Station 2.

In Mud Creek, average daily temperatures for July ranged 16.7°C-21.0°C (Figure 2; Appendix B). Average daily temperature for August ranged 13.4°C-19.6°C. September average daily temperatures ranged 8.9°C-14.3°C. Maximum daily temperatures exceeded 20°C for >6 hours on 40 of 74 days.

In the upper North Fork Payette River, average daily temperature for July ranged 13.1°C-18.8°C (Figure 3; Appendix B). August average daily temperature ranged 13.4°C-18.0°C and September averages were 10.7°C-12.7°C. Maximum daily temperatures exceeded 20°C for >6 hours on six of 69 days.

South Fork Salmon River Guided Fishery

Idaho Department of Fish and Game received information from guided fishing trips that took place from July 19 through September 7. Steelhead/redband trout *Oncorhynchus mykiss gairdneri*, westslope cutthroat trout *O. clarki*, mountain whitefish *Prosopium williamsoni*, and one yearling chinook salmon *O. tshawytscha* were reported in the catch (Table 1). Angler catch rates for all species combined were lower in 1999 (1.6 fish/h) than were reported in 1998 (1.8 fish/h), 1997 (2.13 fish/h) and 1994 (2.3 fish/h); but were higher than 1995 (1.2 fish/h) (Janssen et al. 2000a, 2000b, 2000c, 2000d, 2001). Steelhead/redband trout ≤10" continued to dominate the catch as in 1994 through 1998.

Big Creek Angling Survey

Only steelhead/redband trout (63%) and westslope cutthroat trout (37%) were caught during angling on Big Creek (Table 2). Steelhead parr <10" dominated the catch. Average catch rate for both species combined was 8 fish/hr. Snorkeling surveys also documented bull trout *Salvelinus confluentus*, juvenile chinook salmon, and mountain whitefish throughout the sampled reach.

North Fork Payette River above Payette Lake

We completed counts on five different days with the peak kokanee spawner count of 15,590 live fish on October 4, 1999 (Table 3). The total spawning run estimate including those trapped was 26,971 fish. Average fork length of post-spawned fish was 257 mm for both males and females. Average total length was 276 mm and 275 mm for males and females. We found the average weight of mature, green fish to be 184 g (males 198 g, females 170 g).

DISCUSSION

Temperature Monitoring in the Upper Little Salmon River and the Upper North Fork Payette River

Summer river temperatures were lower than temperatures recorded since this monitoring began in 1994 (Janssen et al. 2000a, 2000b, 2000c). However, temperatures exceeding 20°C for more than six hours occurred daily July 14-August 11 and August 13-30. A constant pattern continues to develop regarding the differences between stations 1 and 2. Station 2 continued to be the cooler of the two stations, probably due to the local effect of cooler inflow from Goose Creek. Stations 1 and 2 are appropriate sites to continue monitoring because recorders remain shaded and in flowing water throughout the season. The Bureau of Land Management maintains temperature recorders in the river from near Round Valley Creek downstream to the confluence with the Salmon River (Craig Johnson, personal communication). No additional sites should be needed to characterize river temperatures throughout the mainstem of the Little Salmon River. Annual summer temperature monitoring will continue to identify trends with weather, flow regime, and recovery of the riparian community.

Mud Creek is a headwater tributary to the Little Salmon River. The temperature recorder is located within a riparian enclosure on land owned by Boise Cascade Corporation. Average temperatures were lower than in 1998. This station will be monitored annually to identify trends in stream temperatures with varying weather, flow regime, and recovery of the riparian community.

Summer water temperature in 1999 in the North Fork Payette River was within the criteria to support salmonids. We will continue to monitor summer river temperatures until data are collected over an adequate range of weather and water conditions.

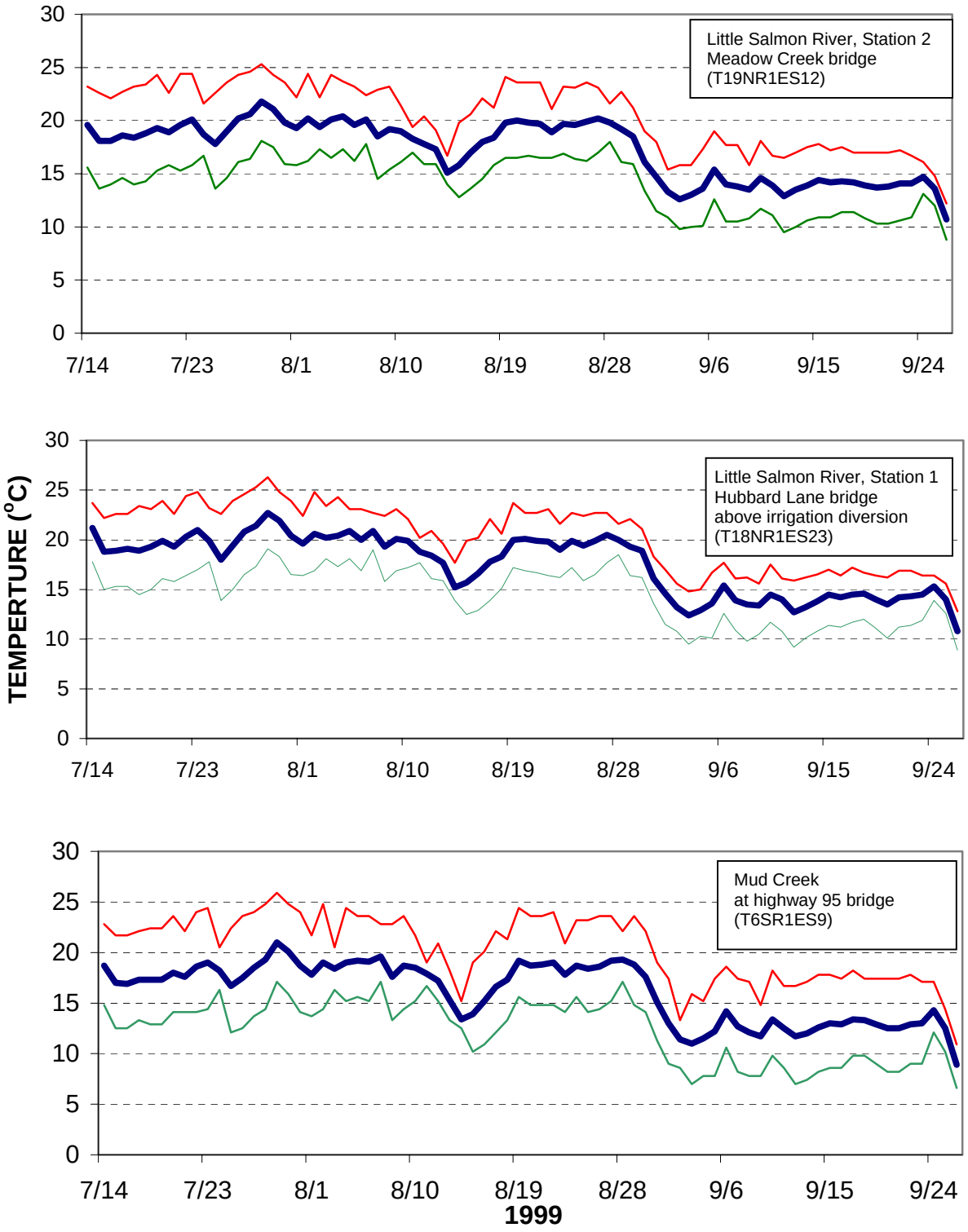

Figure 2. Mean, maximum, and minimum daily water temperatures in the upper Little Salmon River.

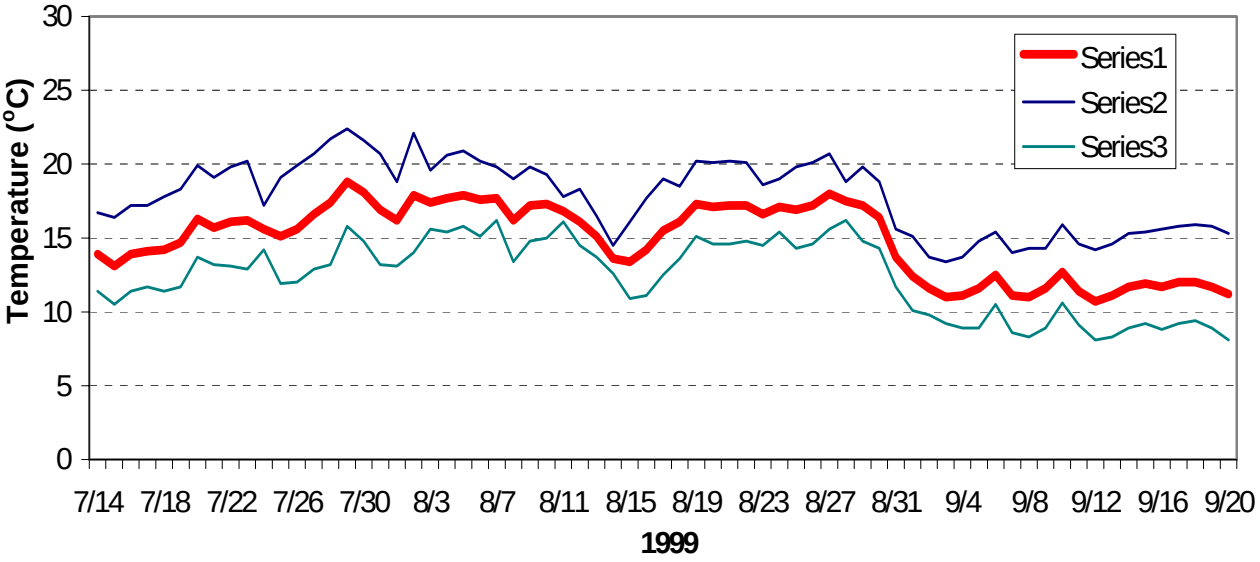

Figure 3. Daily minimum, mean, and maximum water temperatures in the North Fork Payette River, at USGS gauge below Fisher Creek, 1999.

Table 1. Fish caught and released during guided angling trips with Wapiti Meadows Ranch Outfitters, South Fork Salmon River, downriver from the Secesh River confluence, 1999.

Fish length (inches)	Numbers of fish caught and released			
	Steelhead/ redband trout	Westslope cutthroat trout	Mountain whitefish	Chinook salmon
4	2	0	0	0
5	5	0	0	1
6	5	0	0	0
7	2	0	0	0
8	14	0	0	0
9	8	1	0	0
10	12	3	0	0
11	2	3	0	0
12	5	2	1	0
13	2	0	0	0
14	2	1	0	0
15	0	6	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
Totals	59	16	1	1

Average catch rate=1.6 fish/hr; total hours fished=47.

Table 2. Number and length of fish caught and released in Big Creek by anglers (Department personnel). All angling was done from Taylor Ranch down river to the Middle Fork Salmon River, August 1999.

Fish length (inches)	Numbers of fish caught and released			
	August 2, 1999		August 3, 1999	
	Steelhead/ redband trout	Westslope cutthroat trout	Steelhead/ redband trout	Westslope cutthroat trout
4	2	1	18	
5	1	2	9	
6		1	30	
7		1	20	7
8	2	1	17	6
9		2	5	2
10		1		2
11	1		1	3
12		6	3	10
13		1		8
14		1		4
15		1		4
16				
Totals	6	18	103	46

Average catch rate 8\2\99= 4.8 fish\hr; total hours fished=5hr.
Average catch rate 8\3\99=9.03 fish\hr; total hours fished=16.5hr.

Table 3. Estimated total kokanee spawning run size and biomass from 1988 through 1999 for Payette Lake (1,715 ha usable kokanee depth (>40 ft).

Year	Peak count	Estimated # spawners	#/ha	Average weight (g)	kg/ha
1988	13,200	22,800	13.3	346	4.6
1989	18,400	14,500	8.4	349	2.9
1990	19,642	16,700	9.7	358	3.5
1991	10,400	18,000	10.5	505	5.3
1992	16,945	29,300	17.1	377	6.4
1993	34,994	59,310[1]	34.6	245	8.5
1994	25,550	44,200	25.8	214[2]	5.5
1995	32,050	55,450	32.3	147	4.8
1996	35,090	60,707	35.4	162[3]	5.7
1997	36,300	64,891[4]	37.8	148	5.6
1998	14,585	25,232	14.7	143	2.1
1999	15,590	26,971	15.7	184	2.9

[1] Estimate made from stream and weir counts (Frost and Bennett 1994).
[2] From gill net data of captured spawners in Payette Lake during lake survey.
[3] From trawling collections made in September 1996.
[4] Includes 2,092 females trapped and spawned by Nampa Fish Hatchery.

South Fork Salmon River Guided Fishery

Angler catch rates were lower in 1999 (1.6 fish/hr) than were reported in 1998 (1.8 fish/hr), 1997 (2.13 fish/hr) and 1994 (2.3 fish/hr); but were higher than 1995 (1.2 fish/hr) (Janssen et al. 2000a, 2000b, 2000c, 2000d, 2001).

Big Creek Angling Survey

Angling catch rates were high on August 2-3 in Big Creek. The two primary anglers were very experienced Department personnel. No bull trout or mountain whitefish were captured during this survey, probably attributable to the use of dry flies rather than nymphs or other tackle. This survey provided managers with fishery data that is difficult to collect from traditional angler surveys. This information should be considered qualitative and not comparable to standardized population surveys.

North Fork Payette River above Payette Lake

The kokanee run was the fourth lowest since 1988 but still well above the low recorded in 1990. Based on estimated values, average fecundity should have been about 350 eggs/female with a potential egg deposition of 4,719,925 eggs. The continued large kokanee run suggests conditions in Payette Lake, including lake trout predation, are not suppressing the population.

RECOMMENDATIONS

1. We should continue to monitor summer river temperature in the upper Little Salmon River and the North Fork of the Payette River on an annual basis. This will create a long-term database to evaluate changes in river temperatures with recovery of riparian community and changes in discharge.

2. Continue kokanee spawner counts in the North Fork Payette River to monitor Payette Lake kokanee stocks and to help calibrate Payette Lake kokanee population estimate work.

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APPENDICES

Appendix A. Daily mean, maximum and minimum stream temperature (°C), Little Salmon River, 1999.

	Station 2			Station 1		
Date	Mean	Maximum	Minimum	Mean	Maximum	Minimum
07/14/99	19.6	23.2	15.6	21.2	23.7	17.8
07/15/99	18.1	22.6	13.6	18.8	22.2	15.0
07/16/99	18.1	22.1	14.0	18.9	22.6	15.3
07/17/99	18.6	22.7	14.6	19.1	22.6	15.3
07/18/99	18.4	23.2	14.0	18.9	23.4	14.5
07/19/99	18.8	23.4	14.3	19.3	23.1	15.0
07/20/99	19.3	24.3	15.3	19.9	23.9	16.1
07/21/99	18.9	22.6	15.8	19.3	22.6	15.8
07/22/99	19.6	24.4	15.3	20.3	24.4	16.4
07/23/99	20.1	24.4	15.8	21.0	24.8	17.0
07/24/99	18.7	21.6	16.7	19.9	23.2	17.8
07/25/99	17.8	22.6	13.6	18.0	22.6	13.9
07/26/99	19.0	23.6	14.6	19.4	23.9	15.0
07/27/99	20.2	24.3	16.1	20.8	24.6	16.5
07/28/99	20.6	24.6	16.4	21.4	25.3	17.3
07/29/99	21.8	25.3	18.1	22.7	26.3	19.1
07/30/99	21.1	24.3	17.5	21.9	24.8	18.3
07/31/99	19.8	23.6	15.9	20.4	23.9	16.5
08/01/99	19.3	22.2	15.8	19.6	22.4	16.4
08/02/99	20.2	24.4	16.2	20.6	24.8	16.9
08/03/99	19.4	22.2	17.3	20.2	23.4	18.1
08/04/99	20.1	24.3	16.5	20.4	24.3	17.3
08/05/99	20.4	23.7	17.3	20.9	23.1	18.1
08/06/99	19.6	23.2	16.2	20.0	23.1	16.9
08/07/99	20.1	22.4	17.8	20.9	22.7	19.0
08/08/99	18.5	22.9	14.5	19.3	22.4	15.8
08/09/99	19.2	23.2	15.4	20.1	23.1	16.9
08/10/99	19.0	21.4	16.1	19.9	22.1	17.2
08/11/99	18.3	19.4	17.0	18.8	20.2	17.7
08/12/99	17.8	20.4	15.9	18.4	20.9	16.1
08/13/99	17.3	19.1	15.9	17.7	19.6	15.9
08/14/99	15.1	16.7	14.0	15.2	17.7	13.9
08/15/99	15.8	19.8	12.8	15.7	19.9	12.5
08/16/99	17.0	20.6	13.6	16.6	20.2	12.9
8/17/99	18.0	22.1	14.5	17.8	22.1	13.9
8/18/99	18.4	21.2	15.8	18.3	20.6	15.1

Appendix A. Continued.

	Station 2			Station 1		
Date	Mean	Maximum	Minimum	Mean	Maximum	Minimum
08/20/99	20.0	23.6	16.5	20.1	22.7	16.9
08/21/99	19.8	23.6	16.7	19.9	22.7	16.7
08/22/99	19.7	23.6	16.5	19.8	23.1	16.4
08/23/99	18.9	21.1	16.5	19.0	21.6	16.2
08/24/99	19.7	23.2	16.9	19.9	22.7	17.2
08/25/99	19.6	23.1	16.4	19.4	22.4	15.9
08/26/99	19.9	23.6	16.2	19.9	22.7	16.5
08/27/99	20.2	23.1	17.0	20.5	22.7	17.7
08/28/99	19.8	21.6	18.0	20.0	21.6	18.5
08/29/99	19.2	22.7	16.1	19.3	22.1	16.4
08/30/99	18.5	21.2	15.9	18.9	21.1	16.2
08/31/99	16.1	19.0	13.4	16.1	18.3	13.6
09/01/99	14.7	18.0	11.5	14.6	17.0	11.5
09/02/99	13.3	15.4	10.9	13.2	15.6	10.8
09/03/99	12.6	15.8	9.8	12.4	14.8	9.5
09/04/99	13.0	15.8	10.0	12.9	15.0	10.3
09/05/99	13.6	17.3	10.1	13.6	16.7	10.1
09/06/99	15.4	19.0	12.6	15.4	17.7	12.6
09/07/99	14.0	17.7	10.5	13.9	16.1	10.9
09/08/99	13.8	17.7	10.5	13.5	16.2	9.8
09/09/99	13.5	15.8	10.8	13.4	15.6	10.5
09/10/99	14.6	18.1	11.7	14.5	17.5	11.7
09/11/99	13.9	16.7	11.1	14.0	16.1	10.8
09/12/99	12.9	16.5	9.5	12.7	15.9	9.2
09/13/99	13.5	17.0	10.0	13.2	16.2	10.1
09/14/99	13.9	17.5	10.6	13.8	16.5	10.8
09/15/99	14.4	17.8	10.9	14.5	17.0	11.4
09/16/99	14.2	17.2	10.9	14.2	16.4	11.2
09/17/99	14.3	17.5	11.4	14.5	17.2	11.7
09/18/99	14.2	17.0	11.4	14.6	16.7	12.0
09/19/99	13.9	17.0	10.8	14.0	16.4	11.1
09/20/99	13.7	17.0	10.3	13.5	16.2	10.1
09/21/99	13.8	17.0	10.3	14.2	16.9	11.2
09/22/99	14.1	17.2	10.6	14.3	16.9	11.4
09/23/99	14.1	16.7	10.9	14.5	16.4	11.9
09/24/99	14.7	16.1	13.1	15.3	16.4	13.9
09/25/99	13.6	14.8	12.0	14.0	15.6	12.6
09/26/99	10.7	12.2	8.8	10.8	12.8	8.9

Appendix B. Daily mean, maximum and minimum stream temperature (°C) in Mud Creek (tributary to Little Salmon River) and upper North Fork Payette River, 1999.

	Mud Creek			Upper North Fork Payette River		
Date	Mean	Maximum	Minimum	Mean	Maximum	Minimum
07/14/99	18.7	22.8	14.8	13.9	16.7	11.4
07/15/99	17.0	21.7	12.5	13.1	16.4	10.5
07/16/99	16.9	21.7	12.5	13.9	17.2	11.4
07/17/99	17.3	22.1	13.3	14.1	17.2	11.7
07/18/99	17.3	22.4	12.9	14.2	17.8	11.4
07/19/99	17.3	22.4	12.9	14.7	18.3	11.7
07/20/99	18.0	23.6	14.1	16.3	19.9	13.7
07/21/99	17.6	22.1	14.1	15.7	19.1	13.2
07/22/99	18.6	24.0	14.1	16.1	19.8	13.1
07/23/99	19.0	24.4	14.4	16.2	20.2	12.9
07/24/99	18.2	20.5	16.3	15.6	17.2	14.2
07/25/99	16.7	22.4	12.1	15.1	19.1	11.9
07/26/99	17.5	23.6	12.5	15.6	19.9	12.0
07/27/99	18.5	24.0	13.7	16.6	20.7	12.9
07/28/99	19.3	24.8	14.4	17.4	21.7	13.2
07/29/99	21.0	25.9	17.1	18.8	22.4	15.8
07/30/99	20.1	24.8	15.9	18.1	21.6	14.8
07/31/99	18.7	24.0	14.1	16.9	20.7	13.2
08/01/99	17.8	21.7	13.7	16.2	18.8	13.1
08/02/99	19.0	24.8	14.4	17.9	22.1	14.0
08/03/99	18.4	20.5	16.3	17.4	19.6	15.6
08/04/99	19.0	24.4	15.2	17.7	20.6	15.4
08/05/99	19.2	23.6	15.6	17.9	20.9	15.8
08/06/99	19.1	23.6	15.2	17.6	20.2	15.1
08/07/99	19.6	22.8	17.1	17.7	19.8	16.2
08/08/99	17.6	22.8	13.3	16.2	19.0	13.4
08/09/99	18.7	23.6	14.4	17.2	19.8	14.8
08/10/99	18.5	21.7	15.2	17.3	19.3	15.0
08/11/99	17.9	19.0	16.7	16.8	17.8	16.1
08/12/99	17.2	20.9	15.2	16.1	18.3	14.5
08/13/99	15.3	18.2	13.3	15.1	16.5	13.7
08/14/99	13.4	15.2	12.5	13.6	14.5	12.6
08/15/99	13.9	19.0	10.2	13.4	16.1	10.9
08/16/99	15.2	20.1	10.9	14.2	17.7	11.1
08/17/99	16.6	22.1	12.1	15.5	19.0	12.5

Appendix B. Continued.

	Mud Creek			Upper North Fork Payette River		
Date	Mean	Maximum	Minimum	Mean	Maximum	Minimum
08/18/99	17.3	21.3	13.3	16.1	18.5	13.6
08/19/99	19.2	24.4	15.6	17.3	20.2	15.1
08/20/99	18.7	23.6	14.8	17.1	20.1	14.6
08/21/99	18.8	23.6	14.8	17.2	20.2	14.6
08/22/99	19.0	24.0	14.8	17.2	20.1	14.8
08/23/99	17.8	20.9	14.1	16.6	18.6	14.5
08/24/99	18.7	23.2	15.6	17.1	19.0	15.4
08/25/99	18.4	23.2	14.1	16.9	19.8	14.3
08/26/99	18.6	23.6	14.4	17.2	20.1	14.6
08/27/99	19.2	23.6	15.2	18.0	20.7	15.6
08/28/99	19.3	22.1	17.1	17.5	18.8	16.2
08/29/99	18.8	23.6	14.8	17.2	19.8	14.8
08/30/99	17.6	22.1	14.1	16.4	18.8	14.3
08/31/99	15.1	19.0	11.3	13.7	15.6	11.7
09/01/99	13.0	17.4	9.0	12.4	15.1	10.1
09/02/99	11.4	13.3	8.6	11.6	13.7	9.8
09/03/99	11.0	15.9	7.0	11.0	13.4	9.2
09/04/99	11.5	15.2	7.8	11.1	13.7	8.9
09/05/99	12.2	17.4	7.8	11.6	14.8	8.9
09/06/99	14.2	18.6	10.6	12.5	15.4	10.5
09/07/99	12.7	17.4	8.2	11.1	14.0	8.6
09/08/99	12.1	17.1	7.8	11.0	14.3	8.3
09/09/99	11.7	14.8	7.8	11.6	14.3	8.9
09/10/99	13.4	18.2	9.8	12.7	15.9	10.6
09/11/99	12.5	16.7	8.6	11.4	14.6	9.1
09/12/99	11.7	16.7	7.0	10.7	14.2	8.1
09/13/99	12.0	17.1	7.4	11.1	14.6	8.3
09/14/99	12.6	17.8	8.2	11.7	15.3	8.9
09/15/99	13.0	17.8	8.6	11.9	15.4	9.2
09/16/99	12.9	17.4	8.6	11.7	15.6	8.8
09/17/99	13.4	18.2	9.8	12.0	15.8	9.2
09/18/99	13.3	17.4	9.8	12.0	15.9	9.4
09/19/99	12.9	17.4	9.0	11.7	15.8	8.9
09/20/99	12.5	17.4	8.2	11.2	15.3	8.1
09/21/99	12.5	17.4	8.2			
09/22/99	12.9	17.8	9.0			
09/23/99	13.0	17.1	9.0			
09/24/99	14.3	17.1	12.1			
09/25/99	12.5	14.4	10.2			
09/26/99	8.9	10.9	6.6			

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project II: Technical Guidance | Subproject II-C: Southwest Region (McCall)

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

McCall Subregion fishery management personnel responded to more than 300 requests and opportunities for technical input. Comments were provided to state and federal agencies on proposed activities for which they have regulatory authority. Advice and technical assistance were provided to private businesses and the public on activities associated with fish or having impacts on fish populations or fish habitat. The major topics of involvement included stream channel alterations, Idaho Outfitters and Guides licensing, private pond permits, and land management planning. We provided data and technical advice to an increased number of fisheries consultants. The listing of three native salmonids and a petition to protect cutthroat trout *Oncorhynchus clarki* under the Endangered Species Act has increased the number of requests for technical input.

Regional fishery personnel continued participation on a technical advisory committee for the Big Payette Lake Water Quality Council. The group conducted studies, developed a comprehensive technical report identifying nutrient and bacterial contamination sources, and recommended remedial action. The technical report resulted in a lake management plan and an implementation program, which were passed into legislation in the 1998 session.

Fishery personnel participated on a technical advisory committee for the Cascade Restoration Project to improve water quality and fish habitat in Lake Cascade. Lake Cascade is listed as a water quality limited water by the Idaho Division of Environmental Quality, not fully supporting beneficial uses including coldwater biota. The technical advisory committee identified phosphorus sources and developed reduction measures. A Total Maximum Daily Load (TMDL) was established that will result in a 37% reduction in phosphorus loading. Source plans were prepared and an implementation plan was drafted.

McCall regional personnel contributed important fishery sections to Idaho Department of Water Resources Comprehensive Basin Management Plans for the Payette River and the Little Salmon River basins. We also participated on a local working group for a bull trout *Salvelinus confluentus* recovery plan with USFWS and an interdisciplinary team working to rehabilitate streams within the Stibnite mine site.

Two large-scale resort developments required ongoing review and input. WestRock Resort is proposed for the west side of Lake Cascade and could potentially double the population of Valley County. We provided technical review on several components of the proposal. The expansion of Shore Lodge on Payette Lake also required numerous contacts with proponents and opponents. Our participation minimized impacts to the water quality in Payette Lake, impacts to fish habitat immediately downstream in the North Fork Payette River,

and protected the water source for the McCall Fish Hatchery from turbidity and accidental chemical/fuel spills.

We also gave numerous presentations to schools, sportsperson groups, and civic organizations. We answered many questions from the angling public on fishing opportunities, regulations, techniques, and specific waters. Additionally, we maintained fishing reports for the IDFG Internet Homepage and 1-800-ASK-FISH.

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1999 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management

Project III: Habitat Management Subproject III-C: Southwest Region (McCall)

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

McCall area fishery personnel participated in many fora for the restoration, maintenance, and enhancement of fish habitat and water quality. This participation included membership on several technical advisory committees for state and federal planning efforts. Fishery personnel commented on more than 300 requests for input for technical advice. Many proposed land management activities required Idaho Department of Fish and Game (IDFG) review to assure fish habitat consideration. Other natural resource agencies requested contributions to planning documents regarding fishery resources and habitat. Much of our participation is described in the Technical Guidance section of this annual report, as there is considerable overlap between technical guidance and habitat management.

The development of community fishing ponds increases fish habitat, angler opportunity, and overall participation in the sport. The IDFG initiated planning and development of fishing ponds in the communities of Council and Cascade. Both ponds are scheduled for construction within city parks and have strong community support. Cost sharing among the IDFG, the cities and private interests demonstrated the popularity of these ponds. Another existing pond was opened to public fishing as result of negotiations with the new owner of a large golf resort and residential development.

Fisheries personnel identified a need for screening juvenile and adult rainbow trout *Oncorhynchus mykiss* from four ditches on Lake Fork, a tributary to Lake Cascade. A low-tech, flat screen and a fishway were designed and constructed as part of the new diversion structure at Mahala ditch. Various state and federal agencies cost shared with the irrigators to jointly fund this project. Efforts were initiated to reduce fish loss at the other three canal diversions and cooperation with the irrigators will continue to be pursued.

Minimum stream flows are necessary to maintain fish habitat, but Idaho water law and over-appropriated water rights make obtaining adequate flows difficult to obtain. Fishery personnel have negotiated with local irrigators to allow some water to remain in streams whenever the irrigators can accommodate fish needs and still meet irrigation commitments. Although far from adequate, these informal minimum flows greatly improve the conditions when the streams are otherwise totally dewatered for irrigation needs.

A minimum instream flow water right, held by the Idaho Water Resources Board for the upper North Fork Payette River, was approved by the 1999 Idaho legislature. This was the result of an instream flow study that was conducted by regional fishery personnel in 1996.

The upper Little Salmon River has been the focus of riparian and instream habitat improvement activities on private lands for the past four years. The most recent project is a

cooperative effort among IDFG, U.S. Natural Resource Conservation Service, U.S. Fish and Wildlife Service, and a private landowner. A 30-year easement was acquired on 250 acres of meadow floodplain where livestock grazing will be excluded. Riparian planting will commence next year.

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