Colville Tribal Fish Hatchery

Annual Report
2002 - 2003

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Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

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COLVILLE
TRIBAL FISH HATCHERY
ANNUAL REPORT FOR 2003

CCT/RF-2003-1 **December 2003**

Colville Confederated Tribes Fish and wildlife Department
Resident Fish Division

COLVILLE
TRIBAL FISH HATCHERY ANNUAL REPORT FOR 2003

October 1, 2002 – September 30, 2003
CCT Project # 3120
BPA Project # 198503800

Prepared by

Dan Fairbank-Fish Biologist II

With Support From

David Christensen, Rodney Stensgar, Bernadette Fall, Anthony Cleveland, and John Arterburn
Colville Tribal Hatchery Staff

Prepared for

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-3621

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Executive Summary

The Colville Tribal Hatchery produced 62,335 pounds of trout during the contract period, however, only 46,092 pounds were liberated to lakes and streams. The remaining production will be carried over to 2004 to be planted as larger fish into reservation waters for the lakes opener. New raceways were completed in November and brought on line in the spring. These raceways currently hold the redband rainbow brood stock and will be spawned in 2004. Efforts are continuing to capture redbands from other streams in coordination with the monitoring and evaluation program. Creel was expanded by hiring a second creel clerk to give better coverage of reservation waters by reducing travel time. Marking continues on all fish planted from CTH and refinements continue to be made. The first tag retention study has been completed and the second study is now underway to determine long term tag recognition. Lakes continue to be surveyed to complete the baseline analysis of all reservation lakes and will be completed in 2004.

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INTRODUCTION

Federal hydropower projects as well as private power utility systems have had a devastating impact upon anadromous fish resources that once flourished in the Columbia River and it's tributaries. Several areas have been completely blocked to anadromous fish by dams, destroying the primary food resource (salmon) for many native people forcing them to rely heavily upon resident fish to replace these lost resources. The Colville Tribal Fish Hatchery is an artificial production program that addresses the loss of anadromous fish resources in the Upper Columbia Sub-Region within the "blocked area" created by the construction of Chief Joseph and Grand Coulee Dams. This project enhances resident fisheries located in the Intermountain and Columbia Cascade Provinces, specifically within the Colville Reservation portion of the Upper Columbia, SanPoil and Oakanogan Sub-Basins. The project particularly mitigates for anadromous fish losses through protection/augmentation of resident fish populations to enhance fishery potential (i.e. in-place, out -of-kind mitigation) pursuant to Resident Fish Substitution Policy of the Northwest Power Planning Councils Fish and Wildlife Program. The hatchery was accepted into the Council's Fish and Wildlife Program in 1984 and the hatchery was completed in 1990.

The Colville Tribal Hatchery (CTH) is located on the northern bank of the Columbia River just down stream of the town of Bridgeport, Washington that is just down stream of Chief Joseph Dam. The hatchery is located on land owned by the Colville Tribes. The minimum production quota for this facility is 22,679 kg (50,000 lbs.) of trout annually.
All fish produced are released into reservation waters, including boundary waters in an effort to provide a successful subsistence /recreational fishery for Colville Tribal members and provide for a successful non-member sport fishery. The majority of the fish distributed from the facility are intended to support "carry-over" fisheries. Fish produced at the facility are intended to be of sufficient quality and quantity to meet specific monitoring and evaluation goals and objectives outlines in the 2003 statement of work (SOW).

Goal

The goal of the project as stated in the 2003 Statement Of Work (SOW) was to provide artificial production of fish that will help support and enhance tribal subsistence fisheries and non-tribal recreational sport fisheries within the Colville reservation, including it's boundary waters. The majority of the hatchery production provide "carry-over" fisheries rather than a "put-and-take" fisheries.

Hatchery Production

Objectives

1 Integrate triploiding technology and knowledge into the Colville Tribal Hatchery (CTH) yet still maintain a 22,679 kg (50,000 lbs) minimum production of resident salmonids to be planted into reservation waters. See Table 1 for specific tasks.

Table 1.-Tasks by numbers and description from 2003 SOW associated with this objective 1 for Colville Tribal Hatchery production with results from 2003 quantified where possible.

Task	Description	Results/status
1A	Hatch, rear and stock 38,000 lbs. of yearling (5 fish/lb) triploid rainbow trout, 9,600 lbs of triploid sub-yearling (25 fish/lb.) triploid trout, 4,000 lbs of yearling (5 fish/lb.) triploid brook trout, 7,200 lbs of subyearling (25 fish/lb.) brook trout, and 2,595 lbs of subyearling (25 fish/ lb.) or yearling (5 fish/lb.) lahontan cutthroat trout.	Completed/on-going (62,335 pounds)
1B	Hatch, rear and stock 4,480 lbs of redband rainbow trout.	On-going (590 pounds on station)
1C	Provide monthly fish health monitoring for all stocks.	Completed/on-going
1D	Develop the technical expertise and equipment necessary to triploid 500,000 eggs taken at WDFW Goldendale hatchery and deliver eggs to CTH (WDFW in-kind support $7,500).	Completed (1.8 million eggs)
1E	Annually, obtain 800,000 eastern brook trout eggs from Owhi lake brood stock and develop the technical expertise and equipment necessary to triploid 400,000 of these eggs.	Completed/on-going
1F	Determine age structure and growth of spawning population utilizing lengths and otoliths.	Completed/on-going
1G	To reduce costs, obtain 65,000 fingerling lahontan cutthroat trout from WDFW, Omak hatchery at 100-300 fish/lb. (in-kind support $13,000).	Changed to taking spawn at Omak Lake
1H	Obtain and rear 100,000 westslope cutthroat eyed eggs and 26,000 fry from WDFW hatchery located at Lake Chelan (in-kind support $9,200) every 3 years.	Scheduled for 2004

Colville Tribal Hatchery Production 2003

Species	On Station Start		Eggs In	Fry Ponded	# Planted	Lbs. Planted	On Station End	
Rainbow	469,435	(15,298 lbs)	1,869,182	705,806	507,386	37,091	238,472	(30,637 lbs)
Brook	33,638	(1,889 lbs)	660,014	39,490	27,611	5,523	38,847	(2,940 lbs)
Lahontan	75,686	(837 lbs)	44,000	22,000	76,525	3,478	22,000	(100 lbs)
Redband	4,800	(*)	0	0	0	0	4,300	(590 lbs)
Totals	583,559	(18,024 lbs)			611,522	46,092	303,619	(34,267 lbs)

Egg Acquisition

To achieve the minimum production quota, CTH received 1,869,182 green rainbow trout eggs from the WDFW Goldendale Hatchery that were triploided upon arrival at CTH in November and December of 2002. An additional 250,000 green eggs were provided for triploiding from the WDFW Ell Springs Hatchery in January , 2003. Females were stripped at the hatchery and eggs placed in insulated coolers. Males were stripped and the milt placed in ziplock bags. Upon arrival at CTH, the eggs and milt were mixed and allowed to sit for 20 minutes and then placed in a hot water bath at 15 degrees C above ambient temperature for 15 minutes. The eggs were then rinsed and cooled before being placed in hatching jars to eye up. The increase in egg loss for rainbows is due to triploiding techniques and was closely anticipated (50% additional loss). Additional egg losses occurred because of poor hatchery practices and a lack of on site management. There is a large surplus of rainbow eggs available from state facilities so we can afford to lose a high percentage to triploiding at this time and triploiding will only be needed for a couple of more years because we are switching production over to the native redband stocks.

Brook trout eggs were taken from Owhi lake in late October and transported to CTH green. 660,000 eggs were taken but most did not eye up and there were large losses in the incubators due to poor hatchery practices. Age analysis of Owhi lake spawners continues and results show are similar to previous data. The majority (90%) are 3 year old fish.

The raceway expansion was completed by Rognlins construction company in November, on time and within budget, this should improve on-going problems related to limited rearing and holding space.

We experienced considerable mortality related to two separate outbreaks of bacterial coldwater disease (CWD). The disease outbreak was discovered by hatchery employees and verified by Bob Rogers health specialist for WDFW who prescribed medicated feed. This disease is considered common at hatcheries around Washington State. The management priorities for stocking fish into Colville Reservation waters, is to distribute fish at the largest

possible size to improve survival and return to creel, so less fish were stocked and more are being carried over for spring plantings.
Lahontan Cutthroat were spawned at Omak Lake in May, the trap site was located in the northern most embayment of the lake near the mouth of No Name Creek and monitored three days per week throughout the adult collection period.
Spawning consisted of retrieving gravid fish from the holding pens, delivering them to a shore location, where they were held in fresh water until actual spawning. Fish were live-spawned at a 1:1 sex ratio and released back into the lake. Milt activation, egg rinsing and water-hardening occurred with fresh water from the hatchery. The fertilized, water-hardened eggs were transported to the hatchery in 19 liter, insulated water coolers. Biological samples (kidney, spleen and ovarian fluid) were taken from 60 spawned adults during the second spawn take and sent to the Washington Animal Disease Laboratory in Pullman for bacterial and viral analysis.

Incubation

Cutthroat and brook trout eggs were received at the hatchery on the same day as the spawning operation (within a few hours), and immediately surface disinfected with a 10-minute iodiphor bath (100 ppm) and loaded into hatching jars for bulk eyeing. After eye-up, rainbow brook and cutthroat eggs were picked and inventoried before being transferred to vertical heath incubators. The fish were held in vertical incubators from eye to button up when they were transferred to indoor rearing troughs.
Incubation success could be improved by treating eggs with formalin before hatching to reduce fungus formation.

Rearing

Trout were ponded into the inside rearing troughs after button up and observed until 80% swim up occurred at which time they were started on feed. Fish are reared inside the hatchery and fed 6 times per day until they reach approximately 600/ pound and are then transferred to outside raceways.
Fish are reared outdoors until they reach 100/ pound and are then taken off feed to be adipose clipped and elastomer tagged.

Distribution

Fish are outplanted from CTH during the spring (legals) and fall (subyearlings) into reservation lakes using two 1200 gallon fish distribution trucks and one 600 gallon distribution unit. All fish are trucked from the hatchery and no onsite releases are made.

Table 1.- Maximum rearing densities and loadings for the Colville Tribal Hatchery calculated using the load factor method (Piper 1970).

Hatchery Troughs

Max. Flow (GPM)	Length (inches)	Permissible Loadings (Pounds/per trough)	Capacity (Number/trough)	Fish/pound	Loadings Max (lbs/gpm)	Max Density (Pounds/cu.ft)
101	1	110	274594	2500	1.09	0.06
101	2	220	68539	312	2.18	0.12
101	3	330	30480	92.5	3.26	0.19
101	4	439	16783	38.2	4.35	0.25
101	5	549	10929	19.9	5.44	0.31

Outdoor Ponds

Max. Flow (GPM)	Length (inches)	Permissible Loadings (Pounds/per pond)	Capacity (Number/per pond)	Fish/pound	Loadings Max (lbs/gpm)	Max Density (Pounds/cu.ft)
483	2	1051	327764	312	2.18	0.22
483	3	1576	145760	92.5	3.26	0.33
483	4	2101	80193	38.2	4.35	0.44
483	5	2626	52316	19.9	5.44	0.55
483	6	3152	36561	11.6	6.53	0.66
483	7	3677	26642	7.2	7.61	0.77
483	8	4202	20010	4.8	8.70	0.88
483	9	4727	16300	3.4	9.79	1.00
483	10	5253	13331	2.5	10.88	1.11

Marking

Objective 2. – Maintain return to creel between 50 and 66% on a per pound basis and determine the contribution to subsistence and recreational fisheries of naturally produced fish, and hatchery origin fingerling, sub-yearling and legal size fish by developing a marking program for 100% of production for all creeled lakes (Owhi, North Twin, South Twin, Round, McGinnis, Buffalo, and Omak).

Task 2a. - Develop/implement marking program for hatchery origin fish (approx. 1,000,000 fish).

Task 2b. - Conduct roving creel census surveys on Buffalo Lake, Owhi Lake, North Twin Lake, and South Twin Lake.

Task 2c. – Conduct voluntary creel census surveys on all reservation waters not currently creeled.

Task 2d. –Conduct elastomer tag retention study.

Fish marking

A major accomplishment in 2001 was the design, purchase, and construction of a mass-marking trailer (Figure 2). Upon completing the construction of this marking trailer, it was

immediately pressed into service so that all sub-catchable and catchable rainbow, brook, and cutthroat trout on station could be marked before being stocked into reservation waters.
The marking program was originally set up to start tagging in May, but since the hatchery personnel have problems getting their fish to proper size on time, we have moved back the start of the season to June. In 2003, we ad-clipped and elastomer tagged 410,213 fish from June through September. A fluorescent green elastomer was used for 2003 and mark locations were either in the adipose eyelid tissue or in the anal fin depending on what group we were working with.
Northwest Marine Technology personnel made several site visits to CTH this year to help troubleshoot the system. We determined that a different mark location (caudal fin) would be more appropriate for what we are doing and that will be incorporated into the 2004 program.

Figure 2: Fish marking trailer was designed, constructed, and began marking fish in 2001.

Creel Census Activities

Creel Census activities conducted on Owhi, North Twin, and South Twin lakes utilized a roving creel survey with a non-uniform probability sampling (Malvestudo). The Omak Lake creel census is a volunteer creel but is supported by regulation. Voluntary creel surveys were added at McGinnis, Little Goose, and Round lakes in 2003 and a second creel clerk was hired in to provide better coverage of eastside reservation lakes

Creel census criteria of particular interest are species caught, angler effort, average fish length, angler catch rates (ARC), and return to creel observed in these fisheries. Survey data can be used to adjust quantity, size, timing, and species of fish stocked from the Colville Tribal Hatchery and help achieve specific fishery management goals and objectives.

2003 Creel Summary

Water Body	CPUE	Catch by Species		Month Sampled	Total Catch	Comments
Bourgeau Lake	0.6517	RBT	1963	8	1386	Survey 2002
		EBT	578			
		Bass	0			
Buffalo Lake	0.7452	RBT	2854	12	3014	Survey 2003
		EBT	0			
		Bass	0			
		Kok	578			
Elbow Lake	0.64	RBT	247	6	247	Dry most years
		EBT	0			
Hall Creek	1.667	RBT	288	2	288	
		EBT	0			
LaFleur Lake	1.8448	RBT	1563	5	1563	Survey 2002
		EBT	0			
		Bass	0			
Lake Roosevelt	1.5	RBT	753	5	1695	Hells Gate to Res. Border
		EBT	84			
		Bass	84			
		Walleye	774			
Little Goose Lake	2.2024	RBT	202	12	376	Voluntary
		EBT	174			
		Bass	0			
McGinnis Lake	1.0064	EBT	170	12	170	Voluntary
Nicholas Lake	0	RBT	0		0	Survey 2002
		EBT	0			
North Twin Lake	1.17475	RBT	4891	10	9571	Survey 2003
		EBT	2463			
		Bass	2217			
Omak Lake	1.6231	Lahontan	3377	12	3377	Voluntary
Owhi Lake	1.44	EBT	3049	12	3049	Brook Only
Round Lake	1.3167	RBT	811	10	1383	
		EBT	334			
		Bass	238			
Rebecca Lake		RBT	0	12		Little sampling effort
		Bass	4828			

Rufus Woods		RBT		4		Net Pen Fishery
San Poil River		RBT	0	4	0	Little sampling effort
		EBT				
Simpson Lake	0.7143	EBT	144	4	144	
South Twin Lake	1.1305	RBT	4845	10	8613	Survey 2003
		EBT	1762			
		Bass	2006			
Stranger Creek	0	RBT	0	2	0	
		EBT	0			
Sugar Lake	0	RBT	0	4	0	Survey 2002
		EBT	0			
Summit Lake		RBT	0	12	0	Limited sampling effort
		EBT	0			Missed fisherman
Wilmont Creek	0	RBT	0	2	0	
		EBT	0			

Average CPUE Lakes	1.12
Average CPUE Streams	0.56
Total Catch	31,827

Elastomer Tag Retention

A study to determine long-term Elastomer retention rates and differences in retention from various marking locations was initiated in 2001. Four groups of 250 fingerling rainbow trout were marked. Group 1 was marked in the dorsal fin, group 2 in the lower jaw, group 3 in the anal fin, and group 4 in the right eye/cheek. Retention data is collected quarterly and the fish will be planted out in 2004. The fish were sampled and thinned out during 2003 because of a lack of holding space. 400 fish at approximately 6 pounds each are currently being held and tag recognition is 42% on 3 year old fish. Tag recognition may be higher on the next group because we will be using fluorescent colors and different tagging locations.

Objective 3 – Determine potential sources of wild redband trout with potential for utilization as a production source or development of a captive broodstock program to support harvest of native species and reduce reliance upon non-native stocks of rainbow trout.

Task 3a – Conduct presence/absence surveys throughout lotic systems on the Colville Reservation.
Task 3b – Conduct genetic analysis of redband trout identified in 3a.
Task 3c – Develop a redband trout broodstock program at CTH and find a suitable lake to develop a wild brood stock population.

Brood Stock Development and Fishery Monitoring /Evaluation

Brood stock Development

Adult adfluvial rainbow trout were monitored using "picket weirs" in the San Poil River and in Bridge Creek as part of the Lake Roosevelt Tributary/Habitat Enhancement Project in 2003. If any of these populations represent a pure red-band rainbow trout stock then fish will be collected to continue the captive brood stock program at the Colville Tribal Hatchery. Approximately 5,000 pure redbands are being held at CTH now and the first egg takes will occur in 2004.
Portions of this task were scheduled to be eliminated during 2003 because of budget issues, but we did survey a number of streams that were high priority because of the potential for recruitment of fish to managed lakes.
Approximately 100 genetic samples of rainbow trout were collected and sent to the University of Idaho center for threatened and sensitive species to verify pure redbands.

Lake Tributaries

2003 Technical Report

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program

Photo 1. Photos of Omak Lake, Buffalo Lake and Round Lake.

Introduction

From 4/03 to 5/03 five tributary streams to four separate lakes located on the Colville Confederated Tribes Reservation in north central Washington were sampled to determine fish presence/absence and fish habitat parameters. Kartar and no name creek (tributaries to Omak

Lake), Buffalo Lake Creek, Cornstalk Creek (tributary to Round Lake), and Gold Creek (tributary to Gold Lake) were sampled. These samples were performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure while David Christensen, Larry Boyd, Marvin Bob, Bernadette Fall, and Brandit West carried out the field work.

Kartar and No Name Creeks

Kartar Creek is a 1-2 order stream that flows northwest into the southeastern cove of Omak Lake. This stream becomes intermittent in several areas during the dry months of the year (Refer to Photo 1 and Figure 1). The stream flows through sage and bunchgrass habitat types with scattered willows and shrubs along the creek. The watershed has been utilized heavily for livestock grazing. No Name Creek is a 1 order creek that flows into the northwest cove of Omak Lake. This stream flows through agricultural land utilized mostly for the production of sheep and cattle. The riparian area can be very dense with shrubs, cottonwoods, locust and birch.

Omak Lake is the largest alkaline lake in Washington and has a surface area of 3,243 acres with a maximum depth of 325 feet. The lake supports a trophy population of Lahontan cutthroat trout *Oncorhynchus clarki henshawi,* bridgelip suckers *Catostomus columbianus,* peamouth *Mylocheilus caurinus*, redside shiners *Richardsonius balteatus* and sculpin *Cottus sp*. Little is known how much these fish utilize the tributaries for spawning and rearing, especially the cutthroat trout which are currently maintained by tribal hatchery reared stocks.

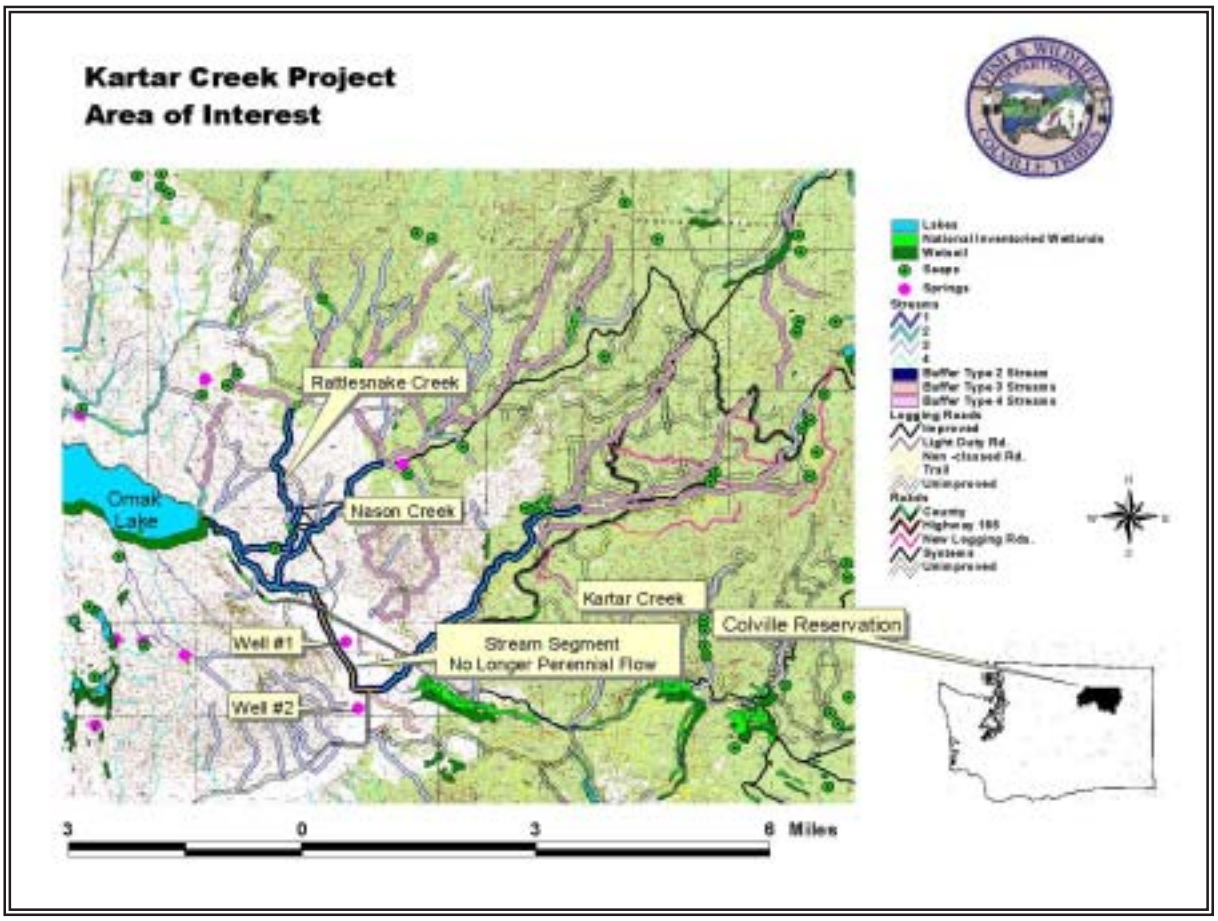


Figure 1. Map view of Kartar Creek and intermittent section on southeastern end of Omak Lake.

Buffalo Lake Creek

Buffalo Lake Creek is a 1-2 order stream that flows into the southeastern end of Buffalo Lake (see Photo 1 and Map 1). The stream has a defined riparian area and originates in a narrow forested canyon. The stream exits the canyon approximately .5 miles before it enters the lake. This section has a less developed riparian and is utilized heavily for cattle grazing.

Buffalo Lake has a population of rainbow trout *Oncorynchus mykiss*, kokanee *Oncorynchus neka*, bridgelip suckers, pumpkinseed *Lepomis gibbosus* and largemouth bass *Micropterus salmoides*. Little is known if rainbow trout or kokanee utilize Buffalo Lake Creek for spawning or rearing.

Cornstalk Creek and Gold Creek

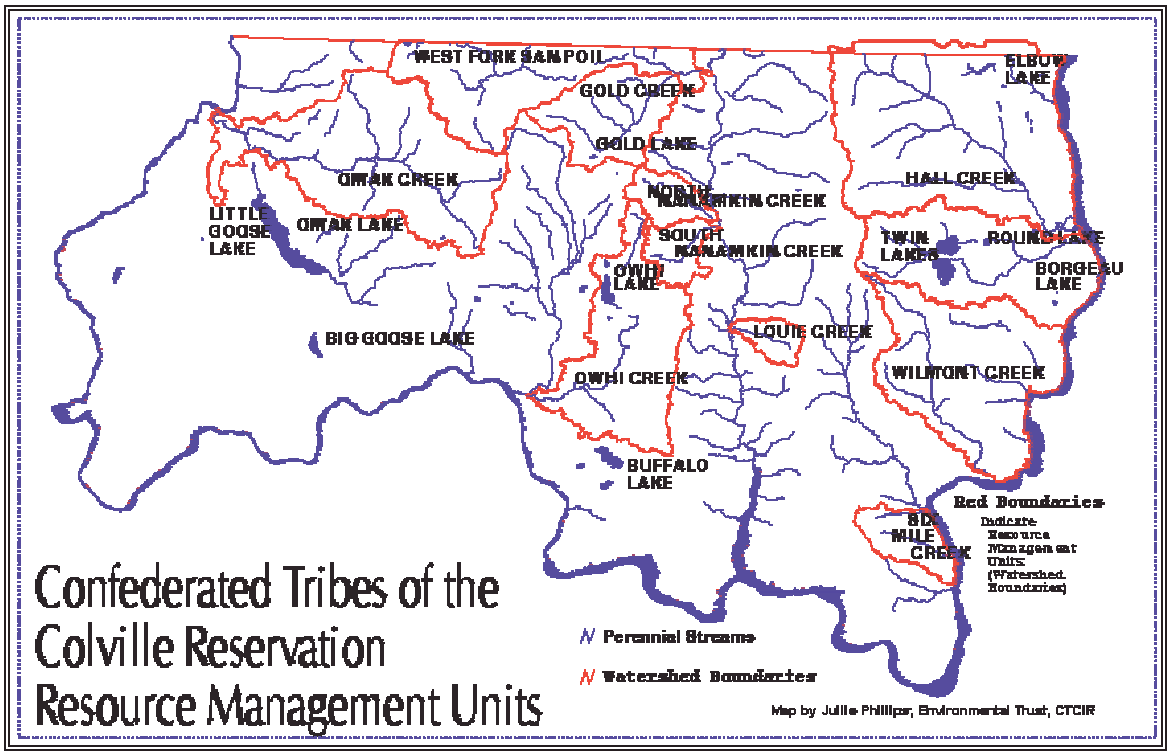
Cornstalk Creek is a 1 order stream that originates from North Twin Lake and flows into the western side of Round Lake (see Map 1). The mouth of the stream is an extensive wetland

system in which the stream widens and slows. This section is dominated by cattails. The remainder of the stream all the way to North Twin Lake flows through dense stands of fir and cedar. The area is utilized for timber extraction and cattle grazing.

Round lake contains populations of brook trout *Salvelinus fontinalis*, rainbow trout, bridgelip sucker, fathead minnow *Pimephales promelas* and golden shiners. Little is known to what level these fish utilize Cornstalk Creek for spawning or rearing. Rainbow and brook trout are stocked in the lake each year.

Gold Creek flows into the southwestern end of the lake (see Map 1). This is a 1-2 order stream that flows through thick stands of fir and cedar. The area is utilized for timber and moderate cattle grazing.

Gold Lake contains a population of brook trout, westslope cutthroat trout *Oncorhynchus clarki* and bridgelip suckers. It has not been determined how these fish utilize the tributary or if they utilize it at all.



Map 1. Map of the Colville Confederate Tribes Reservation located in north central Washington.

Methods

Kartar, No name, Buffalo Lake, Gold, and Cornstalk Creeks were all sampled using the same procedures. Each stream was located on a map and from the map the general locations of 3

possible sample sites were located systematically. The first site was usually at or near the mouth of the tributary where it enters the lake. We would then walk upstream .4-.5 miles and measure a second site and then continue the procedure for the third site. However, with No Name Creek the 3rd sight was the closest to the lake and the 1st sight was the furthest away. A 50m sample section was measured in each area and flagged. A GPS waypoint was set at the downstream end of each sample section.

The section was then electrofished on a 1 pass basis to determine presence and absence of fish species only. We used a 12-B Smith-Root battery powered backpack electrofisher with one person manning the shocker and two netters. Fish were enumerated at a > or < 6 inch basis.

When the electrofishing procedure was finished we measured habitat parameters. We started at the downstream end of the section and every 10m we measured stream width, average depth, riffle/run/pool, velocity, substrate (% sand, silt, clay, cobble, boulder, bedrock), and percent cover (in stream and canopy).

Results

Kartar Creek sampling procedures are represented in Table 1, No name Creek in Table 2, Buffalo Lake Creek in Table 3, Cornstalk Creek in Table 4, and Gold Creek in Table 5. The tables contain information from the electrofishing and habitat sampling procedures for all 5 streams and each section sampled from the stream.

Kartar Creek		transects = 50m					
Section 1	4/3/2003	GPS	N48 14.856 W119 19.8000			Water Temp. 9 C	
Species	> 6 in	< 6 in					
Bridgelip sucker	22						
brook trout		4					
lahontan cutthroat		2					
(m) from bottom		stream	ave. depth	riffle/run/pool	substrate %		% cover
of transect		width (in)	(in)				
0		255	3.65	run	si=10, sa=10, gr=80		c=0, in=15
10		204	5.2	run	si=20, sa=50, gr=30		c=0, in=20
20		94	8.5	run	si=10, sa=10, gr=80		c=0, in=20
30		68	5	run	si=20, sa=60, gr=20		c=0, in=10
40		88	8	run	si=20, sa=80		c=90, in=30
velocity = 4.4ft/s							
Section 2	4/1/2003	GPS	N48 14.857 W119 19.801			Water Temp. 9 C	
(m) from bottom		stream	ave. depth	riffle/run/pool	substrate %		% cover
of transect		width (in)	(in)				
0		182	4.6	riffle	si=5, sa=25, gr=50, co=20		c=20, in=20
10		72	6.2	run	si=10, sa=50, co=40		c=0, in=15
20		106	6.5	riffle	si=10, sa=40, co=50		c=0, in=15
30		66	7.2	run	si=10, sa=80, co=10		c=30, in=30
40		64	10	run	si=10, sa=90		c=10, in=30
velocity = 6.4 ft/s							
Section 3	4/1/2003	GPS	N48 14.634 W119 19.246			Water temp. 10 C	
(m) from bottom		stream	ave. depth	riffle/run/pool	substrate %		% cover
of transect		width (in)	(in)				
0		68	12.6	run	si=10, gr=80, co=10		c=70, in=40
10		72	8.5	run	sa=20, gr=40, co=30, bo=10		c=85, in=40
20		56	9	run	sa=25, gr=30, co=40, bo=5		c=10, in=35
30		61	9.1	run	sa=45, co=45, bo=10		c=0, in=20
40		59	7	run	sa=40, gr=10, co=40, bo=10		c=70, in=40
velocity = 4.1 ft/s							

Table 1. Fish and habitat parameters for Kartar Creek. C=clay, si=silt, sa=sand, gr=gravel, co=cobble, bo=boulder, be=bedrock, c=canopy, and in=instream.

No Name Creek			transects = 50m					
Section 1	4/2/2003		GPS	N48 19.631 W119 26.040			Water Temp.= 11 C	
species	> 6 in	< 6 in						
no fish sampled								
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (in)	(in)				
0			144	21	pool	si=10, sa=90		c=95, in=40
10			54	7.3	pool	sa=5, gr=5, be=90		c=80, in=40
20			36	8.8	run	sa=60, gr=40		c=50, in=30
velocity = 2 ft/s								
Section 2	3/31/2003		GPS	N48 19.861 W119 26.174			Water Temp.=11 C	
species	> 6 in	< 6 in						
no fish sampled								
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (in)	(in)				
0			139	4.8	pool	si=50, sa=50		c=80, in=50
10			149	5.2	run	si=50, sa=50		c=95, in=50
20			68	9.2	run	si=30, sa=70		c=75, in=65
30			52	8.8	run	si=50, sa=50		c=100, in=70
40			58	10.2	run	si=50, sa=50		c=75, in=90
velocity = 2.7 ft/s								
Section 3	3/31/2003		GPS	N48 19.704 W119 26.099			Water Temp.=12 C	
species	> 6 in	< 6 in						
no fish sampled								
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (in)	(in)				
0			61	6.6	run	sa=90, gr=10		c=75, in=65
10			52	7.8	run	sa=35, gr=65		c=40, in=25
20			40	5.6	run	sa=70, gr=30		c=75, in=10
velocity = 2 ft/s								

Table 2. Fish and habitat parameters for No Name Creek. C=clay, si=silt, sa=sand, gr=gravel, co=cobble, bo=boulder, be=bedrock, c=canopy, and in=instream.

Buffalo Lake Creek			transect = 50m					
Section 1	4/7/2003		GPS	N48 19.869 W119 26.180			Water Temp. 6 C	
Species	> 6 in	< 6 in						
brook trout	1							
dace		1						
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			4.1	5	riffle	sa=40, gr=60		c=0, in=25
10			3.6	4.3	run	sa=40, gr=60		c=0, in=10
20			3.1	4.3	run	si=10, sa=40, gr=50		c=0, in=5
30			5.4	4.6	run	si=20, sa=20, gr=60		c=0, in=15
40			2.6	5.6	run	sa=40, gr=60		c=0, in=5
velocity = 6.6 ft/s								
Section 2	4/7/2003		GPS	N48 03.205 W118 52.149			Water Temp. 6 C	
Species	> 6 in	< 6 in						
brook trout	1							
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			3.5	5.8	run	si=10, sa=30, gr=60		c=15, in=20
10			2.2	5.2	run	sa=40, gr=60		c=65, in=25
20			3.4	7.8	run	sa=50, gr=50		c=10, in=15
30			3.7	4.5	run	sa=30, gr=70		c=60, in=20
40			2.6	9.8	run	sa=70, gr=30		c=40, in=15
velocity = 5.8 ft/s								
Section 3	4/7/2003		GPS	N48 03.163 W118 52.000			Water Temp. 6 C	
Species	> 6 in	< 6 in						
brook trout	1							
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			2.9	7.2	run	sa=20, gr=80		c=10, in=15
10			3.6	4.5	run	gr=100		c=75, in=40
20			3.4	7	run	sa=10, gr=90		c=75, in=5
30			3.5	4	run	sa=20, gr=80		c=15, in=5
40			2.2	4.5	riffle	sa=20, gr=80		c=10, in=5
velocity = 6.2 ft/s								

Table 3. Fish and habitat parameters for Buffalo Lake Creek. C=clay, si=silt, sa=sand, gr=gravel, co=cobble, bo=boulder, be=bedrock, c=canopy, and in=instream.

Cornstalk Creek			transect = 50m					
Section 1	4/9/2003		GPS	N48 17.524 W118 20.245			Water Temp. 6 C	
Species	> 6 in.	< 6 in.						
brook trout		3						
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			5	6.8	riffle	sa=20, gr=80		c=95, in=15
10			2.4	9.5	run	sa=30, gr=70		c=95, in=25
20			2.6	13	run	si=10, sa=30, gr=60		c=100, in=45
30			2.2	7.6	run	sa=30, gr=70		c=65, in=25
40			3	9.2	run	sa=20, gr=80		c=75, in=35
velocity = 7 ft/s								
Section 2	4/9/2003		GPS	N48 17.557 W118 20.341			Water Temp. 6 C	
Species	> 6 in.	< 6 in.						
brook trout		7						
H RBT	1							
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			2.4	7.3	riffle	sa=20, gr=80		c=40, in=20
10			2	9.2	riffle	sa=20, gr=80		c=90, in=20
20			2.3	6.5	run	sa=10, gr=90		c=90, in=30
30			1.9	6	run	sa=30, gr=70		c=60, in=40
40			2	7.5	run	sa=20, gr=80		c=60, in=10
velocity = 7.5 ft/s								
Section 3	4/9/2003		GPS	N48 17.618 W118 20.534			Water Temp. 9 C	
Species	> 6 in.	< 6 in.						
brook trout		3						
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			1.9	9.2	riffle	sa=10, gr=90		c=70, in=30
10			2.2	6.2	riffle	sa=30, gr=70		c=70, in=30
20			1.7	8	riffle/pool	sa=20, gr=80		c=60, in=30
30			2.4	6	rifle	sa=20, gr=80		c=55, in=80
40			1.8	6.2	riffle/pool	sa=20, gr=80		c=90, in=40
velocity = 5.7 ft/s								

Table 4. Fish and habitat parameters for Cornstalk Creek. C=clay, si=silt, sa=sand, gr=gravel, co=cobble, bo=boulder, be=bedrock, c=canopy, and in=instream. H RBT = hatchery reared rainbow trout.

Gold Creek			transect = 50m					
Section 1	5/6/2003		GPS				Water Temp. 4 C	
Species	> 6 in	< 6 in						
no fish sampled								
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			3.1	18.3	run	si=20, sa=20, gr=60		c=0, in=15
10			2.9	9.8	run	si=5, sa=20, gr=75		c=0, in=5
20			3.7	10	run	sa=10, gr=90		c=0, in=10
30			4.5	8.8	run/pool	si=40, sa=60		c=0, in=0
40			3.2	15.5	pool	si=5, sa=15, gr=80		c=30, in=30
velocity = 4.3 ft/s								
Section 2	5/6/2003		GPS	N48 21.911 W118 56.225			Water Temp. 4 C	
Species	> 6 in	< 6 in						
brook trout		1						
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
0			6	9.2	run/pool	si=20, sa=10, gr=70		c= 10, in=30
10			4.4	10.5	run	si=5, sa=10, gr=75, co=10		c=5, in=5
20			3.1	12.8	run	si=10, gr=80, co=5, bo=5		c=30, in=30
30			2.2	21.2	run/pool	si=20, sa=80		c=50, in=50
40			4.3	12.5	run	si=40, sa=50, gr=10		c=0, in=20
velocity = 4.2 ft/s								
Section 3	5/6/2003		GPS	N48 21.914 W118 56.309			Water Temp. 4 C	
Species	> 6 in	< 6 in						
brook trout		1						
H BKT		1						
H w estslope								
cutthroat	1	1						
(m) from bottom			stream	ave. depth	riffle/run/poo	substrate %		% cover
of transect			w idth (m)	(in)				
10			13.1	4.3	run	si=30, sa=20, gr=50		c=15, in=15
20			4.6	9	run/pool	si=50, gr=50		c=15, in=50
30			2.7	7.6	run	gr=100		c=60, in=15
40			2.9	15.5	run	si=10, sa=10, gr=80		c=75, in=40
50			5.1	6.3	riffle	si=20, sa=5, gr=60, co=15		c=10, in=30
velocity = 5.9 ft/s								

Table 5. Fish and habitat parameters for Gold Creek. C=clay, si=silt, sa=sand, gr=gravel, co=cobble, bo=boulder, be=bedrock, c=canopy, and in=instream. H westslope cutthroat = hatchery reared fish.

Discussion

Kartar Creek

The Kartar Creek electrofishing sample yielded 22 bridgelip suckers over 6 in., 4 brook trout less than 6 in. and 2 Lahontan cutthroat under 6 in. (Table 1). All suckers were concentrated in the first 20m of the first transect at the lake mouth. These fish may have been preparing to spawn since bridgelip suckers occasionally reproduce in streams in the spring. The presence of these fish may have also been due to avoiding predation by cutthroats in the lake. Four juvenile brook trout suggest there is at least a small resident reproducing population in the stream. No brook trout have been sampled from the lake and brook trout do not survive well physiologically in alkaline waters such as Omak Lake. Kartar Creek is not stocked by the tribal hatchery. Two hatchery reared Lahontan cutthroat < 6 in. that were planted originally in Omak Lake were sampled from the stream. The presence of the juvenile brook and cutthroat trout and the habitat sampled (Table 1) suggests that at least minimal rearing habitat exists in the stream.

During the time of sampling adult Lahontan cutthroat were congregating in the lake in preparation for spawning. While measuring habitat parameters, 1 adult cutthroat (18-20 in) was observed swimming upstream in Kartar Creek. Most likely this fish was preparing to spawn in the creek. Habitat data taken from the three sample sites suggest potential spawning habitat due to the abundance of gravel in selected areas (Table 1). However, in returning to the sight in 5/03 the water was much higher and off color. Many of the graveled areas were smothered with sand washed down from upstream. Specific studies would have to be conducted to determine the level of escapement and natural recruitment of adfluvial Lahontan cutthroat in the creek.

Table 1 shows that canopy cover is nonexistent in 7 out of 15 sampled areas in the three separate transects. Four of the remaining 8 sites had canopy cover < 30 % (Table 1). The absence of riparian habitat was prevalent throughout the stream corridor and appears to be due to cattle grazing. Riparian improvements may be enough to reduce dewatering (Figure 1) and sedimentation. Such improvements could have a beneficial effect on natural cutthroat recruitment.

No Name Creek

No fish were sampled during the electrofishing survey conducted on the stream (Table 2). Only one potential migration barrier existed at the start of transect 1 which was the furthest transect from the lake in this survey. The barrier was a flow gauge at a natural plunge falls. The falls was approximately 4-5 feet tall. However, residents in the agricultural area upstream have reported seeing adult adfluvial Lahontan cutthroat above the falls, which suggests that no migrational barrier exists. Only our 3rd transect which was closest to the lake showed adequate spawning gravel for adfluvial or resident fish. All three samples from this transect had gravel percentages of 10-65 % (Table 2). Two large adult Lahontan cutthroat (18-22 in.) were observed spawning over a redd between transect 2 and 3. Studies would be needed to determine the level of natural escapement and recruitment of adfluvial cutthroat in the creek.

Much of the lower creek is channelized by wood flanks installed years ago in an attempt to trap adfluvial cutthroat for spawning purposes. Removal of these flanks could allow for a more

natural flow regime and depositional pattern. This could increase rearing and spawning habitat in the lower section of the creek.

Buffalo Lake Creek

Brook trout were sample from all three transects. All fish were < 6 in. except for 1 brook trout sampled near the lake in the 1st transect (Table 3). One dace *Rhinichthys sp*. was sampled from the first transect. All three transects had gravel deposits between 30-100 % (Table 3). All transects had minimal rearing habitat as well, represented by the presence of brook trout and the percent cover values in Table 3.

A shallow outwash fluvial deposit in the lake may potentially limit adfluvial fish movement into the creek for spawning purposes. However, small channels in the deposit up to 8 in. deep may allow for some fish passage. During spring runoff events the water level would be much higher and may be a time when lake type fish can access the creek. Specific escapement and recruitment studies would have to be conducted in the stream to determine adfluvial fish use of the creek.

Cornstalk Creek

A total of 13 brook trout were sampled from the three transects. All but 1 of these fish were < 6 in. (Table 4). One hatchery rainbow trout > 6 in. was sampled from the 3rd transect. The creek is not stalked with trout so the rainbow must have migrated up from Round Lake or down from North Twin Lake. The sample sections all contained good canopy and instream cover (Table 4). Each section also had high levels of gravel deposits from 60-90 % of the total substrate (Table 4). Due to the abundance of quality spawning and rearing habitat there is a potential that fish from Round Lake are utilizing the stream for spawning purposes. A high percentage of the brook trout sampled from Round Lake during the lake survey in 6/03 were wild and stunted. Stunted populations of brook trout are typically seen when reproduction and survival is high.

Gold Creek

No fish were sampled in the first transect nearest the lake. However, 2 wild brook trout < 6 in. and 1 hatchery brook trout < 6 in. were sampled from the 2nd and 3rd transects. Two hatchery reared westslope cutthroat trout one < 6 in. and the other > 6 in. were sampled from the 3rd transect (Table 5). These are fish that were planted into the lake and migrated upstream. Due to the abundance of gravel and rearing habitat in many of our sample sites, these fish could potentially reproduce and develop a naturalized resident or adfluvial population. Continual studies would need to be conducted to determine if this is occurring over time. Currently, it does not appear to be the case.

Objective 4 – Collect temperature, bathymetry, and oxygen profiles plus presence/absence data for 5 lakes per year for lakes currently stocked by this program and for new potential fisheries.
Objective 5 – Collect relative abundance data on 5 lakes per year currently being stocked by the CTH that do not have a creel census component.
Objective 6 – Evaluate the populations of non-native, non-salmonid species illegally introduced into lakes currently being stocked by this program with emphasis on largemouth bass.

Buffalo, Round, Gold, North Twin and South twin lakes were surveyed this year as part of the ongoing monitoring and evaluation program to obtain baseline information and develop management plans. Complete technical reports are included on following pages.

Buffalo Lake

2003 Technical Report

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program

Photo 1. East facing view of Buffalo Lake located 9 miles northeast of Coul

Introduction

Buffalo Lake is located approximately 9 miles northeast of Coulee Dam in Okanogan County on the Colville Confederated Tribes Reservation in north central Washington State. From June 2 to June 4, 2003 the lake was sampled to determine habitat, fish population parameters and wild/hatchery fish interactions. This sample was performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure, while David Christensen, Larry Boyd and Marvin Bob carried out the fieldwork.

Buffalo Lake is a 539 acre body of water and is fed by 1 unnamed tributary that enters on the southeast end. The lake contains no actual outlet and is greatly subject to climate and water conditions. The lake is surrounded by high rolling hills covered in grasses, sagebrush and scattered Ponderosa pine. The southeast end is dominated by P. pine. The open hills are used for cattle grazing while logging has occurred on the forested slopes. Nutrification of the lake has led to extensive weed bed development on the southeastern end. Crawfish are extremely abundant in the lake along all shorelines.

Table 1. Physical Data of Buffalo Lake	
Elevation	2,402 ft
Surface Area	539 ac
Volume	33,700 ac-ft
Maximum Depth	121 ft
Mean Depth	70 ft
Trophic State	Mesotrophic

Access to the lake is good from the northwest end by paved road and the entire southern shoreline is accessible by a maintained single-track dirt road. Reynolds Resort is located in the furthest northwest cove and offers camping, boating, fishing and swimming. Development of a few small cabins and summer homes has occurred along the southern shoreline but is not extensive.

The lake contains an illegally introduced population of largemouth bass *Micropterus salmoides* and pumpkinseed *Lepomis gibbosus*. Both species are extensive in the lake. However, pumpkinseed are limited to the southeast shoreline where weed growth is most extensive but also exist sporadically in other shallow coves along the north shore. Largemouth bass were located in any area in the lake where cover was present (i.e. logs, beaver lodges, weed beds, rocks). Three black crappie *Pomoxis nigromaculatus* were sampled near the tributary inlet. During the 3 night sampling period in 6/03, 101 bass and 331 pumpkinseed were sampled. All pumpkinseeds were smaller than 149mm minus 1 fish that was 170mm. Sixty-one percent of the bass sampled were greater than 300mm.

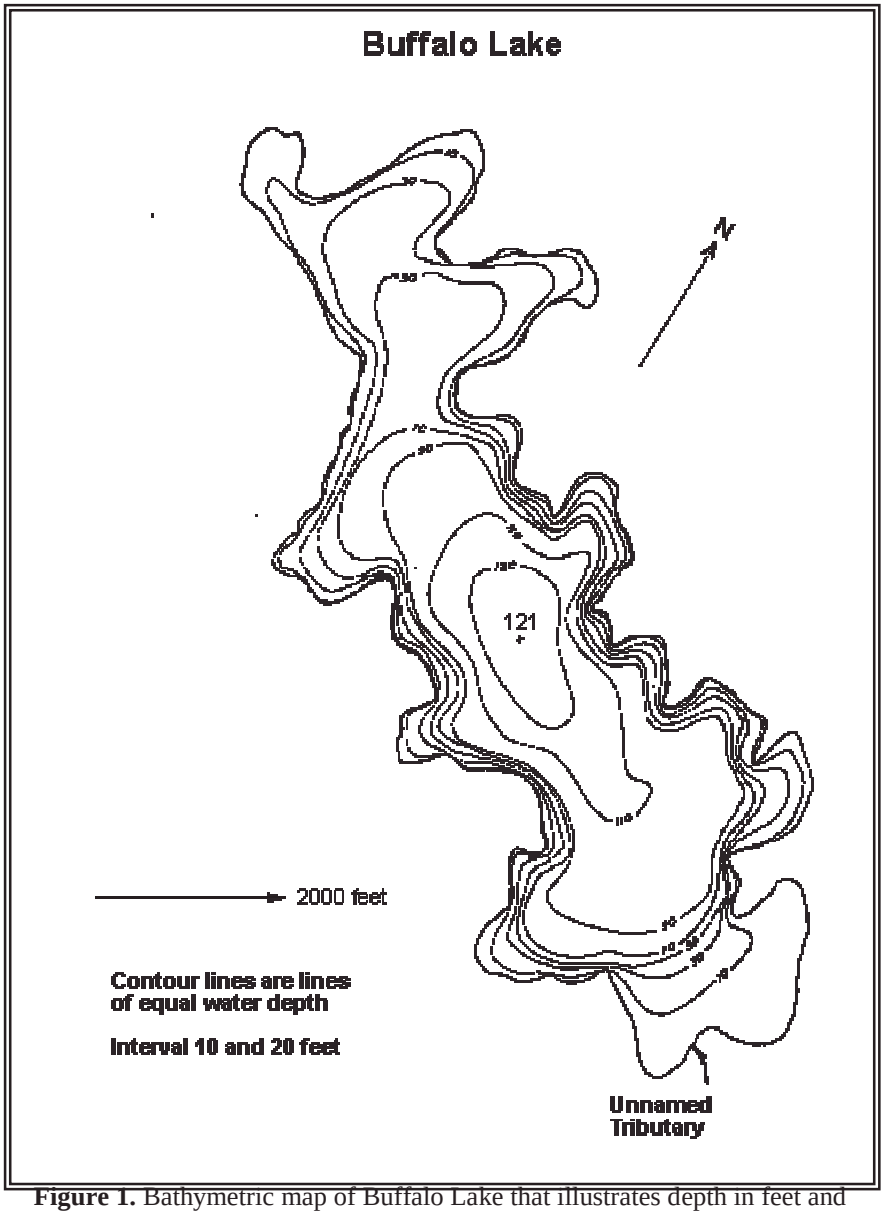


Figure 1. Bathymetric map of Buffalo Lake that illustrates depth in feet and unnamed tributary. Map extracted from (www.wsu.edu/cctfish/buffalo.html).

Rainbow trout *Oncorhynchus mykiss* and kokanee *Oncorhynchus nerka* also exist in the lake and appeared in our samples. During the 6/03 sampling period 211 rainbow trout and 18 kokanee were captured. Rainbow trout ranged from 140mm to 469mm in size and kokanee were 220mm to 409mm in size. For the last four years 20,000 – 65,000 rainbow trout have been planted in the lake each year. Kokanee are a self-sustaining population that originated from a 1958 stocking conducted by the Washington Department of Fish and Wildlife (Halfmoon, 1978). Brook trout *Salvelinus fontinalis* have appeared in past samples, creel

surveys, and have been planted historically but did not appear in our samples. Bridgelip suckers *Catostomus columbianus* were also present and comprised 12% of the total sample.

Methods

Buffalo Lake was sampled for three nights using two 250 ft. by 6 ft. sinking experimental monofilament gill nets. The nets were set at 8:30 pm and pulled the next day at 7:30 am for an approximate set of 11 hours. One net was set along the northeastern shore while the second was set along the southwestern shoreline.

Two trap nets with two leading ends were used for one night. One trap net was placed in the cove by Reynolds Resort, the other was placed near the tributary inlet on the southeastern end of the lake. Both were placed in approximately 4 feet of water for one night. The net was set at 9 pm and pulled the next day at 6 am for an approximate set of 9 hours. Refer to Figure 1.

The entire shoreline of Buffalo Lake was sampled using a Smith-Root GPP 5.0 electrofishing boat with umbrella shaped anodes and hanging cable cathodes. The boat was fixed with a 5000-watt generator. Range and duty cycle were adjusted when appropriate to solicit fish taxis (response to electrical current). Sampling the entire shoreline took approximately 3 nights.

All rainbow trout, kokanee and bridgelip suckers were sampled for length and weight. Rainbows were sampled for elastomer tag identification. Largemouth bass and pumkinseed were sampled for length and weight measurements. Community composition, relative abundance, length class frequencies and relative weights (Wr) were determined for rainbow trout, kokanee and largemouth bass. Preferred stock densities (PSD) were determined for largemouth bass. Only fish over 150mm were considered in the samples due to collection bias associated with smaller fish.

Relative weights (Wr) were determined by two formulas:

1. Power Function Ws = a*(L^b)

Estimated values of (a) and (b) come from the regression line graphed from the log length (x-axis) against the log weight (y-axis) of the species. The slope is represented by (a) while the y-intercept is represented by (b). These values can be obtained for the species on page 462, Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

2. Relative Weight Wr = 100*(W/Ws)

Preferred stock density (PSD) was calculated by the equation:

PSD = (# of fish >or= minimum quality length / # of fish >or= stock length) * 100

Minimum quality and stock lengths for various species is contained on page 464, Table 15.2 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

Habitat data was collected from Buffalo Lake on 6/09/03. Information collected were secchi disc depth, conductivity, percent littoral macrophyte community, three macroinvertebrate samples from random locations using D-nets, three zooplankton samples taken from each third of the length of the lake with a standard hoop trawl. Macroinvertebrate and zooplankton samples will not be processed until winter and will not be discussed in this report. Oxygen and temperature profiles were taken from the deepest location in the lake with an Oxy-guard meter.

Results

The 6/03 sampling procedures yielded 211 rainbow trout, 16 kokanee, 101 largemouth bass, 331 pumkinseed, 3 black crappie and 90 bridgelip suckers. Rainbow trout comprised 28%, kokanee 2%, largemouth bass 13%, pumkinseed 44% and bridgelip suckers 12% of the sampled population. Refer to Figure 2 for species composition histogram.

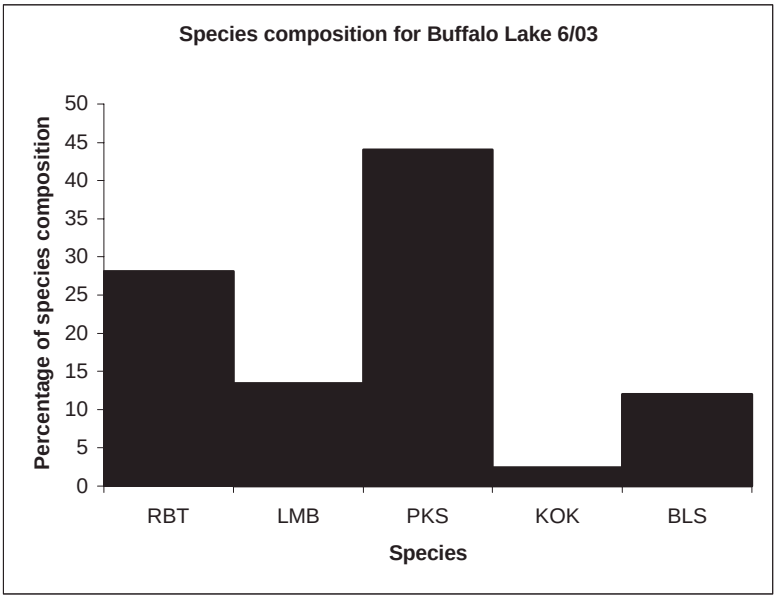
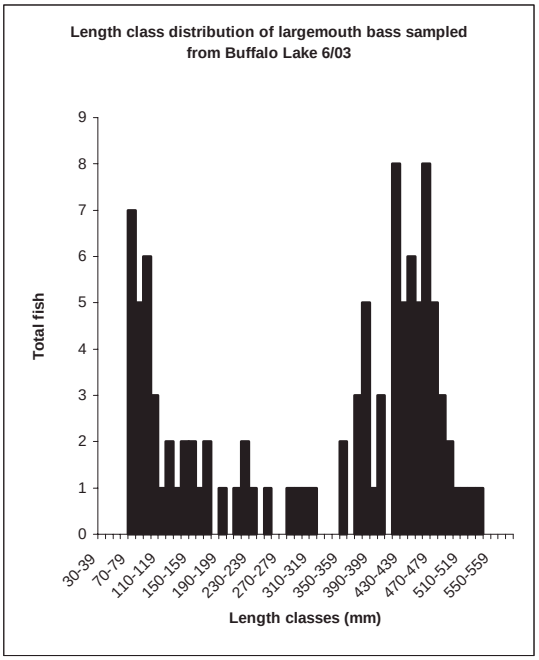


Figure 2. Species composition histogram of fish sampled from Buffalo Lake 6/03. Rainbow trout RBT, largemouth bass LMB, pumpkinseed PKS, kokanee KOK and bridgelip sucker BLS.

Figure 3 and 4 are histograms representing length class distribution for largemouth bass and pumkinseed sampled from Buffalo Lake during the 6/02/03 sampling period. Sixty-one percent of the largemouth bass were over 300mm. Thirty-two percent of the bass were under 179mm. Seven percent of the bass were between 180mm-300mm. Bass PSD was 90. Three hundred and thirty of 331 pumpkinseed were under 149mm. Pumpkinseed PSD was 0.



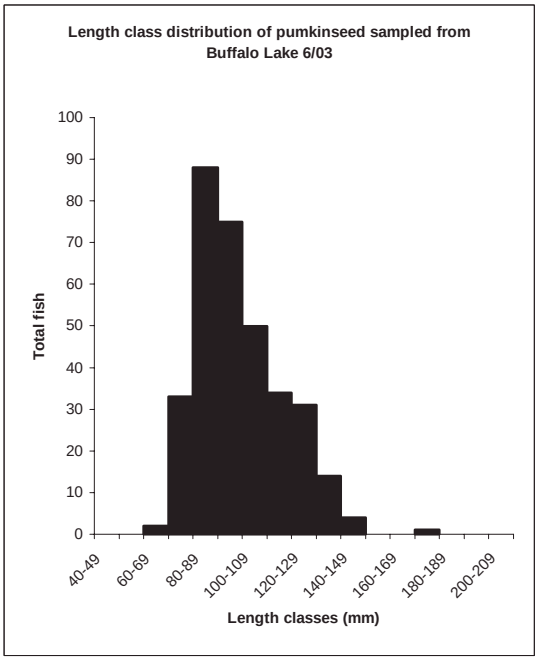
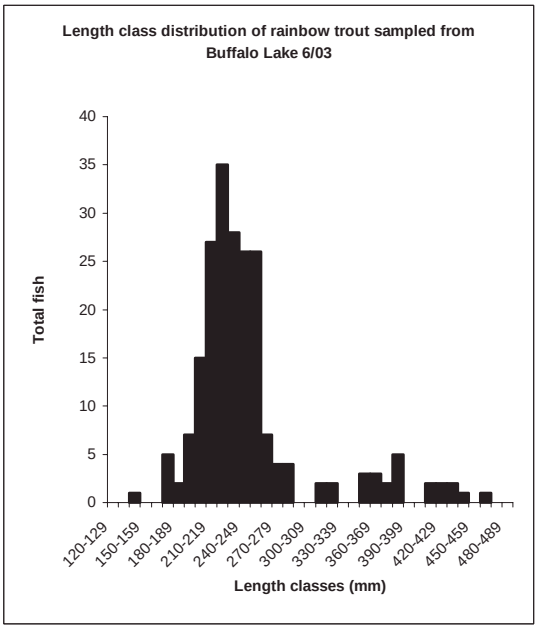


Figure 3 and 4. Length class distribution of largemouth bass and pumkinseed sampled from Buffalo Lake 6/03.

Figure 5 and 6 are histograms representing sampled populations of rainbow trout and kokanee. Eighty- eight percent of the 211 rainbow trout sampled were smaller than 289mm. The remaining 12% ranged in size from 310mm-469mm. Kokanee ranged in size from 220mm-409mm. Fifteeen of the 16 sampled fish were between 280mm-409mm and exhibited an even distribution.



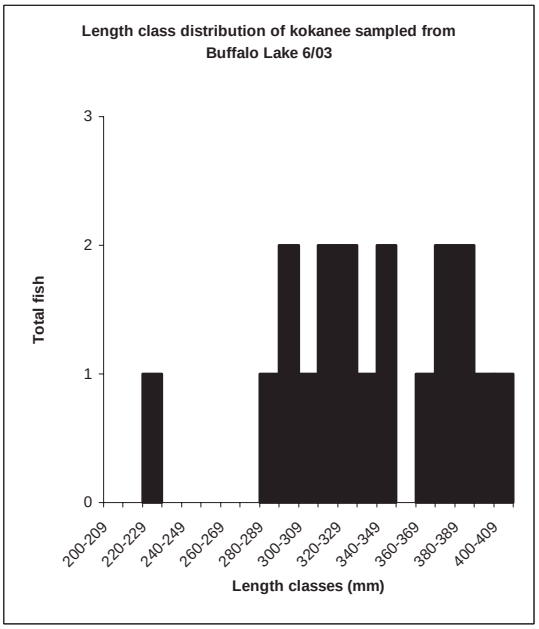


Figure 5 and 6. Length class distribution of rainbow trout and kokanee sampled from Buffalo Lake 6/03.

Figure 7 is a histogram for bridgelip sucker length class distribution. Bridgelip suckers ranged in size from 90mm-439mm. Of the 90 fish sampled 53% were between 360-439mm. Twenty-one percent were between 90mm-119mm and 25% between 150mm-199mm.

Relative weights (Wr) for largemouth bass are expressed in Figure 8. All Wr values are between 61 and 138. Pumpkinseed Wr values were not determined due to inaccuracy in weight measurements. Figure 9 contains Wr values for rainbow trout. Relative weights for rainbows were all between 76 and 145. Fish between 140mm-280mm had an average Wr of 86 while fish from 310mm-460mm had an average Wr of 109. Kokanee Wr values range from 79 to 128. In general, Wr values decrease as the length of the kokanee increases. See Figure 10. Rainbow trout and largemouth bass Wr values increase with an increase in fish length.

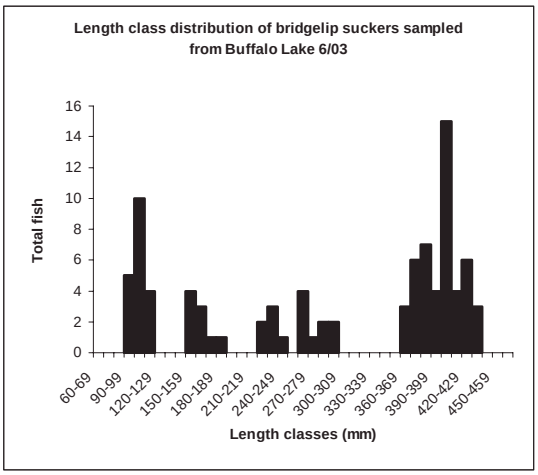


Figure 7. Length class distribution of bridgelip sucker sampled from Buffalo Lake 6/03.

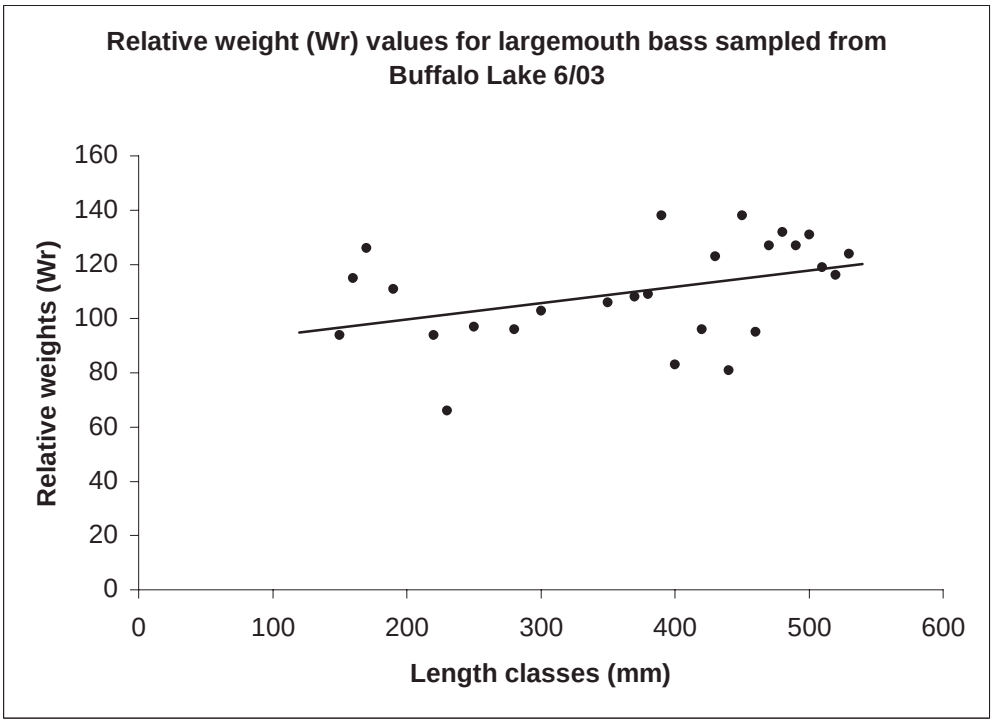
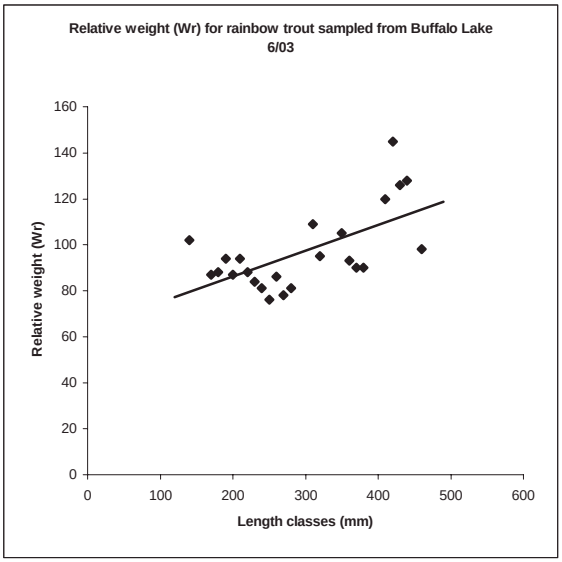


Figure 8. Relative weight (Wr) distribution for largemouth bass sampled from Buffalo Lake 6/03.



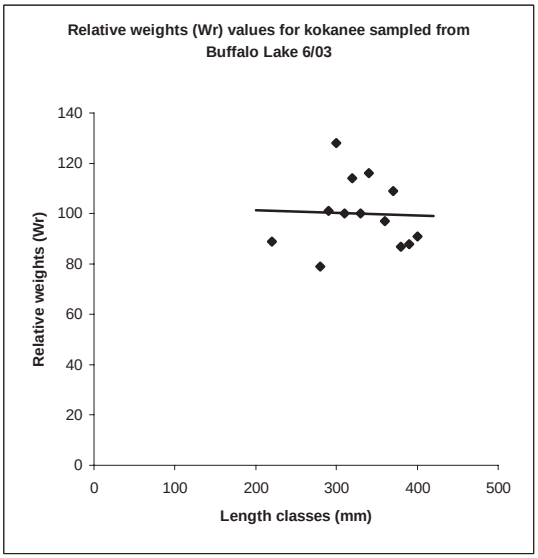
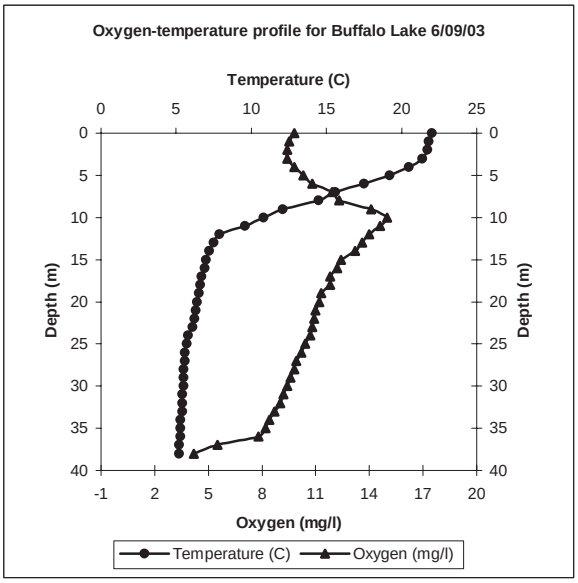


Figure 9 and 10. Relative weights (Wr) distribution for rainbow trout and kokanee sampled from Buffalo Lake 6/03.

Conductivity for Buffalo Lake was 128 microseimens. Approximately 10% of the littoral zone contained dense aquatic macrophytes. All macrophyte growth was on the southeast end where the inlet enters the lake. Figure 11 and 12 are oxygen-temperature graphs for Buffalo Lake on 6/09/03 and 2/13/03. The 6/09/03 graph shows a temperature of 22 C at the surface decreasing to 19.2 C at 5m. Dissolved oxygen levels increased from 9.8mg/l at the surface to 14.6mg/l at 11m. Then dissolved oxygen levels decreased to 5.5mg/l at 37m and 4.2mg/l at 38m. On 2/13/03 dissolved oxygen was 13.2mg/l at the surface and increased to 14.3mg/l at 8m. From a depth of 8m the dissolved oxygen content decreased until reaching a maximum low of 11.5mg/l at 36m.



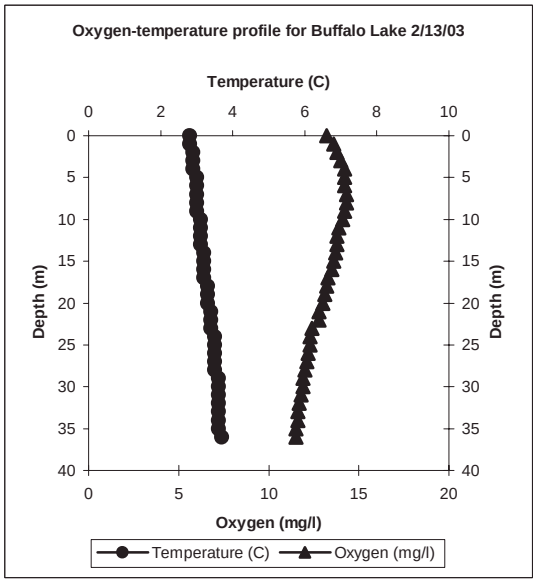


Figure 11 and 12. Oxygen-temperature graphs for Buffalo Lake representing sampling periods 6/09/03 and 2/13/03.

Discussion

Figure 3 shows that sixty-one percent of the 101 largemouth bass sampled are over 300mm. The largemouth bass PSD of 90 also is an expression of high numbers of large fish >300mm in comparison to few smaller but reproductively capable fish >200mm. In general, bass populations such as these tend to have good recruitment but poor survival of juvenile fish to larger sizes. This poor growth and survival of largemouth bass may be due to competition with an overpopulation of stunted pumpkinseed in Buffalo Lake. See Figure 4 for pumpkinseed length class histogram.

Pumpkinseed have a PSD of 0 indicating an overpopulated and stunted population. The length class histogram in Figure 4 supports this claim by expressing 99.6% of the population is under 140mm. Small pumpkinseed compete for the same food resources that juvenile bass consume such as zooplankton and macroinvertebrates. Juvenile bass growth and survival then decrease. Once the few juvenile bass that manage to survive become large enough to predate on the pumkinseed, growth and survival increase leading to a population of large bass. High relative weights (Wr) for largemouth bass >150mm suggest the fish are growing well and have a surplus of food in the lake. See Figure 8 for largemouth bass relative weights. However, the number of large bass is not great enough to crop the pumpkinseed population in Buffalo Lake.

Largemouth bass in Buffalo Lake may also be predating heavily on the abundant crawfish that exist along the shorelines. During the night electrofishing sampling routine many large bass were sampled in open sandy areas that supported large crawfish populations. Because crawfish are so abundant and easier to catch than pumpkinseeds, largemouth bass may have developed a preference for them. This could decrease predation on pumpkinseeds even further leading to overpopulation and stunting.

The absence of many mid-sized bass in the sample could also be due to human harvest. See Figure 3. The harvest limit is 25 fish of any size. If mid-sized bass (200mm-350mm) are kept the most the result could be a population dominated by large bass and reduced predation on pumkinseed. Mid-sized bass generally make up the majority of a predating population. Harvest records would need to be summarized and analyzed to determine if harvest or environmental factors are affecting the bass.

Of 211 rainbow trout sampled, eighty-eight percent were smaller than 289mm. See Figure 5. This smaller size group had an average relative weight (Wr) of 86 while fish greater than 300mm had an average Wr of 109. Of the 185 fish in the smaller size range 130 had adipose fin clips and 25 had orange elastomer tags. The orange tag indicates the fish were part of the 6/03 plant. Most likely all of the fish in this size grouping were part of the 6/03 plant. The lower relative weights (Wr) of these fish are typical of recently stocked fish trying to adapt to a new environment. See Figure 9.

Only three of the 26 rainbow trout that were greater than 300mm had adipose fin clips. All three of these fish contained white elastomer tags which indicates they were planted in the spring of 2002. All the other fish are assumed to be wild or individuals that never received marks while at the tribal hatchery.

Only 18 kokanee were sampled during the 6/03 sampling period. This restricts what the length class histogram in Figure 6 can reveal about the population. Figure 6 shows that the fish are equally distributed across lengths from 280mm to 409mm. In general, relative weights (Wr) for kokanee are good with the trend line being near 100 for all lengths as illustrated in Figure 10. Overall, Wr decreases slightly with an increase in fish length.

The lack of kokanee and length class diversity in rainbow trout may be due to sampling techniques that were used. More kokanee and rainbow trout may have appeared in the sample if vertical gill nets were used pelagically in the water column in conjucture with the horizontal gill nets. Rainbow trout size diversity may have been greater if more nets were used in the sample as well. Only two nets were used per night for the 3 nights on the lake, which is 539 acres in size. This leaves a huge portion of the lake unsampled.

However, the possibility exists that the kokanee and rainbow trout populations are limited environmentally or anthropogenically to a smaller population size leading to low gill net samples. Excessive harvest for both species and/or poor recruitment for kokanee and low stocking rates for rainbows could have an effect on the salmonid populations in Buffalo Lake.

Figure 11 and 12 depict oxygen-temperature profiles taken on 6/9/03 and 2/13/03. Adequate dissolved oxygen levels for salmonids (>5mg/l) exist to a depth of 37m during the winter and summer sampling procedures. This represents good available habitat for salmonid growth and survival. Nutrification appears to be occurring on the southeast end of the lake where the tributary enters the lake. This is evident by extensive aquatic macrophyte growth wich may be encouraging pumkinseed population development.

Management Recommendations

The Colville Tribe policy is to remove illegally introduced non-native fishes from reservation waters. Considerations should be made for largemouth and pumkinseed removal. High relative weights (Wr) for adult rainbow trout and kokanee indicate that there is no negative competition occurring in the lake between salmonids and centrarchids. However, newly recruited kokanee and rainbow trout may be subject to predation from bass and competition with pumkinseed in the littoral community near the tributary inlet.

Fish removal from Buffalo Lake can be done in two ways: mechanically and chemically. Mechanical removal with an electrofishing boat, nets and increased angler harvest would reduce the population but not eradicate it. This method would need to be continual and could be time and cost inefficient. Chemical removal would kill the target species as well as desirable species such as wild kokanee. Chemical removal would have the greatest impact on the undesirable fish but is not a guarantee of permanent removal. It is common for a body of water to become invested again within a few years.

Adult kokanee and rainbow trout appear to be in good condition as indicated by relative weight (Wr) values expressed in Figure 9 and 10. However, small sample sizes do not give an accurate picture of what is really happening in the population. To understand the kokanee population

better, vertical and horizontal gill nets could be used. These net sets could be done in cooler months (March-May) to minimize fish mortality. Creel data should be collected and analyzed with a focus on kokanee and rainbow trout. Comparisons should be made with past creel surveys to determine harvest trends and possible regulation changes (i.e. reduced limit on kokanee which is currently 15 fish/day).

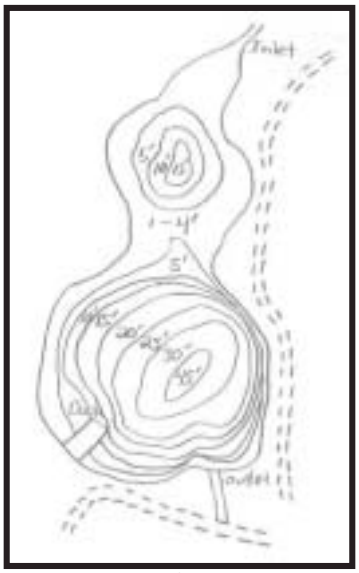
Sampling for rainbow trout with the electrofishing boat and gill nets could be conducted earlier in the year (March-May) to get better results due to cooler temperatures near the shoreline. Temperatures during our sampling procedure in 6/03 reached 19C during the night and 22C during the day. Sampling before the first hatchery plant could also help reduce sampling bias and give a better representation of the established rainbow trout population.

Currently, removal of largemouth bass and pumpkinseed from Buffalo Lake has occurred on an experimental basis for two consecutive weeks in 6/03. Approximately 101 largemouth bass, 100-150 pumkinseed and 3 black crappie were removed from the lake and placed in Big Goose Lake, which is managed as a warm water fishery.

Gold Lake

2003 Technical Report

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program



Bathymetric map of Gold Lake. Depths are in feet.

Introduction

Gold Lake is located 14 miles north of Nespelem in Okanogan County on the Colville Confederated Tribes Reservation in north central Washington State. From June 16 to June 18, 2003 the lake was sampled to determine habitat, fish population parameters and wild/hatchery fish interactions. This sample was performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure while David Christensen, Larry Boyd and Marvin Bob carried out the field work.

Gold Lake is a 27 acre water body and a part of the San Poil River watershed (www.wsu.edu/cctfish/gold1/html). The lake has an unnamed tributary that enters from the northwest and exits the lake on the southern end. Littoral communities are dominated by aquatic macrophytes on the northwestern half of the lake. Average depth in these areas is approximately 2-4 feet. The landscape is dominated by steep slopes with mixed fir and spruce forests. The watershed is utilized for grazing and timber harvest.

Table 1. Physical Data of Gold Lake (www.wsu.edu/cctfish/gold1/html)

Elevation	2,950 ft.
Surface Area	27 acres
Volume	478 acre-feet
Maximum Depth	48 ft
Trophic State	Eutrophic

Brook trout *Salvelinus fontinalis*, westslope cutthroat trout *Oncorhynchus clarki* and bridgelip suckers *Catostomus columbianus* all exist in the lake. Brook and cutthroat trout were introduced into the lake and populations are supplemented by the Colville Tribal Fish hatchery. No trout were stocked in the lake during 2003. During the sampling period 41 brook trout, 14 westslope cutthroat and 199 bridgelip

suckers were sampled using 1 gill net, 1 trap net and an entire electrofishing pass around the perimeter of the lake completed in 1 night.

Methods

Gold Lake was sampled for 1 night using 1 sinking monofilament experimental gill net measuring 250ft by 6ft. The nets were set at 9pm and pulled the next day at 6am for an approximate set of 9 hours. The net was placed perpendicular to the west bank and pulled towards the deepest area of the lake.

One trap net with two leading ends was used for 1 night. The net was placed in the shallow channel along the north bank. The water depth was between 3-4 feet. The net was set at 9pm and pulled the proximate day at 6am for a total set of 9 hours.

The entire shoreline was sampled using a Smith-Root GPP 5.0 electrofishing boat with umbrella shaped anodes and hanging cable cathodes. The boat was fixed with a 5000-watt generator. Range and duty cycle were adjusted when appropriate to solicit fish taxis. Sampling the entire shoreline took approximately 1 night. All other samples were designed to further fish population investigation but are not discussed in this report.

All brook and westslope cutthroat trout were sampled for length, weight and adipose clips. Bridgelip suckers were sampled for length and weight values. Relative weights (Wr) were determined for both trout species while length class distributions were calculated for all 3 species.

Relative weights (Wr) were determined by two formulas:

1. Power Function Ws=a*(L^b)
2. Relative Weight (Wr) = 100*(W/Ws)

Estimated values of (a) and (b) come from the regression line graphed from the log length (x-axis) against the log weight (y-axis) of the species. The slope is represented by (a) while the y-intercept is represented by (b). These values can be obtained for the species on page 462, Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

Habitat data was collected from Gold Lake on 6/16/03. Information collected were secchi disc depth, conductivity, percent littoral macrophyte community, 3 macroinvertebrate samples from random locations, 3 zooplankton samples from each third of the lake. Macroinvertebrate and zooplankton samples will not be processed until winter and will not be discussed in this report. Oxygen-temperature profiles were taken from the deepest location in the lake using an Oxy-guard meter.

Results

In total, 254 fish were sampled in 1 night. Forty-one were brook trout, 14 westslope cutthroat and 199 bridgelip suckers. Figure 1 represents the species composition percentage from the sampled population. All brook trout were between 130-260 mm, westslope cutthroat 150-295 mm and bridgelip suckers 100-300mm. Length class distributions of sampled fish are expressed in Figures 2,3 and 4 respectively.

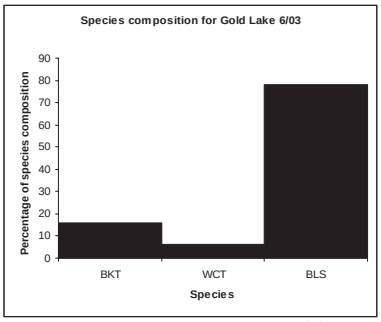
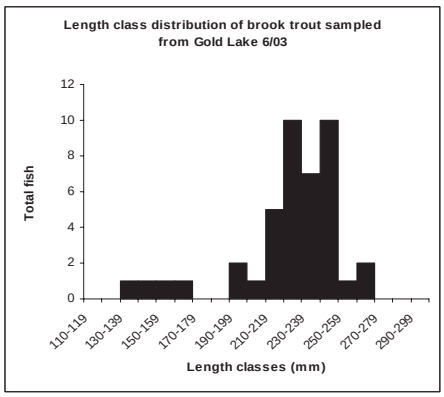


Figure 1. Species composition histogram of fish sampled from Gold Lake 6/03. Brook trout BKT, westslope cutthroat trout WSC and bridgelip suckers BLS.

With such small samples of cutthroat and brook trout, length class distributions are not completely representative of the actual population. However, histograms were included to help better understand the sampled population. Figure 2 shows that 38 of the 41 brook trout are between 190-280mm. Figure 3 shows a patchy length class distribution of cutthroat with one group between 200-250mm and the second between 270-290mm. Bridgelip suckers show a left-skewed length class distribution in Figure 4. The sampled population is dominated by smaller fish between 100-200mm. All cutthroat trout are assumed to be hatchery produced due to initial stockings in 2002. No brook trout had adipose fin clips or elastomer injection tags. These fish are assumed to be wild.



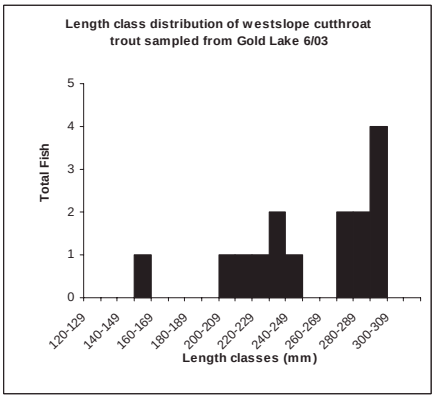


Figure 2 and 3. Length class distribution of brook and westslope cutthroat trout sampled from Gold Lake 6/03.

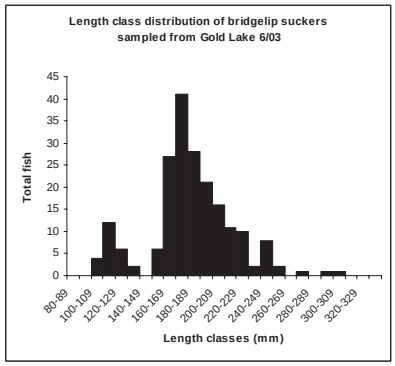
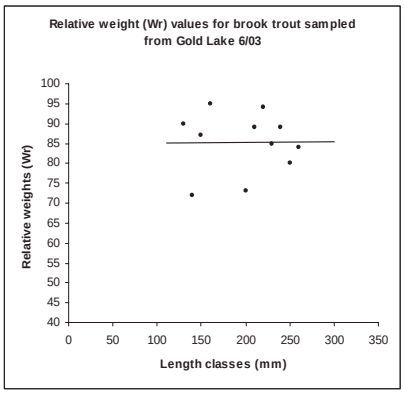


Figure 4. Length class distribution of bridgelip suckers sampled from Gold Lake 6/03.

Relative weight (Wr) values were relatively low for both brook and cutthroat trout. Figure 5 contains Wr values for brook trout. Values range from 74 to 96 with the trend line leveled near 85. Westslope cutthroat trout Wr values range from 64 to 86 with the trend line leveled at 77 as shown in Figure 6. Both species exhibit relatively poor Wr values with trend lines well below 100. The 100 value represents the 75th percentile of all fish sampled used to determine the slope (a) and intercept (b) found in Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.



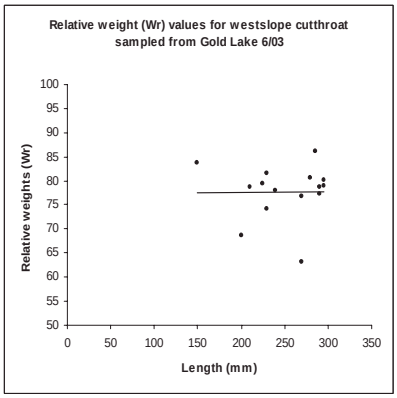


Figure 5 and 6. Relative weight (Wr) distribution of brook trout and cutthroat trout sampled from Gold Lake 6/03.

Conductivity on the sampled date at the surface was 53 uS and the secchi disc was 5.4 m in depth. Figure 7 contains oxygen-temperature profile for 6/03. Temperature at the surface was 22.2 C and dropped to 20.2 C at 3 m. At 4 m the temperature was 17.1 C and continually drops until reaching 5.1 C at the bottom. Dissolved oxygen levels at the surface were 9.4 mg/l and in general increase to 10.3 mg/l at 6 m. The D.O. was 9.9 at 7 m and drops continually until reaching .8 mg/l at the bottom. From 11-15 m the D.O. was only 1.8-.8 mg/l. The thermocline on the sample date was between 4 and 9 m in depth. The winter oxygen-temperature graph composed from a sample taken in 2/03 is not available but represents adequate D.O. for salmonid survival (>5mg/l) from the surface to approximately 6-8 m in depth.

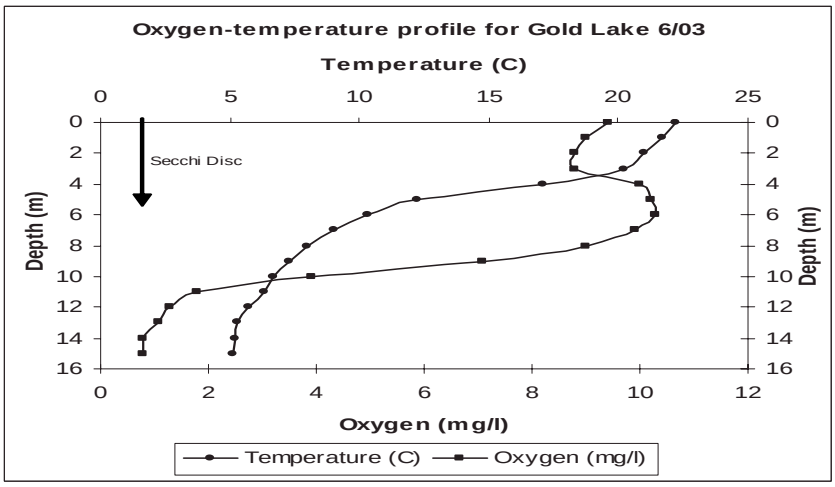


Figure 7. Oxygen-temperature graph for Gold Lake representing sampling period 6/03.

Discussion

Bridgelip suckers dominated the sampled population and comprised 78% of the fish community. All these fish were between 100-300mm in size. See Figure 4. Eighty-four percent of these fish were less than 200 mm. Though these fish dominate the fish community the population appears to be stunted. This could be due to limited food resources from intraspecific composition among themselves and possibly other fish species in the lake.

Brook and cutthroat trout length class distribution and Wr graphs also suggest system constraints. Relative weights of brook trout are expressed by a trend line that is level near 85 and cutthroat trout trend line is level near 77. See Figures 5 and 6. Optimum Wr trend values would be near or above 100. Length classes for both species are all below 290mm. See Figures 2 and 3. These figures represent relatively poor overall condition for the two species and suggest system constraints.

These constraints may be due to competition from an abundance of fish species in the lake. These fish are limited spatially in the lake on the sample date. Figure 7 shows high temperatures (>20C) from 3m to the surface and low D.O. (<5mg/l) from 10m to the bottom. These conditions limit salmonids to 7m of available habitat in the lake. With limited area and food resources competition could be significant.

Management Recommendations

- Analyze creel data to determine angler harvest rates.

- Reduce stocking rates of brook trout in the lake.

- Determine natural reproduction in the tributary for both trout species and along shoreline for brook trout.

- Since no fish were planted in 2003, resample in 2004 or before the next planting to determine current fish response to the absence of recently stocked fish.

- If stocking rates are reduced, plant fewer but larger fish that will contribute to the fishery.

Round Lake

2003 Technical Report

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program

Photo 1. View of Round Lake from access point off of the Bridge Creek hw

Introduction

Round Lake is located approximately 5.8 miles west of Inchelium in Ferry County on the Colville Confederated Tribes Reservation in north central Washington State. From June 24 to June 26, 2003 the lake was sampled to determine habitat, fish population parameters and wild/hatchery fish interactions. This sample was performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure, while David Christensen, Larry Boyd and Marvin Bob carried out the fieldwork.

Round Lake is a 51 acre body of water fed by Cornstalk Creek that flows in from the west and exits from the east. The lake is boardered by a large mountain on the south and a gradual slope on the west. These slopes are dominated by Douglas fir and scattered Ponderosa pine. The rest of the lake is surrounded by open meadow with scattered P. pine. The lake drainage has been used for grazing and logging. The lake is completely surrounded by dense cattail growth and aquatic macrophytes dominate the entire littoral zone. Access to the lake is good with a boat ramp on the north and south shore. The Bridge Creek hwy runs along the north side of the lake. See Figure 1. The lake is managed for tribal members only.

Table 1. Physical Data of Round Lake

Elevation	2,260 ft.
Surface Area	51 ac.
Volume	1,440 ac.-ft.
Maximum Depth	35 ft.
Mean Depth	20
Trophic State	Eutrophic

Sampling procedures yielded 183 brook trout *Salvelinus fontinalis*, 5 rainbow trout *Oncorhynchus mykiss*, 158 redside shiners *Richardsonius balteatus*, 5 fathead minnows

Pimephales promelas and 14 bridgelip suckers *Catostamus columbianus*. Brook trout comprised 50% of the sampled fish while redside shiners were 43%.

The lake is stocked every year with rainbow and brook trout raised at the tribal fish hatchery in Bridgeport, WA. During the last four years an average of 3,319 rainbow trout/year and 3,439 brook trout/year were planted in the lake. A total of 1,994 westslope cutthroat trout *Oncorhynchus clarkii* were planted in the lake in 2002 but no fish appeared in our 6/03 sample. Round Lake has experienced hypoxic conditions (reduced dissolved oxygen) during extreme winter and summer periods limiting growth and survival of salmonid species. Fish kills have been reported periodically in the past.

Methods

Round Lake was sampled for 1 night using one 250 ft. by 6 ft. sinking experimental monofilament gill net. The net was set at 11 pm and pulled the next day at 5 am for an approximate set of 6 hours. The net was set along the western shoreline near the Cornstalk Creek inlet. See Figure 1.

One trap net with two leading ends was used for 1 night. The net was placed near the Cornstalk Creek outlet on the eastern end of the lake. It was placed in approximately 4 feet of water for one night. The net was set at 11 pm and pulled the next day at 5 am for an approximate set of 6 hours. Refer to Figure 1.

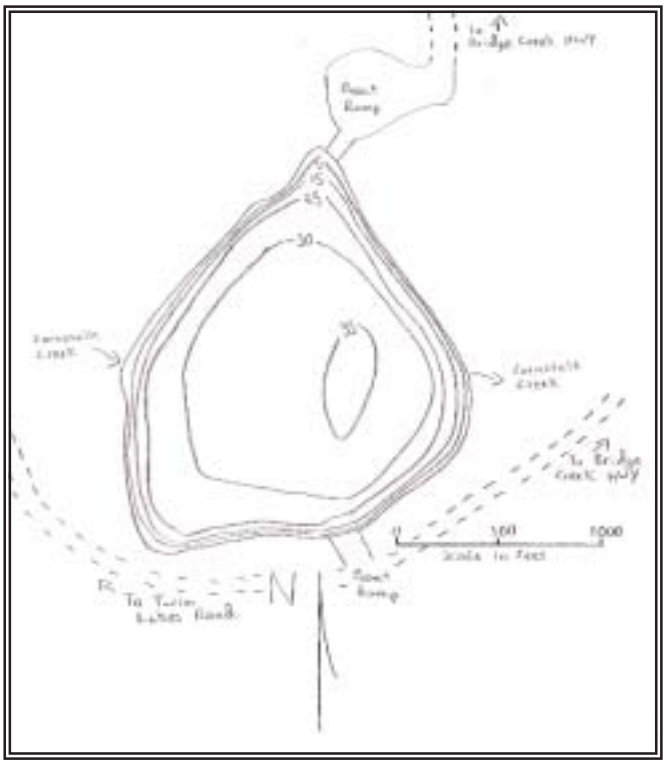


Figure 1. Bathymetric map of Round Lake including depths in feet, boat ramps and roads.

The entire shoreline of Round Lake was sampled using a Smith-Root GPP 5.0 electrofishing boat with umbrella shaped anodes and hanging cable cathodes. The boat was fixed with a 5000-watt generator. Range and duty cycle were adjusted when appropriate to solicit fish taxis (response to electrical current). Sampling the entire shoreline took approximately 2 nights. The 3rd night electrofishing pass was to further investigate fish populations but the data will not be discussed in this report.

All rainbow trout, brook trout and bridgelip suckers were sampled for length and weight. Rainbow and brook trout were sampled for elastomer tag identification. Redside shiners and

fathead minnows were sampled for lengths. Community composition, relative abundance, length class frequencies and relative weights (Wr) were determined for brook trout.

Relative weights (Wr) were determined by two formulas:

3. Power Function Ws = a*(L^b)

Estimated values of (a) and (b) come from the regression line graphed from the log length (x-axis) against the log weight (y-axis) of the species. The slope is represented by (a) while the y-intercept is represented by (b). These values can be obtained for the species on page 462, Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

4. Relative Weight Wr = 100*(W/Ws)

Habitat data was collected from Round Lake on 6/24/03. Information collected were secchi disc depth, conductivity, percent littoral macrophyte community, three macroinvertebrate samples from random locations using D-nets, three zooplankton samples taken from each third of the length of the lake with a standard hoop trawl. Macroinvertebrate and zooplankton samples will not be processed until winter and will not be discussed in this report. Oxygen and temperature profiles were taken from the deepest location in the lake with an Oxy-guard meter.

Results

A total of 365 fish were sampled from Round Lake. Rainbow trout comprised 1% of the sample while brook trout 50%, redside shiners 43%, fathead minnows 1% and bridgelip suckers 14%. Refer to Figure 2 for species composition histogram.

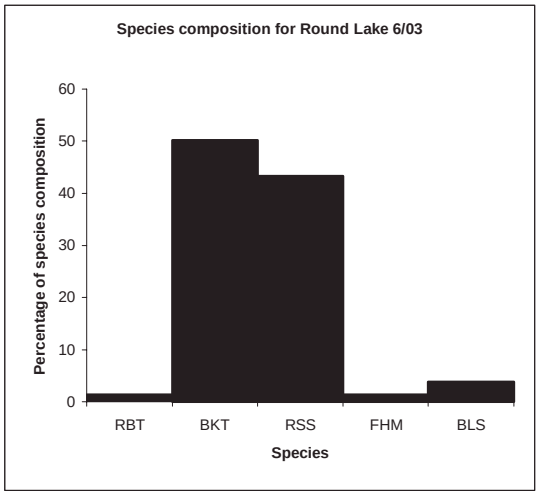
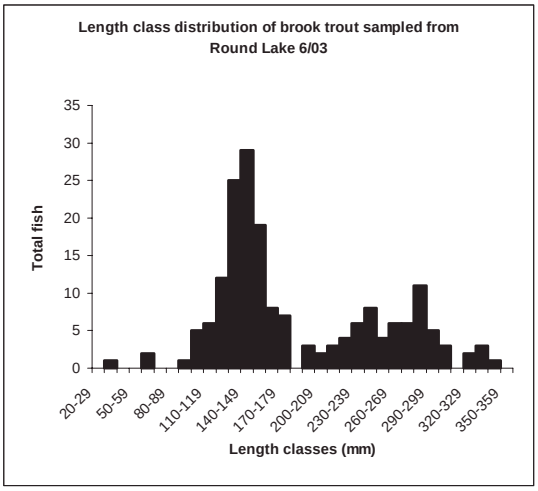


Figure 2. Species composition histogram for fish sampled from Round Lake 6/03. Rainbow trout RBT, brook trout BKT, redside shiner RSS, fathead minnow FHM, bridgelip sucker BLS.

All rainbow trout sampled were between 215mm-310mm, brook trout 36mm-340mm (refer to Figure 3), redside shiners 35-150mm, fathead minnows 60mm-75mm and bridgelip suckers 100mm-270mm.

Figure 3 shows two distinct size groupings of brook trout sampled from Round Lake 6/03. The first is between 90mm-179mm while the second ranges from 190mm-350mm. The first grouping contains 115 fish while the second contains 67 fish. Relative weights (Wr) of brook trout are all between 87-105. Refer to Figure 4 for relative weights (Wr) of brook trout sampled from Round Lake 6/03.



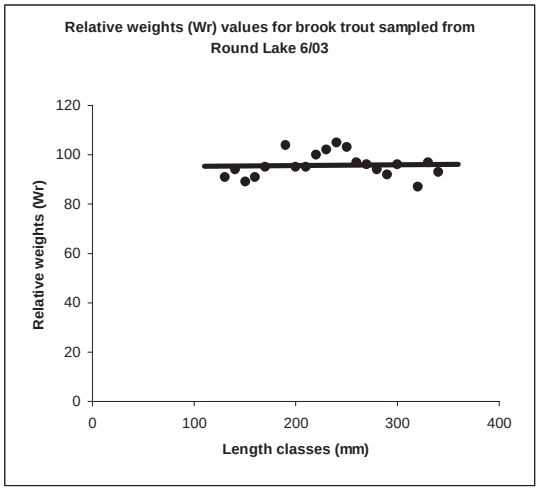
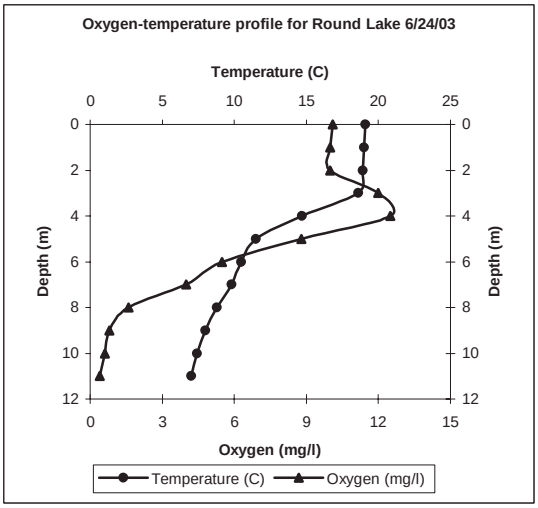


Figure 3,4. Length class distribution and relative weights (Wr) for brook trout sampled from Round Lake.

Secchi disc recording was 3.75m and conductivity was 261microseimens. The entire littoral community is dominated by dense aquatic macrophyte communities. The perimeter of the lake is lined by large floating cattail mats.

The oxygen-temperature profile for 6/24/03 shows temperatures ranging from 19.1C at the surface to 18.6C at 3m and then dropping to 14.7C at 4m. Dissolved oxygen was 10.1mg/l at the surface and increased to 12.5mg/l at 4m then decreased to 5.5mg/l at 6m. From 7m the dissolved oxygen decreased from 4mg/l to .4mg/l at 11m. The thermocline is located between 4m and 5m. Refer to Figure 5. On 2/03/03 the dissolved oxygen was 8.5mg/l at the surface and decreased to 6.8mg/l at 7m. From 8m the dissolved oxygen content decreased from 1.8mg/l to .7mg/l at 12m. See Figure 6.



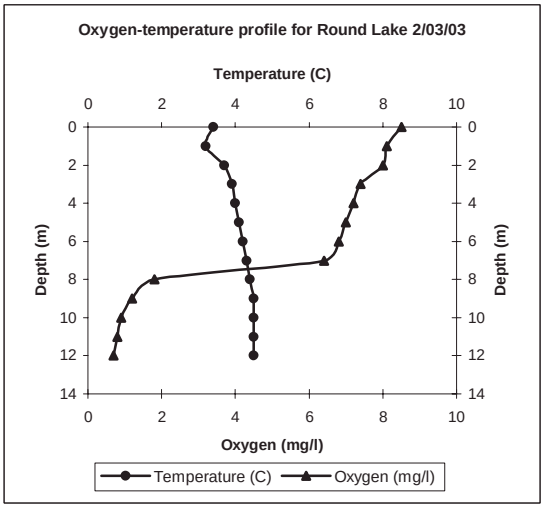


Figure 5 and 6. Oxygen-temperature profiles for Round Lake representing sampling periods 6/24/03 and 2/03/03.

Discussion

Of the 182 brook trout sampled 115 were under 179mm. Sixty-seven were between 190mm-360mm. See Figure 3. Relative weight (Wr) trend line is almost even with 100 which represents good condition. See Figure 4. However, the population is dominated by an abundance of small brook trout with only 9 fish between 300mm (12in.) and 360mm (14in.).

Three brook trout had adipose fin clips and one of these fish had an orange elastomer tag that was inserted at the tribal hatchery. The adipose clip indicates hatchery origin since all hatchery reared fish receive these marks. The orange tag indicates that it was planted in 2003. All non-adipose clipped and tagged fish are assumed to be wild or hatchery plants from previous years before the tagging program was instituted. They are not assumed to be hatchery oriented fish that failed to recieve marks in 2002. This is because of the abundance of non-marked fish in the sample and the majority of these fish are smaller than the typical hatchery planted brook trout which is around 230mm -240mm. See Figure 3.

This relationship of abundant small fish could indicate good natural recruitment in the stream but poor growth or survival to larger sizes >300mm. The poor growth or survival could be due to intraspecific competition or interspecific competition with redside shiners that are extremely abundant in the lake (Figure 2). High temperatures near the surface (18-19C on 6/24/03) and low dissolved oxygen levels (<5mg/l) below 6m-7m in both 6/24/03 and 2/03/03 (Figure 5 and 6) could also reduce growth and survival. Near 80% of the brook trout sampled were within 100m of the Cornstalk Creek inlet. Temperature at the mouth of the inlet was 11C as apposed to 18C on the east side of the lake at 1am on 6/24/03. Excessive angler harvest could also reduce the number of larger brook trout. A combination of these factors could be occurring in Round Lake.

Although an average of 3,319 rainbow trout are planted each year into Round Lake only 5 were sampled in 6/03. These fish were all between 215mm-310mm. Four of the 5 fish had adipose fin clips indicating hatchery origin. The lack of rainbows in our sample may be due to poor survival as a result of temperature and dissolved oxygen extremes during the summer and winter or excessive angler harvest. Poor survival of small newly planted rainbows may occur due to competition with redside shiners.

Redside shiners comprised 43% of our sample in 6/03. However, due to their small size (35mm-150mm) a large portion of the fish did not respond to the electrical current and were not sampled. The redside shiner population is actually larger than what our sample implies. Five fathead minnows were sampled but like the shiners they did not respond well to the electrical current. Their contribution to the fish assemblage in Round Lake is most likely greater than the sample implies. Fathead minnows have not been reported in any other water body on the reservation and were probably introduced by anglers.

Management Recommendations

Round Lake is in the latter successional stages of development and is subject to heavy algal blooms and aquatic macrophyte growth. This organic production leads to decomposition which utilizes large amounts of dissolved oxygen from the water column. Reduced dissolved oxygen levels can stress salmonids leading to reduced growth and mortality.

Increasing dissolved oxygen levels mechanically by using an aeration system could help increase salmonid survival and growth in the lake. Aeration systems can be costly and time consuming to install and maintain. Different varieties exist including solar powered and wind powered systems that either pump oxygen into the lake or pump hypolimnetic water to the surface to be aerated by diffusion.

Competition between juvenile brook trout and redside shiners could be reduced by stocking larger fish capable of predating on the shiners. This could help increase growth and survival of smaller salmonids. Natural recruitment in Cornstalk Creek should be determined for brook trout. If high natural production exists then brook trout stalking could be reduced lowering the amount of intraspecific competition.

The sample implies that brook trout have a higher survival rate than rainbow trout in Round Lake. Creel records should be analyzed to determine levels of natural and fishing mortality. If mortality overall is lower for brook trout than rainbow trout, stocking should be reduced for rainbows while brook trout plants are increased. Brook trout plants should only increase if natural production is minimal, rainbow trout mortality is higher and rainbow trout stocking is reduced or eliminated.

North Twin Lake

2003 Technical Report

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program

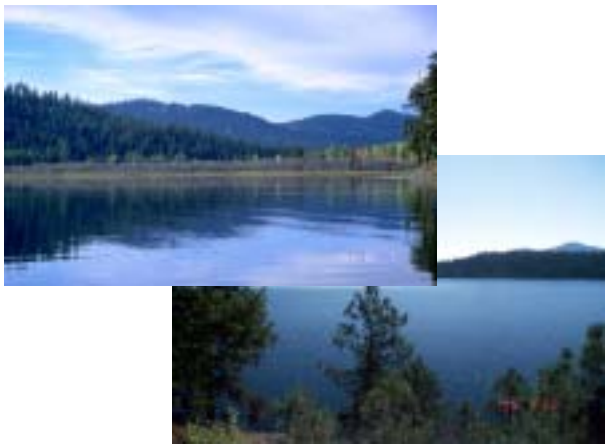


Photo 1. North and south facing views of North Twin Lake.

Introduction

North Twin Lake is located approximately 9 miles west of Inchelium in Ferry County on the Colville Confederated Tribes Reservation in north central Washington State. From June 31 to July 8, 2003 the lake was sampled to determine habitat, fish population parameters and wild/hatchery fish interactions. This sample was performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure, while David Christensen, Larry Boyd and Marvin Bob carried out the fieldwork.

Table 1. Physical Data of North Twin Lake	
Elevation	2,572 ft
Surface Area	917 ac
Volume	29,600 ac-ft
Maximum Depth	50 ft
Mean Depth	30 ft
Trophic State	Eutrophic

North Twin Lake is a 917-acre water body and an important aspect of the Inchelium watershed. The lake is fed by 5 small tributaries and eventually drains into Stranger and Cornstalk Creeks. Drainage into the creeks is either through a controlled artificial outlet in the channel or a spillway on the east bank. (Halfmoon 1978). North Twin is integrally connected to South Twin Lake through a shallow channel. See photo 1 and Figure 1. Collectively, the two lakes are referred to as "Twin Lakes". The lake reaches a maximum depth of 50ft. Dense aquatic macrophyte growth dominates 80-90% of the littoral zone and 100% of the channel between the two lakes. The surrounding terrain is mountainous and dominated by fir and Ponderosa pine. Intensive logging practices have occurred in the watershed within the last 10 years. Access to the lake is excellent with a well-maintained highway along the north shore and paved road along the east

shore. Development of elaborate homes, numerous trailers, cabins and camping areas have occurred along the northern and eastern shorelines. A tribal resort exists along the east shore offering lodging, boat ramps, swimming, fishing and picnicking. Refer to Figure 1.

The lake contains an illegally introduced population of largemouth bass *Micropterus salmoides* and golden shiners *Notemigonus crysoleucas*. Both populations are extensive in the lake and dominate the fish community. Electrofishing and gillnetting surveys conducted in 7/03 yielded 411 largemouth bass and 464 golden shiners. Brook trout *Salvelinus fontinalis* and rainbow trout *Oncorhynchus mykiss* also exist in the lake. Sampling procedures yielded 16 brook and 78 rainbow trout.

The rainbow and brook trout fisheries are supplemented by fish raised at the tribal hatchery in Bridgeport, WA. For the last four years the tribe has planted an average of 90,127 rainbow trout and 78,324 brook trout each year into N. Twin Lake. Little is known about natural reproduction in the lake. However, Halfmoon, 1978 described brook trout spawning along the northeast shoreline and having developed regulations to protect those fish during the spawn.

Methods

North Twin Lake was sampled for one night using two 250 ft. by 6 ft. sinking experimental monofilament gill nets. The nets were set at 8:30 pm and pulled the next day at 7:30 am for an approximate set of 11 hours. One net was set along the northwestern shore while the second was set along the southwestern shoreline.

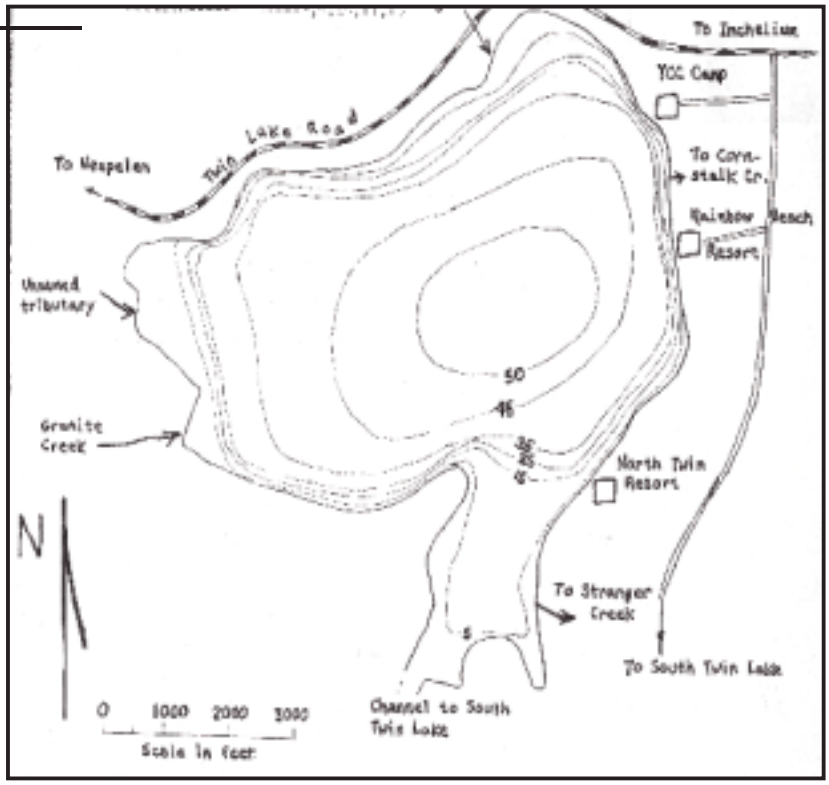


Figure 1. Bathymetric map of North Twin Lake that illustrates depth in feet, tributaries, channel and development.

Two trap nets with two leading ends were used for one night. One was placed in a cove on the west side of the lake. The other was placed in the channel between North and South Twin Lakes. Both were placed in approximately 4 feet of water for one night. The net was set at 9 pm and pulled the next day at 6 am for an approximate set of 9 hours. Refer to Figure 1.

The entire shoreline of North Twin Lake was sampled using a Smith-Root GPP 5.0 electrofishing boat with umbrella shaped anodes and hanging cable cathodes. The boat was fixed with a 5000-watt generator. Range and duty cycle were adjusted when appropriate to solicit fish taxis (response to electrical current). Sampling the entire shoreline took approximately 3 nights.

All rainbow and brook trout were sampled for length, weight and elastomer tag identification. Largemouth bass and golden shiners were sampled for length and weight measurements. Community composition, relative abundance, length class frequencies and relative weights (Wr) were determined for rainbow trout, brook trout and largemouth bass. Preferred stock densities (PSD) were determined for largemouth bass. Only fish over 100mm were considered in the samples due to collection bias associated with smaller fish.

Relative weights (Wr) were determined by two formulas:

5. Power Function Ws = a*(L^b)

Estimated values of (a) and (b) come from the regression line graphed from the log length (x-axis) against the log weight (y-axis) of the species. The slope is represented by (a) while the y-intercept is represented by (b). These values can be obtained for the species on page 462, Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

6. Relative Weight Wr = 100*(W/Ws)

Preferred stock density (PSD) was calculated by the equation:

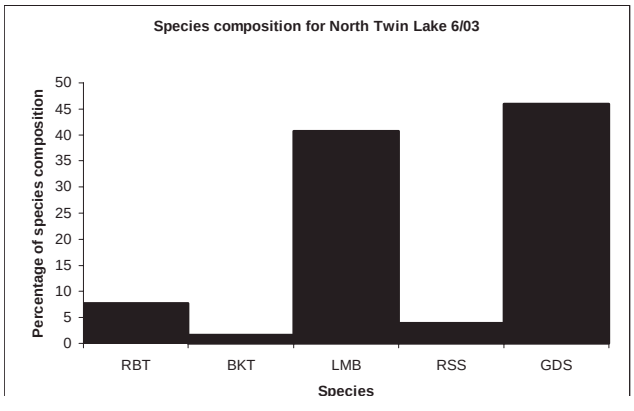
PSD = (# of fish >or= minimum quality length / # of fish >or= stock length) * 100

Minimum quality and stock lengths for various species is contained on page 464, Table 15.2 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

Habitat data was collected from North Twin Lake on 6/31/03. Information collected were secchi disc depth, conductivity, percent littoral macrophyte community, three macroinvertebrate samples from random locations using D-nets, three zooplankton samples taken from each third of the length of the lake with a standard hoop trawl. Macroinvertebrate and zooplankton samples will not be processed until winter and will not be discussed in this report. Oxygen and temperature profiles were taken from the deepest location in the lake with an Oxy-guard meter.

Results

Sampling procedures yielded 411 largemouth bass, 464 golden shiners, 40 redside shiners *Richardsonius balteatus*, 78 rainbow trout and 16 brook trout.



Largemouth bass comprise 40.73% of the sample while golden shiners comprise 45.99%, redside shiners 3.96%, brook trout 1.59% and rainbow trout 7.73%. Refer to Figure 2 for species composition histogram.

Figure 2. Species composition histogram of fish sampled from North Twin Lake 7/03. Rainbow trout RBT, brook trout BKT, largemouth bass LMB, redside shiner RSS and golden shiners GDS.

Figure 3 and 4 refers to the length class distribution of largemouth bass and golden shiners. Eighty-five percent of the largemouth bass sampled are under 250mm. Golden shiners exhibit a typical bell-shaped distribution with all fish between 80mm-219mm.

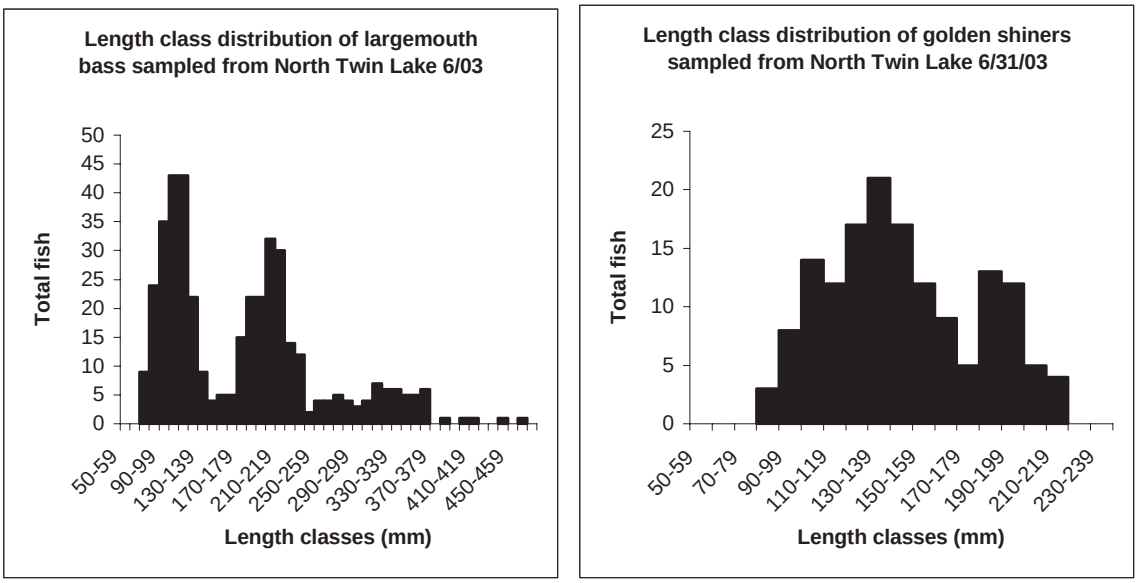


Figure 3 and 4. Length class distribution of largemouth bass and golden shiners sampled from North Twin Lakes 7/3.

Figure 5 and 6 refer to rainbow and brook trout length class distribution. Rainbow trout exhibited two distinct size groups of 230mm-289mm and 300mm-389mm. There were also three rainbow trout between 410mm-469mm. Brook trout also showed two separate size groups. The first consisted of 13 fish between 270mm-350mm and the second contained 3 fish between 390mm-419mm.

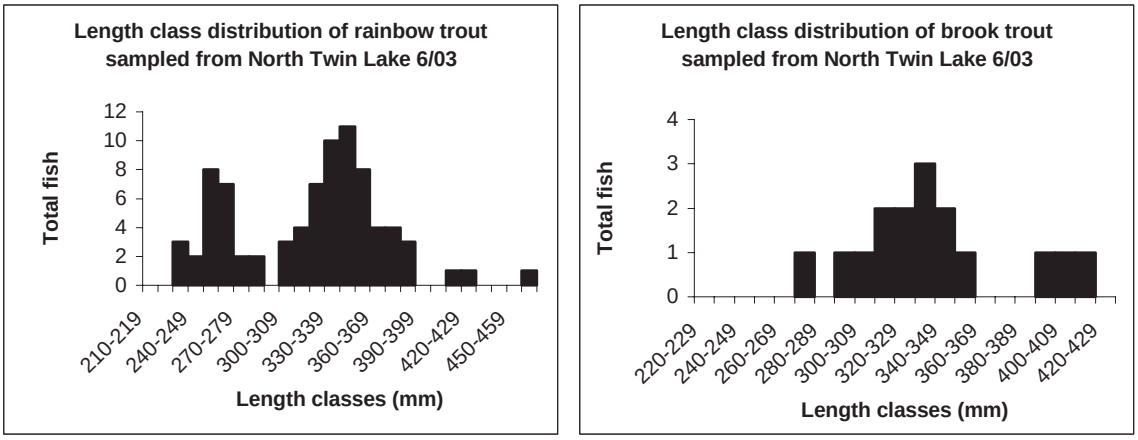


Figure 5 and 6. Length class distribution of rainbow trout and brook trout sampled from North Twin Lake 7/03.

Relative weights (Wr) of largemouth bass are all between 86 and 125. Rainbow trout had relative weights between 87 and 106 while brook trout were 92 to 122. Largemouth bass and brook trout showed an increase in (Wr) values with an increase in size while rainbow trout displayed a negative correlation between increased lengths and (Wr) values. Preferred stock density for largemouth bass was 28. Refer to Figures 7,8 and 9 for relative weight values.

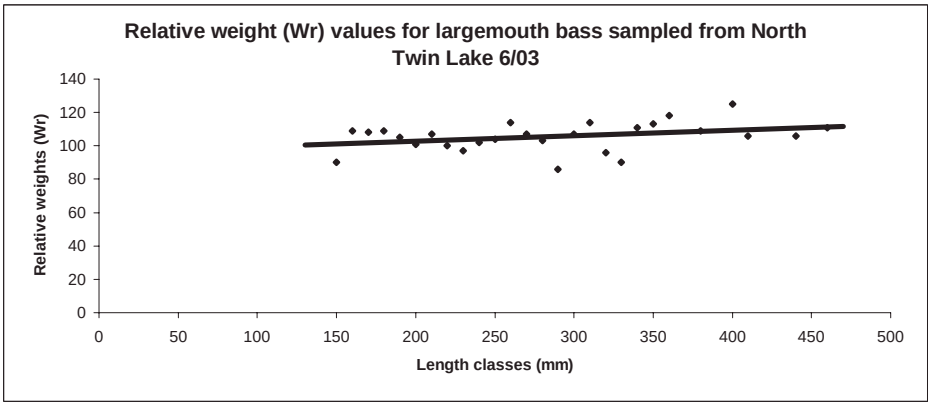


Figure 7. Relative weight (Wr) distribution for largemouth bass sampled from North Twin Lake 7/03.

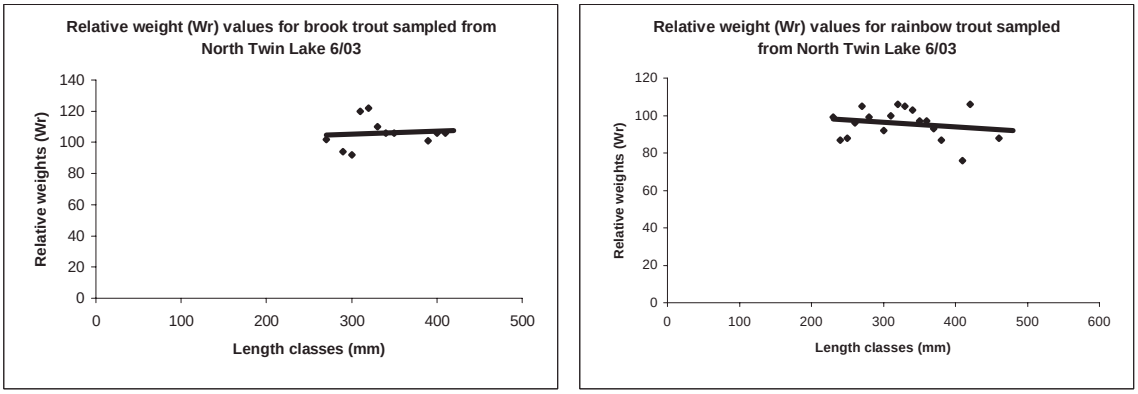


Figure 8 and 9. Relative weights (Wr) distribution for brook and rainbow trout sampled from North Twin Lake 7/03.

Secchi disc recording was 4m and conductivity was 53 microseimens. Eighty-percent of the littoral zone contained dense aquatic macrophyte beds. Figure 10 and 11 are oxygen-temperature graphs for North Twin Lake on 6/31/03 and 2/11/03. The 6/31/03 graph shows water temperatures between 21.6C at the surface to 21.4C at 4m. Dissolved oxygen levels are 10.5mg/l at the surface and increase to 13mg/l at 7m and drop below 5mg/l at a depth of 14m. The thermocline exists between 8m and 10m. On 2/11/03 dissolved oxygen remained above 5mg/l down to a depth of 14m. Refer to Figures 10 and 11 for oxygen-temperature profile graphs.

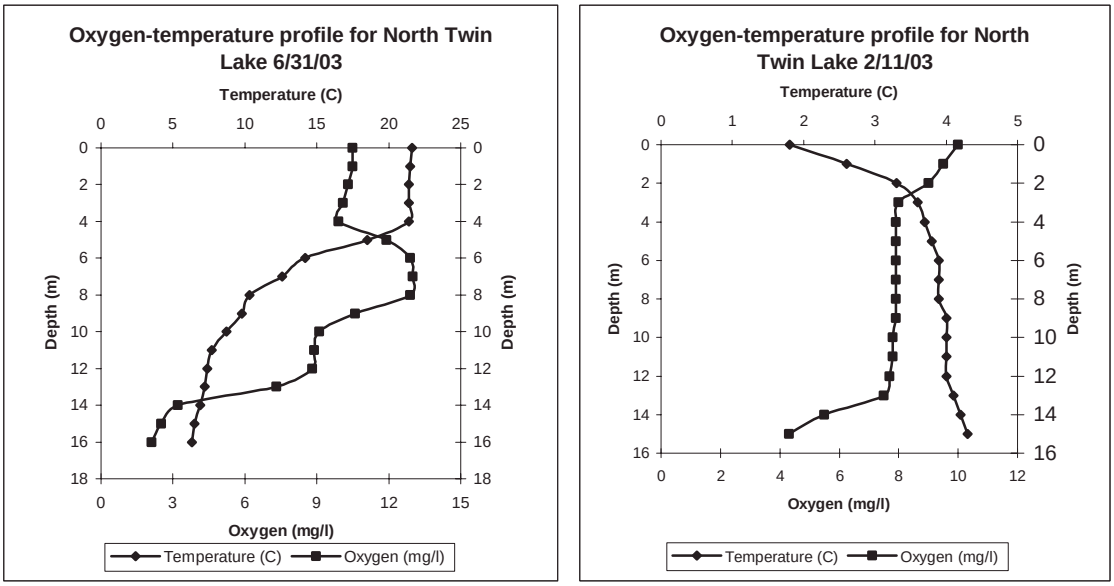


Figure 10 and 11. Oxygen-temperature graphs for North Twin Lake representing sampling periods 6/31/03 and 2/11/03.

Discussion

Largemouth bass were 40.73% of the total sampled fish and golden shiners comprised 45.99%. Although they comprise the majority of the sampled fish in our 7/03 samples they did not appear in gill net sets taken in 1965 and 1975 (Halfmoon, 1978). Refer to Figure 2. Only 40 redside shiners were sampled during the entire procedure while in 1975 they were said to be abundant. The golden shiner population may be suppressing the less dominant redside shiners in the lake.

Eighty-four percent of all the largemouth bass sampled were below 240mm in length. See Figure 3. Largemouth PSD was only 28. A low PSD and left-skewed size distribution generally infers good recruitment but poor survival to larger sizes. This could be due to competition between juvenile largemouth bass and golden shiners that exist in the lake. Many of the smaller bass compete for similar food organisms with the golden shiners and may not be able to obtain adequate size to begin preying on the shiners and thus drop out of the population. The large shiner community may be a result of the lack of predation by largemouth bass. Mid-sized bass (260mm-380mm) make up the majority of a predating population but only comprise 12-16 % (50-65 fish out of 418 total) of the sample taken from the lake.

Despite the low PSD and left-skewed size distribution, relative weights (Wr) for largemouth bass are between 86 and 125. See Figure 7. This implies that largemouth are in good condition in North Twin Lake. High relative weights (Wr) like these are not typical with a population of bass that have a low PSD of 28 and left-skewed size class distribution due to competition, excessive recruitment, poor environmental conditions, or the combination. The harvest limit for bass in North Twin Lake is currently 25 fish per day of any size. Creel data reports should be completed and analyzed to determine if the lack of mid-sized bass is a result of harvest or natural conditions in the lake.

Relative weights (Wr) of rainbow trout are all between 76 and 106 wich represents good condition as a population. However, brook trout relative weights (Wr) were considerably higher with values all between 92 and 122. These values represent excellent condition for brook trout. Refer to Figure 8 and 9 for relative weights of brook and rainbow trout. Twenty-nine of the 78 rainbow trout had adipose fin clips indicating they were hatchery reared. All rainbow trout reared in the tribal hatchery are triploided fish which could elevate relative weight (Wr) values. Overall relative weight values for non-triploided rainbow trout could actually be lower.

Brook trout sampled from North Twin Lake range in size from 270mm-359mm and 390mm-419mm. Only 3 fish in the larger size group were sampled while 13 were sampled in the smaller size group. See Figure 6. Only two brook trout had adipose fin clips administered at the tribal fish hatchery and one of these fish (290mm) had an orange elastomer tag indicating it was planted in 2003. The other 14 brook trout are assumed to be wild fish or holdover fish that never received adipose fin clips while at the hatchery.

Of 78 rainbow trout sampled 24 were between 230mm-289m, 54 were between 300mm-389mm, with 3 fish from 410mm-469mm. See Figure 5. Thirty-seven percent of the rainbow trout had adipose fin clips. Twenty of the 29 adipose clipped fish were between 230mm-289mm and 1 fish with an orange elastomer tag. Most likely all 20 adipose clipped fish within this size range were planted in 2003 as indicated by the orange elastomer tag. The elastomer tags that should have been present in the other fish may have fallen out or not have been visible. The rest of the rainbows sampled are assumed to be wild fish or holdover fish that never received adipose fin clips while at the tribal hatchery.

Management Recommendations

Because the Colville Tribe policy is to remove illegally introduced non-native fishes from reservation waters then considerations should be made for largemouth bass and golden shiner removal. Interspecific competition for zooplankton and macroinvertebrates between bass and shiners could be deleterious to the more desirable brook and rainbow trout. However, high relative weights for both trout species do not indicate this is occurring at this time.

Removal could be done mechanically or chemically. Mechanical would need to be ongoing and would only remedy the problem. Chemical control would eliminate the problem but would damage other organisms. Chemical control does not guarantee permanent removal. Repopulation of problem fishes years after chemical treatment is common.

Leaving the bass in the lake could attain biological control. Since mid-sized bass make up the majority of the predating population and are almost absent in North Twin Lake then efforts should be made to protect these fish. An increase in mid-sized bass could reduce the number of shiners in the lake. If creel data indicates that harvest is causing the decline in mid-sized bass then slot-limits should be established allowing for the harvest of the smaller and larger individuals while protecting the middle-sized fish. Planting larger trout species that are capable of predating on the shiners may also help reduce the shiner population and eventually benefit the trout fishery. Mechanical removal could also be used simultaneously.

Efforts should be made to improve water quality in the lake. Oxygen-temperature profiles taken on 6/31/03 and 2/11/03 show adequate oxygen levels >5mg/l for salmonid survival down to 13m in the summer and 14m during the winter. See Figure 10 and 11. However, extensive macrophyte growth and production over 80-90% of the littoral zone may be encouraging bass and shiner growth and survival and thus impacting the salmonid fishery. A study and management plan should be made to determine nutrification sources and possible solutions.

A study to determine levels of natural recruitment and survival should be conducted. Small, natural recruited salmonids may experience poor growth and survival due to interspecific competition with juvenile bass and golden shiners. These fish may also fall prey to larger bass. The trout that survive these conditions may find sufficient food organisms as they reach larger sizes as expressed by the brook trout relative weights (Wr) in Figure 8.

Currently a mechanical removal program is underway for largemouth bass and golden shiners. Removal is done using an electrofishing boat and will be conducted at an experimental basis for several weeks.

South Twin Lake

2003 Technical Report

Photo 1: View of South Twin Lake and connective channel to North Twin Lake.

Colville Confederated Tribes Fish Hatchery Monitoring and Evaluation Program.

Introduction

South Twin Lake is located approximately 9 miles west of Inchelium in Ferry County on the Colville Confederated Tribes Reservation in north central Washington State. From June 8 to June 16, 2003 the lake was sampled to determine habitat, fish population parameters and wild/hatchery fish interactions. This sample was performed in compliance with the Independent Scientific Review Panel mandate to monitor and evaluate the Colville Tribal Fish Hatchery production and release of resident salmonids into reservation waters. Dan Fairbank directed the procedure, while David Christensen, Larry Boyd, Marvin Bob and Levi Morris carried out the fieldwork.

South Twin Lake is a 1,020 acre water body and an important aspect of the Inchelium watershed. The lake is fed by three unnamed tributaries and eventually drains into Stranger Creek. Drainage into the creek is either through a controlled artificial outlet in the channel or a spillway on the east bank. (Halfmoon 1978). South Twin is integrally connected to North Twin Lake through a shallow channel. See photo 1 and Figure 1. Collectively, the two lakes are referred to as "Twin Lakes". The lake reaches a maximum depth of 57ft. Dense aquatic macrophyte growth dominates 80-90% of the littoral zone and 100% of the channel between the two lakes. The surrounding terrain is mountainous and dominated by fir and Ponderosa pine. Intensive

Table 1. Physical Data of South Twin Lake

Elevation	2,572 ft
Surface Area	1,020 ac
Volume	34,200 ac-ft
Maximum Depth	57 ft
Mean Depth	25 ft
Trophic State	Eutrophic

logging practices have occurred in the watershed within the last 10 years. Access to the lake is excellent with a well-maintained paved road along the east shore. Development of elaborate homes, numerous trailers, cabins and camping areas have occurred along the east shoreline. A private resort exists along the east shore offering lodging, boat ramps, swimming, fishing and picnicking. Refer to Figure 1.

The lake contains an illegally introduced population of largemouth bass *Micropterus salmoides* and golden shiners *Notemigonus crysoleucas*. Both populations are extensive in the lake and dominate the fish community. Electrofishing and gillnetting surveys conducted in 7/03 yielded 1454 largemouth bass and 1446 golden shiners. Brook trout *Salvelinus fontinalis* and rainbow trout *Oncorhynchus mykiss* also exist in the lake. Sampling procedures yielded 31 brook and 14 rainbow trout.

The rainbow and brook trout fisheries are supplemented by fish raised at the tribal hatchery in Bridgeport, WA. For the last four years the tribe has planted an average of 90,127 rainbow trout and 78,324 brook trout each year into S. Twin Lake. Little is known about natural reproduction in the lake. However, Halfmoon, 1978 described brook trout spawning in the tribaturies and along the shoreline.

Methods

South Twin Lake was sampled for one night using two 250 ft. by 6 ft. sinking experimental monofilament gill nets. The nets were set at 8:30 pm and pulled the next day at 7:30 am for an approximate set of 11 hours. One net was set along the northwestern shore while the second was set along the southeastern shoreline.

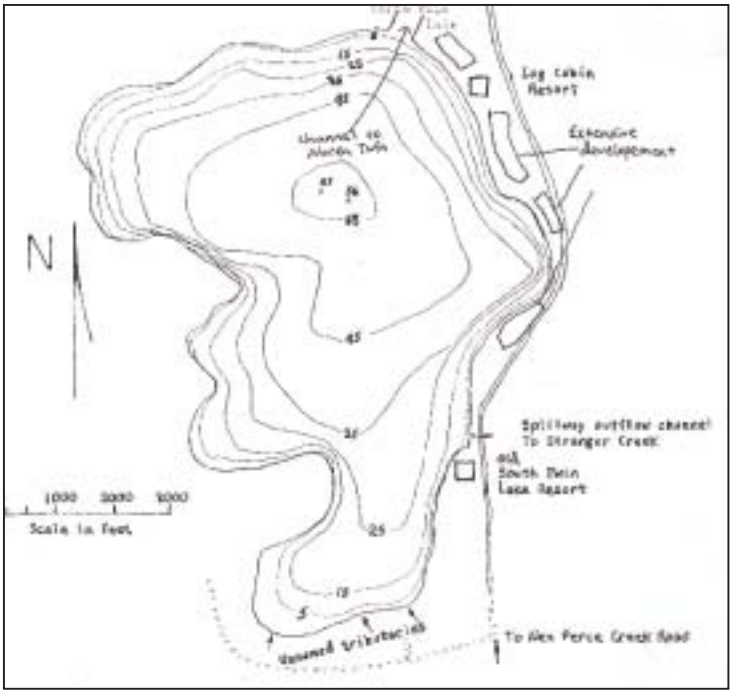


Figure 1. Bathymetric map of South Twin Lake that illustrates depth in feet, tributaries, channel and development.

Two trap nets with two leading ends were used for one night. One was placed in a cove on the northwest side of the lake. The other was placed in the southern most cove. Both were placed in approximately 4 feet of water for one night. The net was set at 9 pm and pulled the next day at 6 am for an approximate set of 9 hours. Refer to Figure 1.

The entire shoreline of South Twin Lake was sampled using a Smith-Root GPP 5.0 electrofishing boat with umbrella shaped anodes and hanging cable cathodes. The boat was

fixed with a 5000-watt generator. Range and duty cycle were adjusted when appropriate to solicit fish taxis (response to electrical current). Sampling the entire shoreline took approximately five nights.

All rainbow and brook trout were sampled for length, weight and elastomer tag identification. Largemouth bass and golden shiners were sampled for length and weight measurements. Community composition, relative abundance, length class frequencies and relative weights (Wr) were determined for rainbow trout, brook trout and largemouth bass. Preferred stock densities (PSD) were determined for largemouth bass. Only fish over 100mm were considered in the samples due to collection bias associated with smaller fish.

Relative weights (Wr) were determined by two formulas:

7. Power Function Ws = a*(L^b)

Estimated values of (a) and (b) come from the regression line graphed from the log length (x-axis) against the log weight (y-axis) of the species. The slope is represented by (a) while the y-intercept is represented by (b). These values can be obtained for the species on page 462, Table 15.1 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

8. Relative Weight Wr = 100*(W/Ws)

Preferred stock density (PSD) was calculated by the equation:

PSD = (# of fish >or= minimum quality length / # of fish >or= stock length) * 100

Minimum quality and stock lengths for various species is contained on page 464, Table 15.2 of Fisheries Techniques, second edition produced by the American Fisheries Society, 1996.

Habitat data was collected from South Twin Lake on 7/15/03. Information collected were secchi disc depth, conductivity, percent littoral macrophyte community, three macroinvertebrate samples from random locations using D-nets, three zooplankton samples taken from each third of the length of the lake with a standard hoop trawl. Macroinvertebrate and zooplankton samples will not be processed until winter and will not be discussed in this report. Oxygen and temperature profiles were taken from the deepest location in the lake with an Oxy-guard meter.

Results

Electrofishing the entire shoreline yielded 1398 largemouth bass, 975 golden shiners, 36 redside shiners *Richardsonius balteteus* and 5 rainbow trout. Two gill net sets for 1 night yielded 56 largemouth bass, 426 golden shiners, 9 rainbow trout and 31 brook trout. Two trap net sets for 1 night yielded 45 golden shiners. Largemouth bass comprise 48.78% of the sample while golden shiners comprise 48.51%, redside shiners 1.21%, brook trout 1.04% and rainbow trout .47%. Refer to Figure 2 for species composition histogram.

Figure 3 and 4 refers to the length class distribution of largemouth bass and golden shiners. Ninety-two percent of largemouth bass sampled are 230-239mm or smaller. Golden shiners exhibit a bell shaped distribution with fish between 70-219mm. Figure 5 and refer to rainbow and brook trout length class distribution. Rainbow trout

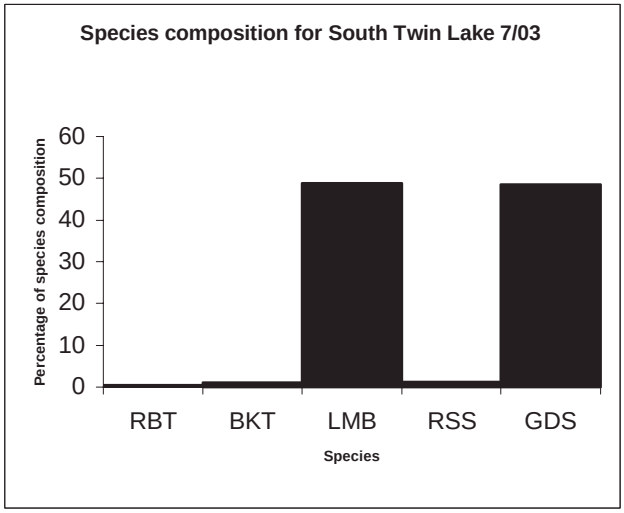


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Figure 2. Species composition histogram of fish sampled from South Twin Lake 7/03. Rainbow trout RBT, brook trout BKT, largemouth bass LMB, redside shiner RSS, golden shiner GDS.

exhibited two distinct size groups of 220-289mm and 320-369mm. Brook trout also showed two separate size groups. The first consisted of 8 fish between 270-299mm. The second group consists of 23 fish between 320-409mm.

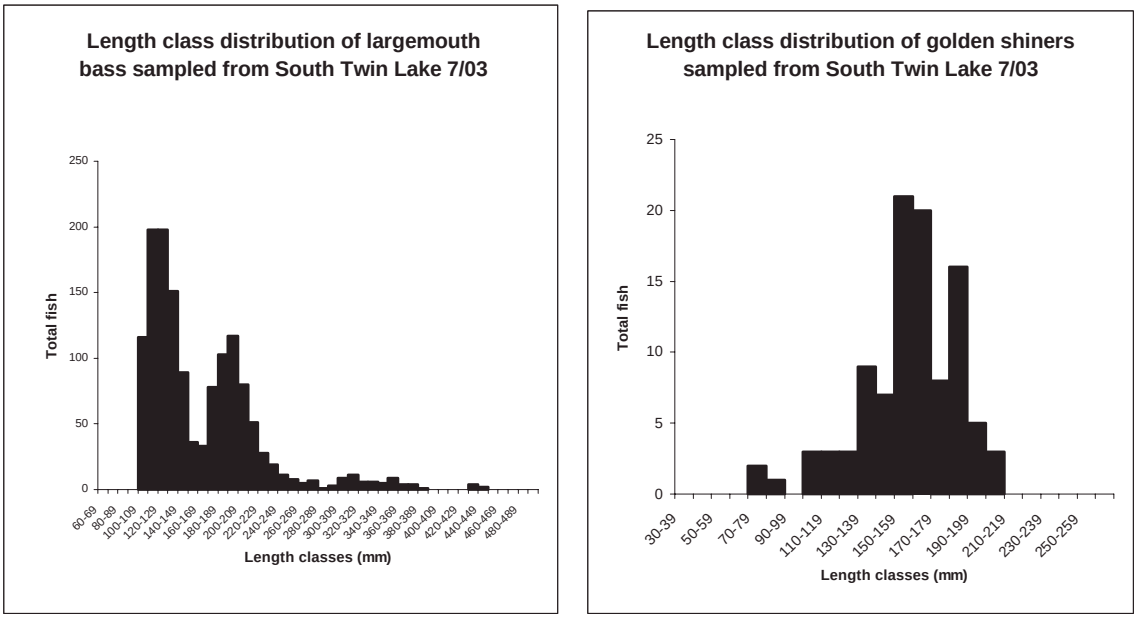
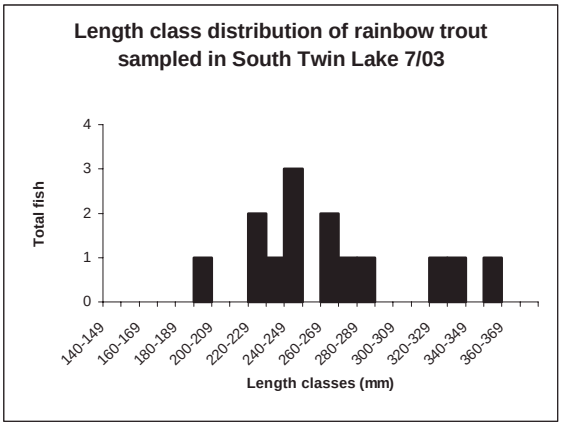


Figure 3 and 4. Length class distribution of largemouth bass and golden shiners sampled from South Twin Lakes 7/03.



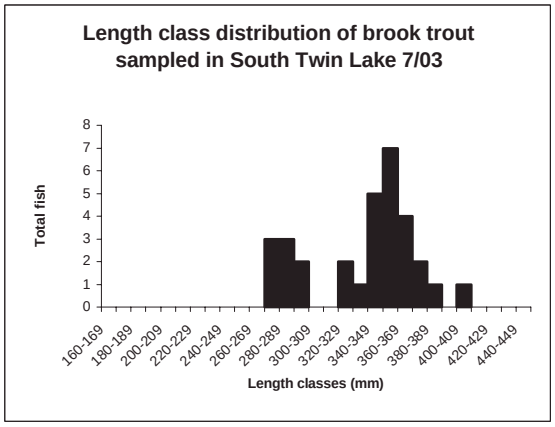


Figure 5 and 6. Length class distribution of rainbow trout and brook trout sampled from South Twin Lake 7/03.

Relative weights (Wr) of largemouth bass are all between 88 and 128. Brook trout expressed values between 92 and 128. Rainbow trout were all between 86 and 127. In general, all three species displayed a general increase in relative weight with an increase in fish length. Refer to Figures 7,8 and 9 for relative weight values. Preferred stock density (PSD) for largemouth bass was 22.

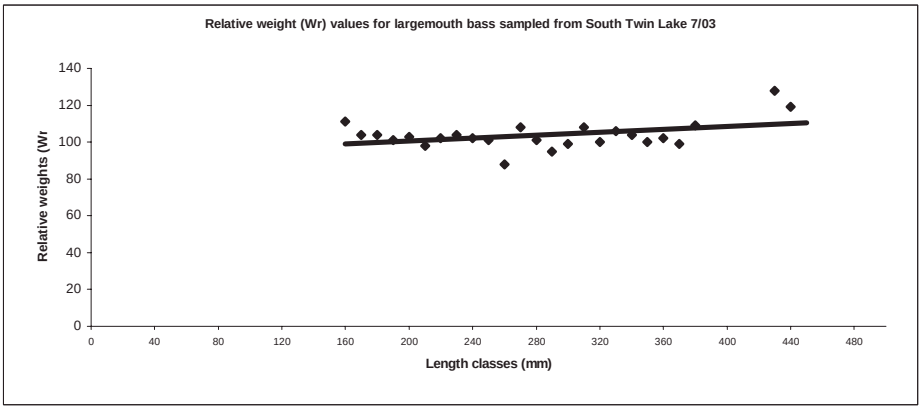
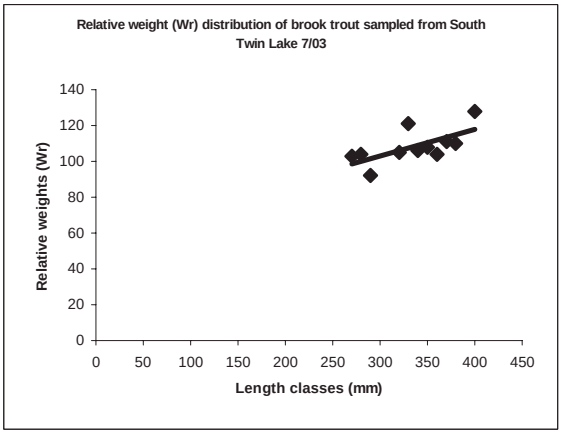


Figure 7. Relative weight (Wr) distribution of largemouth bass sampled from South Twin Lake 7/03.



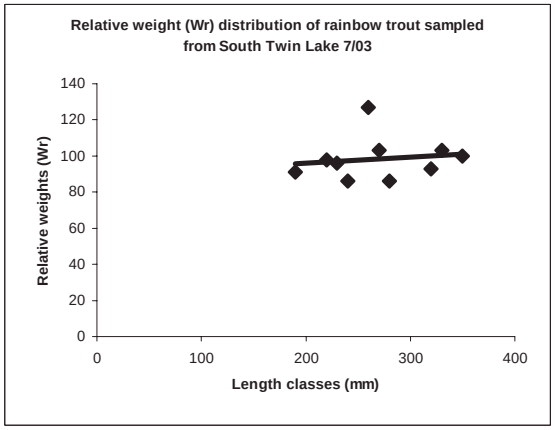


Figure 8 and 9. Relative weights (Wr) distribution of brook and rainbow trout sampled from South Twin Lake 7/03.

Secchi disc recording was 4m and conductivity was 81 microsiemens. Aquatic macrophytes comprise 80% of the littoral zone. Figure 10 comprises oxygen-temperature graphs for 7/16/03 and 2/11/03. The summer graph depicts water temperatures of 25C at the surface to 22.5C at 5m. Dissolved oxygen increases from 8.5mg/l at the surface to 15.3mg/l at 7m and decreases to 7.7mg/l at 16m. The thermocline exists between 5m and 7m. The winter graph depicts dissolved oxygen levels of 12.3mg/l at the surface decreasing rapidly to 7.3mg/l at 1m and remaining near 7mg/l to 8m and then decreasing to .7mg/l at 11m.

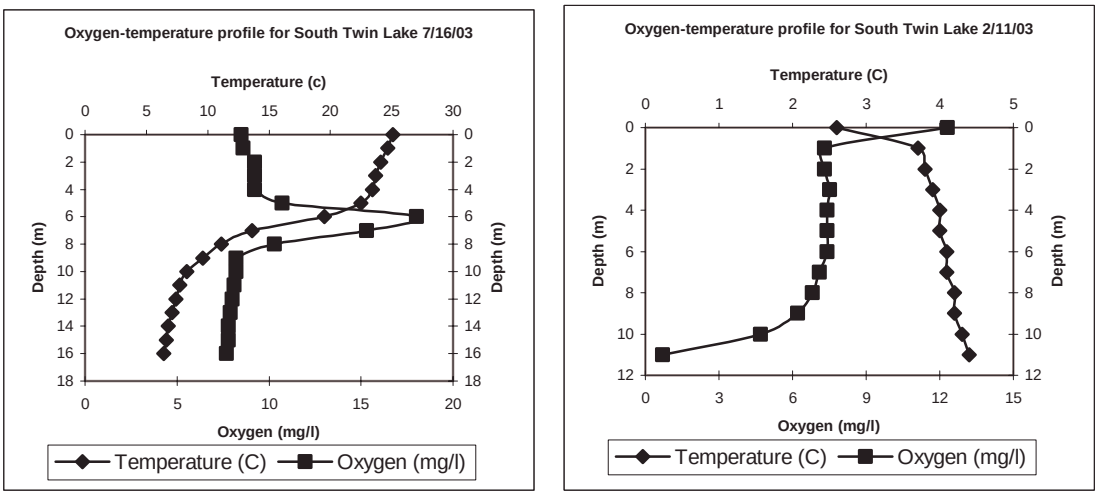


Figure 10 and 11. Oxygen-temperature graphs for South Twin Lake representing sampling periods 7/16/03 and 2/11/03.

Discussion

The sample of 2,981 fish taken from South Twin Lake was dominated by largemouth bass (48.78% of the sample) and golden shiners (48.51% of the sample). Refer to Figure 2. Neither of these two fish species appeared in gill net samples taken in 1965, 1975 (Halfmoon, 1978). However, redside shiners were abundant in the 1965 sample but only 36 were sampled despite the increased effort in our 7/03 sample. Redside shiners may be suppressed by a more dominant golden shiner.

Ninety-two percent of the largemouth bass sampled were less than 250mm and PSD estimates were only 22. See Figure 3. These values indicate good recruitment but possible stunting of the population and inability to survive to larger sizes. This could be due to competition between juvenile bass and golden shiners that exists in the lake. Many of the bass may not be able to obtain adequate size to consume the golden shiners and cannot sustain themselves on the other food sources due to competition. The lack of predation on golden shiners by bass could have allowed for the large population of shiners to exist.

However, relative weights (Wr) for largemouth bass are all near 100 and up to 128 for fish above 150mm. This indicates that the fish are in good overall condition. Refer to Figure 7 for relative weight (Wr) graph for largemouth bass. High relative weights like these are not consistent with a population of bass containing a low PSD of 21.97 and left-skewed size class distribution due to competition, excessive recruitment, poor environmental conditions, or the

combination. Currently, the limit for bass at South Twin Lake is 25 fish of any size. Angler catch records could be made and analyzed to determine if the absence of mid-sized bass is due to harvest or environmental conditions.

Though brook and rainbow trout only consisted of 1.51% of the sampled population, relative weights (Wr) for these fish were all near or above 100, indicating good condition. Refer to Figures 8 and 9 for brook and rainbow trout relative weights (Wr). However, all rainbow trout had an adipose fin clip indicating that they were hatchery reared. All rainbows raised in the tribal hatchery are triploided fish. This could indicate why the rainbow trout relative weights (Wr) were near or above 100. Non-triploided fish may have a lower relative weight (Wr) value.

Two distinct size classes exist for brook trout as indicated in Figure 6. The first is a smaller group of 8 fish between 270-299mm. Seven of the eight fish sampled had adipose clips and one also contained an orange elastomer tag indicating it was planted this year. Most likely each fish in this group were planted this year. Only 2 fish had adipose fin clips in the larger group of fish (23 fish between 320mm-410mm). Those two fish did not contain elastomer marks so stocking dates cannot be determined. The 21 non-marked fish may have been wild fish.

The rainbow trout sample contained two distinct size classes. See Figure 5. The first size class between 190mm and 289mm contained 11 hatchery fish with one orange elastomer mark indicating it was planted this year. The second group between 320mm-359mm contained 3 hatchery fish most likely planted in 2002 or were adult triploided fish planted in 2003.

Management Recommendations

Because the Colville Tribe policy is to remove illegally introduced non-native fishes from reservation waters then considerations should be made for largemouth bass and golden shiner removal. Interspecific competition for zooplankton and macroinvertebrates between bass and shiners could be deleterious to the more desirable brook and rainbow trout. However, high relative weights for both trout species do not indicate this is occurring at this time.

Removal could be done mechanically or chemically. Mechanical would need to be ongoing and would only control the problem. Chemical control would eliminate the problem but would damage other organisms. Chemical control does not guarantee permanent removal. Repopulation of problem fishes years after chemical treatment is common.

Leaving the bass in the lake could attain biological control. Since mid-sized bass make up the majority of the predating population and are almost absent in South Twin Lake then efforts should be made to protect these fish. An increase in mid-sized bass could reduce the number of shiners in the lake. If creel data indicates that harvest is causing the decline in mid-sized bass then slot-limits should be established allowing for the harvest of the smaller and larger individuals while protecting the middle-sized fish. Planting larger trout species that are capable of predating on the shiners may also help reduce the shiner population and eventually benefiting the trout fishery. Mechanical removal could also be used simultaneously.

Efforts should be made to improve water quality in the lake. Oxygen-temperature profiles taken on 7/15/03 and 2/11/03 show adequate oxygen levels >5mg/l for salmonid survival. See Figure 10 and 11. However, extensive macrophyte growth and production over 80-90% of the littoral zone may be encouraging bass and shiner growth and survival and thus impacting the salmonid fishery. A study and management plan should be made to determine nutrification sources and possible solutions.

A study to determine levels of natural recruitment and survival should be conducted. Small, natural recruited salmonids may experience poor growth and survival due to interspecific competition with juvenile bass and golden shiners. These fish may also fall prey to larger bass. The trout that survive these conditions may find sufficient food organisms as they reach larger sizes as expressed by the brook trout relative weights (Wr) in Figure 8.

Currently a mechanical removal program is underway for largemouth bass and golden shiners. Removal is done using an electrofishing boat and will be conducted at an experimental basis for several weeks.

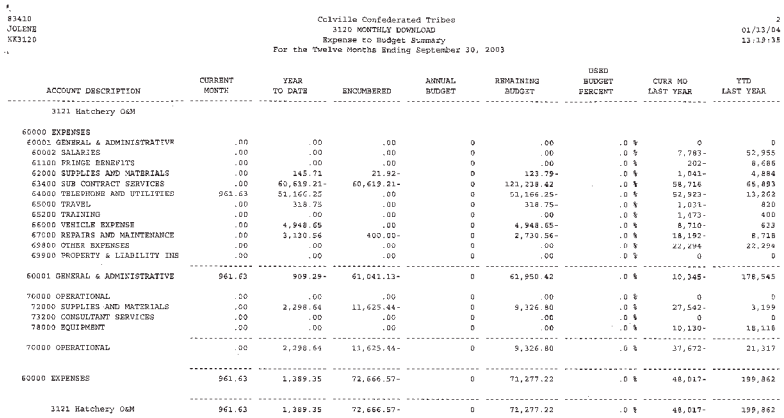
Summary

The year of 2003 marked a distinct shift in management philosophy and personnel. In April, the old project biologist left the resident fish program for the anadromous program after 2 years here. In August the lead field technician left to return to university to obtain a masters degree and a replacement was not found until October. A new creel clerk was added to the eastside to increase our coverage and another technician retired.
The Colville Tribal Fish hatchery distributed 46,092 pounds of trout to reservation and boundary waters and a large portion of the production was held over to be planted as “jumbos” in the spring. High mortality due to bacterial coldwater disease and extensive fungal growth during incubation resulted in higher than normal losses of larval fish.
Continued monitoring of potential reservation rainbow brood stocks identified Manilla, and Wall creeks as potential sources for redband rainbow trout and genetics work is underway to determine the purity of these stocks.
The fisheries within the boundaries of the Colville Reservation were determined to be stable both in regard to populations of trout or other game fish and angler usage. Most of the fisheries monitored meet or exceed establish goals for catch rates, mean size of fish, and fish condition. However, illegally introduced predators and poor spawning habitat resulting in little natural recruitment continue to be limiting factors for many reservation waters. Additionally, surveys of predatory game fish will be continued in 2004.

Budget Summary

83410 Colville Confederated Tribes 1
JOLENE 3120 MONTHLY DOWNLOAD 01/13/04
XR3120 Expense to Budget Summary 13:19:35
For the Twelve Months Ending September 30, 2003

ACCOUNT DESCRIPTION	CURRENT MONTH	YEAR TO DATE	ENCUMBERED	ANNUAL BUDGET	REMAINING BUDGET	USED BUDGET PERCENT	CURR MO LAST YEAR	YTD LAST YEAR
83120 Hatchery Operations								
3120 Hatchery M&E								
60000 EXPENSES								
60001 GENERAL & ADMINISTRATIVE	.00	.00	.00	0	.00	.0 %	0	0
60002 SALARIES	33,410.44	387,806.39	.00	348,858	38,948.39-	111.2 %	57,184	246,398
61100 FRINGE BENEFITS	4,339.32	47,267.43	.00	65,931	18,663.57	71.7 %	9,457	32,328
62000 SUPPLIES AND MATERIALS	34,083.66	62,142.37	651.94	120,119	57,324.74	52.3 %	719	17,331
63000 PROFESSIONAL FEES	.00	.00	.00	0	.00	.0 %	0	0
63400 SUB CONTRACT SERVICES	3,230.68	1,172.48-	4,700.60	7,009	3,480.88	50.3 %	133,921	201,530
64000 TELEPHONE AND UTILITIES	13,912.24	34,903.57	.00	63,546	28,642.43	54.9 %	60,666	56,110
65000 TRAVEL	1,480.80	8,085.87	.00	15,497	7,401.13	52.2 %	1,462	6,398
65200 TRAINING	170.00	1,334.00	150.00	0	1,484.00-	.0 %	1,954	4,080
66000 VEHICLE EXPENSE	4,218.41	31,246.69	207.89	40,070	8,615.42	78.5 %	34,119	40,421
67000 REPAIRS AND MAINTENANCE	274.29-	9,595.62	.00	4,500	5,095.62-	213.2 %	19,561	16,730
68000 BUILDING EXPENSE	.00	.00	.00	0	.00	.0 %	0	0
69800 OTHER EXPENSES	14,065.80	163,266.49	.00	146,869	16,397.49-	111.2 %	1,780	103,733
69900 PROPERTY & LIABILITY INSU	.00	8,341.00	.00	0	8,341.00-	.0 %	0	4,941
60001 GENERAL & ADMINISTRATIVE	107,695.06	752,826.90	5,710.43	812,399	53,861.67	93.4 %	300,823	720,000
70000 OPERATIONAL	.00	.00	.00	0	.00	.0 %	0	0
72000 SUPPLIES AND MATERIALS	3,123.06	9,636.33	939.14	0	10,555.47-	.0 %	60,573	129,784
73200 CONSULTANT SERVICES	.00	.00	.00	0	.00	.0 %	0	0
78000 EQUIPMENT	3,537.60	7,793.24	1,462.40	16,725	7,509.36	55.1 %	17,200	96,713
70000 OPERATIONAL	6,660.66	17,369.57	2,401.54	16,725	3,046.11-	118.2 %	77,773	226,497
60000 EXPENSES	114,355.72	770,196.47	8,111.97	829,124	50,815.56	93.9 %	378,596	946,497
3120 Hatchery M&E	114,355.72	770,196.47	8,111.97	829,124	50,815.56	93.9 %	378,596	946,497



83410 Colville Confederated Tribes 2
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For the Twelve Months Ending September 30, 2003

ACCOUNT DESCRIPTION	CURRENT MONTH	YEAR TO DATE	ENCUMBERED	ANNUAL BUDGET	REMAINING BUDGET	USED BUDGET PERCENT	CURR MO LAST YEAR	YTD LAST YEAR
3121 Hatchery O&M								
60000 EXPENSES								
60001 GENERAL & ADMINISTRATIVE	.00	.00	.00	0	.00	.0 %	0	0
60002 SALARIES	.00	.00	.00	0	.00	.0 %	7,783-	52,955
61100 FRINGE BENEFITS	.00	.00	.00	0	.00	.0 %	202-	8,686
62000 SUPPLIES AND MATERIALS	.00	145.71	21.92-	0	123.79-	.0 %	1,041-	4,884
63400 SUB CONTRACT SERVICES	.00	60,619.21-	60,619.21-	0	121,238.42	.0 %	58,716	65,893
64000 TELEPHONE AND UTILITIES	961.63	51,166.25	.00	0	51,166.25-	.0 %	52,923-	13,262
65000 TRAVEL	.00	318.75	.00	0	318.75-	.0 %	1,031-	820
65200 TRAINING	.00	.00	.00	0	.00	.0 %	1,473-	400
66000 VEHICLE EXPENSE	.00	4,948.65	.00	0	4,948.65-	.0 %	8,710-	633
67000 REPAIRS AND MAINTENANCE	.00	3,130.56	400.00-	0	2,730.56-	.0 %	18,192-	8,728
69800 OTHER EXPENSES	.00	.00	.00	0	.00	.0 %	22,294	22,294
69900 PROPERTY & LIABILITY INS	.00	.00	.00	0	.00	.0 %	0	0
60001 GENERAL & ADMINISTRATIVE	961.63	909.29-	61,041.13-	0	61,950.42	.0 %	10,345-	178,545
70000 OPERATIONAL	.00	.00	.00	0	.00	.0 %	0	0
73000 SUPPLIES AND MATERIALS	.00	2,298.64	11,625.44-	0	9,326.80	.0 %	27,542-	3,199
73200 CONSULTANT SERVICES	.00	.00	.00	0	.00	.0 %	0	0
78000 EQUIPMENT	.00	.00	.00	0	.00	.0 %	10,130-	18,118
70000 OPERATIONAL	.00	2,298.64	11,625.44-	0	9,326.80	.0 %	37,672-	21,317
60000 EXPENSES	961.63	1,389.35	72,666.57-	0	71,277.22	.0 %	48,017-	199,862
3121 Hatchery O&M	961.63	1,389.35	72,666.57-	0	71,277.22	.0 %	48,017-	199,862

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