Warmwater Fisheries Surveys of the I-82 Ponds (Yakima County) 2000 & 2001

by

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Abstract

The I-82 Ponds, Yakima County, Washington, were surveyed during May 2000 and September 2001. Past fisheries management and accessibility influenced survey and gear type selection for the ponds. As I-82 Ponds 1, 2, 3, 5, and 7 share a history of primarily warmwater fish populations and management, standard boat electrofishing, gill netting, and fyke netting surveys were conducted at each of these sites. Alternatively, I-82 Ponds 4 and 6, managed primarily for channel catfish and catchable trout, were sampled with boat electrofishing, trotlines, and slat-traps to reduce channel catfish mortality associated with gill net sampling. Four of the I-82 Ponds (1, 2, 3, and 5) were sampled in May 2000; I-82 Pond 7 was sampled in September 2001 because high water prevented access to the pond in May 2000; and I-82 Ponds 4 and 6 were sampled in September 2001 using alternative methods. The primary objectives of these surveys were to describe the status of fish populations in each pond, to test the feasibility of sampling stocked channel catfish using trotlines and slat-traps, and to make recommendations on the future management at each pond.

- The I-82 Pond 1 fish community generally consisted of a low density largemouth bass population, a walleye population exhibiting characteristics of a population lacking an adequate prey base, and low density yellow perch and pumpkinseed sunfish populations. This is in sharp contrast to fish community assessments conducted pre- and post-walleye stocking in the early 1990s, which showed stunted populations of yellow perch and pumpkinseed sunfish. Management considerations for Pond 1 include: maintaining the outlet screen, installing a fishing dock, lifting the no harvest regulation for walleye, and stocking additional panfish.
- The I-82 Pond 2 fish community was found to be prey crowded with yellow perch and pumpkinseed sunfish. Largemouth bass density was low and fish sampled exhibited high condition. Management considerations include: increasing largemouth bass density, designing and installing a barrier to fish passage, and installing a fishing dock to enhance angling opportunity.
- I-82 Pond 3 was dominated by non-game fish undesirable to anglers and low density gamefish populations. Largemouth bass and panfish populations exhibited above average growth and condition. Largescale sucker and chiselmouth were abundant. Management considerations include: constructing a barrier to fish passage, increasing predator density, and chemical or mechanical removal of undesirable species.
- In I-82 Pond 5 largemouth bass exhibited characteristics of a balanced population; however, panfish population indices exhibited characteristics of overabundance likely due to interspecific competition. Channel catfish stocking provides some angling opportunity for large fish. Largescale sucker were a large proportion of the sample by weight. Managers should consider it a high priority to build and maintain an outlet barrier to fish passage, reduce the abundance of non-game species, and increase predator densities.

- I-82 Pond 7 was prey crowded with abundant bluegill and pumpkinseed sunfish and few predators. Largemouth bass were low in abundance and high in condition. Managers should consider whole or partial rehabilitation with chemical or mechanical methods and increasing predator abundance by stocking adult largemouth bass and channel catfish.
- Sampling with trotlines for channel catfish in I-82 Ponds 4 and 6 was effective for sampling adult fish. Although sample size was small, no mortality of fish sampled was observed. Slat-traps were not affective at either site. Channel catfish in several size groups were sampled at both ponds indicating successful stocking over several years. Managers should continue stocking channel catfish at the current level.

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Introduction

The I-82 Ponds are located south of the city of Yakima in Yakima County, Washington (Figure 1). This group of seven ponds, commonly referred to by number one through seven, range in size from 6 to 12 hectares and are managed for a variety of fishing opportunities including largemouth bass *Micropterus salmoides* and panfish, channel catfish *Ictalurus punctatus*, and catchable trout.

The I-82 Ponds were created by gravel pit mining in the Yakima River flood plain during the construction of Interstate 82 in 1979 and 1980. Following the completion of the freeway, the ponds were purchased from the Washington State Department of Transportation by the Washington State Department of Game. Once acquired, Department of Game biologists surveyed most of the ponds and developed fisheries management objectives for each (Fletcher 1980; Fletcher 1981; Fletcher 1982). Over the years, the ponds have experienced a variety of fisheries management techniques and use including: the stocking of a variety of gamefish species, rotenone rehabilitation to remove undesirable fish, the installation of artificial structures, riparian habitat improvement projects, the installation of fish passage barriers, access improvement projects (e.g., fishing docks and parking areas), periodic sampling of the fish communities, and warmwater fishery research study sites.

Fisheries management objectives for each pond have largely been influenced by accessibility, angling pressure, and connectivity to the Yakima River. I-82 Ponds 1, 2, 3, 5, and 7 are walk-in access only, which limits the pressure from anglers, whereas I-82 Ponds 4 and 6 are accessible by car and receive more pressure. I-82 Ponds 4, 5, and 7 experience periodic flooding by the Yakima River during high water years; whereas Ponds 1, 2, 3, and 6 are more isolated. Some of the ponds have outlets to the river. The affect of periodic exchange with the Yakima River can substantially influence fisheries management goals and objectives by allowing the access of non-gamefish such as common carp *Cyprinus carpio*, largescale sucker *Catostomus macrocheilus*, and chiselmouth *Acrocheilus alutaceus* to the fish communities. Since their acquisition, the ponds as a group have been managed mainly for warmwater fish species including largemouth bass, yellow perch *Perca flavescens*, bluegill *Lepomis macrochirus*, walleye *Stizostedion vitreum*, and channel catfish; however, rainbow trout *Oncorhynchus mykiss* and brown trout *Salmo trutta* have been stocked to provide additional angling opportunity, especially at the high use ponds 4 and 6.

Washington Department of Fish and Wildlife (WDFW) personnel with the Warmwater Fisheries Enhancement Program conducted surveys in May 2000 and September 2001 to assess the status of the I-82 Pond fish communities. Past fisheries management and accessibility influenced survey and gear type selection for the ponds. As I-82 Ponds 1, 2, 3, 5, and 7 share a history of primarily warmwater fish populations and management, standard boat electrofishing, gill netting, and fyke netting surveys (Bonar et al. 2000) were conducted at each of these sites. Alternatively, I-82 Ponds 4 and 6, managed primarily for channel catfish and catchable trout, were sampled

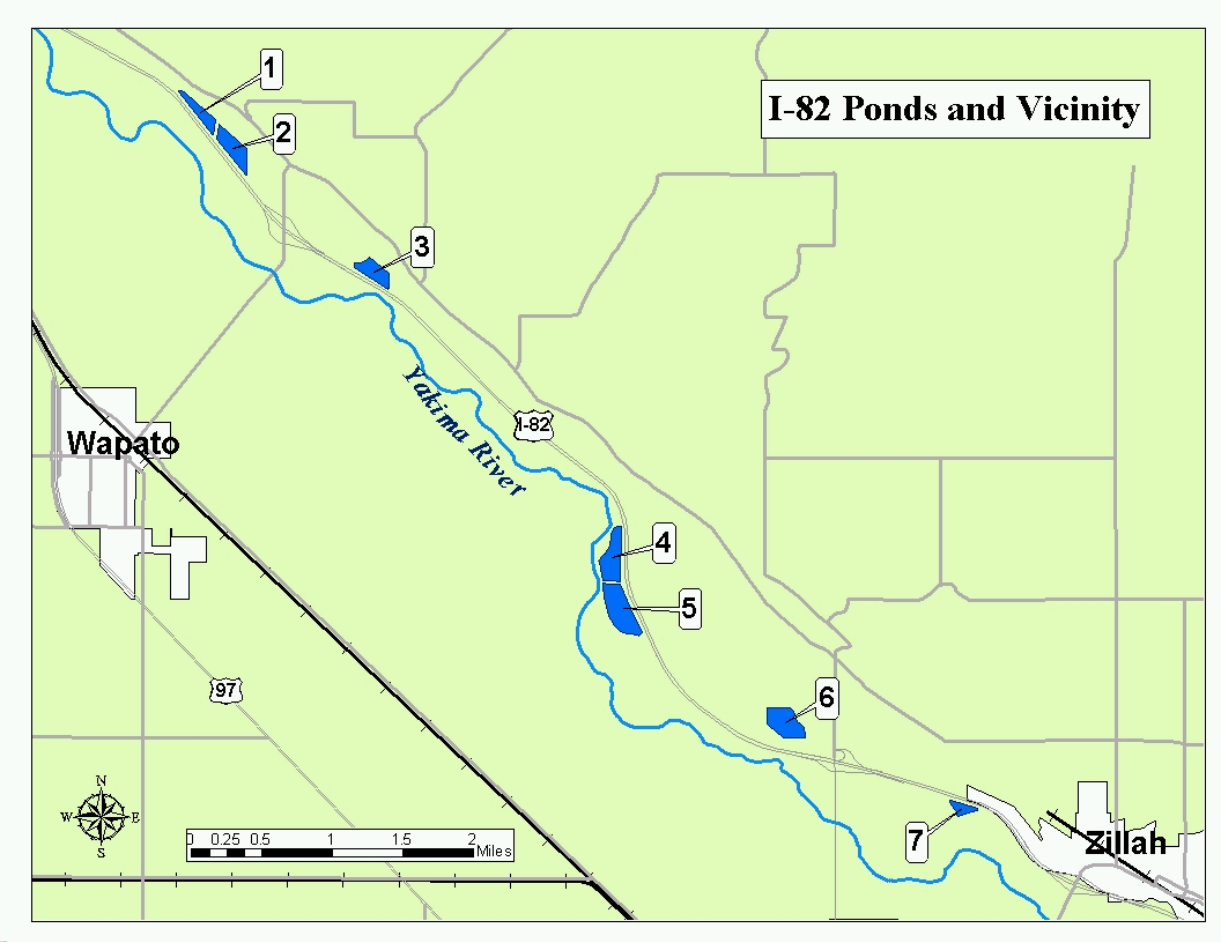

Figure 1. I-82 Ponds (Yakima County) and vicinity.

with boat electrofishing, trotlines, and slat-traps to reduce channel catfish mortality associated with gill net sampling. The primary objectives of these surveys were to describe the status of fish populations in each pond, to test the feasibility of sampling stocked channel catfish using trotlines and slat-traps, and to make recommendations on the future management at each pond. Four of the I-82 Ponds (1, 2, 3, and 5) were sampled in May 2000. I-82 Pond 7 was sampled in September 2001 because high water prevented access to the pond in May 2000. In addition to pond 7, I-82 Ponds 4 and 6 were sampled in September 2001 using alternative methods.

For ease of interpretation and presentation, the results of each survey are presented here in a single technical report. I-82 Ponds 1, 2, 3, 5, and 7 are covered first under the heading *I-82 Ponds Managed Primarily for Warmwater Fish Angling* followed by the results for I-82 Ponds 4 and 6 under the heading *I-82 Ponds Managed Primarily for Catchable Trout and Channel Catfish Angling*. Each section includes a brief background description of past management activities particular to each pond, survey results, and discussion.

Methods

I-82 Ponds Managed Primarily for Warmwater Fish Angling

Sampling

Four of the five I-82 Ponds (1, 2, 3, 5) managed primarily for warmwater fish angling opportunity were sampled in May 2000. Due to limited accessibility at certain times of the year, the fifth, I-82 Pond 7, was sampled in September 2001. Accessing this pond by vehicle requires crossing a side channel of the Yakima River, which is not possible during high water periods. Each of these ponds was sampled by a three person team using boat electrofishing, gill netting, and fyke netting (Bonar et al. 2000). The electrofishing unit consisted of a 5.5 m Smith-Root 5.0 GPP "shock boat" using a DC current of 120 cycles / sec^{-1} at 5 to 6 amps power. Experimental gill nets (45.7 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 stretched mesh) monofilament. Fyke nets were constructed of a main trap (4.7 m long and 1.2 m in diameter), a lead net (30.5 m long x 1.2 m), and two wings (7.6 m long x 1.2 m deep).

Sampling locations were selected by dividing the shoreline into sections of approximately 400 meters. Three sections were randomly sampled by boat electrofishing, two by gill netting and two by fyke netting at I-82 Ponds 1 and 3 (Table 1). The entire shoreline was sampled by boat electrofishing at I-82 Ponds 2, 5, and 7 (4, 3, and 2 sections respectively). Additionally, two sections were randomly sampled by gill netting and two by fyke netting at these locations. While electrofishing, the boat was maneuvered through the shallows adjacent to the shoreline. Electrofishing was conducted at night to maximize the size and number of fish captured. Electrofishing is more effective at night because some fish species move more freely at night (Reynolds 1996; Dumont and Dennis 1997). Electrofishing effort consisted of sampling each chosen section 600 seconds ("pedal-down" time). Gill nets were set perpendicular to the

Table 1. Number of sections available and sampling effort by gear type conducted at I-82 Ponds 1, 2, 3, 5, and 7 in May 2000 and September 2001.

		Boat Electrofishing	Gill Netting	Fyke Netting
Location	# of sections available	Sections - Effort	Sections - Effort	Sections - Effort
I-82 Pond 1	4	3 - 1800 Seconds	2 - 2 net nights	2 - 2 net nights
I-82 Pond 2	4	4 - 2400 Seconds	2 - 2 net nights	2 - 2 net nights
I-82 Pond 3	4	3 - 1800 Seconds	2 - 2 net nights	2 - 2 net nights
I-82 Pond 5	3	3 - 1800 Seconds	2 - 2 net nights	2 - 2 net nights
I-82 Pond 7	2	2 - 1200 Seconds	2 - 2 net nights	2 - 2 net nights

shoreline with the small mesh end attached onshore and the large mesh end anchored offshore. Fyke nets were set perpendicular to the shore with the lead net anchored onshore and the wing nets set at 45 degree angles to the trap. Fyke nets were set so that the trap was no deeper than three meters (Bonar et al. 2000).

Each fish captured was identified to species, measured to total length (mm TL) and weighed (g). Scales were collected for age and growth analysis from largemouth bass, black crappie, yellow perch, pumpkinseed sunfish *Lepomis gibbosus*, bluegill, and walleye. Scale samples (up to five per 10 mm length class for each species) were mounted, pressed, and aged according to Jerald (1983) and Fletcher et al. (1993). Catfish, carp, and suckers were not aged.

Water quality data was collected at I-82 Ponds 1, 2, 3, and 5 on four occasions from May to August 2000. Data were recorded for dissolved oxygen, temperature, specific conductance, total dissolved solids, and pH using a Hydrolab probe and digital recorder. Water clarity was measured using a Secchi disc.

Data Analysis

Percentages of the total biomass and number of fish collected for each species provides useful information regarding the balance and productivity of the community (Swingle 1950; Fletcher et al. 1993). From data collected at I-82 Ponds 1, 2, 3, and 5, species composition by weight (kg) and number was calculated using the first three boat electrofishing sections, both gill netting sections, and both fyke netting sections to calculate the species composition of the lake. This methodology was utilized to maintain a standardized 1:1:1 ratio of electrofishing to gill netting to fyke netting (1:1:1 -1800 seconds of boat electrofishing:24 hours of gill netting:24 hours of fyke netting) to compare the species composition from this survey with future surveys at the same location or in other ponds sampled. This technique is employed to reduce bias between gear types (Fletcher et al. 1993). Species composition was calculated first, for the total number of fish collected (to aid in determining recruitment) and second, for the total of fish collected with the exception of young-of-the-year. Young-of-the-year were excluded as fry numbers can fluctuate dramatically according to sampling location, sampling methodology, and time of hatches (Fletcher et al. 1993). Including young-of-the-year fish in the calculation of species composition can give a false impression of year-class strength due to the abundance of small fish, which can suffer extensive mortality during the first winter (Chew 1974). For I-82 Pond 7, species composition was calculated using all fish sampled. The small size of this pond did not allow for the standard ratio of gear types, therefore the interpretation of species composition results is limited.

Catch per unit of effort (CPUE), by gear type, was determined for each fish species collected (number of fish/hour electrofishing, number of fish/gill net night, and number of fish/fyke net night). The CPUE for each fish species was calculated using all fish excluding young-of-the-year and also using only stock length fish and longer. Stock length fish, which varies by species, is the length of fish that offers a threshold recreational value to an angler (Anderson 1976).

Randomly chosen sample sections can contribute to high variability among samples, therefore, 80 percent confidence intervals (CI) were calculated for each mean CPUE by species and gear type. Each CI was calculated as the mean ±t(%,N-1)×SE, where *t*=Student's *t* for % confidence level with N-1 degrees of freedom (two tailed) and SE=standard error of the mean. When standardized sampling is used, CPUE is a useful index to compare lakes within the state of Washington and to monitor changes in relative abundance over time.

Length frequency histograms (percent frequency captured by each gear type) were developed to evaluate the length structure of species sampled in abundance.

Proportional stock density (PSD), calculated as the number of fish$quality length/number of fish$stock length×100, was determined for each warmwater fish species collected that have established stock lengths (Anderson and Neumann 1996). PSD can provide information about the proportion of various length fish in a population and can be a useful tool when sample size is adequate (Willis et al. 1993; Divens et al. 1998). Stock and quality lengths are based on percentages of world record catch length and vary depending on fish species (Table 2). Stock length (20-26 percent of the world record) refers to the minimum length fish of recreational value, and quality length (36-41 percent of the world record) refers to the minimum length fish anglers would like to catch. In addition to stock and quality length, Gabelhouse (1984b) introduced relative stock density (RSD), which includes preferred, memorable, and trophy lengths. Preferred length (45-55 percent of world record length) refers to the length fish anglers would prefer to catch. Memorable length (59-64 percent of the world record length) refers to the minimum length fish most anglers remember catching, whereas trophy length (74-80 percent of world record length) refers to the minimum length fish worthy of acknowledgment. RSD, calculated as the number of fish$specific length/number of fish$stock length×100, was also calculated for each warmwater fish species. Like PSD, RSD can also provide useful information regarding population dynamics and is more sensitive to changes in year class strength. For example, relative stock density preferred (RSD-P) is the percentage of stock length fish preferred length and longer, RSD-M is the percentage of stock length fish memorable length and longer, and RSD-T is the percentage of stock length fish trophy size and longer. Eighty-percent confidence intervals for PSDs and RSDs are provided as an estimate of statistical precision and were calculated using normal approximation (Conover 1980; Gustafson 1988). Bister et al. (2000) developed additional PSD and RSD length categories for 83 additional species, including brown bullhead, which were previously uncategorized.

Age and growth of warmwater fishes sampled at I-82 Ponds 1, 2, 3, and 5 were evaluated using the direct proportion method (Fletcher et al. 1993) and Lee's modification of the direct proportional method (Carlander 1982). Using the direct proportional method, total length at annulus formation, L_n, was back–calculated as $L_n=(A\times TL)/S$, where *A* is the radius of the fish scale at age *n*, TL is the total length of the fish captured, and *S* is the total radius of the scale at capture. Using Lee's modification, L_n was back–calculated as $L_n=a+A\times(TL-a)/S$, where *a* is the species-specific standard intercept from a scale radius-fish length regression. Mean back–calculated lengths at age *n* for each species were presented in tabular form for easy

Table 2. PSD/RSD length categories for fish species collected from I-82 Ponds 1-7 (Yakima County) in May, 2000 and September, 2000. Measurements are total length (mm) for each category (Anderson and Neumann 1996; Bister et al. 2000). Numbers in parenthesis represent percentages of world record lengths (Gabelhouse 1984b).

Species	Standard Length Categories				
	Stock (20-26%)	Quality (36-41%)	Preferred (45-55%)	Memorable (59-64%)	Trophy (74-80%)
Black Crappie	130	200	250	300	380
Black Bullhead	150	230	300	380	460
Bluegill	80	150	200	250	300
Brown Bullhead	130	200	280	360	430
Brown Trout	150	130	300	380	460
Channel Catfish	280	410	610	710	910
Common Carp	280	410	530	660	840
Largemouth Bass	200	300	380	510	630
Pumpkinseed Sunfish	80	150	200	250	300
Rainbow Trout	250	400	500	650	800
Walleye	250	380	510	630	760
Yellow Perch	130	200	250	300	380

comparison of growth between year classes, as well as between the lake average and what has been found in other areas around the state of Washington (Fletcher et al. 1993) for the same species. Fletcher et al. (1993) calculated state averages using data collected from select warmwater fish populations throughout the state. These growth rates are referred to as the state average in the results section. Although not a true state average, this is likely representative of fish growth for lakes sampled within the state.

The Relative weight (W_r) index was calculated to evaluate the condition of fish collected. Relative weight is calculated as the actual weight of a fish divided by the standard weight (W_s) for the same species at the same length times 100 ($W_r = W/W_s \times 100$, where W is the weight (g) of an individual fish and W_s is the standard weight of a fish of the same length). The standard weight (W_s) is calculated from the standard log 10 weight-log10 length relationship defined for the species of interest. Standard weight equations have been established for many freshwater game and non-gamefish species (Anderson and Neumann 1996; Bister et al. 2000). Relative weights are useful for comparing the condition of different size groups within a single population to determine if all sizes are getting adequate nutrition (ODFW 1997). A W_r value of 100 generally indicates that a fish is in average condition when compared to the national average for that species (Anderson and Gutreuter 1983). Fish collected with relative weights below 85 are underweight and may be an indication of extensive competition for available food resources (Flickinger and Bulow 1993). Anderson and Neumann (1996) list the parameters for the W_r equations of many warmwater fish species, including the minimum length recommendations for

their application. Relative weight values from this survey were compared to the national average (W_r=100) for each species.

I-82 Ponds Managed Primarily for Catchable Trout and Channel Catfish Angling

Sampling

I-82 Ponds 4 and 6 were sampled in September 2001. Each pond was sampled by a 3-person team using boat electrofishing, trotlines, and slat-traps. The electrofishing unit consisted of a 5.5 m Smith-Root 5.0 GPP "shock boat" using a DC current of 120 cycles / sec^{-1} at 5 to 6 amps power. The commercially produced trotlines were 36.6 m long with 25 swivels for hook attachment and were constructed of double 100 lb. test nylon cord. Commercially produced leaders were made of 15 lb. test monofilament with size 1 bait hooks. Trotlines were baited with either night crawlers, powerbait catfish nuggets, cheesebait, chicken liver, or cut bait chunks of fresh fish (e.g., yellow perch). Commercially produced round slat-traps measured 1.2 m long x 38 centimeters in diameter. Slat-traps were baited with cheesebait.

Sampling locations for boat electrofishing were selected by dividing the shoreline of each pond into three sections of approximately 400 meters. At I-82 Pond 4, two sections were randomly sampled by boat electrofishing while three sections were sampled at I-82 Pond 6 (Table 3). While electrofishing, the boat was maneuvered through the shallows adjacent to the shoreline. Electrofishing was conducted at night to maximize the size and number of fish captured. Electrofishing is more effective at night because some fish species move more freely at night (Reynolds 1996, Dumont and Dennis 1997). Electrofishing effort consisted of sampling each randomly chosen section 600 seconds ("pedal-down" time). Four baited trotlines were set overnight at each pond. Two trotlines were set nearshore perpendicular to the shoreline in randomly chosen sections and two were set offshore. Slat-traps were baited and set offshore. Trotlines and slat-traps were set in the evening and retrieved the following morning.

Each fish captured was identified to species, measured to total length (mm TL) and weighed (g). No age analysis was done for these surveys.

Table 3. Number of sections available and sampling effort by gear type conducted at I-82 Ponds 4 and 6 in September, 2001.

Location	# of sections available	Boat Electrofishing	Trotline	Slat-traps
		Sections - Effort	Locations - Effort	Locations - Effort
I-82 Pond 4	3	2 - 1200 seconds	12 - 12 set nights	12 -12 trap nights
I-82 Pond 6	3	3 - 1800 seconds	12 -12 set nights	12 - 12 trap nights

Data Analysis

Data analysis for sampling conducted at I-82 Ponds 4 and 6 was similar to that completed for the other ponds with the following exceptions:

- Species composition was calculated for all fish captured using boat electrofishing, trotlines, and slat-traps. Since the gear types used in these surveys varied from the standard sampling protocols, the comparison of species composition results is limited to future surveys of these ponds or other sites sampled in a similar manor.
- Catch per unit effort was calculated using all fish captured by gear type.
- Proportional stock density was not presented as sample sizes were too small.
- No age analysis was done as it was our intent to not injure fish sampled, especially channel catfish, but to return those caught back to the lake unharmed.

I-82 Ponds Managed Primarily for Warmwater Fish Angling

I-82 Pond 1

Background

I-82 Pond 1 (Yakima County) is 6.07 hectares in size and has a maximum depth of approximately 7.6 meters. A WDFW parking area provides 0.5 kilometer walk-in access to the pond. I-82 Pond 1 lies adjacent to I-82 Pond 2. The Ponds are separated by a dike, but are connected by a culvert, which was screened in 1993 to limit fish passage between the ponds. A fishing dock was constructed in 1989 to provide additional shoreline angling, but the dock was burned by vandals in 1993 and has not since been reconstructed.

I-82 Pond 1 has been surveyed many times since its completion in 1980. An initial fish survey was conducted by Fletcher (1980) and showed that largemouth bass were already in the pond. Recommendations at the time were to stock the pond with largemouth bass and yellow perch. These species were stocked in the fall of that year (Table 4). The pond was surveyed again in 1983, and results showed viable populations of largemouth bass and yellow perch. Additionally, pumpkinseed sunfish were found, which was undesirable to managers due to their propensity to overpopulate, stunt, and compete with more desirable species. In 1987, survey results showed that the quality of yellow perch was in decline. A recommendation to stock walleye as a biological control over stunted yellow perch was made.

Considering this recommendation, managers launched a research project on Pond 1 to monitor the results of walleye stocking over a period of three years to document any changes in population structure. The adjacent I-82 Pond 2 was chosen as a control site for its similar species composition and stunted yellow perch and pumpkinseed sunfish. Research surveys began in 1992 prior to the stocking of walleye. Following the initial surveys of largemouth bass, yellow perch and pumpkinseed sunfish, 16 adult walleye were stocked in 1992 and 57 adult walleye were stocked in 1993. A research progress report of data collected in 1992 and 1993 showed little change in the yellow perch population, although catch-per-unit-effort appeared to decline (Bolding et al. 1995). In a final report, Bolding et al. (1997) reported that yellow perch and pumpkinseed sunfish populations declined and yellow perch size-at-age increased, relative to the control pond over the course of the study. In addition to monitoring changes in fish populations, data on the diet of stocked walleye was collected. Bolding et al. (1996) and Bolding et al. (1998) reported that pumpkinseed sunfish were abundant in the diet of walleye sampled. This was in contrast to previously published work on the diet of walleye. During the same time period, Bonar et al. (1994) used data collected at I-82 Pond 1 in a largemouth bass diet study.

Additional I-82 Pond 1 management highlights include: a shoreline habitat improvement in which 98 6' black cottonwood trees were planted in 1997, the placement of 15 apple tree brush

piles in the pond in 1996, and a state record black bullhead catfish *Ameiurus melas* caught by an angler in May 1994 (E. Anderson, WDFW, personal communication).

Table 4. Fish stocking history for I-82 Pond 1 (Yakima County) 1980 to 2000.

Stocking Date	Species	Number	Size
1980	Largemouth Bass	75	Adult / Sub-adult
1980	Yellow Perch	215	Adult
1987- 1991	Brown Trout	18,374	Fingerling
1987	Largemouth Bass	225	Sub-adult
1992-1993	Walleye	16	Adult
1993	Walleye	57	Adult
1998	Walleye	1053	Fry
2000	Bluegill	563	Fry
2000	Largemouth Bass	47	Adult

Results

Water Quality I-82 Pond 1

I-82 Pond 1 has a steep shoreline with limited littoral area and a maximum depth of approximately eight meters (Table 5). Measured water temperatures ranged from 12EC in May to 24.3EC in August, 2000 and were within the acceptable range of warmwater fish species (Boyd 1990). Temperatures were within the optimal range for warmwater fish growth (20EC - 28EC) only during July and August. Measured pH values ranged from 8.1 to 9.4. The preferred range for warmwater fish species is pH 6.5 to 9 (Swingle 1969). In general, dissolved oxygen levels were adequate in the majority of the lake throughout the summer. However, dissolved oxygen levels were below the desired range for warmwater fish species in a portion of the lake in July and August 2000, suggesting that at least part of the lake was not available to fish at certain times of the year.

Table 5. Water quality collected from May through August 2000 at I-82 Pond 1 (Yakima County).

Date	Depth (m)	Temp (°C)	pH	DO (mg/l)	TDS	Conductivity	Secchi (m)
05/23/00	0	19.8	9.0	4.0	0.1	229.0	
	2	19.7	9.0	4.4			
	4	14.9	8.9	5.4			
	6	12.8	8.6	4.8			
	8	12.0	8.4	2.3	0.2	250.2	
06/28/00	0	22.5	9.1		0.1	211.5	2.5
	2	20.6	9.1				
	4	18.1	9.3				
	6	15.9	9.3				
	7.5	13.8	8.9		0.2	244.0	
07/26/00	0	24.3	9.4	8.9	0.1	185.6	2
	2	22.6	9.4	9.2			
	4	18.7	9.0	5.2			
	6	15.7	8.6	1.1			
	7.4	14.9	8.4	0.5	0.1	233.7	
08/22/00	0	21.3	8.3	7.1	0.1	180.2	3
	2	20.1	8.2	6.9			
	4	19.0	8.1	4.4			
	6	17.7	8.1	0.4			
	7.2	16.4	8.1	0.4	0.1	219.0	

Species Composition I-82 Pond 1

Five species of fish were collected from I-82 Pond 1 in 2000. Common carp contributed the highest proportion of biomass, followed by largemouth bass and walleye (Table 6). Yellow perch were most numerous, but comprised only 2.87 percent of the sample by weight. Pumpkinseed sunfish were observed only in low numbers. Species composition analysis had little effect on the results when excluding young-of-the-year (YOY) as only two YOY largemouth bass and one YOY pumpkinseed sunfish were caught (Table 7). Bluegill sunfish, stocked as fry in 2000, were not observed during this survey. It is unknown what became of these fish.

Table 6. Species composition by weight (kg) and number for all fish collected at I-82 Pond 1 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Common Carp	24.74	61.49	16	10.74	350	730
Largemouth Bass	7.73	19.20	10	6.71	70	500
Walleye	6.51	16.18	5	3.36	267	650
Yellow Perch	1.15	2.87	111	74.50	82	145
Pumpkinseed Sunfish	0.10	0.25	7	4.70	43	116

Table 7. Species composition (excluding young-of-the-year) by weight (kg) and number for fish collected at I-82 Pond 1 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Common Carp	24.74	61.51	16	10.96	350	730
Largemouth Bass	7.72	19.18	8	5.48	85	500
Walleye	6.51	16.19	5	3.42	267	650
Yellow Perch	1.15	2.87	111	76.03	82	145
Pumpkinseed Sunfish	0.10	0.25	6	4.11	52	116

CPUE I-82 Pond 1

Stock length common carp were sampled at the highest rate by boat electrofishing and gill netting (Table 8). Of the gamefish species observed, stock length largemouth bass and walleye were sampled at the highest rate. Relatively abundant were yellow perch between age one and stock length (Table 9).

Table 8. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all fish excluding young-of-the-year collected at I-82 Pond 1 (Yakima County) in May 2000.

	Gear Type					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Common Carp	28.00 ± 28.54	3	1.00 ± 1.28	2	2	2
Largemouth Bass	16.00 ± 10.25	3	0.00	2	2	2
Pumpkinseed Sunfish	12.00 ± 11.75	3	0.00	2	2	2
Walleye	10.00 ± 6.78	3	0.00	2	2	2
Yellow Perch	206.00 ± 141.04	3	4.00 ± 5.13	2	2	2

Table 9. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for stock length fish collected at I-82 Pond 1 (Yakima County) in May 2000.

	Gear Types					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Common Carp	28.00 ± 28.54	3	1.00 ± 1.28	2	0.00	2
Largemouth Bass	14.00 ± 9.24	3	0.00	2	0.00	2
Pumpkinseed Sunfish	8.00 ± 6.78	3	0.00	2	0.00	2
Walleye	10.00 ± 6.78	3	0.00	2	0.00	2
Yellow Perch	8.00 ± 10.25	3	0.00	2	0.00	2

Stock Density Indices I-82 Pond 1

Sample size of stock length fish for all species was low, which limits interpretive value (Table 10). The quality of common carp, largemouth bass, and walleye sampled; however, was relatively high. It seems important to note the absence of many stock length pumpkinseed sunfish and yellow perch.

Table 10. Traditional stock density indices by sampling method, including 80% confidence intervals, for fish collected from I-82 Pond 1 (Yakima County) in May 2000.

	Electrofishing				
Species	# Stock Length	PSD	RSD-P	RSD-M	RSD-T
Common Carp	14	93 ± 9	7 ± 9	7 ± 9	0
Largemouth Bass	7	100 ± 0	43 ± 24	0	0
Walleye	5	80 ± 23	60 ± 28	20 ± 23	0

Largemouth Bass I-82 Pond 1

I-82 Pond 1 largemouth bass sampled ranged in length from 70 to 500 mm total length (Table 6). The age of largemouth bass sampled ranged from one to eight years (Table 11). Largemouth bass growth rates were higher than the known Washington state average. The condition of largemouth bass was generally above the national average (Figure 2).

Table 11. Age and growth of largemouth bass sampled from I-82 Pond 1 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age							
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1999	0								
1998	0								
1997	3	66	255	355					
		83	260	355					
1996	1	50	147	279	369				
		67	159	284	369				
1995	1	65	130	205	268	369			
		82	143	214	273	369			
1994	0								
1993	0								
1992	1	55	120	236	326	386	420	473	500
		73	135	247	333	391	424	474	500
Direct Proportion Overall Mean		59	163	269	321	378	420	473	500
Lee's Weighted Mean		78	203	301	325	380	424	474	500
Direct Proportion State Average		60	146	222	261	289	319	368	396

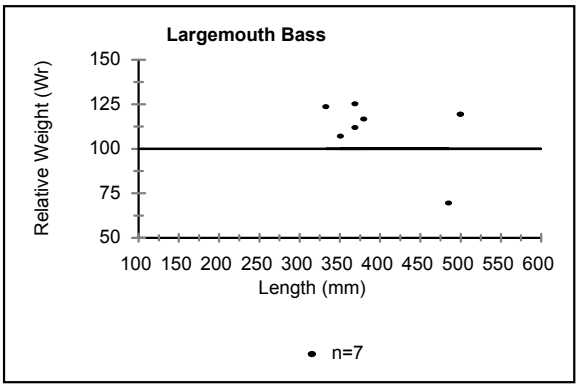

Figure 2. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 1 (Yakima County) in May 2000 compared to the national 75th percentile.

Walleye I-82 Pond 1

I-82 Pond 1 walleye sampled ranged in length from 267 to 650 mm total length (Table 6). Walleye sampled were aged at one, five, and six years (Table 12). This coincides with WDFW stocking history records. The condition of walleye sampled was below the national average (Figure 3).

Table 12. Age and growth of walleye sampled from I-82 Pond 1 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age					
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**	**6**
1999	1	230					
		237					
1998	0						
1997	0						
1996	0						
1995	3	142	257	364	436	472	
		183	282	376	440	472	
1994	1	143	221	284	392	440	496
		183	252	307	403	446	496
Direct Proportion Overall Mean		171	239	324	414	456	496
Lee's Weighted Mean		194	274	359	431	465	496

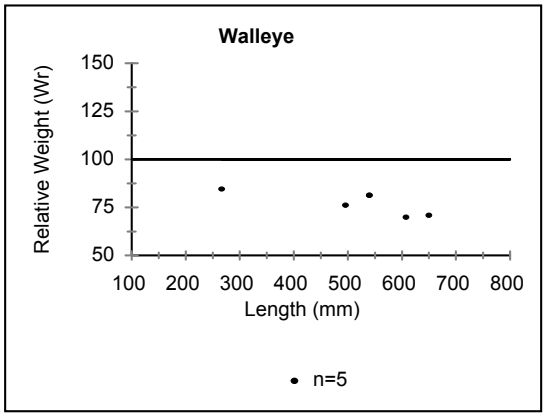

Figure 3. Relative weight (W_r) of walleye sampled at I-82 Pond 1 (Yakima County) in May 2000 compared to the national 75th percentile.

Yellow Perch I-82 Pond 1

I-82 Pond 1 yellow perch sampled ranged in length from 82 to 145 mm total length (Table 6; Figure 4). Yellow perch sampled were aged at one and two years (Table 13). Growth rates were higher than the known Washington state average. The condition of yellow perch was at or below the national average (Figure 5).

Table 13. Age and growth of yellow perch sampled from I-82 Pond 1 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
1999	13	63	
		74	
1998	4	63	123
		79	126
Direct Proportion Overall Mean		63	123
Lee's Weighted Mean		75	126
Direct Proportion State Average		60	120

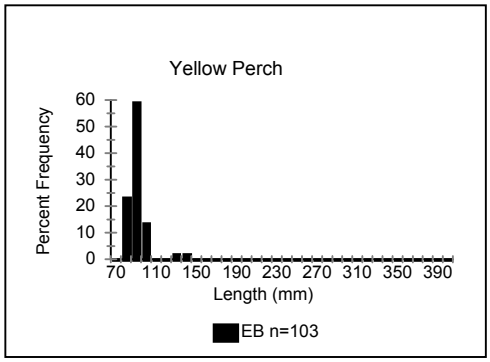

Figure 4. Length frequency distribution of yellow perch, excluding young-of-the-year, sampled at I-82 Pond 1 (Yakima County) in May 2000 by boat electrofishing.

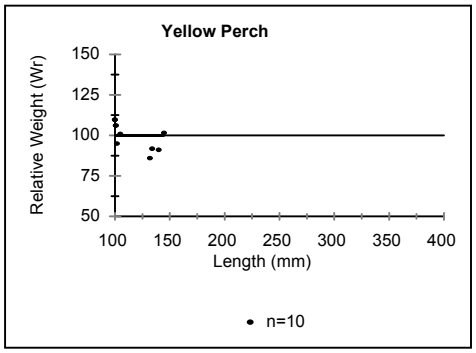

Figure 5. Relative weight (W_r) of yellow perch sampled at I-82 Pond 1 (Yakima County) in May 2000 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 1

I-82 Pond 1 pumpkinseed sunfish sampled ranged in length from 43 to 116 mm total length (Table 6). Pumpkinseed sunfish sampled were aged at two years (Table 14). Growth rates were higher than the known Washington state average. The condition of pumpkinseed sunfish was at or above the national average (Figure 6).

Table 14. Age and growth of pumpkinseed sunfish sampled from I-82 Pond 1 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
1999	0		
1998	3	32	92
		50	95
Direct Proportion Overall Mean		32	92
Lee's Weighted Mean		50	95
Direct Proportion State Average		24	72

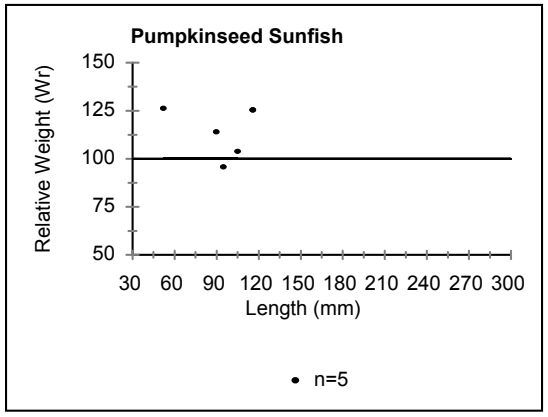

Figure 6. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 1 (Yakima County) in May 2000 compared to the national 75th percentile.

Common Carp I-82 Pond 1

I-82 Pond 1 common carp sampled ranged in length from 350 to 730 mm total length (Table 6). Common carp condition was at or above the national average (Figure 7). Scales were not sampled from common carp for age analysis.

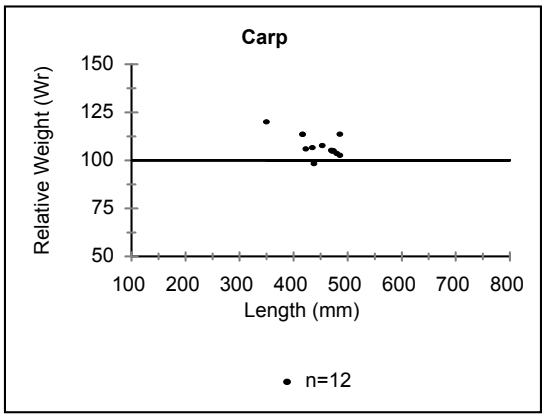

Figure 7. Relative weight (W_r) of common carp sampled at I-82 Pond 1 (Yakima County) in May 2000 compared to the national 75th percentile.

I-82 Pond 1 - Discussion

At the time of this survey, the fish community generally consisted of a low density largemouth bass population, a walleye population exhibiting characteristics of a population lacking an adequate prey base, and low density populations of yellow perch and pumpkinseed sunfish with few, if any, fish which offer angling opportunity. The results of the I-82 Pond 1 survey showed a dramatic change in the structure of the fish community since walleye were introduced and studied from 1992 to 1995. Prior to the introduction of walleye in 1992, the fish community in I-82 Pond 1 was prey crowded with over-abundant and stunted yellow perch and pumpkinseed sunfish populations. The low density largemouth bass population was unable to control the panfish at that time (Bolding et al. 1997). At the end of the walleye stocking study in 1995, yellow perch and pumpkinseed sunfish populations had decreased slightly and yellow perch growth showed limited improvement. In this survey, the pumpkinseed sunfish population was found to be in low abundance compared to the research results from the early 1990s. Bolding et al. (1997) reported boat electrofishing CPUE ranged from a high of over 50 fish/hr in 1993 to a low of less than 20 fish/hr in 1995. Our results showed boat electrofishing CPUE for all fish to be 12 fish/hr. Where Bolding et al. (1997) reported condition of pumpkinseed sunfish varying widely, the relatively few fish we sampled exhibited relative weights at or above the national average, indicative of a low density population. Bolding et al. (1997) reported boat electrofishing CPUE for stock length yellow perch (130 mm) was near 25 fish/hour, results of this survey indicate a less dense population with CPUE near 8 fish/hour. Yellow perch W_r seemed similar with fish exhibiting values at or below the national average. In contrast, I-82 Pond 2 (the control for the walleye stocking experiment) populations looked very similar to what they had previously.

These results suggest that more time may have been needed to document a significant change in the I-82 Pond 1 fish community following the introduction of walleye. It is apparent that the stocking of walleye into the previously prey crowded community successfully reduced the abundance of yellow perch and pumpkinseed sunfish. Had the monitoring gone on beyond 1995, the researchers may have documented the time necessary to observe a significant difference in the fish community. Although prey species abundance was reduced, it may have been too much of a shift in predator prey balance of the pond. At the time of this survey, there was not a quality yellow perch population, which was the primary objective of the walleye introduction. It would be beneficial to sample the pond again using the same methodology employed earlier including population estimates to document the degree of change that has occurred.

To improve angling opportunities at I-82 Pond 1, managers should work to improve the balance of predator/prey populations in the pond. This may be achieved by reducing the abundance of walleye in the pond for a time to allow prey populations to rebound to a desired level. Additionally, desirable panfish prey species might be stocked to achieve the desired affect more rapidly. As both of the major prey species populations, yellow perch and pumpkinseed sunfish, are low density, managers may have an opportunity to introduce more desirable species than pumpkinseed sunfish such as bluegill with hopes that stocked bluegill out compete other panfish

and become established. However, there may be an advantage to attempting to get the yellow perch population back into balance with the predators in the pond. Management goals since the pond was constructed have been to provide quality perch angling.

Since walleye were initially introduced in 1992 there has been a no walleye harvest regulation in effect. Considering the state of the fish community and the low condition of walleye, managers should consider lifting the restrictive regulation to allow for the harvest of some walleye. For simplicity, adopting the statewide walleye regulation should be considered. The current statewide regulation is a 16 to 22 inch slot-limit which allows the harvest of five walleye less than 16 inches or greater than 22 inches, only one of which can be over 22 inches. This should allow some walleye angling opportunity while protected walleye within the slot would remain for future panfish control.

Bank angling opportunities at Pond 1 are limited by pond-side vegetation. The fishing dock destroyed by vandals provided bank anglers better access to the pond. Replacing the fishing dock should be considered a high priority by regional managers and the Warmwater Fish Enhancement Program.

I-82 Pond 2

Background

I-82 Pond 2 (Yakima County) is 10.1 ha in size with a maximum depth of approximately eight meters. This pond is intermittently connected to the Yakima River via an overflow outlet channel, which allows for potential species exchange with the river at times. The pond shares a walk-in access site with I-82 Pond 1. I-82 Pond 2 shares a history similar to I-82 Pond 1 with regard to stocking, surveys, and research. The 1980 fall survey showed largemouth bass present. Like Pond 1, it was recommended that largemouth bass and yellow perch be stocked. Several adult largemouth bass and yellow perch were stocked between 1980 and 1983 (Table 15). A 1983 survey showed pumpkinseed sunfish had established in the pond. In addition to warmwater fish, catchable rainbow trout have been stocked periodically to provide additional angling opportunity.

Several research projects have used Pond 2 as a study site. As discussed in the section for I-82 Pond 1, I-82 Pond 2 served as a control reference in the evaluation of stocking walleye to control overabundant yellow perch and pumpkinseed sunfish. During the same time period, a diet analysis of largemouth bass was conducted and I-82 Pond 2 served as a study site (Bonar et al. 1994). In 1993, I-82 Pond 2 was also selected as a research site for a graduate study evaluating sampling methods used to sample warmwater fish populations in Washington (Divens 1995;

Table 15. Fish stocking history for I-82 Pond 2 (Yakima County) 1980 to 2000.

Stocking Date	Species	Number	Size
October 1980	Largemouth bass	125	Adult
May 1981	Rainbow Trout	2000	Catchable
October 1981	Yellow Perch	15	Adult
April 1982	Rainbow Trout	2500	Catchable
April 1982	Yellow Perch	(1 Gallon)	Eggs
June 1982	Largemouth Bass	13	Adult
June 1982	Yellow Perch	31	Adult
1982-1992	Rainbow Trout	74501	Catchable
1987-1991	Brown Trout	22088	Fingerling
1997	Largemouth Bass	750	Fry
1999	Black Crappie	6009	Fry
2000	Largemouth Bass	66	Adult

Divens et al. 1996). Species composition data collected at that time showed ten species present including; bullhead catfish *Ameiurus* spp., bridgelip sucker *Catostomus columbianus*, brown trout, common carp, chiselmouth, largemouth bass, largescale sucker, pumpkinseed sunfish, redside shiner *Richardsonius balteatus*, and yellow perch.

I-82 Pond 2 was included in the shoreline habitat improvement project in March 1997. One hundred forty-four, six foot black cottonwood trees were planted around the pond (E. Anderson, WDFW, personal communication).

Results

Water Quality I-82 Pond 2

I-82 Pond 2 has a steep shoreline with limited littoral area and a maximum depth of approximately eight meters (Table 16). Measured water temperatures ranged from 12.6EC in May to 25.2EC in July, 2000, and were within the acceptable range of warmwater fish species (Boyd 1990). Temperatures were within the optimal range for warmwater fish growth (20EC - 28EC) during June, July and August. Measured pH values ranged from 8.6 to 9.5. The preferred range for warmwater fish species is pH 6.5 to 9 (Swingle 1969). In general, dissolved oxygen levels were adequate in the lake throughout the summer.

Table 16. Water quality collected from May through August 2000 at I-82 Pond 2 (Yakima County).

Date	Depth (m)	Temp (°C)	pH	DO (mg/l)	TDS	Conductivity	Secchi (m)
05/23/00	0	19.0	9.3	3.9	0.1	223.1	
	2	18.9	9.4	3.4			
	4	18.2	9.5	3.6			
	6	13.4	9.1	4.1			
	7.6	12.6	8.8	2.6	0.1	230.9	
06/28/00	0	24.2	9.4		0.1	231.4	3.5
	2	22.0	9.4				
	4	21.0	9.4				
	6	18.0	9.3				
	6.8	16.1	9.0		0.2	236.2	
07/26/00	0	25.2	9.2	8.2	0.1	221.9	4.0
	2	23.9	9.2	7.8			
	4	23.5	9.2	7.5			
	6	21.4	9.0	7.2			
	7.3	19.2	8.9	1.2	0.2	233.5	
08/22/00	0	23.7	8.6	6.7	0.1	223.1	3.2
	2	21.9	8.7	6.9			
	4	21.4	8.7	6.4			
	6	21.1	8.6	5.6			
	7	20.7	8.6	4.2	0.1	222.6	

Species Composition I-82 Pond 2

Combined sampling resulted in eleven fish species collected from I-82 Pond 2 (Table 17). Species composition analysis, using only a portion of the total sampling conducted, to standardize the ratio of gear types employed (see Methods), showed largescale sucker and common carp making up 59% of the sample by weight, but comprising only 5% of the sample by number (Table 18). Pumpkinseed sunfish, yellow perch, and largemouth bass comprised the majority of gamefish sampled. Species composition by weight and number changed little when young-of-the-year fish were excluded from this analysis (Table 19). Young-of-the-year largemouth bass, yellow perch, and pumpkinseed sunfish were collected providing evidence of natural reproduction.

Table 17. Species composition by weight (kg) and number for all fish collected at I-82 Pond 2 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Largescale Sucker	13.35	41.98	14	6.11	190	530
Common Carp	6.78	21.33	3	1.31	511	582
Largemouth Bass	4.67	14.68	32	13.97	64	406
Yellow Perch	2.71	8.54	100	43.67	99	238
Pumpkinseed Sunfish	1.06	3.33	64	27.95	40	144
Bridgelip Sucker	1.05	3.31	2	0.87	391	675
Kokanee	0.98	3.07	5	2.18	252	295
Brown Bullhead	0.88	2.76	3	1.31	266	283
Northern Pike-Minnow	0.21	0.67	4	1.75	175	196
Black Bullhead	0.09	0.27	1	0.44	185	185
Chiselmouth	0.02	0.06	1	0.44	127	127

Table 18. Species composition by weight (kg) and number for fish collected at I-82 Pond 2 (Yakima County) in May 2000. Results of analysis after randomly selecting three electrofishing samples, two gill net samples, and two fyke net samples to maintain the standardized methodology. This approach allows for comparisons among locations similarly sampled.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Largescale Sucker	7.45	35.97	6	4.17	462	530
Common Carp	4.82	23.30	2	1.39	560	582
Largemouth Bass	3.80	18.36	22	15.28	65	406
Bridgelip Sucker	1.05	5.08	2	1.39	391	675
Yellow Perch	1.03	4.97	44	30.56	104	235
Kokanee	0.98	4.72	5	3.47	252	295
Pumpkinseed Sunfish	0.97	4.68	60	41.67	40	144
Brown Bullhead	0.57	2.73	2	1.39	266	279
Northern Pike-Minnow	0.04	0.19	1	0.69	176	176

Table 19. Species composition (excluding young-of-the-year) by weight (kg) and number for fish collected at I-82 Pond 2 (Yakima County) in May 2000. Results of analysis after randomly selecting three electrofishing samples, two gill net samples, and two fyke net samples to maintain the standardized methodology. This approach allows for comparisons among locations similarly sampled.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Largescale Sucker	7.45	36.08	6	4.58	462	530
Common Carp	4.82	23.37	2	1.53	560	582
Largemouth Bass	3.79	18.35	18	13.74	86	406
Bridgelip Sucker	1.05	5.09	2	1.53	391	675
Yellow Perch	0.98	4.77	40	30.53	108	235
Kokanee	0.98	4.73	5	3.82	252	295
Pumpkinseed Sunfish	0.96	4.67	55	41.98	51	144
Brown Bullhead	0.57	2.74	2	1.53	266	279
Northern Pike-Minnow	0.04	0.19	1	0.76	176	176

CPUE I-82 Pond 2

Yellow perch, pumpkinseed sunfish, and largemouth bass were sampled at the highest rate by electrofishing (Table 20). Largescale sucker was the species sampled at the highest rate by gill netting followed by yellow perch. Largescale sucker and bridgelip sucker were the only species sampled by fyke netting. The majority of pumpkinseed sunfish sampled were of stock length, whereas approximately half of the largemouth bass and the majority of yellow perch sampled were less than stock length (Table 21).

Table 20. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all fish excluding young-of-the-year collected at I-82 Pond 2 (Yakima County) in May 2000.

	Gear Types					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Brown Bullhead	4.50 ± 3.68	4	0.00	4	0.00	4
Black Bullhead	0.00	4	0.25 ± 0.32	4	0.00	4
Bridgelip Sucker	1.50 ± 1.92	4	0.00	4	0.25 ± 0.32	4
Chiselmouth	0.00	4	0.25 ± 0.32	4	0.00	4
Common Carp	3.00 ± 3.84	4	0.25 ± 0.32	4	0.00	4
Kokanee	0.00	4	1.25 ± 0.96	4	0.00	4
Largemouth Bass	40.50 ± 7.93	4	0.00	4	0.00	4
Largescale Sucker	4.50 ± 5.77	4	2.50 ± 1.70	4	0.25 ± 0.32	4
Northern Pike-Minnow	0.00	4	1.00 ± 0.91	4	0.00	4
Pumpkinseed Sunfish	87.00 ± 32.70	4	0.25 ± 0.32	4	0.00	4
Yellow Perch	121.50 ± 62.10	4	2.25 ± 0.96	4	0.00	4

Table 21. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for stock length fish collected at I-82 Pond 2 (Yakima County) in May 2000.

	Gear Types					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Brown Bullhead	4.50 ± 3.68	4	0.00	4	0.00	4
Black Bullhead	0.00	4	0.25 ± 0.32	4	0.00	4
Bridgelip Sucker	1.50 ± 1.92	4	0.00	4	0.25 ± 0.32	4
Chiselmouth	0.00	4	0.25 ± 0.32	4	0.00	4
Common Carp	3.00 ± 3.84	4	0.25 ± 0.32	4	0.00	4
Kokanee	0.00	4	1.25 ± 0.96	4	0.00	4
Largemouth Bass	19.50 ± 6.57	4	0.00	4	0.00	4
Largescale Sucker	4.50 ± 5.77	4	2.50 ± 1.70	4	0.25 ± 0.32	4
Northern Pike-Minnow	0.00	4	1.00 ± 0.91	4	0.00	4
Pumpkinseed Sunfish	79.50 ± 31.45	4	0.25 ± 0.32	4	0.00	4
Yellow Perch	9.00 ± 6.66	4	2.00 ± 1.17	4	0.00	4

Stock Density Indices I-82 Pond 2

Sample sizes of stock length fish used for evaluating stock density indices were low limiting interpretive value (Table 22). Of the pumpkinseed sunfish sampled, none were greater than stock length which may be indicative of a stunted population. Largemouth bass stock density indices suggest that at least some quality and preferred fish are present in the population.

Table 22. Traditional stock density indices by sampling method, including 80% confidence intervals, for fish collected from I-82 Pond 2 (Yakima County) in May 2000.

Electrofishing					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Brown Bullhead	3	100 ± 0	33 ± 35	0	0
Common Carp	2	100 ± 0	100 ± 0	0	0
Largemouth Bass	13	23 ± 15	8 ± 9	0	0
Pumpkinseed Sunfish	53	0	0	0	0
Yellow Perch	6	50 ± 26	0	0	0

Gill Netting					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Yellow Perch	8	50 ± 23	0	0	0

Largemouth Bass I-82 Pond 2

I-82 Pond 2 largemouth bass sampled ranged in length from 64 to 406 mm total length (Table 17). The age of largemouth bass sampled ranged from one to six years (Table 23). Largemouth bass growth rates were higher than the known Washington state average at all age classes (Fletcher et al. 1993). Length frequency distribution indicates unstable year-class strength (Figure 8). The condition of largemouth bass sampled was both above and below the national average (Figure 9). Low sample size and the high variability in the condition of largemouth bass sampled limits interpretation.

Table 23. Age and growth of largemouth bass sampled from I-82 Pond 2 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age					
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**	**6**
1999	13	74					
		78					
1998	8	76	254				
		90	255				
1997	3	57	148	294			
		73	158	294			
1996	0						
1995	0						
1994	2	55	138	191	284	324	378
		72	151	201	289	327	378
Direct Proportion Overall Mean		65	180	243	284	324	378
Lee's Weighted Mean		81	216	257	289	327	378
Direct Proportion State Average		60	146	222	261	289	319

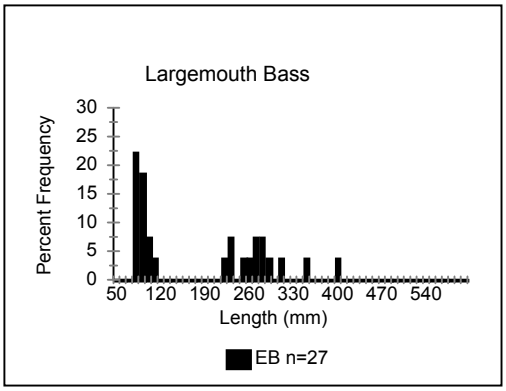

Figure 8. Length frequency distribution of largemouth bass, excluding young-of-the-year, sampled at I-82 Pond 2 (Yakima County) in May 2000 by boat electrofishing.

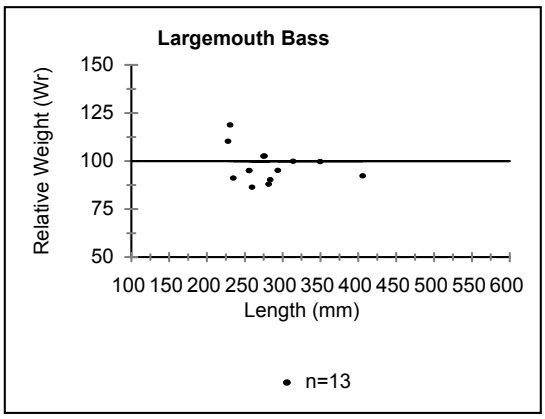

Figure 9. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 2 (Yakima County) in May 2000 compared to the national 75th percentile.

Yellow Perch I-82 Pond 2

I-82 Pond 2 yellow perch sampled ranged in length from 99 to 238 mm total length (Table 17). The age of yellow perch sampled ranged from one to three years (Table 24). Yellow perch growth rates were higher than the known state average (Fletcher et al. 1993). Length frequency distribution may indicate unstable year-class strength (Figure 10). Yellow perch condition was below the national average (Figure 11).

Table 24. Age and growth of yellow perch sampled from I-82 Pond 2 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
1999	19	94		
		100		
1998	9	106	198	
		121	200	
1997	1	70	176	234
		91	183	234
Direct Proportion Overall Mean		90	187	234
Lee's Weighted Mean		106	199	234
Direct Proportion State Average		60	120	152

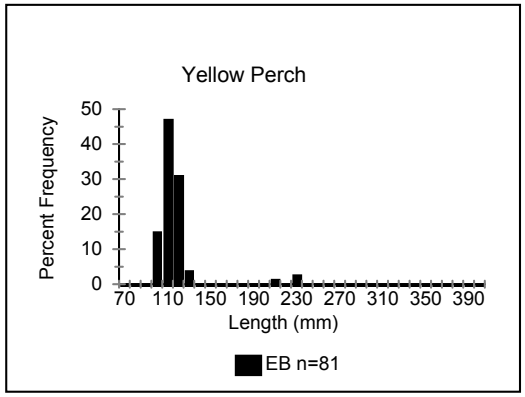

Figure 10. Length frequency distribution of yellow perch, excluding young-of-the-year, sampled at I-82 Pond 2 (Yakima County) in May 2000 by boat electrofishing.

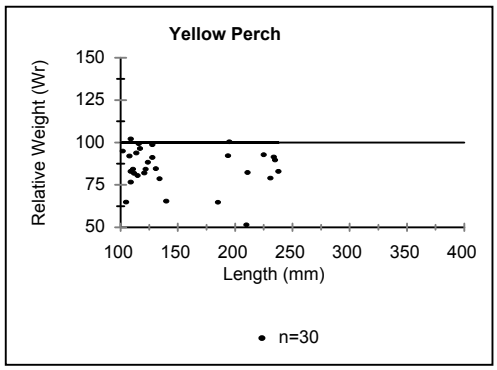

Figure 11. Relative weight (W_r) of yellow perch sampled at I-82 Pond 2 (Yakima County) in May 2000 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 2

I-82 Pond 2 pumpkinseed sunfish sampled ranged in length from 40 to 144 mm total length (Table 17). All fish sampled for age and growth information were aged at two years (Table 25). The growth of these fish was higher than the known Washington state average. No larger, older, pumpkinseed sunfish were sampled (Figure 12). Pumpkinseed sunfish condition varied widely with individuals exhibiting values both higher and lower than the national average (Figure 13).

Table 25. Age and Growth of pumpkinseed sunfish sampled from I-82 Pond 2 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
1999	0		
1998	23	33	85
		50	89
Direct Proportion Overall Mean		33	85
Lee's Weighted Mean		50	89
State Average		24	72

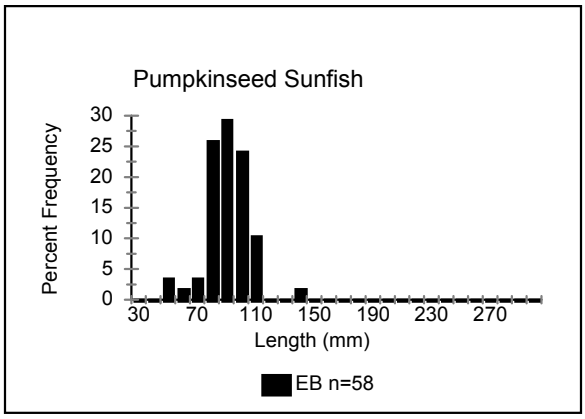

Figure 12. Length frequency distribution of pumpkinseed sunfish, excluding young-of-the-year, sampled at I-82 Pond 2 (Yakima County) in May 2000 by boat electrofishing.

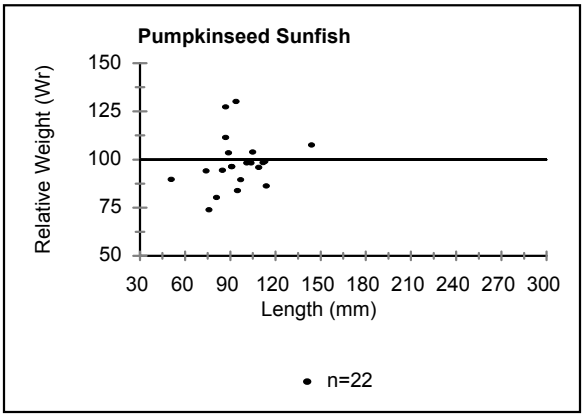

Figure 13. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 2 (Yakima County) in May 2000 compared to the national 75th percentile.

Brown and Black Bullhead I-82 Pond 2

Bullhead catfish were sampled in low numbers. Brown bullhead *Ameiurus nebulosus* sampled ranged in length from 266 to 283 mm total length (Table 17). The condition of brown bullhead sampled was below the national average (Figure 14). One 185 mm black bullhead was sampled.

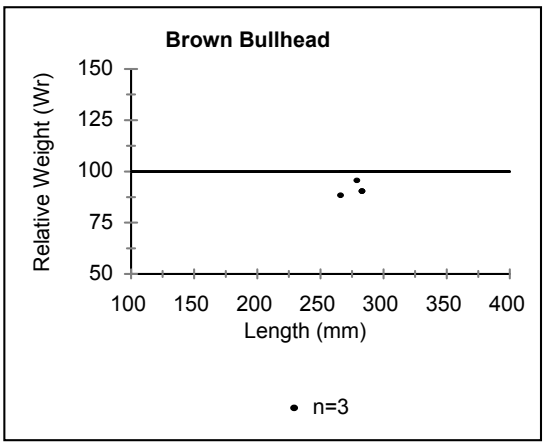

Figure 14. Relative weight (W_r) of brown bullhead sampled at I-82 Pond 2 (Yakima County) in May 2000 compared to the national 75th percentile.

Kokanee Salmon I-82 Pond 2

Five kokanee *Oncorhynchus nerka* were sampled by gill netting in I-82 Pond 2. The kokanee sampled ranged from 252 to 295 mm total length (Table 17). Scales were collected from three of these fish and analysis showed all to be age one (Table 26). It is unknown as to how these fish originated in Pond 2, but kokanee populations are present in the reservoirs at the headwaters of the Yakima River. I-82 Pond 2 is connected, at least intermittently, to the Yakima River and so it is possible that the kokanee immigrated to the pond via the river from one of the populations upstream.

Table 26. Age and growth of kokanee sampled from I-82 Pond 2 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993).

		Mean Total Length (mm) at Age
Year Class	**# Fish**	**1**
1999	3	160
Direct Proportion Overall Mean		160

I-82 Pond 2 - Discussion

The results of this survey indicated that the I-82 Pond 2 fish community has changed little in the last ten years. The species composition of the pond is very similar to that observed in the early 1990s research (Bolding et al. 1997). Pumpkinseed sunfish, yellow perch, and largemouth bass were still the most abundant species sampled. However, pumpkinseed sunfish accounted for a smaller proportion of the species composition than in the past (Divens 1995). Yellow perch and largemouth bass now make up larger proportions of the sample. Two species observed during this sampling, but not in the past, were kokanee and northern pike-minnow *Ptychocheilus oregonensis*. These species likely immigrated from the Yakima River. Alternatively, two species, brown trout and redside shiner, were observed in the past, but not during this survey. Brown trout were last stocked into Pond 2 in 1991. Yellow perch indices of density and condition were similar to those reported for 1995 by Bolding et al. (1997) indicating little change in the population. Pumpkinseed sunfish CPUE and relative weight were similar as well. The density of largemouth bass as indicated by a higher CPUE has increased, but the condition of largemouth bass was similar. These indices of largemouth bass population structure indicate that the population has increased numerically, without a reduction in the condition of individual fish, suggesting that sufficient room for additional predators was available in this prey crowded community.

To enhance the quality of I-82 Pond angling opportunity, managers should continue to work towards increasing the density of largemouth bass in the pond. Adopting a new statewide 12-to17-inch slot-limit regulation for largemouth bass in 2000 was likely a step in this direction. However, angler education and enforcement of the regulation may be a challenge. With good angler compliance, this regulation should increase the number of largemouth bass in the pond. An increase in predators should not only increase catch rates for largemouth bass, but also improve the quality of other gamefish species by reducing inter and intraspecific competition. To decrease the amount of time to realize the desired affect of the new regulation, managers should consider periodically stocking additional adult largemouth bass to the pond.

In addition to fisheries management activities, managers should work to enhance the infrastructure at the site. An outlet barrier should be designed and installed which would stop fish exchange, both immigration and emigration, between the pond and the Yakima River. Lastly, a fishing dock or pier, similar to the one installed at Pond 1 in the past, should be designed and installed to provide additional opportunity for shoreline anglers.

I-82 Pond 3

Background

I-82 Pond 3 (Yakima County) is 7.6 hectares in size and approximately eight meters maximum depth. The pond is accessed by a short walk from a WDFW parking site. This pond has an outlet, which allows intermittent connection of the pond with the Yakima River. Initial fish surveys conducted in 1980 showed northern pike-minnow, common carp, longnose sucker, and largescale sucker inhabiting the pond. Considering these results, it was recommended for a fish passage barrier be constructed, the pond to be rehabilitated with rotenone, and the stocking of largemouth bass. This work was completed in 1982. A 1983 survey showed the barrier to be ineffective as additional species including brown bullhead, pumpkinseed sunfish, common carp, chiselmouth, and longnose sucker had re-invaded the pond. In 1994, it was recommended that channel catfish be added to the pond. This species, in addition to many others have been stocked over the years (Table 27).

Like I-82 Pond 2, I-82 Pond 3 served as a graduate study site for evaluating sampling methods (Divens 1995). Species composition results from this study showed 13 species present including: black crappie *Pomoxis nigromaculatus*, bluegill, bridgelip sucker, brown trout, bullhead catfish, common carp, chiselmouth, largemouth bass, largescale sucker, northern pike-minnow, pumpkinseed sunfish, rainbow trout, and yellow perch.

Additional management highlights for I-82 Pond 3 include the planting of 58 6' black cottonwood trees, the installation of 18 artificial reef structures constructed of apple trees and concrete weights, and creel reports of channel catfish measuring 12 to 22 inches caught by anglers.

Table 27. Fish stocking history for I-82 Pond 3 (Yakima County) 1980 to 2002.

Stocking Date	Species	Number	Size
October 1980	Largemouth bass	125	Adult
May 1981	Rainbow Trout	2000	Catchable
October 1981	Yellow Perch	15	Adult
April 1982	Rainbow Trout	2500	Catchable
April 1982	Yellow Perch	(1 Gallon)	Eggs
June 1982	Largemouth Bass	13	Adult
June 1982	Yellow Perch	31	Adult
1983	Largemouth Bass	21	Sub-adult
1985	Bluegill	200	Sub-adult
1985	Largemouth Bass	5	Adult
1986-1992	Brown Trout	20132	Fingerling
1994	Brown Trout	1005	Catchable
1994	Channel Catfish	582	Fry
1995-2002	Brown Trout	4187	Catchable
1996	Channel Catfish	480	Fry
1997	Largemouth Bass	3600	Fry
1997	Bluegill	2080	Fry
1998	Black Crappie	2415	Fry
1998	Channel Catfish	482	Fry
1999	Black Crappie	1986	Fry
1999	Channel Catfish	250	Sub-adult
2000	Largemouth Bass	87	Adults
2001	Channel Catfish	250	Sub-adult
2002	Brown Trout	688	Catchable

Results

Water Quality I-82 Pond 3

I-82 Pond 3 has a steep shoreline with limited littoral area and a maximum depth of approximately eight meters (Table 28). Measured water temperatures ranged from 13.5EC in May to 23EC in July, 2000, and were within the acceptable range of warmwater fish species (Boyd 1990). Temperatures were within the optimal range for warmwater fish growth (20EC - 28EC) during June, July and August. Measured pH values ranged from 8.4 to 9.2. The preferred range for warmwater fish species is pH 6.5 to 9 (Swingle 1969). In general, dissolved oxygen levels were adequate in the lake throughout the summer.

Table 28. Water quality collected from May through August 2000 at I-82 Pond 3 (Yakima County).

Date	Depth (m)	Temp (ºC)	pH	DO (mg/l)	TDS	Conductivity	Secchi (m)
05/25/00	0	18.3	8.6	3.2	0.1	190.0	
	2	17.9	8.7	3.2			
	4	16.9	8.7	3.3			
	6	15.3	8.6	3.5			
	7.6	13.5	8.5	3.4	0.1	193.7	
06/28/00	0	22.9	9.2		0.1	193.9	3.5
	2	22.2	9.2				
	4	19.6	9.2				
	6	16.7	9.0				
	7.7	15.5	8.8		0.1	190.2	
07/27/00	0	23.0	9.0	8.7	0.1	200.3	4.0
	2	22.3	9.0	8.5			
	4	21.4	8.7	8.8			
	6	17.3	8.5	2.5			
	7.5	16.1	8.4	1.3	0.1	205.8	
08/22/00	0	22.8	8.9	9.2	0.1	214.3	4.0
	2	20.9	8.9	9.0			
	4	20.1	8.7	8.6			
	6	18.7	8.6	6.7			
	7.5	17.7	8.5	1.5	0.1	212.7	

Species Composition I-82 Pond 3

Thirteen fish species were collected from I-82 Pond 3 in 2000. Non-game species including largescale sucker, bridgelip sucker, common carp, chiselmouth, and northern pike-minnow comprised 86% of the sample by weight (Table 29). Although few in number, largemouth bass comprised the highest proportion of gamefish by weight. Yellow perch and pumpkinseed sunfish were the most numerous gamefish. Other gamefish including bluegill, bullhead catfish,

and black crappie were observed only in low numbers. Species composition analysis changed little when young-of-the-year (YOY) fish were excluded (Table 30). Only young-of-the-year yellow perch were sampled in notable numbers.

Table 29. Species composition by weight (kg) and number for all fish collected at I-82 Pond 3 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Largescale Sucker	48.94	63.72	36	11.50	203	591
Bridgelip Sucker	5.45	7.10	5	1.60	423	500
Common Carp	5.40	7.03	2	0.64	443	612
Chiselmouth	5.28	6.87	37	11.82	114	283
Largemouth Bass	2.51	3.27	10	3.19	55	408
Yellow Perch	2.04	2.65	104	33.23	91	252
Pumpkinseed Sunfish	1.83	2.38	79	25.24	72	171
Brown Bullhead	1.78	2.32	4	1.28	294	320
Northern Pike-Minnow	1.22	1.59	7	2.24	156	330
Brown Trout	1.17	1.53	3	0.96	332	365
Black Bullhead	0.55	0.71	6	1.92	156	207
Bluegill	0.50	0.65	19	6.07	30	181
Black Crappie	0.14	0.18	1	0.32	200	200

Table 30. Species composition (excluding young-of-the-year) by weight (kg) and number for fish collected at I-82 Pond 3 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Largescale Sucker	48.94	63.84	36	12.29	203	591
Bridgelip Sucker	5.45	7.11	5	1.71	423	500
Common Carp	5.40	7.04	2	0.68	443	612
Chiselmouth	5.28	6.88	37	12.63	114	283
Largemouth Bass	2.51	3.28	9	3.07	84	408
Yellow Perch	1.89	2.47	87	29.69	98	252
Pumpkinseed Sunfish	1.83	2.38	79	26.96	72	171
Brown Bullhead	1.78	2.33	4	1.37	294	320
Northern Pike-Minnow	1.22	1.59	7	2.39	156	330
Brown Trout	1.17	1.53	3	1.02	332	365
Black Bullhead	0.55	0.71	6	2.05	156	207
Bluegill	0.50	0.65	17	5.80	50	181
Black Crappie	0.14	0.19	1	0.34	200	200

CPUE I-82 Pond 3

Pumpkinseed sunfish, yellow perch and bluegill were sampled at the highest rate by boat electrofishing (Table 31). Chiselmouth was the species sampled at the highest rate by gill netting followed by largescale sucker. Black crappie and bluegill were the only species sampled by fyke netting. The majority of pumpkinseed sunfish sampled were of stock length, whereas approximately half of the largemouth bass and the majority of yellow perch sampled were less than stock length (Table 32).

Table 32. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all fish excluding young-of-the-year collected at I-82 Pond 3 (Yakima County) in May 2000.

	Gear Type					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Brown Bullhead	7.38 ± 4.78	3	0.00	2	0.00	2
Black Crappie	0.00	3	0.00	2	0.50 ± 0.64	2
Bluegill	31.38 ± 26.04	3	0.00	2	0.50 ± 0.64	2
Black Bullhead	0.00	3	3.00 ± 1.28	2	0.00	2
Bridgelip Sucker	4.00 ± 5.13	3	1.50 ± 1.92	2	0.00	2
Brown Trout	0.00	3	1.50 ± 0.64	2	0.00	2
Chiselmouth	12.14 ± 11.92	3	15.00 ± 1.28	2	0.00	2
Common Carp	1.69 ± 2.17	3	0.50 ± 0.64	2	0.00	2
Largemouth Bass	16.45 ± 5.70	3	0.00	2	0.00	2
Largescale Sucker	17.07 ± 8.96	3	13.50 ± 9.61	2	0.00	2
Northern Pike-Minnow	3.38 ± 4.33	3	2.50 ± 0.64	2	0.00	2
Pumpkinseed Sunfish	154.28 ± 66.46	3	0.00	2	0.00	2
Yellow Perch	143.01 ± 20.14	3	7.50 ± 7.05	2	0.00	2

Table 31. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for stock length fish collected at I-82 Pond 3 (Yakima County) in May 2000.

	Gear Type					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Brown Bullhead	7.38 ± 4.78	3	0.00	2	0.00	2
Black Crappie	0.00	3	0.00	2	0.50 ± 0.64	2
Bluegill	25.38 ± 18.35	3	0.00	2	0.50 ± 0.64	2
Black Bullhead	0.00	3	3.00 ± 1.28	2	0.00	2
Bridgelip Sucker	4.00 ± 5.13	3	1.50 ± 1.92	2	0.00	2
Brown Trout	0.00	3	1.50 ± 0.64	2	0.00	2
Chiselmouth	12.14 ± 11.92	3	15.00 ± 1.28	2	0.00	2
Common Carp	1.69 ± 2.17	3	0.50 ± 0.64	2	0.00	2
Largemouth Bass	8.76 ± 7.71	3	0.00	2	0.00	2
Largescale Sucker	17.07 ± 8.96	3	13.50 ± 9.61	2	0.00	2
Northern Pike-Minnow	3.38 ± 4.33	3	2.50 ± 0.64	2	0.00	2
Pumpkinseed Sunfish	130.28 ± 47.13	3	0.00	2	0.00	2
Yellow Perch	5.38 ± 3.77	3	1.50 ± 1.92	2	0.00	2

Stock Density Indices I-82 Pond 3

Sample sizes for evaluating stock density indices were low for all species except pumpkinseed sunfish (Table 33). Pumpkinseed sunfish PSD indicates a crowded community.

Table 33. Traditional stock density indices by sampling method, including 80% confidence intervals, for fish collected from I-82 Pond 3 (Yakima County) in May 2000.

Electrofishing					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Bluegill	13	8 ± 9	0	0	0
Brown Bullhead	4	100 ± 0	100 ± 0	0	0
Largemouth Bass	5	80 ± 23	20 ± 23	0	0
Pumpkinseed Sunfish	67	6 ± 4	0	0	0
Yellow Perch	3	33 ± 35	0	0	0

Gill Netting					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Black Bullhead	6	0	0	0	0
Brown Trout	3	100 ± 0	100 ± 0	0	0
Yellow Perch	3	100 ± 0	67 ± 35	0	0

Largemouth Bass I-82 Pond 3

I-82 Pond 3 largemouth bass sampled ranged in size from 55 to 408 mm total length (Table 29). The age of largemouth bass sampled ranged from one to four years (Table 34). Largemouth bass growth rates were higher than the known Washington state average at all age classes. The condition of largemouth bass sampled was at or near the national average (Figure 15).

Table 34. Age and growth of largemouth bass sampled from I-82 Pond 3 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age			
Year Class	**# Fish**	**1**	**2**	**3**	**4**
1999	4	80			
		84			
1998	1	55	207		
		70	208		
1997	2	52	245	312	
		69	249	312	
1996	2	80	226	317	352
		95	233	320	352
Direct Proportion Overall Mean		67	226	314	352
Lee's Weighted Mean		81	235	316	352
Direct Proportion State Average		60	146	222	261

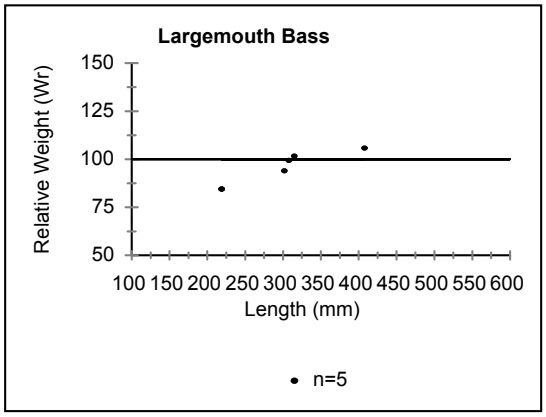

Figure 15. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 3

I-82 Pond 3 pumpkinseed sunfish sampled ranged in length from 72 to 171 mm total length (Table 29). The age of pumpkinseed sunfish sampled ranged from two to four years (Table 35). Pumpkinseed sunfish growth rates were higher than the known Washington state average at all age classes (Fletcher et al. 1993). Length frequency distribution indicates stable year-class strength (Figure 16). Pumpkinseed sunfish condition was approximately equal above and below the national average (Figure 17).

Table 35. Age and growth of pumpkinseed sunfish sampled from I-82 Pond 3 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age			
Year Class	**# Fish**	**1**	**2**	**3**	**4**
1999	0				
1998	32	31	86		
		48	90		
1997	2	18	72	136	
		40	85	138	
1996	3	26	83	135	164
		47	95	140	164
Direct Proportion Overall Mean		25	80	135	164
Lee's Weighted Mean		48	90	139	164
Direct Proportion State Average		24	72	102	123

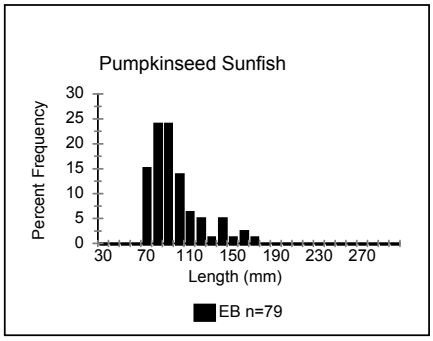

Figure 16. Length frequency distribution of pumpkinseed sunfish, excluding young-of-the-year, sampled at I-82 Pond 3 (Yakima County) in May 2000 by boat electrofishing.

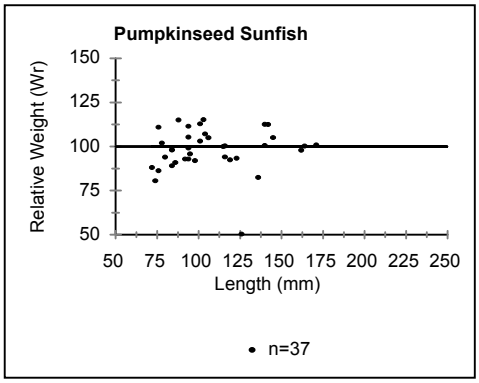

Figure 17. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Yellow Perch I-82 Pond 3

I-82 Pond 3 yellow perch sampled ranged in length from 91 to 252 mm total length (Table 29). Yellow perch age analysis showed that samples were one or three years (Table 36). Growth rates were above the known Washington state average. Length frequency distribution and age data suggest a possible year-class failure in 1998 (Figure 18). The condition of yellow perch was below the national average (Figure 19).

Table 36. Age and growth of yellow perch sampled from I-82 Pond 3 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
1999	18	88		
		95		
1998	0			
1997	4	87	185	237
		106	192	238
Direct Proportion Overall Mean		88	185	237
Lee's Weighted Mean		97	192	238
Direct Proportion State Average		60	120	152

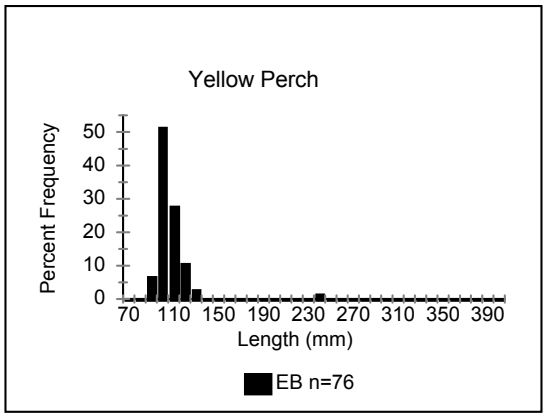

Figure 18. Length frequency distribution of yellow perch, excluding young-of-the-year, sampled at I-82 Pond 3 (Yakima County) in May 2000 by boat electrofishing.

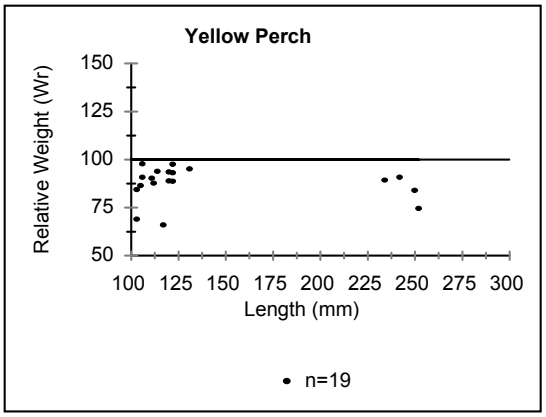

Figure 19. Relative weight (W_r) of yellow perch sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Bluegill Sunfish I-82 Pond 3

I-82 Pond 3 bluegill sampled ranged in length from 30 to 181 mm total length (Table 29). The age of bluegill sampled was two (Table 37). Growth rates were below the known Washington state average. The condition of bluegill sunfish sampled varied with values both above and below the national average (Figure 20).

Table 37. Age and growth of bluegill sunfish sampled from I-82 Pond 3 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
1999	0		
1998	13	22	90
		38	94
Direct Proportion Overall Mean		22	90
Lee's Weighted Mean		38	94
Direct Proportion State Average		37	97

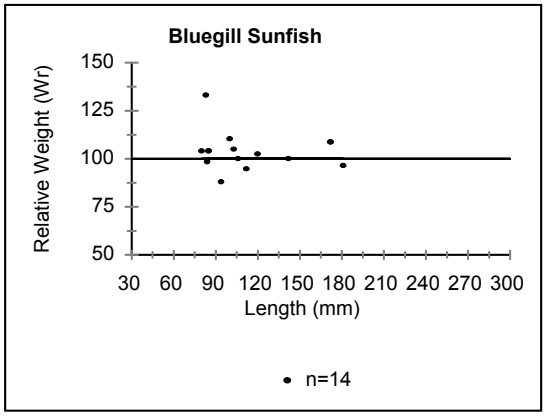

Figure 20. Relative weight (W_r) of bluegill sunfish sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Black Crappie I-82 Pond 3

One 200 mm black crappie was sampled (Table 29). This fish was three years of age and its growth rate was below the known Washington state average for two years, but exceeded the average for year three (Table 38). The condition of this fish was above the national average (Figure 21).

Table 38. Age and growth of black crappie sampled from I-82 Pond 3 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
1999	0			
1998	0			
1997	1	35	74	188
		64	96	190
Direct Proportion Overall Mean		35	74	188
Lee's Weighted Mean		64	96	190
Direct Proportion State Average		46	111	157

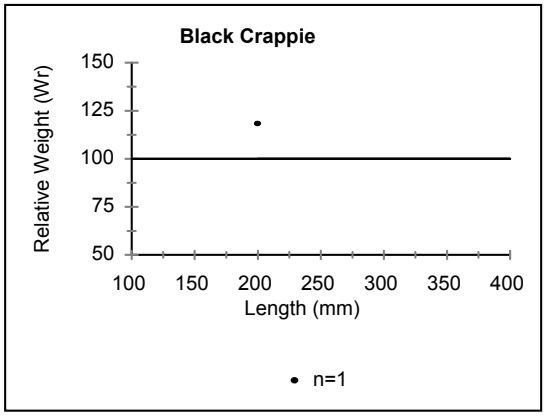

Figure 21. Relative weight (W_r) of black crappie sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Black Bullhead I-82 Pond 3

I-82 Pond 3 black bullhead catfish sampled ranged in length from 156 to 207 mm total length (Table 29). No age data was collected for this species. Condition was below the national average except for one individual (Figure 22).

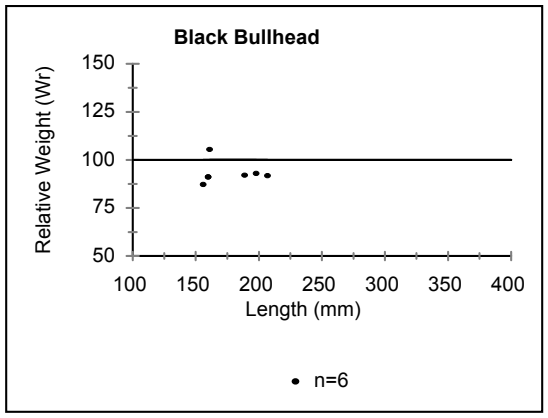

Figure 22. Relative weight (W_r) of black bullhead sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Brown Bullhead I-82 Pond 3

I-82 Pond 3 brown bullhead catfish sampled ranged in length from 294 to 320 mm total length (Table 29). No age data was collected for this species. The condition of brown bullhead sampled was near or above the national average (Figure 23)

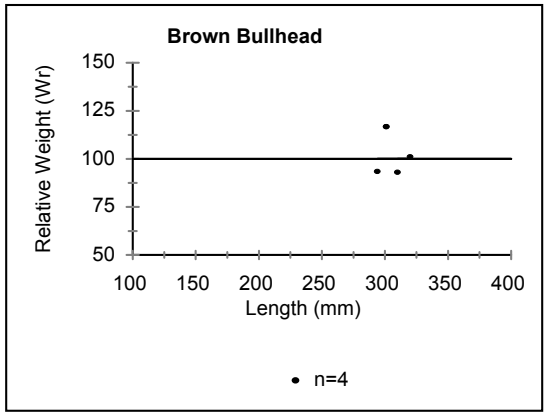

Figure 23. Relative weight (W_r) of brown bullhead sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Brown Trout I-82 Pond 3

I-82 Pond 3 brown trout sampled ranged in length from 332 to 365 mm total length (Table 29). No age data was collected for this species, but they are stocked into the pond periodically. The condition of the fish sampled was below the national average (Figure 24).

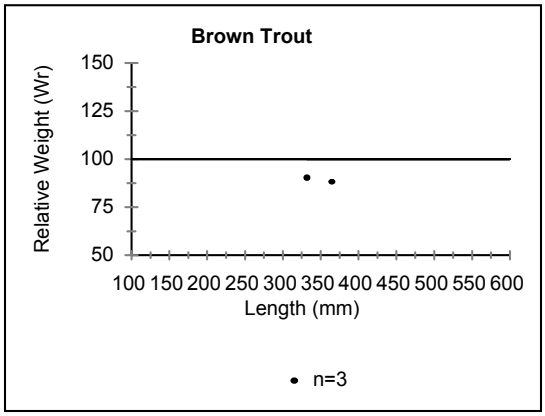

Figure 24. Relative weight (W_r) of brown trout sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Chiselmouth I-82 Pond 3

I-82 Pond 3 chiselmouth sampled ranged in length from 114 to 283 mm total length (Table 29). No age data was collected for this species. Length frequency indicates variable year-class strength (Figure 25). This may be an indication that chiselmouth, and possibly other species enter the pond at times via the outlet connection with the Yakima River.

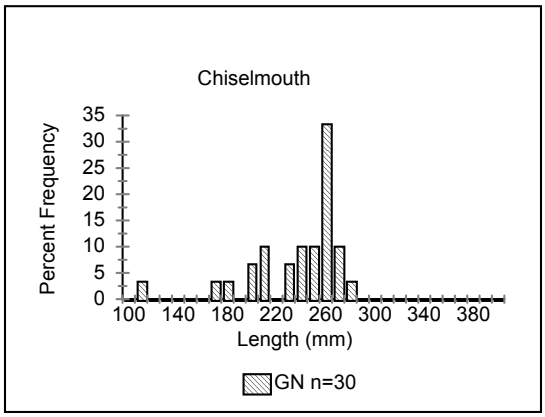

Figure 25. Length frequency distribution of chiselmouth, excluding young-of-the-year, sampled at I-82 Pond 3 (Yakima County) in May 2000 by gill netting.

Largescale Sucker I-82 Pond 3

I-82 Pond 3 largescale sucker sampled ranged in length from 203 to 591 mm total length (Table 29). No age data was collected for this species. Length frequency distribution shows most fish sampled were large adults (Figure 26). It is possible that these fish entered the pond as adults from the Yakima River via the outlet channel.

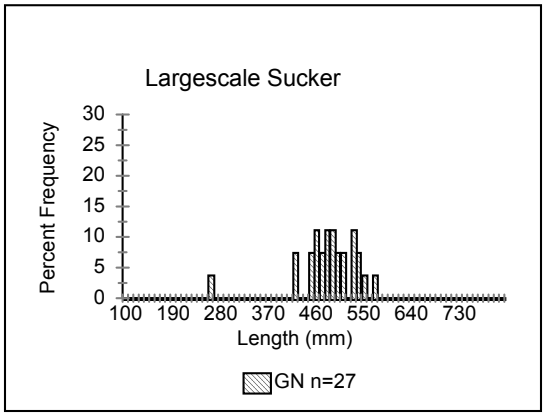

Figure 26. Length frequency distribution of largescale sucker sampled at I-82 Pond 3 (Yakima County) in May 2000 by gill netting.

Common Carp I-82 Pond 3

Two common carp, measuring 423 and 500 mm total length, were sampled during this survey (Table 29). No age data was collected for this species. The condition of common carp was higher than the national average (Figure 27).

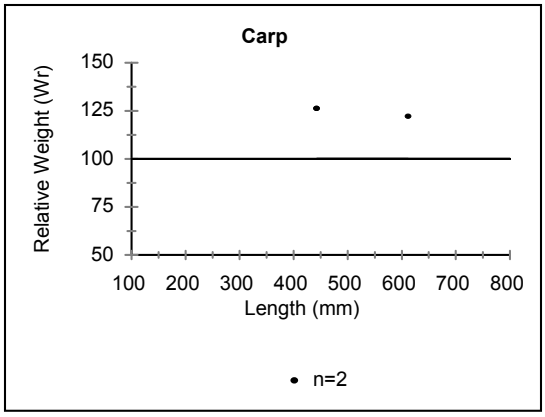

Figure 27. Relative weight (W_r) of common carp sampled at I-82 Pond 3 (Yakima County) in May 2000 compared to the national 75th percentile.

Discussion - I-82 Pond 3

Survey results for I-82 Pond 3 show a community dominated by non-gamefish undesirable to anglers and low density gamefish populations. Largemouth bass, the primary predator in the pond, exhibited indices of population structure indicating low density. Yellow perch and pumpkinseed sunfish were the most numerous panfish species sampled. Bluegill and black crappie were sampled in lower numbers. Panfish populations including yellow perch, bluegill, black crappie, and pumpkinseed sunfish exhibited high growth and/or high condition values. This result differs from results reported for species composition from 1993 sampling (Divens 1995). The most notable difference is in the proportion of largemouth bass, largescale sucker, and chiselmouth sampled. In 1993, largemouth bass were more abundant, where largescale sucker and chiselmouth were sampled in lower numbers.

Considering the fast growth and good condition of the largemouth bass population, it is likely that numbers could be increased in the pond without sacrificing quality. The implementation of the 12- to 17-inch slot-limit should improve the structure of the population in time if anglers comply. Panfish population indices also indicate room for additional numbers. This may be more the result of habitat and productivity than species interactions within the pond. Considering these results, and the high proportion of non-game species present, the full fishery production potential has likely not been realized in Pond 3 due to the constant connectivity to the Yakima River via the outlet channel. As was recommended following initial survey work in the early 1980's, the construction of an adequate outlet barrier to fish passage should be designed and installed prior to future enhancement efforts (Fletcher 1980).

Following the construction of an adequate outlet structure, fishery management options should increase. If this is achieved, a first priority should be to increase the number of predators in the pond be it largemouth bass or a combination of largemouth bass and brown trout. This objective can be achieved by supplementing the existing population with adult fish or alternatively may be achieved in time through the recently adopted slot-limit regulation for largemouth bass.

If an outlet structure is installed, managers should consider altering the structure of the community through mechanical or chemical means to reduce the number of non-gamefish in the community. If mechanical manipulation of the community is a chosen alternative, managers should consider employing boat electrofishing and gill netting to reduce the number of undesirable species. If a complete fish removal using chemical means is a chosen alternative, managers should seek to keep the assemblage simple by choosing and stocking two gamefish species such as largemouth bass and bluegill.

The current stocking regiment of stocking channel catfish every other year and catchable sized brown trout should be continued until a better outlet control structure is installed.

I-82 Pond 5

Background

I-82 Pond 5 (Yakima County) is 10.9 hectares in size and approximately 7 meters maximum depth. The pond lies adjacent to I-82 Pond 4, and is accessed by a short walk from a paved parking area maintained by WDFW. The pond is connected by a culvert to Pond 4, which allows at least some fish passage. The pond sits closely to the Yakima River and can be flooded in years of high water. An intermittent outlet to the river also allows for fish exchange with the river at times. An outlet barrier structure was built in the past, but maintenance and structure problems have made it difficult to keep an effective barrier in place. Presently, there is no outlet barrier as flooding in 1996/1997 destroyed the structure. This pond was completed shortly after 1980 and initially surveyed in 1983. The 1983 survey showed longnose sucker, northern pike-minnow, brown bullhead catfish, pumpkinseed sunfish, and largemouth bass inhabited the pond. At that time it was recommended to stock walleye. Seventy thousand walleye sac-fry and 18 adults were stocked in 1983. Thirty-six additional adult walleye were stocked in 1984. There is no record showing that walleye were a successful introduction or that they contributed to the fishery. From 1986 to 1992 brown trout were stocked annually. Since 1993 stocking has consisted of channel catfish, largemouth bass, and black crappie (Table 39).

In 1993, I-82 Pond 5 was used as a study site to evaluate the survival and growth of stocked channel catfish and to test electrofishing and trapping techniques (Bonar et al. 1995; Bonar et al. 1997). In this study, channel catfish of various length groups were stocked and monitored using traps and boat electrofishing to document survival, growth, and condition. The results of evaluating the two capture techniques showed that sampling channel catfish with baited traps was more effective than boat electrofishing. The results of stock monitoring showed that growth and condition was similar to other regions and that stocking channel catfish greater than 150 mm total length improved survival. Those researchers also developed a dichotomous key to assess lake and pond channel catfish suitability and recommended alternate-year stocking rates of 25 fish/acre (>6 inches total length) for suitable sites.

Table 39. Fish stocking history for I-82 Pond 5 (Yakima County) 1980 - 2002.

Stocking Date	Species	Number	Size
1983	Walleye	70000	Sac-fry
1983	Walleye	18	Adult
1984	Walleye	36	Adult
1986	Brown Trout	5980	Fingerling
1988-1989	Brown Trout	4586	Fingerling
1990-1992	Brown Trout	1600	Catchable
1993	Channel Catfish	501	Fry
1996	Channel Catfish	750	Fry
1997	Largemouth Bass	3600	Fry
1998	Channel Catfish	752	Fry
1999	Black Crappie	6009	Fry
2000	Channel Catfish	130	Sub-adult
2002	Channel Catfish	325	Sub-adult

Results

Water Quality I-82 Pond 5

I-82 Pond 5 has a gradual sloping shoreline with a moderate littoral area and a maximum depth of approximately seven meters (Table 40). Measured water temperatures ranged from 16.4EC in May to 24.8EC in July, 2000, and were within the acceptable range of warmwater fish species (Boyd 1990). Temperatures were within the optimal range for warmwater fish growth (20EC - 28EC) during June, July, and August. Measured pH values ranged from 8.2 to 9.5. The preferred range for warmwater fish species is pH 6.5 to 9 (Swingle 1969). In general, dissolved oxygen levels were adequate in the majority of the lake throughout the summer.

Table 40. Water quality collected from May through August 2000 at I-82 Pond 5 (Yakima County).

Date	Depth (m)	Temp (°C)	pH	DO (mg/l)	TDS	Conductivity	Secchi (m)
05/30/00	0	17.9	8.4	3.2	0.1	126.9	
	2	17.9	8.4	3.0			
	4	17.9	8.4	3.0			
	6	17.3	8.4	3.0			
	6.9	16.4	8.2	2.6	0.1	124.6	
06/28/00	0	24.3	9.3		0.1	127.4	4.0
	2	22.3	9.2				
	4	21.4	9.1				
	6	19.1	9.0				
	6.9	18.7	8.9		0.1	122.2	
07/27/00	0	24.8	9.5	7.9	0.1	119.4	2.7
	2	24.6	9.4	7.9			
	4	23.0	9.2	6.9			
	5.5	20.3	8.9	4.6	0.1	119.3	
08/22/00	0	23.6	9.2	8.3	0.1	118.2	0.5
	2	22.6	9.3	8.0			
	4	21.5	9.0	6.0			
	6	17.2	8.7	1.4	0.1	124.4	

Species Composition I-82 Pond 5

Thirteen fish species were collected from I-82 Pond 5 in 2000 (Table 41). Combined, largescale sucker and largemouth bass comprised 60% of the sample by weight. Bluegill, followed by largemouth bass, were the most numerous species sampled. Yellow perch, black crappie, and pumpkinseed sunfish were also sampled at relatively high numbers. Brown bullhead, black bullhead, and channel catfish were the other gamefish sampled, but only at low levels. Species composition analysis changed little when young-of-the-year (YOY) fish were excluded (Table 42). Only two largemouth bass and three bluegill young-of-the-year were sampled.

Table 41. Species composition by weight (kg) and number for all fish collected at I-82 Pond 5 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Largescale Sucker	24.68	36.38	38	12.22	157	570
Largemouth Bass	16.43	24.22	55	17.68	67	486
Channel Catfish	9.09	13.40	5	1.61	455	710
Common Carp	8.34	12.29	5	1.61	447	520
Yellow Perch	3.00	4.42	36	11.58	146	218
Bluegill	2.66	3.91	107	34.41	35	177
Black Crappie	1.16	1.72	22	7.07	138	221
Pumpkinseed Sunfish	0.73	1.07	25	8.04	91	141
Northern Pike-Minnow	0.59	0.87	3	0.96	264	300
Brown Bullhead	0.58	0.86	2	0.64	280	287
Chiselmouth	0.46	0.68	8	2.57	121	219
Black Bullhead	0.07	0.11	1	0.32	189	189
Redside Shiner	0.05	0.07	4	1.29	90	116

CPUE I-82 Pond 5

Table 42. Species composition (excluding young-of-the-year) by weight (kg) and number for fish collected at I-82 Pond 5 (Yakima County) in May 2000.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Largescale Sucker	24.68	36.39	38	12.42	157	570
Largemouth Bass	16.42	24.21	53	17.32	81	486
Channel Catfish	9.09	13.41	5	1.63	455	710
Common Carp	8.34	12.29	5	1.63	447	520
Yellow Perch	3.00	4.42	36	11.76	146	218
Bluegill	2.65	3.91	104	33.99	47	177
Black Crappie	1.16	1.72	22	7.19	138	221
Pumpkinseed Sunfish	0.73	1.07	25	8.17	91	141
Northern Pike-Minnow	0.59	0.87	3	0.98	264	300
Brown Bullhead	0.58	0.86	2	0.65	280	287
Chiselmouth	0.46	0.68	8	2.61	121	219
Black Bullhead	0.07	0.11	1	0.33	189	189
Redside Shiner	0.05	0.07	4	1.31	90	116

Bluegill and largemouth bass were sampled at the highest rate by boat electrofishing (Table 43). Yellow perch was the species sampled at the highest rate by gill netting followed by black crappie. Channel catfish were caught only in gill nets. No fish were sampled in fyke nets. A high proportion of largemouth bass and bluegill sampled were less than stock length (Table 44).

Table 43. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all fish excluding young-of-the-year collected at I-82 Pond 5 (Yakima County) in May 2000.

	Gear Type					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Brown Bullhead	4.00 ± 2.56	3	0.00	2	0.00	2
Black Crappie	10.00 ± 9.24	3	8.50 ± 5.77	2	0.00	2
Bluegill	206.00 ± 54.79	3	0.50 ± 0.64	2	0.00	2
Black Bullhead	0.00	3	0.50 ± 0.64	2	0.00	2
Channel Catfish	0.00	3	2.50 ± 0.64	2	0.00	2
Chiselmouth	4.00 ± 5.13	3	3.00 ± 1.28	2	0.00	2
Common Carp	6.00 ± 4.44	3	1.00	2	0.00	2
Largemouth Bass	102.00 ± 4.44	3	1.00	2	0.00	2
Largescale Sucker	48.00 ± 29.11	3	7.00 ± 1.28	2	0.00	2
Northern Pike-Minnow	2.00 ± 2.56	3	1.00	2	0.00	2
Pumpkinseed Sunfish	48.00 ± 20.34	3	0.50 ± 0.64	2	0.00	2
Redside Shiner	2.00 ± 2.56	3	1.50 ± 1.92	2	0.00	2
Yellow Perch	0.00	3	18.00 ± 1.28	2	0.00	2

Table 44. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for stock length fish collected at I-82 Pond 5 (Yakima County) in May 2000.

	Gear Type					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Night
Brown Bullhead	4.00 ± 2.56	3	0.00	2	0.00	2
Black Crappie	10.00 ± 9.24	3	8.50 ± 5.77	2	0.00	2
Bluegill	176.00 ± 49.50	3	0.50 ± 0.64	2	0.00	2
Black Bullhead	0.00	3	0.50 ± 0.64	2	0.00	2
Channel Catfish	0.00	3	2.50 ± 0.64	2	0.00	2
Chiselmouth	4.00 ± 5.13	3	3.00 ± 1.28	2	0.00	2
Common Carp	6.00 ± 4.44	3	1.00	2	0.00	2
Largemouth Bass	62.00 ± 11.17	3	1.00	2	0.00	2
Largescale Sucker	48.00 ± 29.11	3	7.00 ± 1.28	2	0.00	2
Northern Pike-Minnow	2.00 ± 2.56	3	1.00	2	0.00	2
Pumpkinseed Sunfish	48.00 ± 20.34	3	0.50 ± 0.64	2	0.00	2
Redside Shiner	2.00 ± 2.56	3	1.50 ± 1.92	2	0.00	2
Yellow Perch	0.00	3	18.00 ± 1.28	2	0.00	2

Stock Density Indices I-82 Pond 5

Sample size of stock length fish used in stock density analysis was good for bluegill and marginal for largemouth bass, yellow perch, and pumpkinseed sunfish (Table 45). Proportional stock density (PSD) for bluegill was low and high for largemouth bass. Largemouth bass were also sampled in the preferred range indicating a high quality population. Yellow perch captured by gill netting exhibited a relatively high PSD value.

Table 45. Traditional stock density indices by sampling method, including 80% confidence intervals, for fish collected from I-82 Pond 5 (Yakima County) in May 2000.

Electrofishing					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Black Crappie	5	20 ± 23	0	0	0
Bluegill	88	10 ± 4	0	0	0
Brown Bullhead	2	100 ± 0	100 ± 0	0	0
Common Carp	3	100 ± 0	0	0	0
Largemouth Bass	31	61 ± 11	10 ± 7	0	0
Pumpkinseed Sunfish	24	0	0	0	0

Gill Netting					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Black Crappie	17	0	0	0	0
Common Carp	2	100 ± 0	0	0	0
Largemouth Bass	2	50 ± 45	0	0	0
Yellow Perch	36	69 ± 10	0	0	0

Largemouth Bass I-82 Pond 5

I-82 Pond 5 largemouth bass sampled ranged in length from 67 to 486 mm total length (Table 41). The age of largemouth bass sampled ranged from one to seven years (Table 46). Largemouth bass growth rates were higher than the known Washington state average. Age data and length frequency distribution show relatively stable year-class strength (Figure 28). Largemouth bass condition was generally below the national average, but appeared to increase with length and age (Figure 29).

Table 46. Age and growth of largemouth bass sampled from I-82 Pond 5 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age						
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1999	1	75						
		77						
1998	24	74	179					
		86	180					
1997	14	43	201	290				
		61	207	291				
1996	8	45	129	298	347			
		62	142	301	347			
1995	1	98	210	318	385	439		
		114	220	324	388	439		
1994	0							
1993	1	36	164	267	361	410	452	481
		55	177	276	366	413	454	481
Direct Proportion Overall Mean		62	176	293	364	424	452	481
Lee's Weighted Mean		75	182	295	353	426	454	481
Direct Proportion State Average		60	146	222	261	289	319	368

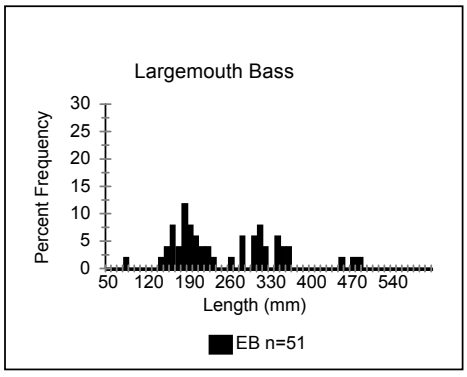

Figure 28. Length frequency distribution of largemouth bass, excluding young-of-the-year, sampled at I-82 Pond 5 (Yakima County) in May 2000 by boat electrofishing.

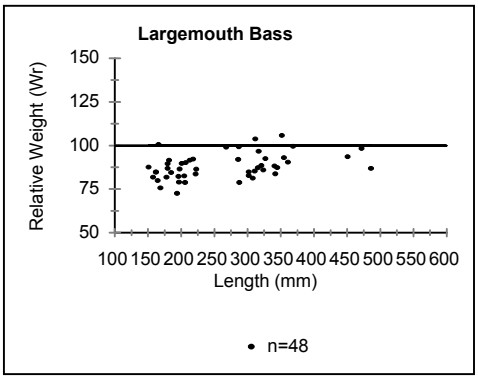

Figure 29. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Bluegill Sunfish I-82 Pond 5

I-82 Pond 5 bluegill sampled ranged in length from 35 to 177 mm total length (Table 41). The age of bluegill sampled ranged from two to five years (Table 47). Except for the single 5-year old fish, growth rates appeared to be lower than the known Washington state average. The condition of bluegill was generally at or below the national average with a few exceptions (Figure 31). Condition appeared to increase with length and age.

Table 47. Age and growth of bluegill sunfish sampled from I-82 Pond 5 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age				
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**
1999	0					
1998	32	34	81			
		47	85			
1997	13	15	75	136		
		33	85	138		
1996	0					
1995	1	18	64	126	155	173
		36	77	131	157	174
Direct Proportion Overall Mean		22	73	131	155	173
Lee's Weighted Mean		43	85	138	157	174
Direct Proportion State Average		37	97	132	148	170

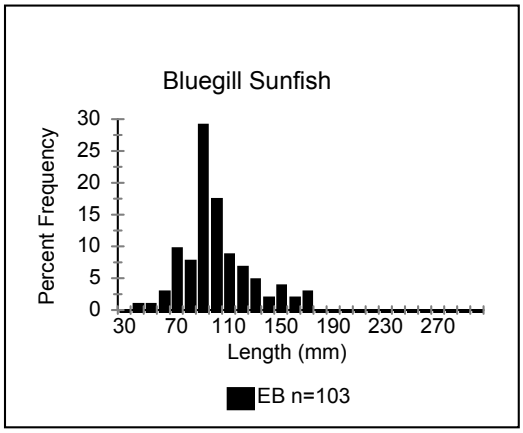

Figure 30. Length frequency distribution of bluegill sunfish, excluding young-of-the-year, sampled at I-82 Pond 5 (Yakima County) in May 2000 by boat electrofishing.

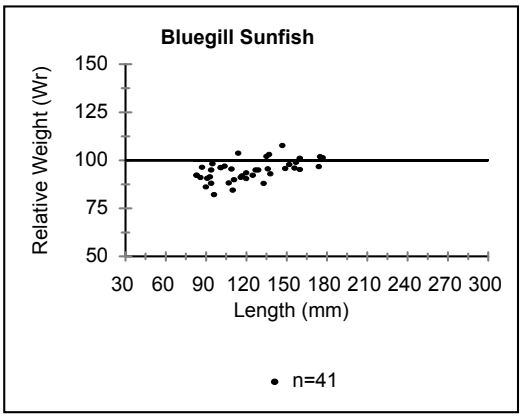

Figure 31. Relative weight (W_r) of bluegill sunfish sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Yellow Perch I-82 Pond 5

I-82 Pond 5 yellow perch sampled ranged in length from 146 to 218 mm total length (Table 41). The age of yellow perch sampled was two and three years (Table 48). Growth rates were higher than the known Washington state average. Age data and length frequency distribution suggest variable year-class strength (Figure 32). The condition of yellow perch was below the national average (Figure 33).

Table 48. Age and growth of yellow perch sampled from I-82 Pond 5 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
1999	0			
1998	7	70	126	
		87	132	
1997	14	67	144	192
		87	153	194
Direct Proportion Overall Mean		69	135	192
Lee's Weighted Mean		87	146	194
Direct Proportion State Average		60	120	152

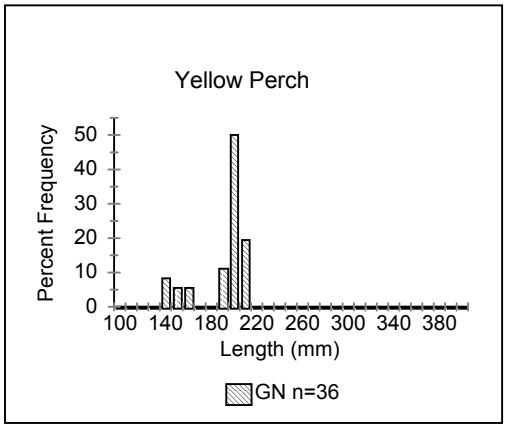

Figure 32. Length frequency distribution of yellow perch, excluding young-of-the-year, sampled at I-82 Pond 5 (Yakima County) in May 2000 by gill netting.

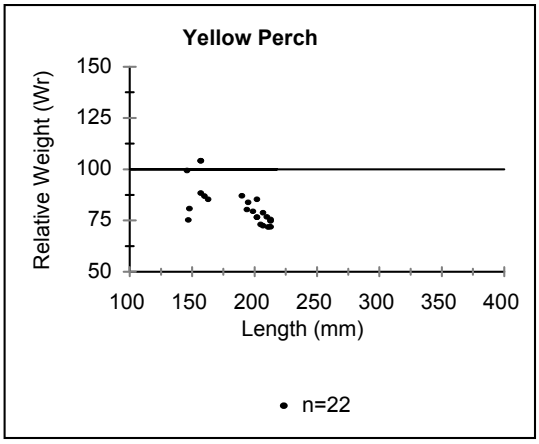

Figure 33. Relative weight (W_r) of yellow perch sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Black Crappie I-82 Pond 5

I-82 Pond 5 black crappie sampled ranged from 138 to 221 mm total length (Table 41). All crappie were aged at two years, which coincides with stocking records for the pond (Table 49). Growth rates were higher than the known Washington state average. The condition of black crappie varied widely, exhibiting values both above and below the national average (Figure 34).

Table 49. Age and growth of black crappie sampled from I-82 Pond 5 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
1999	0		
1998	15	63	133
		84	138
Direct Proportion Overall Mean		63	133
Lee's Weighted Mean		84	138
Direct Proportion State Average		46	111

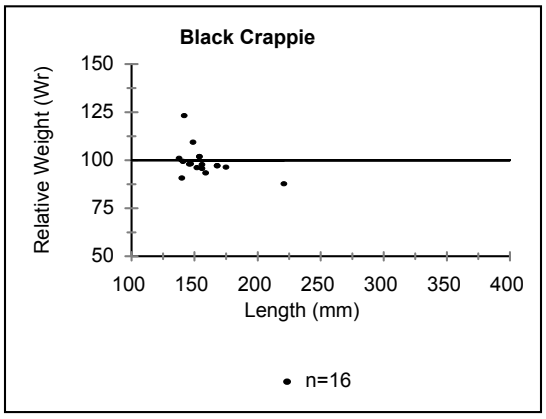

Figure 34. Relative weight (W_r) of black crappie sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 5

I-82 Pond 5 pumpkinseed sunfish sampled ranged from 91 to 141 mm total length (Table 41). Pumpkinseed sunfish were aged at two and three years (Table 50). Growth rates were higher than the known Washington state average. The condition of pumpkinseed sunfish was generally near or below the national average (Figure 35).

Table 50. Age and growth of pumpkinseed sunfish sampled from I-82 Pond 5 (Yakima County) in May 2000. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Flethcer et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
1999	0			
1998	8	41	89	
		56	91	
1997	7	26	82	129
		46	91	130
Direct Proportion Overall Mean		33	85	129
Lee's Weighted Mean		51	91	130
Direct Proportion State Average		24	72	102

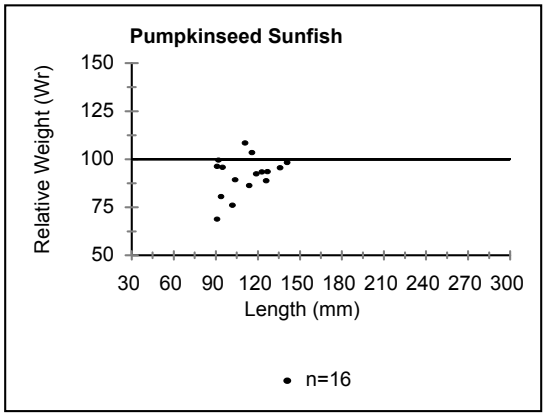

Figure 35. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Channel Catfish I-82 Pond 5

I-82 Pond 5 channel catfish sampled ranged from 455 to 710 mm total length (Table 41). The ages of channel catfish sampled, determined from analysis of pectoral spines, were three, five, and seven years (Table 51), which corresponds to the stocking cycle (Table 39). The condition of channel catfish sampled was below the national average (Figure 36).

Table 51. Age and growth of channel catfish sampled from I-82 Pond 5 (Yakima County) in May 2000 using the direct proportion method (Fletcher et al. 1993).

		Mean Total Length (mm) at Age						
Year Class	**# Fish**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1999	0							
1998	0							
1997	1	189	343	498				
1996	0							
1995	1	134	210	294	386	462		
1994	0							
1993	2	256	319	395	479	562	638	673
Direct Proportion Overall Mean		193	291	396	432	512	638	673

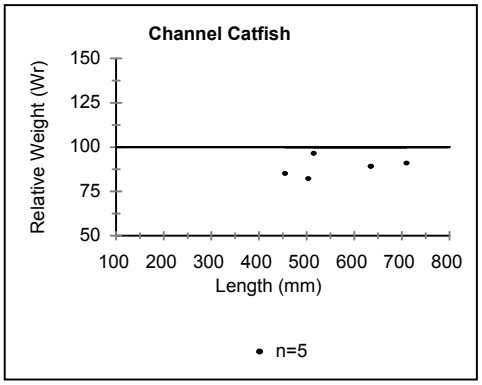

Figure 36. Relative weight (W_r) of channel catfish sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Brown Bullhead I-82 Pond 5

I-82 Pond 5 brown bullhead sampled ranged in length from 280 to 287 mm total length (Table 41). No age data was collected for this species. The condition of brown bullhead was below the national average (Figure 37).

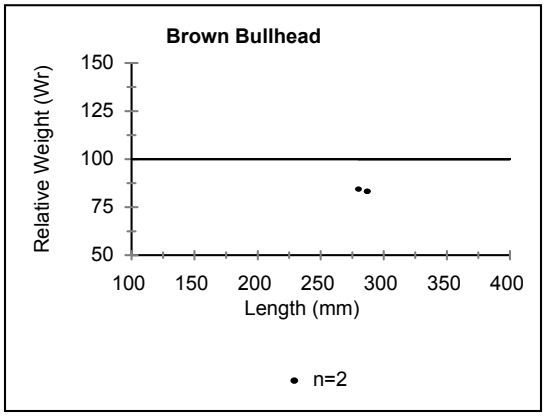

Figure 37. Relative weight (W_r) of brown bullhead sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

Common Carp I-82 Pond 5

I-82 Pond 5 common carp sampled ranged in length from 447 to 520 mm total length (Table 41). No age data was collected for this species. The condition of common carp was similar to the national average (Figure 38).

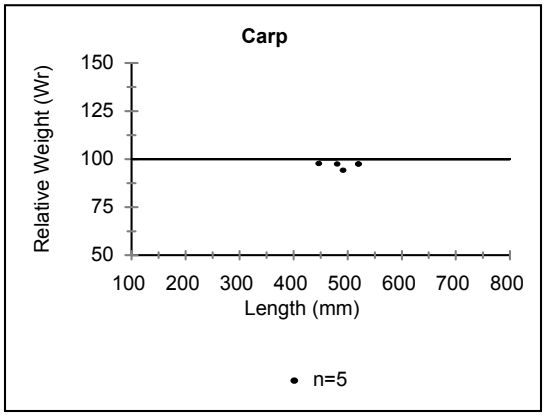

Figure 38. Relative weight (W_r) of common carp sampled at I-82 Pond 5 (Yakima County) in May 2000 compared to the national 75th percentile.

I-82 Pond 5 - Discussion

At the time of this survey, the I-82 Pond 5 largemouth bass population exhibited index characteristics one would expect from a balanced community. Largemouth bass made up a high proportion of the sample by number, exhibited relatively high PSD and RSD values, adequate recruitment, and good growth. Limited harvest may also play a role in the structure of this population. Unfortunately, the large number of additional fish species in the pond make it difficult to see indices suggesting balance in other populations. Bluegill comprised a large proportion of the sample numerically; however, the population exhibited a low PSD value, slow growth, and condition less than the national average. Intense interspecific competition with a variety of species, including young largemouth bass may be limiting the potential of the bluegill population and possibly the other panfish species present including yellow perch and black crappie.

The yellow perch population was sampled in relatively low abundance and likely provides only limited angling opportunity. Black crappie sampled were primarily the result of a 1999 stocking. It is probably too early to determine whether black crappie will contribute beneficially to the sport fishery. Although initial growth and condition appear good, interspecific competition may limit the success of black crappie.

Channel catfish sampled exhibited condition below the national average, but growth for 7-year old fish was higher than the averages reported by Wydoski and Whitney (1979) for populations in Oklahoma, Iowa, California, and Lake Erie. Apparently, stocked channel catfish do provide some angling opportunity for large fish. Considering this unique 'big fish' opportunity, channel catfish stocking should continue at the current rate and cycle of 25 fish/acre every other year.

Several non-gamefish species including largescale sucker made up the majority of the sample by weight. These fish are likely the result of intermittent connectivity to the Yakima River via the outlet canal. Eliminating these species from the community would benefit more desirable gamefish populations. Managers should consider it a high priority to build and maintain an outlet structure with a barrier to fish passage.

I-82 Pond 7

Background

I-82 Pond 7, is the smallest pond in the group at 3.2 hectares. Walk-in access to the pond is available from the Yakima River access site south southeast of Zillah, Washington, on Zillah Road. This pond lies within the Yakima River flood plain and may be susceptible to inundation in high water years. There is no other connection with the river. Without an initial survey, it was recommended in 1980 that the pond be stocked with channel catfish each spring at 100 per acre (Doug Fletcher 1980, intra-agency letter, unpublished data); however, no stocking of channel catfish was done prior to 1994 that we are aware of (Table 52). Additionally, Fletcher (1980) recommended stocking 80 adult largemouth bass; again, there is no stocking record of largemouth bass being stocked in I-82 Pond 7. In 1993, a boat electrofishing survey found common carp, black crappie, pumpkinseed sunfish, bluegill, and largemouth bass populations (WDFW, unpublished data). In 1994, a recommendation was made to stock channel catfish in the pond and channel catfish have been stocked regularly since.

Table 52. Fish stocking history for I-82 Pond 7 (Yakima County) 1980 to 2001.

Stocking Date	Species	Number	Size
1994	Channel Catfish	230	Fry
1996	Channel Catfish	209	Fry
1998	Channel Catfish	199	Fry
2000	Black Crappie	250	Sub-adult
2001	Channel Catfish	100	Sub-adult

Results

Species Composition I-82 Pond 7

Eight fish species were collected from I-82 Pond 7 in September 2001 (Table 53). Common carp and largescale sucker comprised 74% of the sample by weight. Largemouth bass and bluegill were the most abundant gamefish species by weight (21%) and were the most numerous of all species. Channel catfish, black crappie, pumpkinseed sunfish, and yellow perch were sampled at lower numbers.

Table 53. Species composition by weight (kg) and number for all fish collected at I-82 Pond 7 (Yakima County) in September 2001.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	**(kg)**	**(%w)**	**(#)**	**(%n)**	**Min**	**Max**
Common Carp	45.74	45.30	19	2.84	476	710
Largescale Sucker	29.50	29.22	25	3.74	432	515
Largemouth Bass	16.90	16.73	110	16.44	57	377
Bluegill	4.40	4.36	390	58.30	35	157
Channel Catfish	1.53	1.51	2	0.30	420	486
Black Crappie	1.29	1.27	33	4.93	75	211
Pumpkinseed Sunfish	1.00	0.99	78	11.66	56	135
Yellow Perch	0.61	0.61	12	1.79	72	243

CPUE I-82 Pond 7

Bluegill, pumpkinseed sunfish, and largemouth bass were the species sampled at the highest rate by boat electrofishing (Table 54). Largescale sucker and black crappie were sampled at the highest rate by gill netting. Bluegill were sampled at the highest rate by fyke netting. A large proportion of bluegill, pumpkinseed sunfish, and largemouth bass sampled were less than stock length (Table 55). The boat electrofishing catch rate for bluegill appears extremely high; however, the upper and lower 80% confidence interval was broad. The fact that I-82 Pond 7 is small and can be sampled in only two sections is partly responsible for this result.

Table 54. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all fish excluding young-of-the-year collected at I-82 Pond 7 (Yakima County) in September 2001.

	Gear Types					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Black Crappie	6.00 ± 7.69	2	7.00 ± 5.13	2	8.50 ± 4.49	2
Bluegill	621.00 ± 480.58	2	1.50 ± 0.64	2	90.00 ± 89.71	2
Channel Catfish	0.00	2	1.00	2	0.00	2
Common Carp	51.00 ± 11.53	2	1.00	2	0.00	2
Largemouth Bass	168.00 ± 53.83	2	0.00	2	0.00	2
Largescale Sucker	21.00 ± 11.53	2	9.00 ± 1.28	2	0.00	2
Pumpkinseed Sunfish	225.00 ± 196.08	2	1.00	2	0.50 ± 0.64	2
Yellow Perch	0.00	2	2.00	2	0.00	2

Table 55. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for stock length fish collected at I-82 Pond 7 (Yakima County) in September 2001.

	Gear Types					
	Electrofishing		Gill Netting		Fyke Netting	
Species	(#/hour)	Sites	#/Net Night	Net Nights	#/Net Night	Net Nights
Black Crappie	0.00	2	1.50 ± 1.92	2	6.50 ± 1.92	2
Bluegill	393.00 ± 265.28	2	1.50 ± 0.64	2	54.00 ± 47.42	2
Channel Catfish	0.00	2	1.00	2	0.00	2
Common Carp	51.00 ± 11.53	2	1.00	2	0.00	2
Largemouth Bass	111.00 ± 42.29	2	0.00	2	0.00	2
Largescale Sucker	21.00 ± 11.53	2	9.00 ± 1.28	2	0.00	2
Pumpkinseed Sunfish	117.00 ± 96.12	2	0.00	2	0.50 ± 0.64	2
Yellow Perch	0.00	2	2.00	2	0.00	2

Stock Density Indices I-82 Pond 7

With the exception of bluegill, sample sizes of stock length fish were low; however, considering the small size of the pond the relative density of stock length fish present is likely higher than average. Bluegill proportional stock density (PSD) was low whereas the largemouth bass PSD was relatively high (Table 56). These results are indicative of a prey crowded community. No fish larger than quality length were observed.

Table 56. Traditional stock density indices by sampling method, including 80% confidence intervals, for fish collected from I-82 Pond 7 (Yakima County) in September 2001.

Electrofishing					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Bluegill	131	1± 1	0	0	0
Largemouth Bass	37	46 ± 11	0	0	0
Pumpkinseed Sunfish	39	0	0	0	0

Fyke Netting					
Species	**# Stock Length**	**PSD**	**RSD-P**	**RSD-M**	**RSD-T**
Black Crappie	13	23 ± 15	0	0	0
Bluegill	108	0	0	0	0

Largemouth Bass I-82 Pond 7

I-82 Pond 7 largemouth bass sampled ranged in length from 57 to 377 mm total length (Table 53). The age of largemouth bass sampled ranged from one to three years (Table 57). Largemouth bass growth rates were higher than the known Washington state average. Largemouth bass condition was generally at or above the national average (Figure 40).

Table 57. Age and growth of largemouth bass sampled from I-82 Pond 7 (Yakima County) in September 2001. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
2000	12	94		
		107		
1999	9	72	203	
		88	211	
1998	1	49	123	273
		67	137	278
Direct Proportion Overall Mean		72	163	273
Lee's Weighted Mean		97	203	278
Direct Proportion State Average		60	146	222

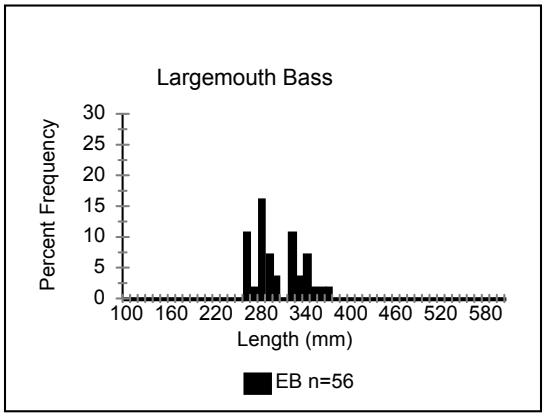

Figure 39. Length frequency distribution of largemouth bass, excluding young-of-the-year, sampled at I-82 Pond 7 (Yakima County) in September 2001 by boat electrofishing (EB).

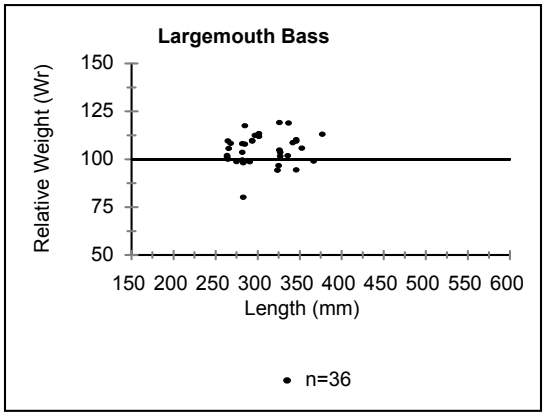

Figure 40. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Black Crappie I-82 Pond 7

I-82 Pond 7 black crappie sampled ranged in length from 75 to 211 mm total length (Table 53). The black crappie sampled for age analysis were aged at one year (Table 58). Black crappie growth rate at age one was similar to the known Washington state average. Black crappie condition was generally at or below the national average (Figure 42).

Table 58. Age and growth of black crappie sampled from I-82 Pond 7 (Yakima County) in September 2001. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age
Year Class	**# Fish**	**1**
2000	16	47
		72
Direct Proportion Overall Mean		47
Lee's Weighted Mean		72
Direct Proportion State Average		46

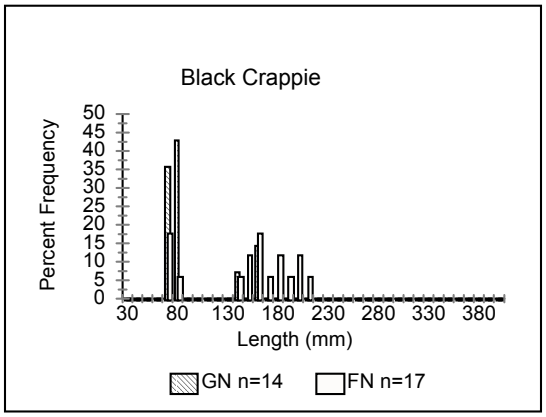

Figure 41. Length frequency distribution of black crappie, excluding young-of-the-year, sampled at I-82 Pond 7 (Yakima County) in September 2001 by gill netting (GN) and fyke netting (FN).

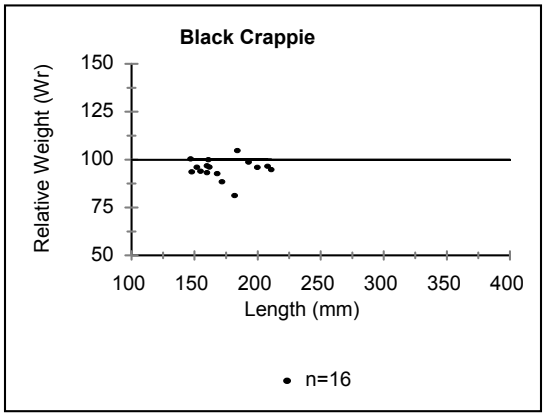

Figure 42. Relative weight (W_r) of black crappie sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Bluegill I-82 Pond 7

I-82 Pond 7 bluegill sampled ranged in length from 35 to 157 mm total length (Table 53). The bluegill sampled for age analysis were aged at one year (Table 59). Bluegill growth rate at age one was below the known Washington state average. Bluegill condition was generally at or below the national average (Figure 44).

Table 59. Age and growth of bluegill sampled from I-82 Pond 7 (Yakima County) in September 2001. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

Year Class	# Fish	Mean Total Length (mm) at Age 1
2000	12	29
		44
Direct Proportion Overall Mean		29
Lee's Weighted Mean		44
Direct Proportion State Average		37

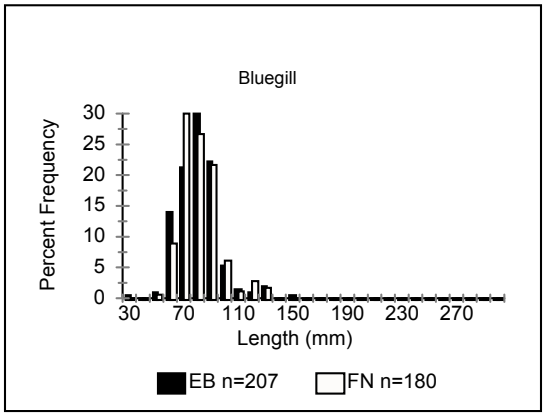

Figure 43. Length frequency distribution of bluegill, excluding young-of-the-year, sampled at I-82 Pond 7 (Yakima County) in September 2001 by boat electrofishing (EB) and fyke netting (FN).

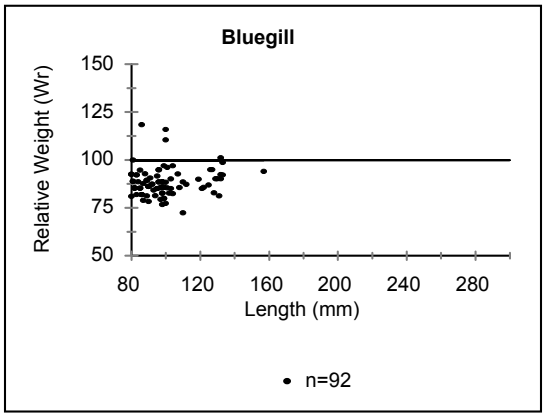

Figure 44. Relative weight (W_r) of bluegill sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 7

I-82 Pond 7 pumpkinseed sunfish sampled ranged in length from 56 to 135 mm total length (Table 53). The pumpkinseed sunfish sampled for age analysis were aged at one and two years (Table 60). Pumpkinseed sunfish growth rates were higher than the known Washington state average. Pumpkinseed sunfish condition was generally at or below the national average (Figure 46).

Table 60. Age and growth of pumpkinseed sunfish sampled from I-82 Pond 7 (Yakima County) in September 2001. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age	
Year Class	**# Fish**	**1**	**2**
2000	1	44	
		59	
1999	6	20	78
		41	87
Direct Proportion Overall Mean		32	78
Lee's Weighted Mean		44	87
Direct Proportion State Average		24	72

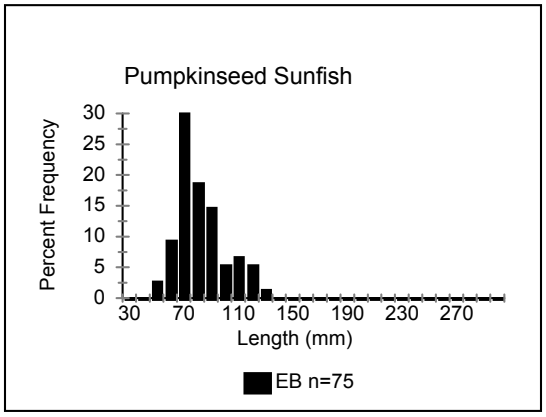

Figure 45. Length frequency distribution of pumpkinseed sunfish, excluding young-of-the-year, sampled at I-82 Pond 7 (Yakima County) in September 2001 by boat electrofishing (EB).

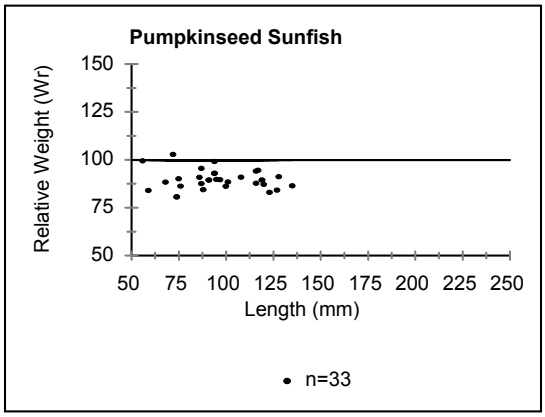

Figure 46. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Yellow Perch I-82 Pond 7

I-82 Pond 7 yellow perch sampled ranged in length from 72 to 243 mm total length (Table 53). The age of yellow perch sampled ranged from one and two years (Table 61). Yellow perch growth rates were higher than the known Washington state average. Yellow perch condition was below the national average (Figure 47).

Table 61. Age and growth of yellow perch sampled from I-82 Pond 7 (Yakima County) in September 2001. Unshaded values are mean back-calculated length at annulus using the direct proportion method (Fletcher et al. 1993). Shaded values are mean back-calculated lengths using Lee's modification method (Carlander 1982).

		Mean Total Length (mm) at Age		
Year Class	**# Fish**	**1**	**2**	**3**
2000	0			
1999	2	83	189	
		102	194	
1998	2	89	147	208
		107	157	210
Direct Proportion Overall Mean		86	168	208
Lee's Weighted Mean		105	176	210
Direct Proportion State Average		60	120	152

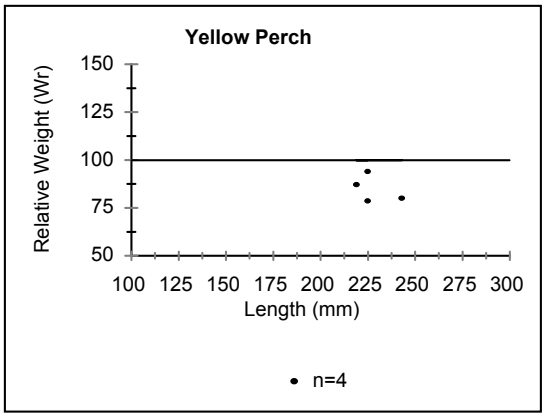

Figure 47. Relative weight (W_r) of yellow perch sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Channel Catfish I-82 Pond 7

I-82 Pond 7 channel catfish sampled ranged in length from 420 to 486 mm total length (Table 53). Age analysis data was not collected for this species. The condition of the two channel catfish observed was below the national average (Figure 48).

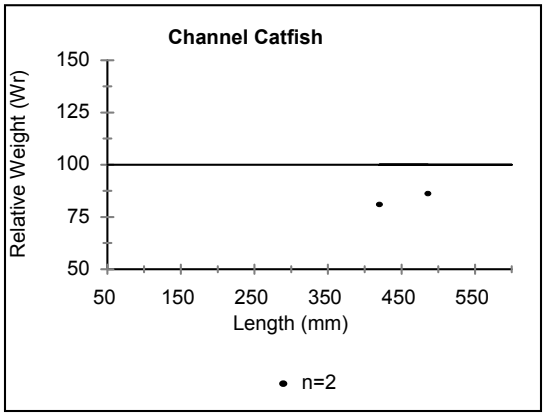

Figure 48. Relative weight (W_r) of channel catfish sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

Common Carp I-82 Pond 7

I-82 Pond 7 common carp sampled ranged in length from 476 to 710 mm total length (Table 53). Age analysis data was not collected for this species. Common carp condition varied both above and below the national average (Figure 49).

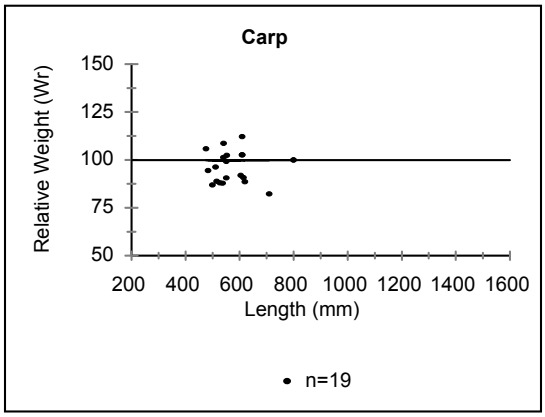

Figure 49. Relative weight (W_r) of common carp sampled at I-82 Pond 7 (Yakima County) in September 2001 compared to the national 75th percentile.

I-82 Pond 7 - Discussion

At the time of this survey, I-82 Pond 7 was found to be prey crowded. Indices of population structure for panfish indicate overabundant, low condition, and possibly stunted fish. Largemouth bass on the other hand, were found to be in relatively low abundance, but high condition. Managers should first consider stocking additional adult largemouth bass to improve the balance of the community by increasing predation on overabundant panfish. Channel catfish may act as an additional predator and offer more opportunity for anglers to catch a large fish, but may also complicate the balance of the community in this small pond. We recommend ceasing the stocking of additional panfish at least until a more desirable predator prey balance can be established in the pond.

The limited number of quality length fish sampled indicate that over-harvest may affect the balance of this small pond. The implementation of the more restrictive slot-limit on largemouth bass may help to improve the predator-prey balance of the community in time if largemouth bass recruitment and angler compliance are adequate. The limited number of panfish of quality length may also be the result of over-harvest. Creel survey data would help determine the affect of harvest on the fish community.

Chemical or mechanical removal of all or part of the fish community may deserve consideration. I-82 Pond 7 is isolated with no connection to the Yakima River except possibly in a major flood year. If a rotenone rehabilitation is feasible, we recommend restocking the pond with largemouth bass and bluegill. If this is not feasible, some undesirable or overabundant fish could possibly be removed by boat electrofishing or gill netting. Removing a substantial proportion of pumpkinseed sunfish, largescale sucker, common carp, and some bluegill would help to drive the community toward a more balanced largemouth bass and bluegill management combination.

I-82 Ponds Managed Primarily For Catchable Trout and Channel Catfish Angling

I-82 Pond 4

Background

I-82 Pond 4 (Yakima County) is 12 hectares in size and approximately 7 meters maximum depth.

The pond has drive-to access with a paved parking area maintained by WDFW. The pond lies adjacent to I-82 Pond 5 and is connected by a culvert, which allows at least some fish passage between the ponds. A 1980 fish survey found longnose sucker, common carp, and bluegill inhabiting the pond (Fletcher 1980). Following this initial survey, it was recommended that managers stock walleye; however, we are not aware of any record that walleye were actually stocked in this pond. In 1983, brown trout fingerlings were stocked to provide angling opportunity at this easily accessible site (Table 62). In 1994, channel catfish were stocked to provide yet another opportunity.

Although no extensive research has been done at this site, a study was completed by a local high school as a science project which reported water quality and fish species sampling.

Table 62. Fish stocking history for I-82 Pond 4 (Yakima County) 1980 to 2002.

Stocking Date	Species	Number	Size
1983	Brown Trout	9300	Fingerling
1984	Brown Trout	4640	Fingerling
1984	Smallmouth Bass	150	Fingerling
1985	Brown Trout	30000	Fingerling
1987	Brown Trout	7000	Fingerling
1988	Brown Trout	9500	Fingerling
1989	Brown Trout	5000	Fingerling
1990	Brown Trout	2002	Catchable
1991	Brown Trout	1608	Catchable
1992	Brown Trout	1734	Catchable
1993	Rainbow Trout	8560	Catchable
1994-2002	Brown Trout	16592	Catchable
1994-2002	Rainbow Trout	89588	Catchable
1994	Channel Catfish	776	Fry
1996	Channel Catfish	720	Fry
1998	Channel Catfish	710	Fry
1999	Black Crappie	6009	Fry
2000	Channel Catfish	250	Sub-adult
2002	Channel Catfish	360	Sub-adult

Results

Species Composition I-82 Pond 4

Ten fish species were collected from I-82 Pond 4 in September 2001 (Table 63). Common carp and largescale sucker comprised 67% of the sample by weight, but were few in number. Channel catfish sampled comprised 26% of the catch by weight. Largemouth bass and yellow perch were the most numerous species sampled. Bluegill, pumpkinseed sunfish, black crappie and bullhead catfish were sampled in low numbers. Catchable rainbow and brown trout periodically stocked into this pond were not observed. This is most likely the result of gear type bias associated with the use of boat electrofishing, which targets nearshore fishes and trotlines designed for sampling catfish. Similarly, black crappie have been stocked, but few were observed, which may also be a result of this species utilizing the open, offshore areas of the pond. The methods employed in this survey were used mainly to sample channel catfish without using gill nets, which are often lethal. Although the species composition of all fish caught does provide a summary of what was observed, it is not comparable to surveys conducted on other ponds using the standard boat electrofishing, gill netting, and fyke netting approach, however, species composition analysis from Pond 4 provides a baseline for comparing future surveys of this site and can be compared to data collected at I-82 Pond 6 where comparable methods were used.

Table 63. Species composition by weight (kg) and number for all fish collected at I-82 Pond 4 (Yakima County) in September 2001.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Common Carp	28.87	50.34	6	5.22	695	770
Channel Catfish	14.86	25.92	15	13.04	358	602
Largescale Sucker	9.69	16.90	7	6.09	394	553
Largemouth Bass	2.78	4.84	56	48.70	41	318
Yellow Perch	0.53	0.92	16	13.91	66	170
Black Bullhead	0.18	0.31	1	0.87	231	231
Pumpkinseed Sunfish	0.17	0.29	3	2.61	108	150
Brown Bullhead	0.16	0.28	1	0.87	236	236
Bluegill	0.10	0.17	9	7.83	37	119
Black Crappie	0.01	0.01	1	0.87	81	81

CPUE I-82 Pond 4

Largemouth bass and largescale sucker were sampled at the highest rate by boat electrofishing, followed by common carp (Table 64). Panfish species such as bluegill, pumpkinseed sunfish, and yellow perch were sampled at a lesser rate. No channel catfish were sampled by boat electrofishing. Channel catfish and bullhead catfish were sampled by trotline.

Table 64. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all stock length fish collected at I-82 Pond 4 (Yakima County) in September 2001.

	Gear Types			
	Electrofishing		Trotline	
Species	(#/hour)	Sites	#/Night	Nights
Brown Bullhead	3.00 ± 3.84	2	0	12
Bluegill	9.00 ± 3.84	2	0	12
Black Bullhead	0	2	.13 ± .16	12
Channel Catfish	0	2	1.25 ± .32	12
Common Carp	18.00 ± 23.07	2	0	12
Largemouth Bass	21.00 ± 11.53	2	0	12
Largescale Sucker	21.00 ± 19.22	2	0	12
Pumpkinseed Sunfish	9.00 ± 11.53	2	0	12
Yellow Perch	8.00 ± 10.25	2	0	12

Channel Catfish I-82 Pond 4

Fifteen channel catfish were caught during this sampling effort and ranged in length from 358 to 602 mm total length (Table 63). Although no age analysis was conducted for channel catfish, length frequency analysis shows that individual fish of varying size are present in the pond (Figure 50). This suggests that stocking efforts over several years have been successful as quality fish are available to anglers. The condition of channel catfish sampled was at or below the national average for this species (Figure 51). This may be the result of limited prey availability or the affect of a shorter growing season in Washington compared to the more southern climate where the species originated.

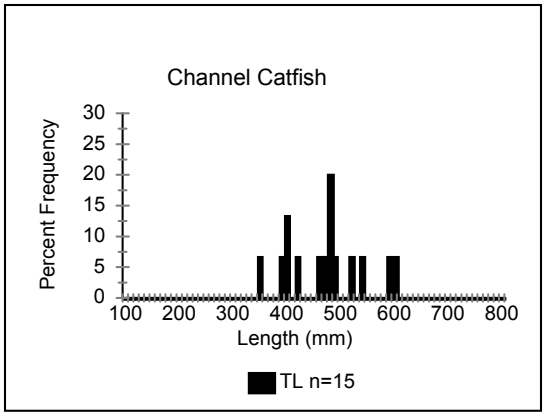

Figure 50. Length frequency distribution of all channel catfish sampled at I-82 Pond 4 (Yakima County) in September 2001 by trotline (TL).

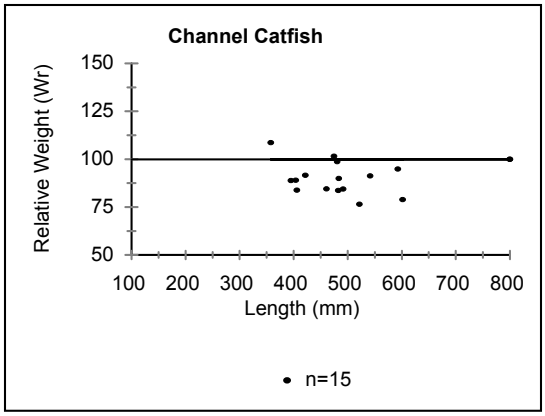

Figure 51. Relative weight (W_r) of channel catfish sampled at I-82 Pond 4 (Yakima County) in September 2001 compared to the national 75th percentile.

Largemouth Bass I-82 Pond 4

I-82 Pond 4 largemouth bass sampled ranged in length from 41 to 318 mm total length (Figure 63). No age analysis was conducted, but length frequency distribution suggests successful reproduction and recruitment (Figure 52). The condition of largemouth bass collected varied and appeared to increase with length (Figure 53). This may be due to a reduction in interspecific competition as bass diet switches from largely invertebrates to fish.

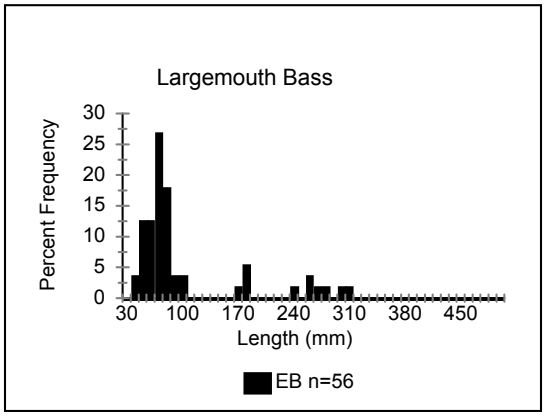

Figure 52. Length frequency distribution of all largemouth bass sampled at I-82 Pond 4 (Yakima County) in September 2001 by boat electrofishing (EB).

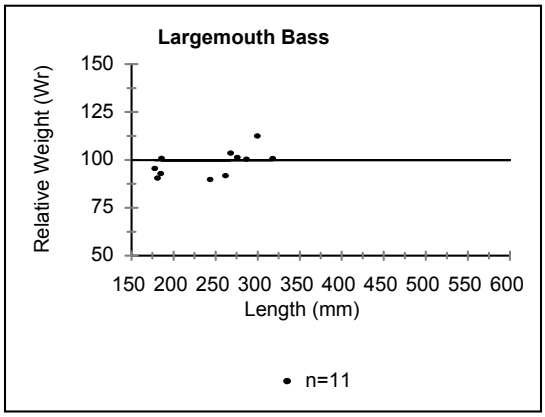

Figure 53. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 4 (Yakima County) in September 2001 compared to the national 75th percentile.

Bluegill Sunfish I-82 Pond 4

I-82 Pond 4 bluegill sampled ranged in length from 37 to 119 mm (Table 63). Although few bluegill were sampled and no age analysis was done, length frequency analysis shows two year-classes of fish (Figure 54). The condition of three bluegill sampled was above the national average (Figure 55).

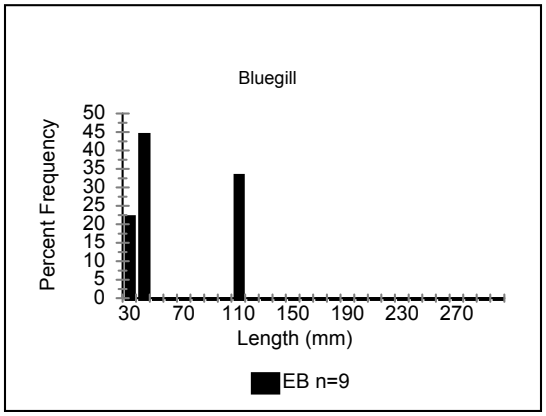

Figure 54. Length frequency distribution of all bluegill sampled at I-82 Pond 4 (Yakima County) in September 2001 by boat electrofishing (EB).

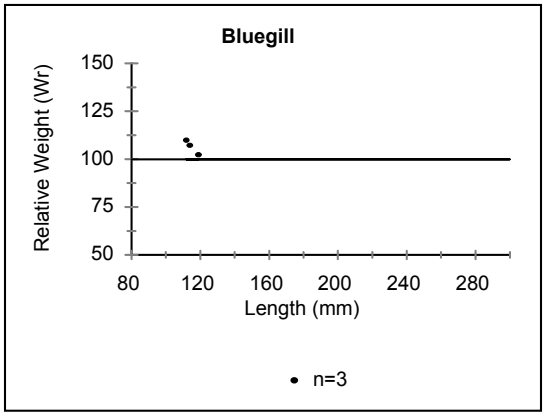

Figure 55. Relative weight (W_r) of bluegill sampled at I-82 Pond 4 (Yakima County) in September 2001 compared to the national 75th percentile.

Yellow Perch I-82 Pond 4

I-82 Pond 4 yellow perch sampled ranged in length from 66 to 170 mm total length (Table 63). No larger yellow perch were sampled; however, it is often the case that larger yellow perch in a population tend to be found offshore and are readily sampled with gillnets, but less often sampled by boat electrofishing. Therefore, it should not be assumed that larger yellow perch are not in the population. The condition of yellow perch sampled was below the national average which is common for populations in Washington (Figure 57).

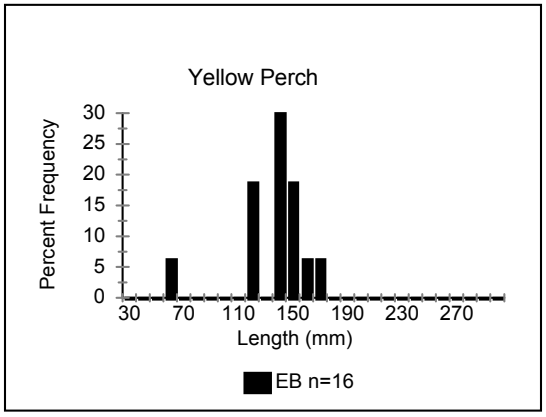

Figure 56. Length frequency distribution of all yellow perch sampled at I-82 Pond 4 (Yakima County) in September 2001 by boat electrofishing (EB).

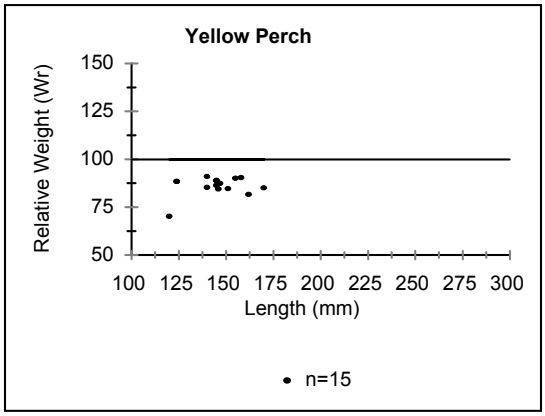

Figure 57. Relative weight (W_r) of yellow perch sampled at I-82 Pond 4 (Yakima County) in September 2001 compared to the national 75th percentile.

I-82 Pond 4 - Discussion

A primary objective of this survey was to test the effectiveness of slat-traps and trotlines for sampling channel catfish populations in Region 3. No fish were caught in three nights of sampling with four traps baited with cheese-bait. Trotlines were more effective. Fifteen channel catfish were caught in three nights of sampling with four lines using a variety of bait. Cut-bait chunks of fresh fish, such as yellow perch, seemed to outproduce other offerings and reduced the catch of other species such as bullhead catfish. Using trotlines also reduced the mortality associated with sampling using gill nets. All channel catfish sampled were released back to the pond in good condition. Considering these results, we recommend sampling channel catfish populations with trotlines in future surveys.

Stocking channel catfish in I-82 Pond 4 appears to be providing angling opportunity for fish of quality size. Channel catfish in several size groups were sampled indicating successful stocking over several years. Apparently, the size at stocking is adequate to keep post stocking mortality to an acceptable level. Below average condition may be an indication of limited forage; however, the actual density of channel catfish is difficult to ascertain with the limited sampling conducted. Creel survey information may provide better information on how channel catfish are contributing to the fishery. Based on the information collected in this survey, we recommend managers maintain channel catfish stocking at the current rate and time interval.

Low CPUE and high condition indicate that the largemouth bass population is low density. However, individual fish in several size classes were sampled indicating successful reproduction in the population. Considering the easy access to I-82 Pond 4, angling pressure may influence largemouth bass abundance more than recruitment. The recent implementation of a 12- to 17-inch slot-limit on largemouth bass may boost population numbers if angler compliance is good.

Yellow perch and bluegill were sampled in low numbers. The fact that only small yellow perch were sampled is likely associated with the gear type bias associated with boat electrofishing. It is common for larger yellow perch in a population to be sampled offshore in deeper water where boat electrofishing is ineffective. Bluegill are more readily sampled by boat electrofishing and therefore the low catch-rate from this sampling effort is likely representative of their low population size. Considering this, yellow perch may be a primary forage fish for channel catfish and largemouth bass in the pond.

I-82 Pond 6

Background

I-82 Pond 6 (Yakima County) is 12 hectares in size with a maximum depth of approximately seven meters. This pond is accessible by car at a paved parking site maintained by WDFW. An initial survey conducted in 1980 found common carp, bluegill, pumpkinseed sunfish, and northern pike-minnow inhabiting the pond (Fletcher 1980). Management recommendations made at that time included constructing a fish barrier at the outlet channel, rehabilitating the pond with rotenone, and stocking channel catfish, rainbow trout, and kokanee. The rehabilitation effort was conducted in 1982, but a complete fish kill was not attained. Nonetheless, channel catfish, kokanee and rainbow trout were stocked in 1982 and 1983. A 1983 gill net survey showed rainbow trout, kokanee, pumpkinseed sunfish, largemouth bass, common carp and chiselmouth inhabited the pond. Since the early 1980s, the pond has been stocked primarily with rainbow trout and channel catfish (Table 65; Table 66).

One additional management note is that a state record channel catfish weighing 36.2 lbs was caught by an angler fishing I-82 Pond 6 in 1999.

Table 65. Fish stocking history for I-82 Pond 6 (Yakima County) 1982 to 1998.

Stocking Date	Species	Number	Size
1982	Rainbow Trout	1325 / 6160	Catchable / Fry
1983	Rainbow Trout	3570 / 6000	Catchable / Fry
1983	Kokanee	6000	Fry
1983	Channel Catfish	1200	Fingerling
1984	Rainbow Trout	6332 / 6035	Catchable / Fry
1984	Kokanee	2000	Fry
1985	Rainbow Trout	8400 / 6004	Catchable / Fry
1986	Rainbow Trout	4543	Catchable
1986	Kokanee	2000	Fry
1987	Rainbow Trout	6288 / 6030	Catchable / Fry
1987	Kokanee	2172	Fry
1988	Rainbow Trout	11858 / 5952	Catchable / Fry
1989	Rainbow Trout	4399 / 5928	Catchable / Fry
1990	Rainbow Trout	8548 / 6014	Catchable / Fry
1991	Rainbow Trout	11396	Catchable
1992	Rainbow Trout	7410	Catchable
1993	Rainbow Trout	10019	Catchable
1993	Channel Catfish	1280	Fry
1994	Rainbow Trout	6822	Catchable
1994	Channel Catfish	970	Fry
1995	Rainbow Trout	10534	Catchable
1996	Rainbow Trout	13492	Catchable
1996	Channel Catfish	750	Fry
1997	Rainbow Trout	12628	Catchable
1998	Rainbow Trout	11506	Catchable
1998	Channel Catfish	752	Fry

Table 66. Fish stocking history for I-82 Pond 6 (Yakima County) 1999 to 2002.

Stocking Date	Species	Number	Size
1999	Rainbow Trout	9084	Catchable
1999	Black Crappie	6002	Fry
2000	Rainbow Trout	9402	Catchable
2000	Channel Catfish	250	Sub-adult
2001	Rainbow Trout	5060	Catchable
2002	Rainbow Trout	8486	Catchable
2002	Channel Catfish	360	Sub-adult

Results

Species Composition I-82 Pond 6

Eleven fish species were collected from I-82 Pond 6 in September 2001 (Table 67). Channel catfish comprised 58% of the sample by weight, but were few in number. Yellow perch, pumpkinseed sunfish, and largemouth bass were the most numerous species sampled. Bluegill, black crappie and bullhead catfish were also sampled in low numbers.

Catchable rainbow trout are periodically stocked into Pond 6; however, only one was sampled. The low catch of rainbow trout may be the result of gear type bias associated with the use of boat electrofishing, which targets nearshore fishes and trotlines designed for sampling catfish. The methods employed in this survey were employed mainly to sample channel catfish without using gill nets, which are often lethal. Although the species composition of all fish caught does provide a summary of what was observed, it is not comparable to surveys conducted on other ponds using the standard boat electrofishing, gill netting, and fyke netting approach. However, species composition analysis from Pond 6 provides a baseline for comparing future surveys of this site and can be compared to data collected at I-82 Pond 4 where comparable methods were used.

Table 67. Species composition by weight (kg) and number for all fish collected at I-82 Pond 6 (Yakima County) in September 2001.

	Species Composition					
	by Weight		by Number		Size Range (mm TL)	
Species	(kg)	(%w)	(#)	(%n)	Min	Max
Channel Catfish	13.26	57.72	14	2.11	283	740
Largescale Sucker	2.52	10.97	2	0.30	466	492
Largemouth Bass	2.04	8.89	102	15.41	54	232
Yellow Perch	1.74	7.59	380	57.40	60	194
Common Carp	1.61	6.99	1	0.15	498	498
Pumpkinseed Sunfish	1.03	4.47	147	22.21	29	126
Rainbow Trout	0.29	1.26	1	0.15	314	314
Black Crappie	0.20	0.85	3	0.45	74	228
Black Bullhead	0.17	0.76	2	0.30	185	190
Bluegill	0.11	0.47	9	1.36	39	109
Brown Bullhead	0.01	0.03	1	0.15	171	171

CPUE I-82 Pond 6

Pumpkinseed sunfish were sampled at the highest rate by boat electrofishing, followed by yellow perch, largemouth bass, and bluegill (Table 68). Channel catfish were sampled at the highest rate by trotline. Bullhead catfish, rainbow trout, and largescale sucker were also sampled by trotline, yet at a lower rate.

Table 68. Mean catch-per-unit-effort by sampling method, including 80% confidence intervals, for all stock length fish collected at I-82 Pond 6 (Yakima County) in September 2001.

	Gear Types			
	Electrofishing		Trotline	
Species	(#/hour)	Sites	#/Night	Nights
Brown Bullhead	2.00 ± 2.56	3	0	12
Black Crappie	2.00 ± 2.56	3	0	12
Bluegill	12.00 ± 11.75	3	0	12
Black Bullhead	0	3	0.17 ± 0.14	12
Channel Catfish	0	3	1.17 ± 0.70	12
Common Carp	2.00 ± 2.56	3	0	12
Largemouth Bass	14.00 ± 2.56	3	0	12
Largescale Sucker	2.00 ± 2.56	3	0.08 ± 0.11	12
Pumpkinseed Sunfish	80.00 ± 46.21	3	0	12
Rainbow Trout	0	3	0.08 ± 0.11	12
Yellow Perch	18.00 ± 19.35	3	0	12

Channel Catfish I-82 Pond 6

Fourteen channel catfish were caught during this sampling effort and ranged in length from 283 to 740 mm total length (Table 67). Although no age analysis was conducted for channel catfish, length frequency analysis shows that individual fish of varying size are present in the pond (Figure 58). This suggests that stocking efforts over several years have been successful and that stocked fish are providing angling opportunity. Except for the largest fish, the condition of channel catfish sampled was at or below the national average (Figure 59). This may be the result of limited prey availability or the affect of a shorter growing season in Washington compared to the more southern climate where the species originated. The higher condition of the largest fish may indicate that as channel catfish grow larger they may experience a reduction in competition as they are more able to make use of larger prey than competitors such as largemouth bass or smaller channel catfish.

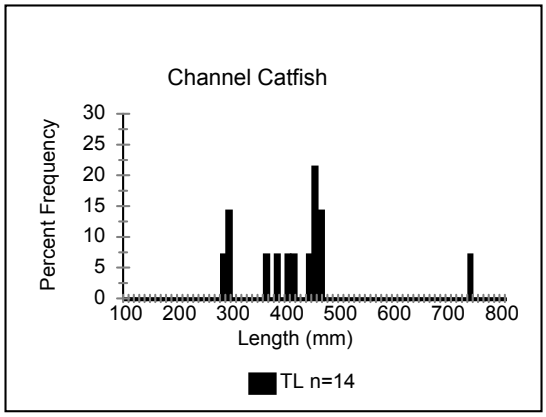

Figure 58. Length frequency distribution of all channel catfish sampled at I-82 Pond 6 (Yakima County) in September 2001 by trotline (TL).

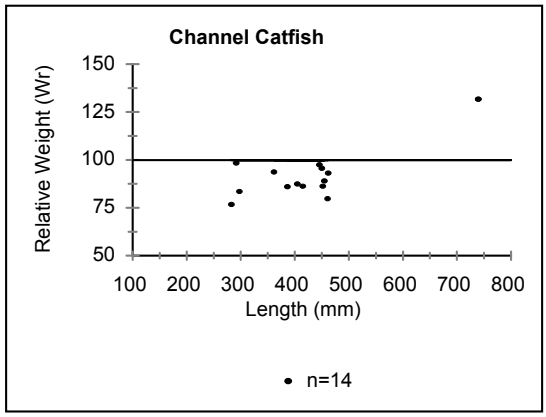

Figure 59. Relative weight (W_r) of channel catfish sampled at I-82 Pond 6 (Yakima County) in September 2001 compared to the national 75th percentile.

Largemouth Bass I-82 Pond 6

I-82 Pond 6 largemouth bass sampled ranged in length from 54 to 232 mm total length (Figure 67). No age analysis was conducted, but length frequency distribution suggests successful reproduction and recruitment (Figure 60). The condition of largemouth bass collected varied and appeared to increase with length (Figure 61). This may be due to a reduction in interspecific competition as bass diet switches from largely invertebrates to fish.

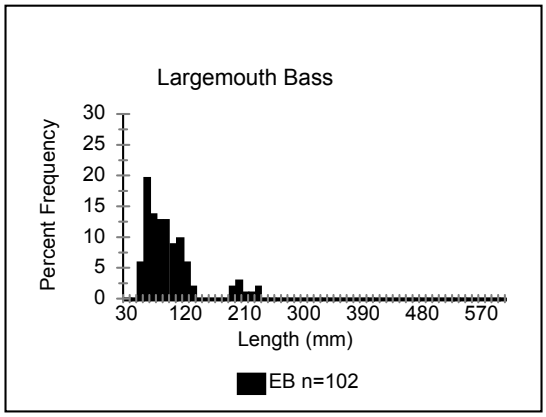

Figure 60. Length frequency distribution of all largemouth bass sampled at I-82 Pond 6 (Yakima County) in September 2001 by boat electrofishing (EB).

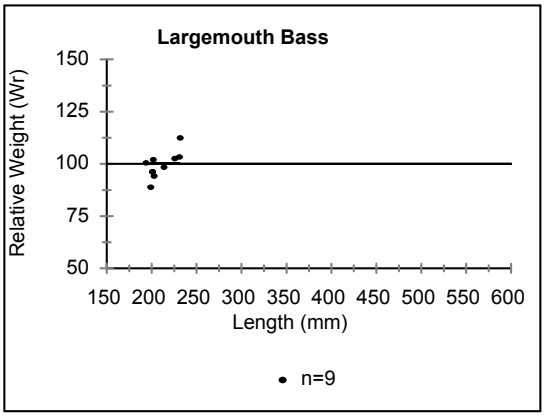

Figure 61. Relative weight (W_r) of largemouth bass sampled at I-82 Pond 6 (Yakima County) in September 2001 compared to the national 75th percentile.

Yellow Perch I-82 Pond 6

I-82 Pond 6 yellow perch sampled ranged in length from 60 to 194 mm total length (Table 67). No larger yellow perch were sampled; however, it is often the case that larger yellow perch in a population tend to be found offshore and are readily sampled with gill nets, but less often sampled by boat electrofishing. Therefore, it should not be assumed that larger yellow perch do not occur in the population. The condition of yellow perch sampled was below the national average, which is common for populations in Washington (Figure 63). The majority of yellow perch sampled were young-of-the-year which indicates year-class potential. Even if few quality adult yellow perch are available to anglers, young perch are readily available to predators such as largemouth bass and channel catfish at times.

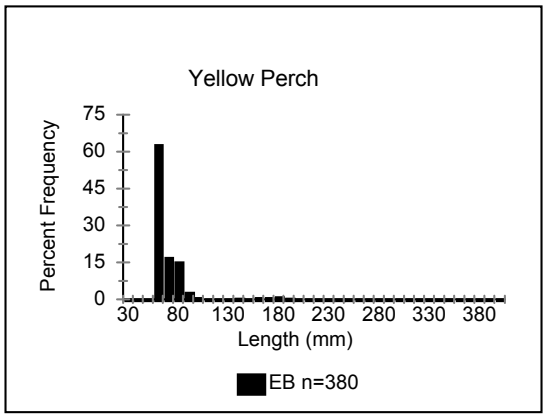

Figure 62. Length frequency distribution of all yellow perch sampled at I-82 Pond 6 (Yakima County) in September 2001 by boat electrofishing (EB).

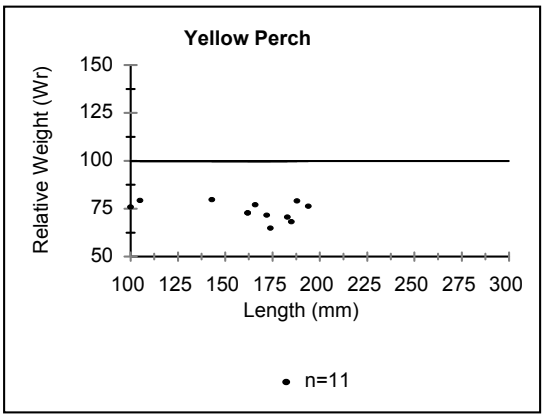

Figure 63. Relative weight (W_r) of yellow perch sampled at I-82 Pond 6 (Yakima County) in September 2001 compared to the national 75th percentile.

Pumpkinseed Sunfish I-82 Pond 6

I-82 Pond 6 pumpkinseed sunfish sampled ranged in length from 29 to 126 mm total length (Table 67). Although no age analysis was done, length frequency distribution suggests consistent year-class strength (Figure 64). The condition of pumpkinseed sunfish sampled varied with smaller length groups exhibiting the greatest variability (Figure 65). Larger individuals exhibited condition which was generally at or below the national average.

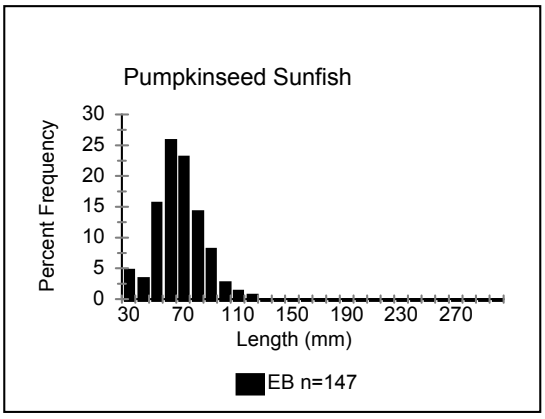

Figure 64. Length frequency distribution of all pumpkinseed sunfish sampled at I-82 Pond 6 (Yakima County) in September 2001 by boat electrofishing (EB).

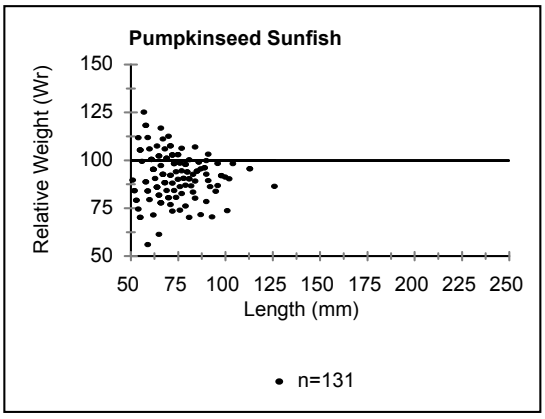

Figure 65. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 6 (Yakima County) in September 2001 compared to the national 75th percentile.

Bluegill I-82 Pond 6

I-82 Pond 6 bluegill ranged in length from 39 to 109 mm total length (Table 67). The condition of the fish sampled was generally below the national average (Figure 66).

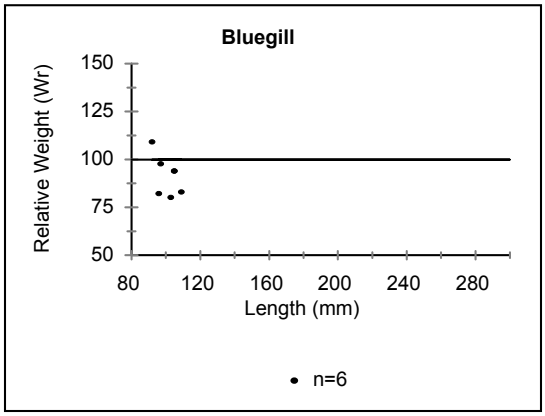

Figure 66. Relative weight (W_r) of pumpkinseed sunfish sampled at I-82 Pond 6 (Yakima County) in September 2001 compared to the national 75th percentile.

I-82 Pond 6 - Discussion

Results of this survey were very similar to what was observed at I-82 Pond 4. Again, no fish were caught using slat-traps baited with cheese-bait in three nights of sampling. The catch rate using trotlines was also similar to that in Pond 4, with fourteen fish sampled. No fish were lost to mortality and all were returned to the pond in good condition.

Fourteen channel catfish ranging in length from 283 to 740 mm total length were sampled. The size range of channel catfish sampled indicates successful stocking efforts over several years. As with Pond 4, this result provides additional support for maintaining current stocking rate, stocking intervals, and size of fish stocked. All but one I-82 Pond 6 channel catfish sampled exhibited condition below the national average, which may be an indication of limited forage. The largest channel catfish (740 mm TL) sampled was the exception, having high condition compared to the smaller channel catfish sampled. This is likely the result of reduced competition and increased forage opportunity with size as larger prey-fish can be eaten. Considering these results, managers are encouraged to continue stocking channel catfish at the same rate and cycle as in past years.

From the results of this survey, we see no reason to deviate from the current stocking rate and cycle (25 fish /acre every other year) or from the size of channel catfish stocked.

Largemouth bass were observed in low density and exhibited near average condition. As in the other ponds, the recently adopted 12 to 17 inch slot-limit may improve the size structure of the population with adequate angler compliance. Managers should consider stocking adult largemouth bass if available in an effort to realize a shift in the balance of the community.

Pumpkinseed sunfish and small yellow perch were abundant and the most numerous species sampled. These species are likely primary forage for predators such as largemouth bass and channel catfish. Yellow perch may provide some angling opportunity of mostly small fish, but without gill net data it is difficult to accurately assess the population size structure. Bluegill were less abundant and only small fish were observed. Creel survey data may provide additional information on the size structure of panfish populations without employing different sampling methods to monitor this fishery.

Management Considerations

Future monitoring of the I-82 fish population should be conducted to evaluate whether or not management objectives are being met. The results of these surveys provide a baseline on the state of the fish communities and should allow for future comparisons of data collected using the standardized approach at ponds 1, 2, 3, 5, and 7, and trotline and electrofishing surveys at ponds 4 and 6. Future monitoring should focus on changes in fish population structure. One key piece of information future monitoring should provide is the change in largemouth bass population structures under the recently adopted statewide slot-limit on largemouth bass. The 12- to 17-inch restrictive slot-limit was implemented in 2000 and data collected in this survey is likely more representative of the populations prior to this regulation change. If the slot-limit achieves the desired effect, managers should see an increase in the number of largemouth bass between 12 and 17 inches. Where this occurs, not only should there be more largemouth bass available for catch-and-release angling, but also reductions of the overabundant panfish populations.

Managers should consider collecting additional creel survey information for all of the ponds to aid in monitoring management goals and objectives. Past creel survey information for the ponds has been largely completed on a spot-check basis by biologists and enforcement personnel. Creel survey data can provide information on the fish community and harvest that is only circumstantially eluded to from standard fish population survey data. Additionally, creel surveys can provide an opportunity to monitor angler compliance with the largemouth bass slot-limit.

I-82 Pond 1

- Maintain outlet screen and repair or replace as needed
- Lift the no walleye harvest regulation to allow for some harvest
- Consider stocking additional panfish such as yellow perch or bluegill
- Install fishing dock similar to the one destroyed by vandals in 1993

I-82 Pond 2

- Design and install a barrier to fish passage at outlet
- Increase largemouth bass density through slot-limit or stocking of adult fish
- Install fishing dock similar to I-82 Pond 1 design

I-82 Pond 3

- Design and install a barrier to fish passage at outlet
- Increase predator density by stocking adult largemouth bass, channel catfish, and brown trout
- Consider chemical or mechanical removal of undesirable species

I-82 Pond 4

- Monitor using trotlines for channel catfish and boat electrofishing
- Continue stocking channel catfish at the current rate and cycle

I-82 Pond 5

- Design and install a barrier to fish passage at outlet
- Continue channel catfish stocking at present rate and cycle
- Monitor the success of black crappie stocking

I-82 Pond 6

- Monitor using trotlines for channel catfish and boat electrofishing
- Continue stocking channel catfish at the current rate and cycle
- Increase largemouth bass numbers through slot-limit or stocking adult fish

I-82 Pond 7

- Work towards producing a largemouth bass, bluegill, and channel catfish fishery
- Consider chemical or mechanical removal of undesirable species
- Increase predator numbers through largemouth bass slot-limit, stocking adult largemouth bass, and stocking channel catfish

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