Warmwater Fish Survey of Spanaway Lake, Pierce County, Spring 2000

by

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Abstract

Spanaway Lake was surveyed by a three-person crew from May 22-25, 2000. Multiple gear types (electrofishing, gill nets, and trap nets) were utilized to reduce any sampling bias associated with each sampling method. A total of 1,702 fish, representing ten species and the family Cottidae were sampled at Spanaway Lake. Of those, yellow perch (*Perca flavescens*) and rock bass (*Ambloplites rupestris*) were the two most abundant by number, respectively. Rock bass and largemouth bass (*Micropterus salmoides*) were the two most abundant by biomass, respectively. Other species sampled included: rainbow trout (*Onchorynchus mykiss*), common carp (*Cyprinus carpio*), smallmouth bass (*M. dolomieu*), coho (*O. kisutch*), pumpkinseed (*Lepomis gibbosus*), sculpin (family Cottidae), brown bullhead (*Ameiurus nebulosus*), and cutthroat trout (*O. clarki*). Sample sizes for most species were too low to draw firm conclusions about the balance of the fish community as a whole. Warmwater anglers will find that there is plenty of opportunity to fish for yellow perch and rock bass, while those willing to work a little harder can catch good sized largemouth and smallmouth bass as well. Recommendations for Spanaway Lake include: 1.) An angler creel survey to estimate angler preference, effort, and harvest; 2.) Continued fish community surveys during both spring and fall seasons; and 3.) An assessment of secondary productivity.

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Introduction and Background

Spanaway Lake is a 262 acre water body located in Pierce County, Washington. The outlet from Spanaway Lake flows into Steilacoom Lake, eventually emptying into Puget Sound via Chambers Creek. The outlet of Spanaway Lake has an outfall structure that is impassable to upstream salmonid migrations.

The land around Spanaway Lake is highly urbanized. A large park on the northeastern shore, Spanaway Lake Park, is the only non-residentially developed piece of land surrounding the lake. This park, maintained by Pierce County, has the only public boat launch on the lake and is a highly utilized spot for bank anglers. This is a popular lake with anglers; it is very close to an urban center, and it is stocked yearly with large numbers of rainbow trout.

Spanaway Lake has been rehabilitated with rotenone twice in its history, in 1950 and 54.

Materials and Methods

Data Collection

Spanaway Lake was surveyed by a three-person team during May 22 - 25, 2000. Fish were captured using three sampling techniques: electrofishing, gill netting, and fyke netting. The electrofishing unit consisted of a Smith-Root SR-16s electrofishing boat, with a 5.0GPP pulsator unit. Peak efficiency of the electrofishing unit is defined as producing a ¼ sine wave. The boat was fished using a pulsed DC current of 120 Hz at 6-8 amps power, as close to peak efficiency as possible. Experimental gill nets, 45.7 meters (m) long x 2.4 m deep, were constructed of four sinking panels (two each at 7.6 m and 15.2 m long) of variable-size (1.3, 1.9, 2.5, and 5.1 cm stretch) monofilament mesh. Fyke (modified hoop) nets were constructed of five 1.2 m diameter hoops with two funnels, and a 2.4 m cod end (6 mm nylon delta mesh). Attached to the mouth of the net were two 7.6 m wings, and a 30.5 m lead.

In order to reduce the gear induced bias in the data, the sampling time for each gear was standardized so that the ratio of electrofishing to gill netting to fyke netting was 1:1:1. The standardized sample is 1800 sec of electrofishing (3 sections), 2 gill net nights, and 2 fyke net nights. Sampling occurred during the evening hours to maximize the type and number of fish captured. Sampling locations were selected from a map by dividing the entire shoreline into 400 m sections, numbering them consecutively and randomly choosing them without replication. While electrofishing, the boat was maneuvered slowly through the shallows for a total of 600 seconds of "pedal-down" time. Gill nets were fished perpendicular to the shoreline; the small-mesh end was tied off to shore, and the large- mesh end was anchored off shore. Fyke nets were fished perpendicular to the shoreline as well. The lead was tied on shore, and the cod-end was anchored off shore, with the wings anchored at approximately a 45E angle from the net lead. Fyke nets are fished with the hoops 0.3 - 0.5 m below the water surface, this sometimes requires shortening the lead. Gill nets and fyke nets were each set overnight at four (4) locations around the lake.

With the exception of sculpin (family Cottidae), all fish captured were identified to the species level. Each fish was measured to the nearest millimeter (mm) and weighed to the nearest gram (g). For aging purposes, scales or dorsal spines were taken from five individuals of each species per centimeter size class.

Water quality data was collected during midday from the deepest section of the lake on May 25, 2000. Using a Hydrolab® probe and digital recorder, dissolved oxygen (mg/l), temperature (CE), pH, turbidity (NTU), and conductivity (Fsiemens/cm) data was gathered in the deepest section of the lake at 1 m intervals through the water column.. Secchi disk readings, used to measure transparency, were taken by the methods outlined by Wetzel (1983).

Data Analysis

Species Composition

The species composition by number of fish captured, was determined using procedures outlined by Fletcher et al.(1993). Species composition by weight (kg) of fish captured, was determined using procedures adapted from Swingle (1950). Only fish estimated to be at least one year old were used to determine species composition. These were inferred from the length-frequency distributions described below, in conjunction with the results of the aging process. Young of year were not considered in biomass and species composition estimates because large fluctuations in their numbers may cause distorted results. Also, most of these fish would be subject to natural attrition during their first winter, resulting in a different size distribution by the following year.

Catch Per Unit of Effort

The catch per unit of effort (CPUE) of electrofishing for each species was determined by dividing the total number in all size classes equal or greater than stock size (defined in Appendix A), by the total electrofishing time (sec). The CPUE for gill nets and fyke nets was determined similarly, except the number equal or greater than stock size was divided by the number of net-nights for each net (usually one). An average CPUE (across sample sections) with 80% confidence interval was calculated for each species and gear type.

For fishes in which there is no published stock size (i.e., sculpins, suckers, etc.), CPUE is calculated using all individuals captured. Furthermore, since it is standardized, the CPUE is useful for comparing stocks between lakes.

Length-Frequency

A length-frequency histogram was calculated for each species and gear type in the sample. Length-frequency histograms are constructed using individuals that are age one and older (determined by the aging process), and calculated as the number of individuals of a species in a given size class, divided by the total individuals of that species sampled. Plotting the histogram this way tends to flatten out large peaks created by an abundant size class, and makes the graph easier to read. These length-frequency histograms are helpful when trying to evaluate the size and age structure of the fish community, and their relative abundance in the lake.

Stock Density Indices

To assess the size structure of fish populations, stock density indices were calculated as described by Gablehouse (1984). Proportional stock density (PSD and relative stock density RSD) are calculated as proportions of various size-classes of fish in a sample. The size classes are referred

to as minimum stock (S), quality (Q), preferred (P), memorable (M), and trophy (T). Lengths have been published to represent these size classes for each species, and were developed to represent a percentage of world-record lengths as listed by the International Game Fish Association (Gablehouse 1984). These lengths are presented in Appendix A.

The indices are accompanied by a 80% confidence interval (Gustafson 1988) to provide an estimate of statistical precision.

Relative Weight

A relative weight index (W_r) was used to evaluate the relative condition of fish in the lake. A W_r value of 100 generally indicates a fish in good condition when compared to the national average for that species and size. Furthermore, relative weights are useful for comparing the condition of different size groups within a single population to determine if all sizes are finding adequate forage or food (ODFW 1997). Relative weights were calculated following Murphy and Willis (1991). The parameters for the standard weight ($W_{s)}$ equations of many fish species, including the minimum length recommendations for their application, are listed in Anderson and Neumann (1996).

Age and Growth

Age determination and annuli measurements from scales or other structures were determined by the Department of Fish and Wildlife Aging Unit. Total length at annulus formation was back-calculated using the Fraser-Lee method with *y*-axis intercepts specified by Carlander (1982). Mean back-calculated lengths at each age for each species were presented in tabular form for easy comparison between year classes. Mean back-calculated lengths at each age for each species were compared to averages calculated from scale samples gathered at lakes sampled by the warmwater enhancement teams.

Results and Discussion

Water Quality and Habitat

Table 1 shows the water quality parameters that were collected in the deepest section of Spanaway Lake. Dissolved oxygen levels are high through most of the water column, but drop off quickly in the bottom meter to near anoxic conditions. Temperature declines steadily with increasing depth, but the lake was not stratified during our sample. Though none were present during our sample, Spanaway Lake has been reported to have summertime blue-green algae blooms.

Table 1. Water quality measurements taken from Spanaway Lake, spring 2000. Measurements taken at midday.

Depth m	Temp C	pH	DO mg/1	Turbidity NTU	Conduct s/cm
0	18.1	8.4	11.7	2.0	98.9
1	18.1	8.5	11.4	8.3	99.0
2	18.2	8.5	11.6	10.1	98.7
3	16.7	7.7	13.7	11.1	96.0
4	14.5	7.0	13.1	11.7	99.9
5	13.3	6.5	9.7	11.2	105.1
6	11.9	6.3	1.4	10.1	117.6

The majority of the lake is fairly deep, with a maximum depth of 28 ft (8.5 m). The shoreline drops off quickly to a depth of 10 ft (3 m). The south end of the lake has a more gradual gradient and during the summer months is probably thick with submerged aquatic vegetation. Besides deep water, there is minimal aquatic habitat in Spanaway Lake. The shoreline is a highly developed residential area with docks and bulkheads. Approximately 18% of the shoreline is along the county park.

Species Composition and Relative Abundance

Our sample at Spanaway Lake was dominated numerically by yellow perch. Rock bass were second most abundant numerically, and accounted for most of the biomass (Table 2).

Catch per unit of effort (CPUE) can be used as an index of abundance. Viewed together with a confidence interval, it can be used to represent the homogeneity of the distribution of fish around the lake. Table 3 shows the CPUE for stock sized and larger fish from our spring 2000 sample of Spanaway Lake, by gear type. Stock sized and larger rock bass had the highest catch per hour. Though yellow perch had the highest total catch by number, most of these fish were smaller than stock sized. For stock sized and larger fish, catch per hour of yellow perch ranked fourth.

Table 2. Species composition by weight and number for fish sampled (Age 1 and older) from Spanaway Lake, spring 2000.

	Species Composition					
	by Weight		by Number		Length (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Rock bass	42.5	39.5	602	35.4	42	241
Largemouth bass	21.0	19.5	42	2.5	84	572
Yellow perch	13.2	12.2	760	44.7	73	270
Rainbow trout	8.2	7.6	45	2.6	101	420
Common carp	7.8	7.2	1	0.1	775	775
Smallmouth bass	5.2	4.8	41	2.4	75	433
Coho	4.0	3.8	28	1.6	124	355
Pumpkinseed	4.0	3.7	96	5.6	75	174
Sculpin	0.8	0.7	81	4.8	29	142
Brown bullhead	0.8	0.7	4	0.2	185	288
Cutthroat trout	0.1	0.1	2	0.1	185	191

Table 3. Average catch per unit effort for fish sampled from Spanaway Lake, spring 2000.

	Electrofishing			Gill Netting			Fyke Netting		
Species	(#/hour)	80% CI	Sample Sites	#/net night	80% CI	# net nights	#/net night	80% CI	# net nights
Rock bass	139.09	23.64	15	16.00	9.11	4	16.00	7.45	4
Sculpin	32.33	9.74	15	—	—	4	—	—	4
Pumpkinseed	31.59	11.27	15	2.50	1.61	4	1.00	0.52	4
Yellow perch	11.99	4.80	15	6.25	3.11	4	—	—	4
Largemouth bass	5.99	3.59	15	0.25	0.32	4	—	—	4
Smallmouth bass	5.60	2.54	15	—	—	4	—	—	4
Rainbow trout	2.00	1.79	15	6.00	1.57	4	—	—	4
Brown bullhead	1.20	1.11	15	0.25	0.32	4	—	—	4
Carp	0.40	0.51	15	—	—	4	—	—	4
Coho	—	—	15	7.00	2.91	4	—	—	4

Sample sizes were too low, for most species, to calculate meaningful PSD's (Table 4). Though, the indications are that the population is in balance. For a population to be in balance, predator species should have a PSD in the range of 40-70, while prey species should be in the 20-60 range.

Table 4. Stock density indices, by gear type, for fish sampled from Spanaway Lake, spring 2000.

Species	# Stock Length	Quality		Preferred		Memorable		Trophy	
		PSD	80% CI	RSD-P	80% CI	RSD-M	80% CI	RSD-T	80% CI
Electrofishing									
Rock bass	348	26	3	1	1	—	—	—	—
Pumpkinseed	79	4	3	—	—	—	—	—	—
Yellow perch	30	17	9	3	4	—	—	—	—
Largemouth bass	15	80	13	53	17	13	11	—	—
Smallmouth bass	14	36	16	21	14	7	9	—	—
Rainbow trout	5	—	—	—	—	—	—	—	—
Brown bullhead	3	33	35	33	35	—	—	—	—
Gill Net									
Pumpkinseed	10	—	—	—	—	—	—	—	—
Rock bass	64	3	3	—	—	—	—	—	—
Yellow perch	25	12	8	—	—	—	—	—	—
Rainbow trout	24	4	5	—	—	—	—	—	—
Fyke Net									
Rock bass	64	27	7	—	—	—	—	—	—
Pumpkinseed	4	50	32	—	—	—	—	—	—

Summary by Species

A total of eleven fish species were sampled at Spanaway Lake, including: rock bass (*Ambloplites rupestris*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), rainbow trout (*Onchorynchus mykiss*), common carp (*Cyprinus carpio*), smallmouth bass (*M. dolomieu*), coho (*O. kisutch*), pumpkinseed (*Lepomis gibbosus*), sculpin (family Cottidae), brown bullhead (*Ameiurus nebulosus*), and cutthroat trout (*O. clarki*). These species are listed in order by decreasing total biomass from the spring 2000 survey.

Ambloplites rupestris, rock bass

Rock bass were the species with the highest CPUE and total biomass in our spring 2000 sample (tables 2 and 4.). Table 5 shows the mean back calculated length at age for each year class. Rock bass in Spanaway Lake grow faster, and larger than what is average for Washington. The largest individual in our sample was 241mm, or about 9.5 inches.

Table 5. Mean back calculated length at age for rock bass from the spring 2000 survey of Spanaway Lake, Pierce County.

		Mean Length at Age (mm)					
Year Class	**n**	**I**	**II**	**III**	**IV**	**V**	**VI**
1999	5	**65**					
1998	19	56	**107**				
1997	24	54	101	**154**			
1996	17	59	117	168	**197**		
1995	9	61	109	163	188	**212**	
1997	4	55	115	172	197	212	**229**
Fraser-Lee	78	57	108	161	194	212	229
State avg.		29	70	118	152	178	193
Direct prop.		39	99	158	193	211	229

Rock bass was one of the few species that had a large enough sample size to calculate a meaningful length-frequency distribution (Figure 1). Rock bass are fairly well defined across their size range. Rock bass relative weights (Figure 2) shows that fish condition is good, but below the national 75th percentile. Also, a least-squares regression line shows a slight decrease in W_r with increasing length.

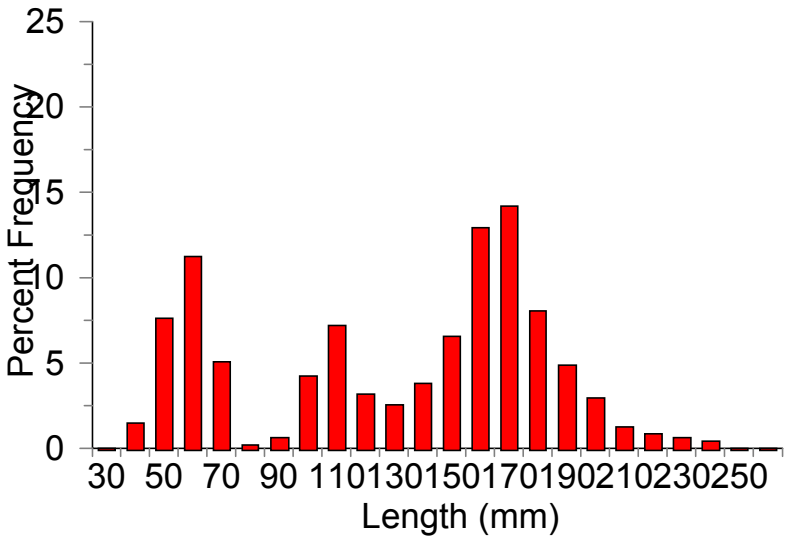

Figure 1. Length-frequency distribution of rock bass from the spring 2000 survey of Spanaway Lake, Pierce County. Represents individuals one year old or older.

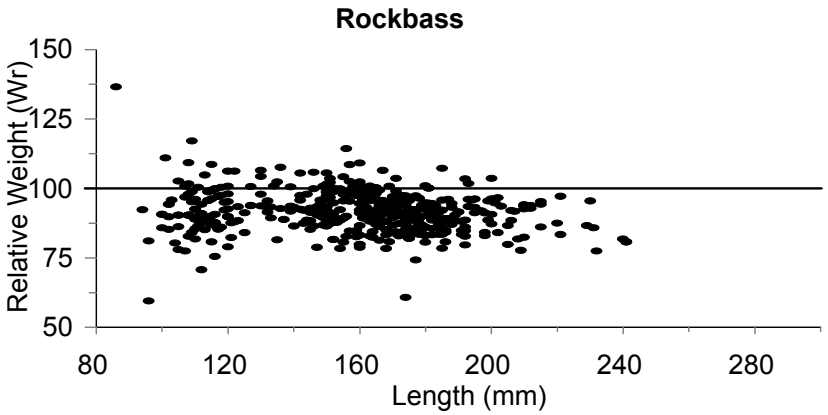

Figure 2. Relative weights of rock bass from the spring 2000 survey of Spanaway Lake, Pierce County. Horizontal line at 100 represents the national 75th percentile.

Micropterus salmoides, largemouth bass

Largemouth bass had the second highest total biomass, but were near the bottom for CPUE (tables 2 and 4). Size of fish in our sample ranged from 84mm to 572mm (3 - 22.5 inches). A few large individuals accounted for most of their biomass. Table 6 shows the mean back calculated length at age for each year class. Largemouth bass in Spanaway Lake grow faster than what is average for Washington. The oldest fish was 14 years old.

Table 6. Mean back calculated length at age for largemouth bass from the spring 2000 survey of Spanaway Lake, Pierce County.

		Mean Length at Age (mm)													
Year class	**n**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**XIII**	**XIV**
1999	21	**96**													
1998	3	79	**217**												
1997	3	105	219	**310**											
1996	4	82	154	272	**365**										
1995	2	101	162	220	355	**405**									
1994	1	70	154	315	375	412	**448**								
1993	0	—	—	—	—	—	—	—							
1992	1	89	221	332	394	414	438	455	**473**						
1991	1	70	148	210	265	382	441	481	511	**535**					
1990	0	—	—	—	—	—	—	—	—	—	—				
1989	0	—	—	—	—	—	—	—	—	—	—	—			
1988	0	—	—	—	—	—	—	—	—	—	—	—	—		
1987	0	—	—	—	—	—	—	—	—	—	—	—	—	—	
1986	1	93	197	249	296	334	377	407	441	465	501	520	546	560	**572**
Fraser-Lee	37	93	186	274	350	392	426	448	475	500	501	520	546	560	572
State avg.		60	146	222	261	289	319	368	396	440	485	472	496		
Direct prop.		84	176	268	346	389	423	445	473	498	499	518	545	560	572

Though there was not a large enough sample size of largemouth bass to create a meaningful length-frequency histogram, bass were sampled from across a large portion of their typical size range. Relative weights for largemouth bass (Wr) were all above the national 75th percentile (Figure 3). This shows that there is plenty of available forage, and bass are effectively finding food.

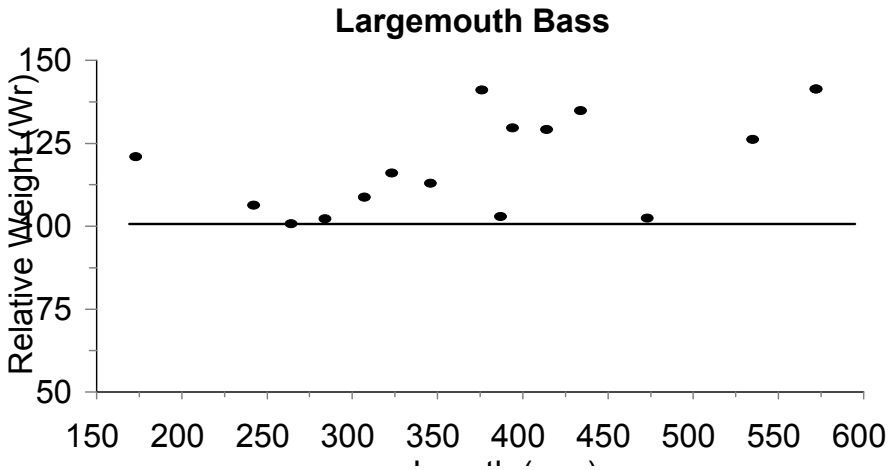

Figure 3. Relative weights of largemouth bass from the spring 2000 survey of Spanaway Lake, Pierce County. Horizontal line at 100 represents the national 75th percentile.

Perca flavescens, yellow perch

Yellow perch were the most abundant species by total number captured, but by catch per hour of stock sized and larger fish, they ranked third (Tables 2 and 4). Size range of fish in our sample was 73mm - 270mm (about 3 - 10.5 inches). Table 7 shows the mean back calculated length at age for each year class. Yellow perch in Spanaway Lake grow faster than what is average for Washington, but the oldest yellow perch sampled was only 3 years old. The length-frequency histogram (Figure 4) shows there was a high abundance of age one fish in the sample, with a very low abundance of older fish in the sample.

Table 7. Mean back calculated length at age for yellow perch from the spring 2000 survey of Spanaway Lake, Pierce County.

		Mean Length at Age (mm)		
Year Class	n	I	II	III
1999	35	**93**		
1998	3	90	**186**	
1997	4	99	178	**232**
Fraser-Lee	42	93	182	232
State avg.		60	120	152
Direct prop.		85	176	232

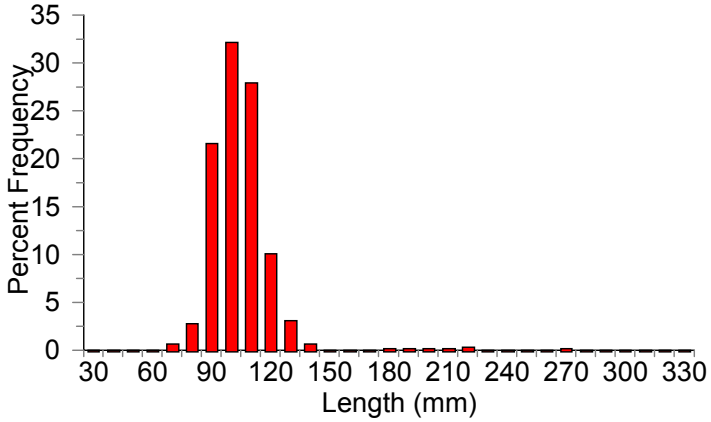

Figure 4. Length-frequency distribution of yellow perch from the spring 2000 survey of Spanaway Lake, Pierce County. Represents individuals one year old or older.

Relative weights of yellow perch (Figure 5) represent the norm for western Washington, they are below the national 75th percentile, and decrease with increasing length. Low relative weights may be caused by competition, or poor foraging efficiency.

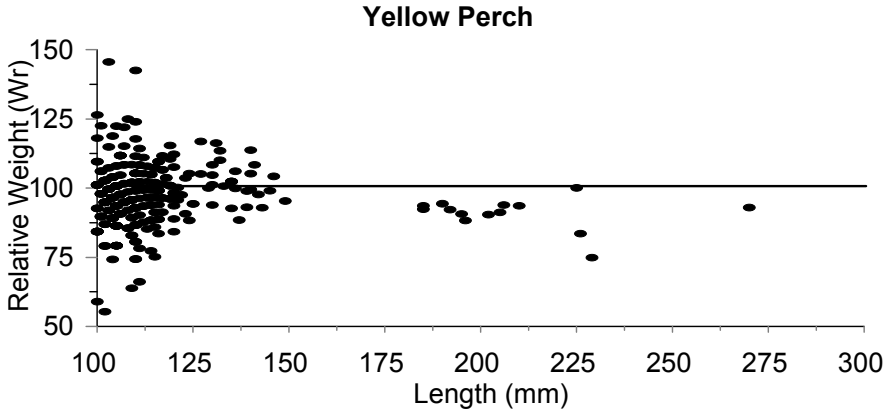

Figure 5. Relative weights of yellow perch from the spring 2000 survey of Spanaway Lake, Pierce County. Horizontal line at 100 represents the national 75th percentile.

Onchorynchus mykiss, rainbow trout

Size range of rainbow trout in our sample was 101mm - 420mm (about 4 - 16.5 inches). The rainbow trout fishery is maintained by the yearly stocking of 15-17,000 catchable sized trout and 20,000 trout fry. Spanaway Lake has also been planted with larger, faster growing triploid rainbow trout, a relatively new component of the trout program.

Cyprinus carpio, common carp

Only a single common carp was sampled in Spanaway Lake. It measured 775mm and weighed 7.8kg. A W_r of 124, well above the national 75th percentile, means this carp had an abundant source of food.

Micropterus dolomieu, smallmouth bass

Smallmouth bass had roughly the same CPUE as largemouth bass (Table 4). Mean back-calculated length at age (Table 8) shows that smallmouth bass are growing at a faster rate than average for western Washington. Also, smallmouth bass growth rates are higher than those of largemouth bass in Spanaway Lake. Fish sampled ranged in size from 75 - 433mm (3 - 17 inches) total length. A sample size of only 40 fish did not produce a meaningful length-frequency histogram (Figure 7), but one is shown for a general view of size distribution of our sample.

Table 8. Mean back calculated length at age for smallmouth bass from the spring 2000 survey of Spanaway Lake, Pierce County.

		Mean Length at Age (mm)				
Year Class	**n**	**I**	**II**	**III**	**IV**	**V**
1999	16	**87**				
1998	9	86	**197**			
1997	4	101	220	**331**		
1996	0	—	—	—	—	
1995	1	144	282	361	401	**433**
Fraser-Lee	30	90	209	337	401	433
State avg.		70	146	212	268	234
Direct prop.		78	203	335	398	433

Relative weights of smallmouth bass (Figure 6) centered around the national 75th percentile, meaning good overall condition. This, together with the above average growth rates, suggests that there is plenty of prey items available for the smallmouth bass population.

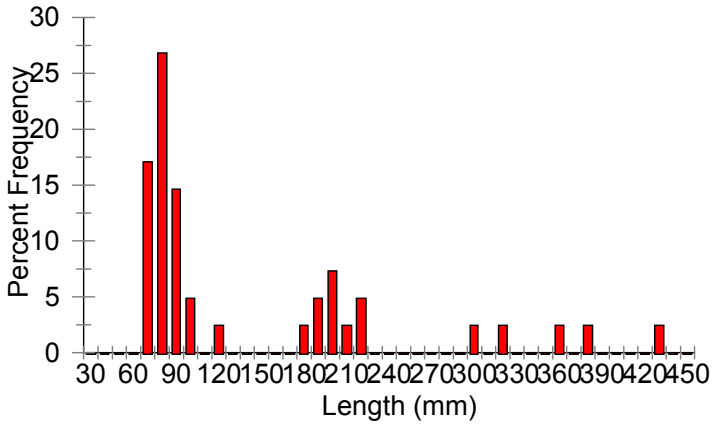

Figure 6. Length-frequency distribution of smallmouth bass from the spring 2000 survey of Spanaway Lake, Pierce County. Represents individuals one year old or older.

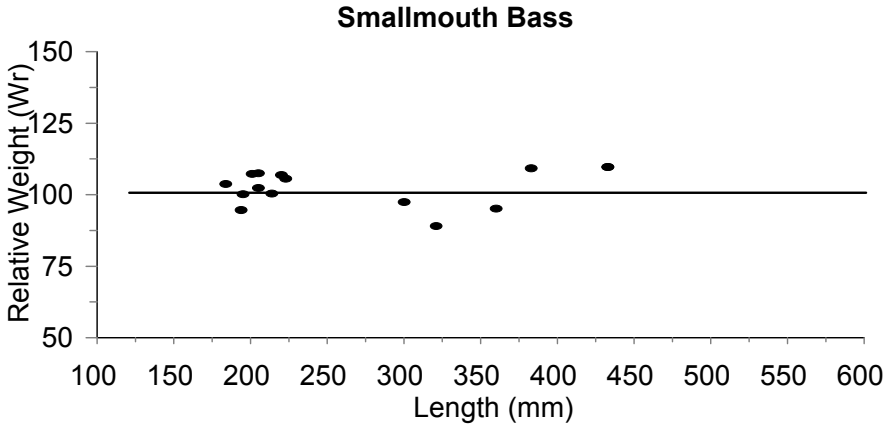

Figure 7. Relative weights of smallmouth bass from the spring 2000 survey of Spanaway Lake, Pierce County. Horizontal line at 100 represents the national 75th percentile.

Onchorynchus kisutch, coho

Coho captured were between 124 and 355mm total length. There is a migration barrier to salmonids below Spanaway Lake. Hatchery fish are planted in a tributary to the lake, and rear in the lake itself before migrating to the sea.

Lepomis gibbosus, pumpkinseed

Pumpkinseed had the third highest CPUE (Table 4). Mean back-calculated length at age (Table 9) showed that pumpkinseed in Spanaway Lake are growing faster than average for western Washington. Pumpkinseed sampled ranged in size from 75 - 175mm (3 - 9 inches). The length-frequency distribution (Figure 8) is very abbreviated and resembles a bell curve.

Relative weights of pumpkinseed (Figure 9) are all well above the national 75th percentile. This means the fish are in good overall condition, and are not lacking prey items.

Table 9. Mean back calculated length at age for pumpkinseed from the spring 2000 survey of Spanaway Lake, Pierce County.

		Mean Length at Age (mm)			
Year Class	**n**	**I**	**II**	**III**	**IV**
1999	0	—			
1998	32	49	**103**		
1997	3	44	88	**136**	
1996	4	53	110	132	**149**
Fraser-Lee	39	49	102	134	149
State avg.		24	72	102	123
Direct prop.		30	98	131	148

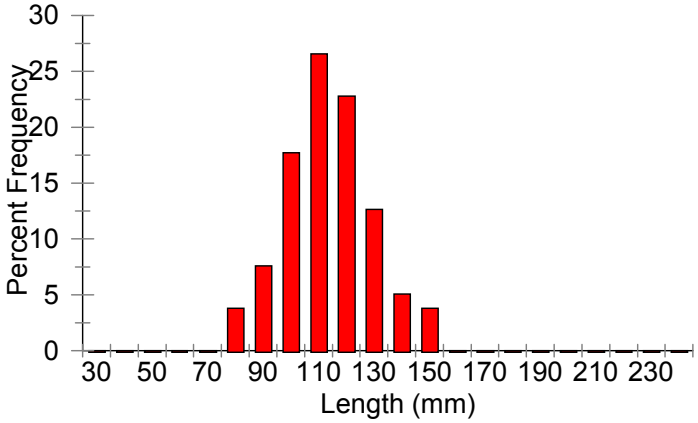

Figure 8. Length-frequency distribution of pumpkinseed from the spring 2000 survey of Spanaway Lake, Pierce County. Represents individuals one year old or older.

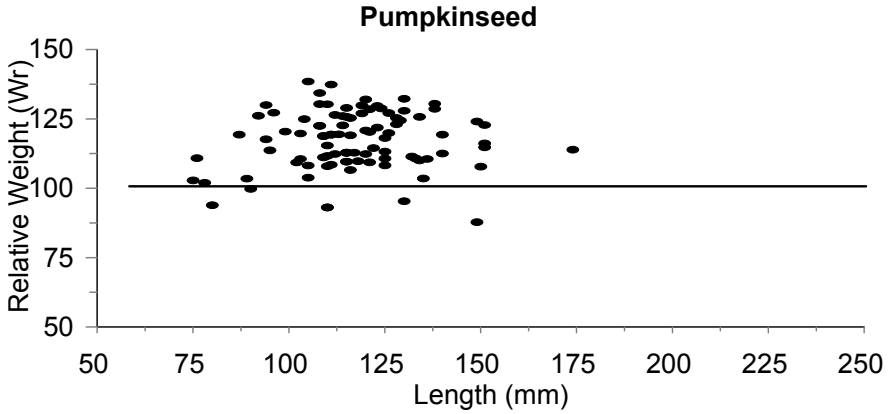

Figure 9. Relative weights of pumpkinseed from the spring 2000 survey of Spanaway Lake, Pierce County. Horizontal line at 100 represents the national 75th percentile.

Cottidae, sculpin

Sculpin had the second highest electrofishing CPUE. These are not an important recreational species. Due to their minute morphological variations, these species are only identified to the family level. No age and growth analysis was performed on these species. Sculpin ranged in size from 29 - 142mm (1 - 5.5 inches) in total length.

Ameiurus nebulosus, brown bullhead

Only four brown bullhead were sampled from Spanaway Lake, ranging in size from 185 - 288mm (7 - 11 inches) in length. These fish were not aged. Relative weights were mostly above the national 75th percentile.

Onchorynchus clarki, cutthroat trout

Only two cutthroat trout were sampled from Spanaway Lake, ranging in size from 185 - 191mm (7 - 7.5 inches) in length. These fish were not aged. Relative weights were right below the national 75th percentile (97 and 95).

Discussion and Management Options

Spanaway Lake has abundant opportunity for angling, primarily for its abundant rock bass population, planted rainbow trout, and both largemouth and smallmouth bass. The lake has been managed with yearly rainbow trout plants, and has enjoyed very high use by anglers and boaters. The warmwater fish community in Spanaway Lake is probably close to being in "balance", but sample sizes for many of the species were too small to really draw any firm conclusions.

Population Health

It is hard to judge the overall health of a fish population from a single sample, especially when the total sample size of many of the key species (i.e. largemouth bass and smallmouth bass) is well below 100 fish. The high, or average relative weights of most of the species may be a good indicator of a healthy community. Yellow perch relative weights, while low, are about average for western Washington lakes. Growth rates for all species are faster than our current western Washington averages. High relative weights and fast growth rates may indicate low competition, an adequate food supply, a low density population, or a combination of these factors.

Important Species

Rock bass occurred throughout the lake in large numbers. These fish are not very common in Washington lakes, but they can be very abundant in the lakes in which they reside. They are fairly common in lakes in this area of Pierce County. Rock bass can be an aggressively striking panfish, and will readily strike at any lure that passes them. For this reason they are often disliked by many bass anglers, but loved by panfishers. They often thrive in the same type of lakes as smallmouth bass. Given the right conditions, a rock bass may grow to be 12 inches (305mm).

Smallmouth bass have more stringent habitat requirements than largemouth bass, this is why we do not see them succeed in as many lakes as largemouth. They require clear, cooler water, usually in lakes with a hard, rocky substrate. In Spanaway Lake, they are out-competing largemouth bass, and were just as abundant in our sample. Though there is plenty of habitat to support both species, the hard, rocky substrate and lack of abundant aquatic vegetation along the shoreline is more suitable to smallmouth bass.

Short Term Management Goals

Further study is needed to gain a better understanding of the fish community and how it is utilized by anglers. Continued standardized surveys should be conducted on a fall/following spring basis to help one get an idea of initial recruitment. Continued on a rotating basis roughly

every three years, we can gradually build a data set to get an idea of recruitment variability, as well as a better understanding of stock density. Also, as Spanaway Lake is one of the few lakes in southwest Washington with a good population of smallmouth bass, more effort should be undertaken to better understand the status of this premier sport fish.

Many species of fish rely on zooplankton, and to a lesser extent, phytoplankton, as a primary food source for part, or for their entire life span. We currently assess food availability based on growth rates and relative weights of individuals. A direct assessment of the primary and secondary productivity throughout the growing season would be beneficial to understanding the growth and abundance of certain fishes in the community.

Spanaway Lake is a popular fishing destination for boat anglers, and supports a fairly substantial bank fishery at the county park. An angler creel survey could help determine angler preference, harvest, and seasonal effort levels on the fisheries in the lake. Meaningful management plans cannot be developed without first understanding how anglers utilize the fishery resources in the lake.

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Appendix A

Table A1. Length categories that have been proposed for various fish species. Measurements are for total lengths (updated from Newmann and Anderson 1996).

	Category									
	Stock		Quality		Preferred		Memorable		Trophy	
Species	**(in)**	**(cm)**	**(in)**	**(cm)**	**(in)**	**(cm)**	**(in)**	**(cm)**	**(in)**	**(cm)**
Black bullhead	6	15	9	23	12	30	15	38	18	46
Black crappie	5	13	8	20	10	25	12	30	15	38
Bluegill	3	8	6	15	8	20	10	25	12	30
Brook trout	5	13	8	20						
Brown bullhead	5	13	8	20	11	28	14	36	17	43
Brown trout	6	15	9	23	12	30	15	38	18	46
Burbot	8	20	15	38	21	53	26	67	32	82
Channel catfish	11	28	16	41	24	61	28	71	36	91
Common carp	11	28	16	41	21	53	26	66	33	84
Cutthroat trout	8	20	14	35	18	45	24	60	30	75
Flathead catfish	11	28	16	41	24	61	28	71	36	91
Green sunfish	3	8	6	15	8	20	10	25	12	30
Largemouth bass	8	20	12	30	15	38	20	51	25	63
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Rainbow trout	10	25	16	40	20	50	26	65	31	80
Rock bass	4	10	7	18	9	23	11	28	13	33
Smallmouth bass	7	18	11	28	14	35	17	43	20	51
Walleye	10	25	15	38	20	51	25	63	30	76
Warmouth	3	8	6	15	8	20	10	25	12	30
White catfish	8	20	13	33	17	43	21	53	26	66
White crappie	5	13	8	20	10	25	12	30	15	38
Yellow bullhead	4	10	7	18	9	23	11	28	14	36
Yellow perch	5	13	8	20	10	25	12	30	15	38