Banks Lake Fishery Evaluation

Annual Report
2002 - 2003

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Banks Lake Fishery Evaluation Project Annual Report: Fiscal Year 2002
(September 1, 2002 to August 31, 2003)

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Abstract

The Washington Department of Fish and Wildlife implemented the Banks Lake Fishery Evaluation Project (BLFEP) in September 2001 with funds from the Bonneville Power Administration. Fiscal Year (FY) 2001 of the BLFEP was used to gather historic information, establish methods and protocols, collect limnology data, and conduct the first seasonal fish surveys. FY 2002 was used to continue seasonal fish and lakewide creel surveys and adjust methods and protocols as needed. Water quality parameters were collected monthly from February to May and bi-monthly from June to August. Banks Lake water temperatures began to increase in April and stratification was apparent by June at all 3 limnology collection sites. By late August, the thermocline had dropped to nearly 20 meters deep, with 16-17 °C temperatures throughout the epilimnion. Dissolved oxygen levels were generally above 10 mg/L until August when dissolved oxygen dropped near or below 5 mg/L below 20-meters deep. Secchi depths ranged from 2.5-8 meters and varied by location and date. Nearshore and offshore fish surveys were conducted in October 2002 and May and July 2003 using boat electrofishing, fyke net, gill net, and hydroacoustic surveys. Yellow Perch *Perca flavescens* (32 %) and cottid spp. (22 %) dominated the nearshore species composition in October; however, by May yellow perch (12 %) were the third most common species followed by smallmouth bass *Micropterous dolomieui* (34 %) and lake whitefish *Coregonus clupeaformis* (14 %). Lake whitefish dominated the offshore catch during October (78 %) and May (81 %). Fish diet analysis indicated that juvenile fishes consumed primarily insects and zooplankton, while adult piscivores consumed cottids spp. and yellow perch most frequently. For FY 2002, the following creel statistics are comprehensive through August 31, 2003. The highest angling pressure occurred in June 2003, when anglers were primarily targeting walleye and smallmouth bass. Boat anglers utilized Steamboat State Park more frequently than any other boat ramp on Banks Lake. Shore anglers used the rock jetty at Coulee City Park 76 % of the time, with highest use occurring from November through April. An estimated total of 11,915 (±140 SD) smallmouth bass, 6,412 (±59 SD) walleye, 5,470 (±260 SD) rainbow trout, and 1,949 (±118 SD) yellow perch were harvested from Banks Lake in FY 2002. Only 3 kokanee were reported in the catch during the FY 2002 creel survey. In the future, data from the seasonal surveys and creel will be used to identify potential factors that may limit the production and harvest of kokanee, rainbow trout, and various spiny-rayed fishes in Banks Lake. The limiting factors that will be examined consist of: abiotic factors including water temperature, dissolved oxygen levels, habitat, exploitation and entrainment; and biotic factors including food limitation and predation. The BLFEP will also evaluate the success of several rearing and stocking strategies for hatchery kokanee in Banks Lake.

Acknowledgements

We thank the Bonneville Power Administration and the Northwest Power Planning Council for funding this project, and the Columbia Basin Fish and Wildlife Authority, Independent Scientific Review Panel, and R. Morinaka (BPA) for approving and providing input and suggestions during development of the research plan. We thank Casey Baldwin for assistance with study designs and protocols, and the development of the proposal for this project. We greatly appreciate the field, logistical and technical support of D. Burgess, K. Simmons, T. Vilante (WDFW) of the Moses Lake research team. We thank Dr. Ross Black (Eastern Washington University) for assistance with the limnology sampling plan, and Dr. Anthony Gabriel (Central Washington University) for assistance with the littoral habitat-sampling plan. The Region 2 warmwater team, J. Korth, J. McLellan, B. Bolding and crew, A. Smith, B. McIlraith, J. Kiesel, H. Woller, the Region 2 WCC crew, and many other WDFW personnel who assisted with fieldwork. We acknowledge the Region 2 office staff. J. Lemieux of the Kalispell Tribal Fisheries Department for creating the GIS map of nearshore sites. We thank Coulee Playland Resort, Coulee City Park, Sun Banks Resort, B.A.S.S, and Walleyes Unlimited for cooperation during fish tagging, tag recovery efforts, and access during creel surveys. Finally, we thank Central Washington University for the use of their aquatics laboratory.

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Section 1.0 The History of Banks Lake and the Fishery

1.1 Introduction

The Bureau of Reclamation created Banks Lake in 1951 to function as an equalizing reservoir for the Columbia Basin Irrigation Project. It occupies the Upper Grand Coulee, formerly a channel of the Columbia River, located in the high scrub desert of Grant County, Washington. The Grand Coulee was formed during the Pleistocene Epoch when an ice sheet temporarily diverted the Columbia River from its present course southward. Water erosion cut the gorge out of basalt rock creating canyon walls rising up to 600 feet. Later, the ice sheet melted and retreated, allowing the Columbia River to flow along its original course leaving the riverbed behind.

Banks Lake is contained within two earth-fill dams, the North Dam and Dry Falls Dam, or the South Dam. The North Dam, near Electric City, WA is 44 m high and 442 m long. Dry Falls Dam, close to Coulee City, is 37 m high and 2987 m long and supports a two-lane highway. Banks Lake is 43 km long, contains 1.6 billion m^3 of water and covers 10,881 ha of surface area (USBOR 1964). At an elevation of 479 m (1,570 ft) (full pool), the average depth is 14 m with a maximum depth of 26 m. Water is pumped up 85 m from a pumping plant at the left forebay of Grand Coulee Dam (Franklin Delano Roosevelt Lake -FDR) to a feeder canal 2.6 km in length, which delivers water to Banks Lake at the North Dam (USBOR 1964).

Additionally, Banks Lake is used as a pumped storage / power generating reservoir. The project includes six pump-generating units (P/G) in order to provide additional power during peak power periods, daily during the morning and evening and seasonally from October to March. The first two units were installed and operational by fall, 1974 (Stober et al. 1974). By early 1984, the other four units were fully operational (B. Mattson, personal communication).

Dry Falls Dam also houses a power plant. Water for irrigation is withdrawn from the south end of Banks Lake through a turbine at Dry Falls Dam with a maximum rate of 8,000-cfs. Another 1,600-cfs is diverted to the spillway during the peak of the irrigation season (J. Moody, personal communication). The water is routed through the Main Canal 13.5 km to Billy Clapp Lake and then distributed to the Columbia Basin Irrigation Project. Return flows from these lands are accumulated in the Potholes Reservoir for irrigation in the southern area of the project (USBOR 1964). The project irrigates approximately 271,140 ha, which is a little over one-half of the authorized lands in the Columbia Basin Project (USFWS 2002). Approximately 3.0 billion m^3 of Banks Lake water is supplied to the Irrigation Project each year (J. O'Callaghan, personal communication). The storage capacity of Banks Lake is a little over 1.6 billion m^3, therefore, the reservoir water volume is completely flushed out about two and one-half times during the irrigation season (USFWS 2002).

Currently, water levels fluctuate minimally (1-2 ft) during the irrigation season, from late March until late October. Historically, a maximum drawdown of five to fifteen feet occurred in May, before the spring runoff increased pumping from Lake Roosevelt, achieving full elevation (1570 feet) during August. Irrigation demand, rainfall, runoff, and power demand contributed to an alteration of this elevation cycle (Stober et al. 1974).

1.2 Historical Fishery

Prior to the inundation of Banks Lake in 1951, Devil's Lake was the largest of several small lakes in the coulee, including Steamboat and Lewis Lakes. There are no records of the fish assimilation in the small lakes, but local fisherman indicated that prior to flooding the coulee sizeable populations of largemouth bass (*Micropterus salmoides*) and pumpkinseed sunfish (*Lepomis gibbosus*) existed (Stober et al. 1975). This is reflected in the Washington Department of Game (currently Washington Department of Fish and Wildlife -WDFW) catch records from 1952-1954 and Steamboat Rock Resort creel counts from 1953-1954, which indicate that bass and pumpkinseed dominated the creel, amounting to 64 % and 32 % of the catch, respectively. Also identified in the 1952-54 catch, in order of decreasing abundance, were yellow perch (*Perca flavescens*), brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), kokanee (*O. nerka*), burbot (*Lota lota*), bull trout (*Salvelinus confluentis*), and black crappie (*Pomoxis nigromaculatus*). All three years yielded a combined CPUE of 3.6 fish/angler/trip (Nelson 1954).

A creel survey conducted by WDFW personnel from 1960-1964 yielded an additional two species not present in the 1952-54 catch, lake whitefish (*Coregonus clupeaformis*) and pike (*Esox lucius*). The fishery had shifted from being dominated by bass and pumpkinseed in the 1950's to being represented mainly by yellow perch (59 %), rainbow trout (24 %), and kokanee (14 %) in the early 1960's. Other fish included in the catch were black crappie, bass, burbot, and pumpkinseed. The average CPUE declined from 3.6 fish/angler/trip in the early 1950's to 2.2 fish/angler/trip (0.7 fish/hr) during the early 1960's (Spence 1965).

Yellow perch and kokanee were once again dominant in a creel survey conducted by Duff (1973) during the years 1971-1972, representing 56 % and 30 % of the catch, respectively. Also present in the sport fishery were the following species: rainbow trout (5 %), black crappie (4 %), largemouth bass (2 %), pumpkinseed (2 %), and lake whitefish, walleye (*Stizostedion vitreum*), and burbot (1 %) (Duff 1973). Duff also recorded the presence of bluegill (*Lepomis macrochirus*) within the fishery. Reported angler usage at Banks Lake was 92,236 fisherman days with a catch of 90 tons of fish, divided almost evenly between salmonid and spiny ray fish. The average CPUE of 3.8 fish/angler/trip (0.9 fish/hr) was reminiscent of the catch seen in the early 1950's. Since 1965, the fishing intensity had risen 300 % and the economic value of the fishery was estimated at $1.6 million (Duff 1973).

Sampling efforts between the years 1973-1976 by Stober et al. (1976) yielded the following species not contained within the sport fishery or previously encountered: longnose sucker (*Catostomus catostomus*), carp (*Cyprinus carpio*), prickly sculpin (*Cottus asper*), mountain whitefish (*Prosopium williamsoni*), chinook salmon (*Oncorhynchus tshawytscha*), peamouth (*Mylocheilus caurinus*), brown bullhead (*Ameiurus nebulosus*), brown trout (*Salmo trutta*), northern pikeminnow (*Ptychocheilus oregonensis*), and largescale sucker (*Catostomus macrocheilus*) (Stober et al. 1975). Bluegill were the only fish not taken that was reported by Duff (1973). Ninety percent of gill net and beach seine catches were comprised of yellow perch, lake whitefish, and kokanee (Stober et al. 1975).

A creel census conducted in 1975 found the sport fishery to consist predominately of kokanee (43.2 %) and yellow perch (34.4 %), with the average CPUE decreasing to 0.5 fish/hr. (Stober et al. 1975). In 1977, a limited creel survey revealed that the relative abundance of kokanee had declined to 17.8 %. However, in 1978, following the implementation of a barrier net designed to retain adult fish in the reservoir, the abundance of kokanee in the creel increased to 83.7 %. A simultaneous reduction in other sportfish occurred and the CPUE was 0.3 fish/hr (Stober et al. 1979).

Routine creel surveys performed by WDFW personnel during the years 1974-1982 (WDFW, Region 2, unpublished data) included the following species not observed in the creel prior: smallmouth bass, carp and catfish. Yellow perch and kokanee dominated the creel from 1974 to 1980 [Kokanee are referred to as kokanee and coho in the creel records. Coho were stocked in 1971 and could not have been present in the creel so they were assumed to be kokanee]. The same trend noted by Stober et al. (1979) toward a reduction of average CPUE was observed in 1977. By 1981 kokanee had disappeared from the creel, and yellow perch CPUE had decreased.

1.3 Species Composition

The following is a summary of fishes known to occur in Banks Lake at various times. Included are comments about the source of the population as well as a brief history. In addition, stocking records from 1953-1998 are located in Appendix A.

Kokanee.—Kokanee have been planted sporadically in the reservoir since 1956; however, they are indigenous to the Columbia River Basin and source populations could have arisen from Lake Roosevelt via inflow from the feeder canal. It was first reported that kokanee were entrained from Lake Roosevelt through the generators of Grand Coulee Dam in 1949 (Gangmark and Fulton 1949, cited in Stober et al. 1975).

Kokanee populations reported in the 1972 creel survey by Duff appeared to be self-sustaining as indicated by the large numbers of 2-, 3-, and 4- year old fish that could not have been from the last plant in 1966. It is possible that these fish could have been entrained from Lake Roosevelt; however, Duff (1973) and Stober et al. (1974) observed kokanee spawning along the shoreline.

Extreme drawdown of the reservoir during 1973 and 1974 reduced the reproductive success of kokanee. This was represented by a decline in the number of kokanee shoreline spawners observed, a decrease in abundance in gill net catch, and a reduction of the catch in the creel (Stober et al. 1977).

By the mid-1980's the kokanee fishery had declined, and has yet to recover, despite intensive stocking efforts in recent years. Significant numbers of kokanee fry are entrained downstream from the irrigation canals after being stocked. This is apparent by the kokanee catch in un-stocked Billy Clapp Reservoir, downstream from Banks Lake (USFWS 2002).

Rainbow Trout.—Rainbow trout have been planted annually since 1956 with few exceptions. However, rainbow trout are native to the Columbia River Basin and the population is probably supplemented by entrainment from Lake Roosevelt.

Rainbow trout were a dominant part of the fishery in the 1960's (Spence 1965). Although targeted by anglers, rainbow trout did not constitute a substantial part of the salmonid fishery in 1975-1976, which was dominated by kokanee (Stober et al. 1976) and coho salmon (WDFW, Region 2, unpublished data). In order to minimize the apparent decline, the size at release was increased, which would help negate predation (USFWS 2002). Entrainment through the irrigation canals might also have impacted the rainbow trout fishery negatively. Stober et al. (1976) discovered that rainbow trout releases made closest to the canals in either end indicated higher loss to entrainment particularly during the summer in the irrigation canal and in winter at the feeder canal. Also compromising the fishery during the 1970's was the effect reservoir drawdown in the spring had on spawning success of rainbow trout, a spring spawner.

Brook Trout.—Other than the appearance of Brook trout in the 1952-1954 creel survey, only one other record exists. Thompson (1952) identified brook trout spawning in Northrup Canyon Creek, a tributary to Banks Lake. Apparently they never became established and a year later, Thompson recommended closing the creek to fishing in order to protect rainbow trout spawning in the creek (Thompson 1953).

Bull Trout.—The only account of Bull trout (*Salvelinus confluentis*) was a few individuals reported in the 1952-54 creel census conducted by Nelson (1954). It is likely that they were entrained from Lake Roosevelt and never became established in Banks Lake, or that they were a misidentified brook trout.

Brown Trout.—Brown trout may have been introduced from Lake Roosevelt or by sport fisherman. Stober and colleagues recorded the two occurrences of brown trout in the fishery during the early 1970's (Stober et al. 1975).

Cutthroat Trout.—Cutthroat trout (*Oncorhynchus clarki*) were planted once by Washington Department of Fish and Game (WDFW) in 1959. They have never been reported in the creel or in reservoir surveys.

Coho Salmon.—WDFW planted coho salmon (*Oncorhynchus kisutch*) in 1971 only, but they failed to become established

Chinook Salmon.—Chinook salmon were planted by WDFW in 1974, 1975, and 1976. The 1975-76 creel survey conducted by Stober and workers yielded a catch consisting of 20 % of the 1974 plant indicating a high rate of return (Stober et al. 1975). Chinook were part of the creel during 1978, but were not observed after 1979.

It is also possible that this species was entrained into Banks Lake from Lake Roosevelt. Stober et al. (1975) noted that large Chinook salmon, five to eleven pounds, had been captured by anglers that were too large to be from the 1974 plant and were likely from a 1971-72 plant into Lake Roosevelt (Stober et al. 1975).

Lake Whitefish.—Lake whitefish were present in a creel survey of Banks Lake in 1965 conducted by Merrill Spence (Duff 1973). Lake whitefish dominated the fishery in 1975 by number and biomass. They were probably introduced from Lake Roosevelt through the feeder canal. Spawning, incubation, and emergence were mostly unaffected by water level fluctuations since these events occurred when the reservoir was held nearly constant at full pool (Stober et al.1976).

Burbot.—Burbot were stocked by WDFW in 1988 in an attempt to restore the fishery expended as a result of over harvest in the 1960's (WDFW, Region 2, unpublished data). A burbot population exists in Lake Roosevelt and the population may have originated as a result of entrainment through the feeder canal.

Northern Pike.—One northern pike was present in the creel survey conducted by Spence (1965). Duff (1973) confirmed the introduction of pike in the reservoir. It is probable that the northern pike occurrence was the result of an angler introduction or entrainment from Lake Roosevelt.

Largemouth bass.—Largemouth bass were present in the small lakes of Grand Coulee prior to inundation. They dominated, along with pumpkinseed, in the 1952-54 creel survey. During the Stober surveys in the mid 1970's largemouth bass still represented an important part of the fishery with approximately the same catch, but lower catch per unit effort as in the early fifties. Largemouth bass numbers seemed to be declining in recent years but the absence of accurate data makes this difficult to determine (USFWS 2002).

Smallmouth Bass.—Smallmouth bass (*M. dolomieui*) were planted in 1981 by WDFW (WDFW, Region 2, unpublished data). They were present in a 1981 creel survey and in bass tournaments during the years 1984-1987 in low numbers; however, their numbers have since increased.

Walleye.—Walleye established a small reproducing population in Banks Lake in the 1960's as reported by Spence (1965). They were probably introduced from Lake Roosevelt as a result of hydro operations as they were known to occur in Lake Roosevelt. WDFW began supplementing the walleye population in 1992, and continued during the years 1995 through 1998.

Yellow Perch.—Yellow perch occurrence in Banks Lake is likely a result of entrainment from Lake Roosevelt. Although the abundance of yellow perch was low in Banks Lake during the 1952-54 creel census, (Nelson 1954) its adaptability combined with high reproductive potential led to its becoming the most successfully abundant species by number during the 1970's (Stober et al. 1975).

Black Crappie.—Black crappie were thought to be introduced via Lake Roosevelt or through angler introduction (Stober et al. 1975).

Pumpkinseed.—Pumpkinseed were present in the small lakes of Grand Coulee prior to inundation. They were dominant in the 1952-54 sport catch, but in the early 1970's few were taken.

Bluegill.—Duff (1973) reported bluegill in the fishery in the early 1970's, which were probably introduced via an illegal plant by anglers. However, Stober (1974) did not find any bluegill present during the reservoir wide survey of 1973-74.

Brown Bullhead.—Brown bullhead may have been entrained from Lake Roosevelt; however, Stober et al. (1975) reasoned that the brown bullhead occurrence in Banks Lake was likely a result of an introduction from an angler since it was not known to occur in Lake Roosevelt during the early 1970's.

Carp.—Carp are believed to occur in Banks Lake as a result of an introduction from Lake Roosevelt through the irrigation pumps. They were present in creel surveys during the latter 1970's and early 1980's.

Channel Catfish.—Channel catfish (*Ictalurus punctatus*) may have been inadvertently introduced into Banks Lake via escapement from a net pen experiment conducted by WDFW in 1988.

Native Non-Game Species.—The mountain whitefish, peamouth, longnose, largescale and bridgelip (*Catostomus columbianus*) suckers, northern pikeminnow, and prickly sculpin are indigenous to the Columbia River system and probably were introduced into Banks Lake as a result of irrigation water input from Lake Roosevelt (Stober et al. 1975). Few of these species were captured by Stober and workers except for the prickly sculpin. They were the most abundant non-game species in 1975.

Additional Species.—Additional species documented in Banks Lake include yellow bullhead (*Ameiurus natalis*), and white catfish (*Ictalurus catus*) (USFWS 2002).

1.4 Entrainment

Stober and workers examined entrainment at the north end of the reservoir via input from irrigation water from Lake Roosevelt, the immigration and/or emigration of fish during pump/generation operation, and entrainment through the irrigation canals at the south end of the reservoir during the years 1974 through 1976.

Feeder canal—Fish were pumped into Banks Lake from Lake Roosevelt at the feeder canals at a lower rate and different species composition than they were pumped out through the irrigation canals. Prickly sculpin, kokanee and largescale sucker were the primary species entrained from Lake Roosevelt in 1975-76, and were entrained at a rate of 0.66 fish/hour (Stober et al. 1976).

Pump / Generation.—Limited investigations revealed that the pump-generation flow (P/G 7 & 8) resulted in relatively minor fish loss. The mean entrainment rate in 1975 was 4.1 fish/hr consisting mostly of small rainbow trout stocked in the fall of 1974. In 1976, the entrainment rate had declined to 1.6 fish/hr. Other species observed included whitefish, chinook, and yellow perch (Stober et al. 1976). Ice and snow cover could have affected these results, as it might have inhibited fish movement leading to an underestimation of total entrainment. The lack of surveys in November and December, a period of greater fish movement, may also have underestimated total entrainment.

Irrigation canal.—Entrainment through the irrigation outlet canal totaled 436,216 fish (110,338 kg biomass) in 1975-76. Yellow perch, kokanee, and lake whitefish were the primary species entrained out of nineteen total species. Northern pikeminnow, brown trout, and bridgelip sucker were the only species that did not occur in the irrigation canal catch (Stober et al. 1977). The timing of entrainment was associated with sexual maturity and pre-spawning activity (Stober et al. 1976).

Stober et al. (1979) conducted more extensive sampling of entrainment through the irrigation canals in 1977 and 1978. They found that the relative abundance of entrained kokanee had decreased to 17.8 % in 1977, compared to 67.4 % in 1975 and 59.6 % in 1976. The catch per haul was reportedly affected by schooling behavior, maturation, and temperature avoidance. They also conducted a mark-recapture study and found that kokanee moved as far as 30 km. A few kokanee were fitted with sonic tags to determine the behavior of fish encountering a barrier net placed in front of the irrigation canal. The barrier net was effective at excluding some of the kokanee from the intake at the irrigation canal (Stober et al. 1979).

1.5 Historical Limnology

Stober and colleagues were contracted in 1973 by the Bureau of Reclamation to assess how the effect pumped storage and irrigation withdrawal impacted the ecology of Banks Lake. The following consists of findings from their limnological studies during the years 1973 through 1976. In summary, they characterized Banks Lake as being divided into two pools, the north pool and the south pool. The north pool, which extends from the North Dam to the Steamboat Rock area, is characterized by a reduction in temperature, transparency, retention time, and zooplankton abundance and by an increase in both nutrients and phytoplankton standing stock when compared to the south pool (Stober et al. 1976).

Temperature.—Temperature observations indicated that Banks Lake is a complex river-run reservoir during the irrigation season and reverted to thermal characteristics of a typical northern latitude lake thereafter. In late spring, as air temperature increased, a thermal stratification was evident at all stations; however, once pumping through the feeder canal began, stratification at the north end disappeared due to turbulent mixing. The cool, dense water pumped in caused an underflow as it met with warmer water in the southern end, causing stratification until September when ambient temperature and pumping rates decreased. The reservoir had turned over by mid-September in 1973 and 1974 (Stober et al.1975).

Transparency.—The south end of the reservoir exhibited the greatest transparency primarily due to the lack of littoral zones in that area. Maximum transparency occurred during winter, while the minimum occurred during spring phytoplankton blooms. Generally, transparency increased from north to south and was influenced by suspended sediment due to phytoplankton standing crop, wave action, and pump induced turbidity (Stober et al. 1976).

PH.—No trends were detected for pH throughout the reservoir and values ranged from 5.7 to 9.0 (Stober et al. 1976).

Dissolved Oxygen.—Dissolved oxygen saturation levels were consistently high. A minimum of 42 % oxygen saturation was observed and only 14 out of 236 observations were less than 70 %. The northern sections of the reservoir exhibited less of a dissolved oxygen stratification due to turbulent mixing compared to the southern end of the reservoir (Stober et al. 1976).

Ionic Composition.—The ionic composition of Banks Lake was dominated by calcium, magnesium, carbonate, and bicarbonate, similar to, but slightly less than Lake Roosevelt. An increase in sodium and potassium was demonstrated from north to south. Sulphate concentrations were higher in the northern end of the reservoir (Stober et al. 1976). A small decline in water hardness was observed during the summer. Water hardness for the system was described as soft to moderately hard (Stober et al. 1976). Conductivity was highest during May, after pumping began from Lake Roosevelt, and lowest in December. Conductivity levels were reportedly low, but normal for the Columbia Basin (Stober et al. 1976).

Silica.—Silica increased with pumping in the spring and declined through the production season when diatoms were actively assimilating this nutrient (Stober et al. 1977).

Phosphate & Nitrogen.—Orthophosphate levels increased correspondingly to pumped water from Lake Roosevelt (Stober et al 1976). Supplies of phosphorus and nitrogen increased slightly between 1974 and 1975 and increased significantly in 1976 (Stober et al. 1977).

Nitrogen was a limiting factor for the reservoir. Nitrate concentrations were typically low with lowest values occurring in the summer during phytoplankton production. Nitrate concentrations exhibited a dependency upon, and increased with, water pumped from Lake Roosevelt. Small amounts of nutrients might be contributed from runoff and ground water sources. During years of high drawdown, nutrients are added to the system due to the breakdown and development of terrestrial and littoral vegetation by recycling nutrients in the sediment and the water column. Seasonal runoff and ground water might also contribute small amounts of nitrogen. Most of the nitrogen was depleted by the time it reached the southern end of the reservoir contributing as a limiting factor for phytoplankton blooms in the south end (Stober et al. 1976).

Chlorophyll α.—Pumped input from FDR was observed to dramatically increase chlorophyll α levels at the north end of the reservoir in early June. Chlorophyll levels began to taper off during the summer months, followed by a fall bloom. This trend may have occurred due to the cessation of pumped input and irrigation withdrawal, resulting in the retention of nutrients and or phytoplankton in the north end. In the southern end of the reservoir chlorophyll α concentrations were repeatedly low (Stober et al. 1974).

Primary Productivity.—Major phytoplankton blooms occurred in the northern portion of the reservoir whereas only minor blooms occurred in the southern end due to nutrient limiting factors. Plant production was also increased in the north end by turbulent mixing. Plant production that occurred flowed into the south pool, where it was retained for a longer period of time.

Drawdown during the growing season may have reduced the surface area available for periphyton as well as the volume of the reservoir available for periphyton production, while terrestrial plant production in the littoral zone and aquatic macrophyte production may have been enhanced (Stober et al. 1975).

Zooplankton.—Zooplankton in the north pool was flushed toward the south end reducing retention and development time, although some zooplanktors were flushed into the north end from Lake Roosevelt. Longer retention times, warmer temperatures, and an inflow of phytoplankton promoted greater stability and abundance of zooplankton in the south pool (Stober et al. 1976).

Benthos.—Water level fluctuations have reportedly affected the benthic community by altering the species composition, reducing the total population and relocating the area of maximum abundance (Stober et al. 1976).

Section 2.0 Banks Lake Limnology and Fisheries Surveys, September 2002 to August 2003.

2.1 Introduction

The Washington Department of Fish and Wildlife implemented the Banks Lake Fishery Evaluation Project (BLFEP) in September 2001 with funds from the Bonneville Power Administration. Fiscal year (FY) 2001 of the BLFEP was used to gather historic information, establish methods and protocols, collect limnological data, and conduct the first seasonal fish surveys. FY 2002 was used to continue seasonal fish and lakewide creel surveys and adjust methods and protocols as needed.

This annual report will summarize the tasks completed during FY 2002, which started on September 1, 2002 and ended August 31, 2003. Due to time constraints, this report will not include completed analysis for each task or discussion of results and potential management implications. Technical reports that correspond to calendar years will be published with WDFW, and if appropriate, may replace this report at a later date. The purpose of this report is to show that we completed our contract obligations by conducting the tasks outlined in our FY 2002 Statement of Work.

2.2 Methods

2.2.1 Limnology

To understand the primary and secondary productivity of Banks Lake, we collected baseline data on water quality, phytoplankton and zooplankton at three fixed sites, once each month from February to May and twice monthly from June to August. Each fixed site represented different basin morphologies of the lake and was located in the north basin (LIM1 – 0345557, 5311151), mid reservoir west of Steamboat Rock (LIM3 – 0340127, 5305651), and the south end near Million-Dollar Mile (LIM5 – 0330396, 5288748) (Figure 1). Three additional sites were added in June 2003 to represent two embayments and the most southern end of the lake and were located in Kruk's Bay (LIM2 – 0343817, 5307049), Devil's Punch Bowl (LIM4 – 0341957, 5302762), and southwest of Goose Island (LIM6 – 0327203, 5281572). Water quality parameters included temperature, dissolved oxygen, conductivity, turbidity and pH, and were collected from the surface to the bottom at 2-m increments with a Hydrolab Inc. water quality instrument. Water samples (three replicates) were collected at 5 m with a Van Dorn bottle and analyzed for chlorophyll *a* (concentration), phytoplankton (identification, enumeration, density, biovolume), and nitrogen and phosphorous (concentration mg/L). Water samples were placed on ice with no exposure to light and taken to the limnology laboratory at Eastern Washington University fro analysis within 24 hours of collection.

Zooplankton was collected with a 50 or 30 cm diameter, 153-micron mesh Wisconsin style net. Three replicate tows were taken from each site from the bottom to the surface. Zooplankton was "fixed" for 20 seconds in 95 % ethanol and then preserved in 70 % ethanol. Laboratory analysis involved zooplankton identification, density and length measurements.

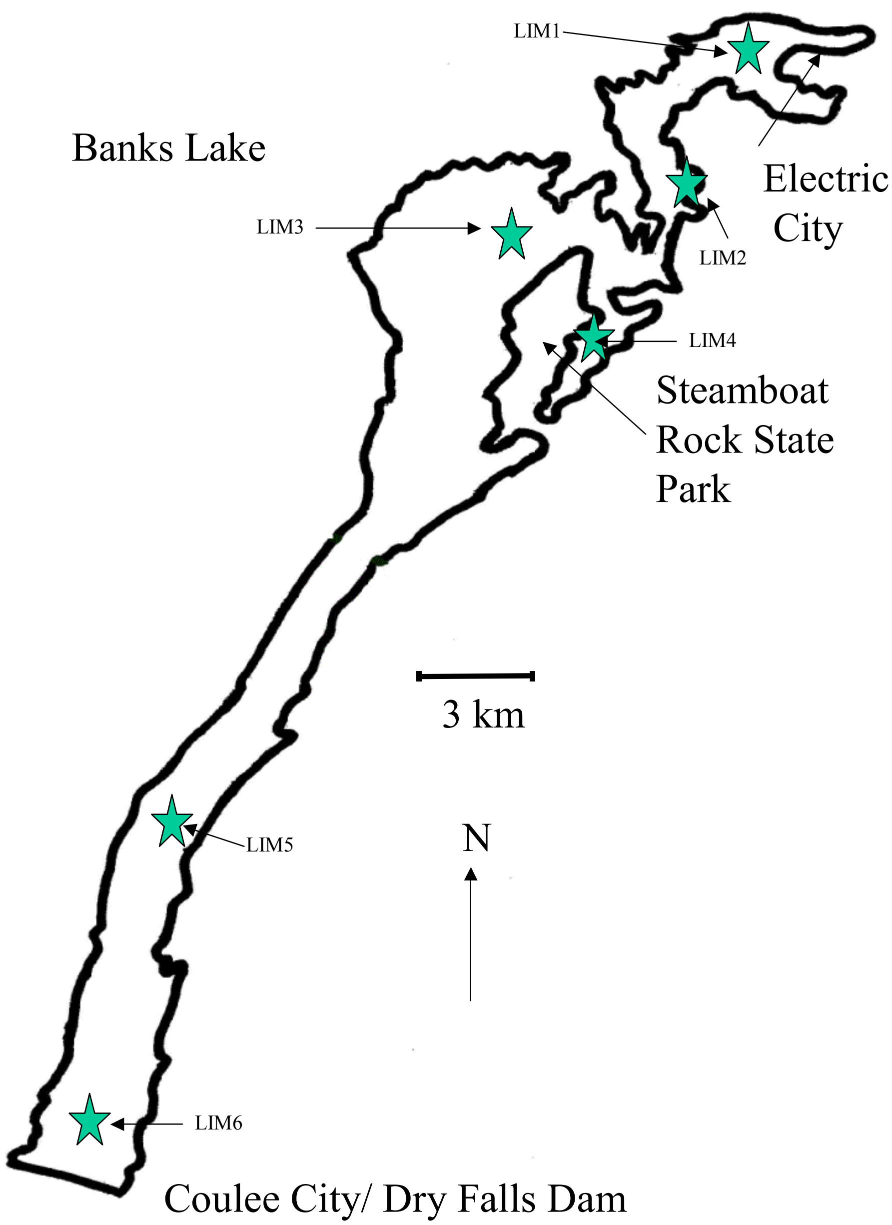

Figure 1. Map of Banks Lake showing the 6-limnology sampling sites for fiscal year 2002.

2.2.2 Fish Surveys

We collected baseline fisheries data for littoral (nearshore) and limnetic (offshore) fish species during the fall (October 21-31) 2002, and spring (May 26 to June 5) and summer (July 21 to August 1) 2003. All shocked and netted fish were measured (TL-mm) and weighed (g), except for age-0 fish that were captured in high numbers during the summer sample. Sub samples of these fish were measured and weighed from each site and the remainders were counted and a total weight was recorded for the batch. Scale samples were taken from live fish and scales and otoliths were taken from dead fish. Diet samples were collected using gastric lavage from live fish collected via electrofishing. Additional diet samples were taken from gill netted fish to supplement species and size classes that were not adequately sampled with electrofishing gear. Dorsal tissue samples were collected from gill netted fish for stable isotope analysis. Stomachs and stomach contents were preserved in 95% ethanol. Bass and walleye greater than 200 mm were tagged prior to release.

Littoral zones surveys.—To determine littoral sample sites, Arcview software was used to divide the shoreline, including islands, into 464 sites that were 400 m long each (Figure 2). Sample sites were then randomly selected using Statview. Our minimum goal was to sample 15 % of the shoreline sites.

We used the standard protocol from the WDFW Warm Water Fish Survey Manual (Bonar et al. 2000) to determine fish species composition, CPUE, and collection of biological data for determining growth, age, condition factor and relative weight. Specific capture methods included boat electrofishing, gill nets, and fyke nets in a 3:2:1 ratio (48 electrofishing sites, 24 gill netting sites, and 16 fyke net sites). The ratio was 3:3:1 in October to accommodate the data needs of the WDFW Fall Walleye Index Netting survey (FWIN). Gill nets were 61 m long by 1.8 m deep and consisted of 8 different stretch mesh sizes including 25, 38, 51, 64, 76, 102, 127, and 152 mm. We used 2-3 electrofishing boats to sample fish and set littoral gill and fyke nets. Each electrofishing boat set gill nets and fyke nets just prior to dusk, and retrieved the nets the following morning. Electrofishing boats traveled parallel to the shoreline at night and sampled for 600 consecutive seconds. To initiate fish galvanotaxis, we produced 1-2 amps by setting the voltage to low power, the frequency to 30 Hz DC and the range to 42-48% of duty cycle. Shocked fish were collected with dip nets and placed into a live well.

Hydroacoustic surveys.—We used an HTI model 241 echosounder with two 200 kHz transducers; a 15° split-beam transducer in vertical orientation and a 6° x 10° elliptical split-beam transducer in horizontal orientation. The transducers were clamped to a pole and mounted 1 m below the surface on the starboard side of 6.7 m vessel. Data were logged directly into a computer and unprocessed echoes were backed up using digital audiotapes. A pulse repetition rate of 8 pings per second was fast multiplexed between the transducers at a pulse width of 1.25 ms and a 10 kHz pulse width chirp. The horizontal transducer was offset by 7° and sampled fish targets from 1.5- to 8 m below the surface. Data within 16 m of the horizontal transducer was excluded from analysis due to the narrow beam width and potential boat avoidance by fish in the near field (Mous and Kemper 1996; Yule 2000). The vertical transducer data were analyzed from 8 m below the transducer (9 m subsurface) to within 1 m of the bottom of the reservoir.

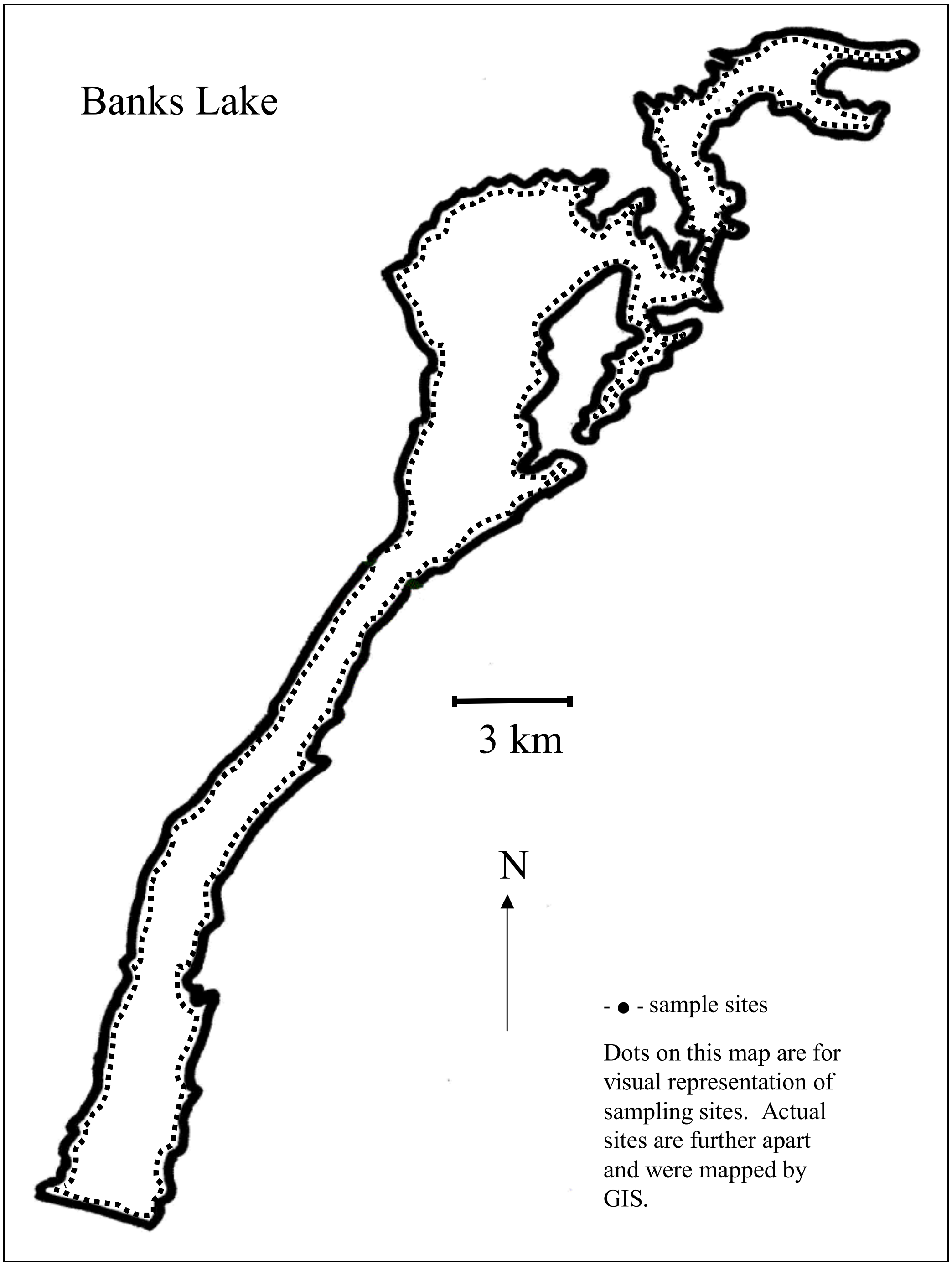

Figure 2. Map of Banks Lake showing sample sites for the nearshore fish surveys. Nearshore sampling sites began every 400 m and included islands not shown on this map.

Additionally, we had to correct our fish counts within each 2 m strata for the probability of detection of fish targets based on the diameter of the sound impulse cone and the fish velocity (boat speed).

Eighteen transects were conducted in an elongated zigzag pattern across the limnetic zone of Banks Lake on July 28, 2003 (Figure 3). The survey began one hour after sunset and each transect covered 1.4 to 3.7 km at a speed of approximately 8 km/hour, for a total survey distance of 51.4 km. A global positioning system (GPS) logged the latitude and longitude into the data files and transect distances were calculated using Terrain Navigator software version 4.05 (Maptech 1999).

A series of acoustic echoes were considered a fish if tracked for at least 3 consecutive pings, within 0.3 m/ping, a maximum velocity of 5 ms/ping, and a target strength between –55 and –28.8 dB. Target strengths were converted to fish lengths using a formula generated by Love (1971, 1977).

Density (fish/m^3) was calculated for each transect and transect densities were averaged together for a reservoir wide estimate of fish density. Mean fish density was then multiplied by reservoir volume to estimate abundance. Two standard errors were used to estimate the 95 % confidence interval of the acoustic abundance estimate. For each transect, individual tracked fish were verified as real within the post-processing software Echoscape 2.10 (HTI 2001). Raw fish counts were adjusted to the effective beam width within each 2 m depth strata by the equation:

$$F_1 = F_0 * [1-(EBW/NBW)]$$

where F_1 was the adjusted fish count, F_0 was the original fish count EBW was the effective beam width for that stratum and NBW was the nominal beam width for the transducer. Density was calculated by dividing the adjusted fish count by the total swept volume for the transect. Swept volume was calculated as the sum of the volumes for every 2 m depth strata for each transect, adjusted for bottom encroachment and multiplied by transect length. The volume of each strata was calculated by the equation:

$$Vs_1 = V_1 – V_2$$

where V_1 was the volume from the transducer to the bottom of the stratum and V_2 was the volume from the transducer to the top of the stratum and:

$$V = (½ * b * h * (l*e)$$

where e was the percent bottom encroachment (proportion of the transect where bottom depths were equal to or greater than the max depth of the stratum), l was the distance (m) of the transect, h was the distance (m) from the transducer to the end of the stratum, and b was the beam diameter calculated by:

$$b = 2 R \tan(NBW/2)$$

where R is the range (m) to the end of the stratum.

Species-specific abundance estimates were calculated by multiplying the species composition of various size classes by the acoustic abundance estimates for the corresponding sizes. We applied the length frequency from the vertical transducer to the horizontal data because fish target echoes in horizontal aspect do not relate to fish length as they do in vertical aspect (Kubecka 1994; Yule 2000). The assumption that fish species composition and size distribution was the same from 1.5- to 8 m (horizontal acoustics) and from 8- to 25 m was validated with netting data.

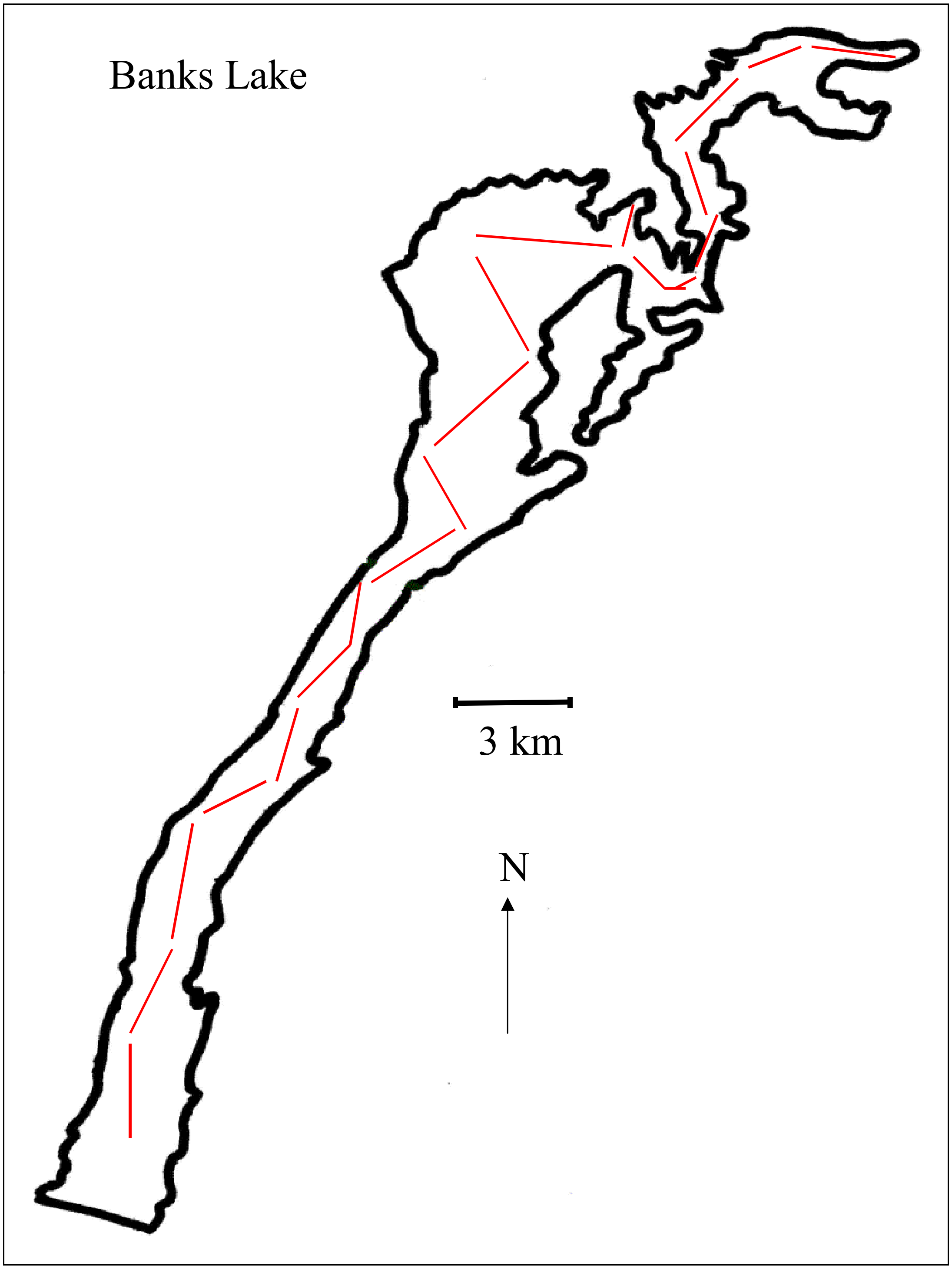

Figure 3. Map of Banks Lake, WA showing locations of hydroacoustic transects where data was collected in July of 2003. The southern most transect was not surveyed due to insufficient nighttime hours.

Limnetic gill netting surveys.--Limnetic gill net surveys were used to provide species verification, depth distributions, and length frequencies of acoustic targets larger than 200 mm. The night of the acoustic survey, and for 3 nights following the survey, 7-14 vertical gill nets and one floating and one sinking horizontal gill net were randomly placed in the limnetic zone of Banks Lake. The 14 vertical nets consisted of replicate samples of seven nets that are 2.6 m wide and 26.2 m deep, consisted of one mesh size throughout (25, 38, 51, 64, 76, 89, or 102 mm stretch). Horizontal nets were 2.6 m deep and 46 m long with seven panels (same mesh array as the verticals) that are 6.5 m long. Beginning May 2003 we began using floating and sinking gill nets that were 61 m long with mesh sizes of 25, 38, 51, 64, 76, 89, 102, 127, and 152 mm stretch.

We stratified Banks Lake into 3 strata, representing the different basin morphologies. Strata 1, 2, and 3 received 42%, 43%, and 15% of the limnetic nets, respectively. We covered 20% (51 of 252) of the potential limnetic sampling sites that were deep enough (at least 12 m) to sample. Maptech software was used to spatially segregate (~500 m diameter) the limnetic sampling sites by placing a point near the center of each quadrant of each section in their respective township and range. Additional points were added along the North, South, East, and West borders of each section, as well as the center point (Figure 4). This method provided uniform coverage, representative offshore sites throughout the lake, and a GPS point to navigate to for net deployment.

2.2.3 Fish Tagging and Marking

Future modeling studies will require an estimate of the abundance of piscivores to expand individual predator consumption to the entire population in order to determine the impact of predation on hatchery and wild salmonids. We used a mark-recapture population estimating technique to calculate the number of bass and walleye in Banks Lake. We used the Big Wally's Walleye Tournament (17-18 May 2003) and the Washington State BASS Federation's Bass Jamboree (24-25 May 2003) to maximize the number of fish for marking. Two, 2-person crews attempted to tag all fish that were returned to the tournament holding tanks. Each fish was measured in mm (TL) and an individually numbered 3 cm FLOY© T-bar anchor tag was inserted adjacent to the posterior end of the first dorsal fin. Due to the size of the tags, we only tagged bass that were larger than 200 mm total length. The recapture event took place during the reservoir-wide fish survey in May and June.

To evaluate acute tagging induced mortality and tag loss, we held 60 walleye in net pens for 72 hours following capture by anglers during the walleye tournament. The walleye were separated into two net pens, with one group (30 walleye) handled and tagged (treatment group) and one group (30 walleye) not handled and not tagged (control group). Water temperatures and dissolved oxygen measurements were recorded at three depths (surface, 3 m and bottom) both inside and outside of the net pens one day prior to the study and each day that walleye were held. Non-tagged walleye were measured and tagged prior to release at the end of the study. A Chi-square test was used to test for a significant difference (at α=0.05) between the two walleye groups.

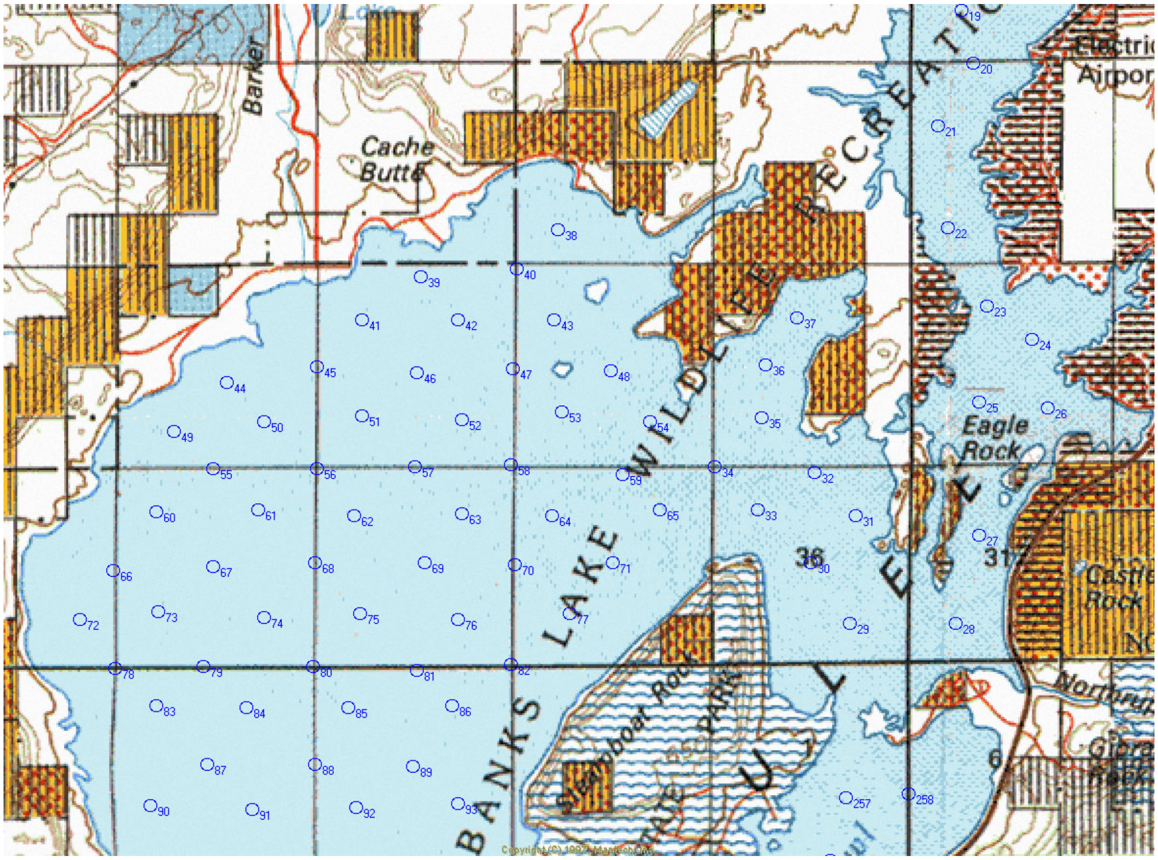

Figure 4. Partial map of Banks Lake showing the layout of limnetic sampling sites. Approximately 20% of the sites were randomly selected and surveyed with vertical and horizontal gill nets.

Hatchery kokanee were oxytetracycaline (OTC) marked, thermal marked and fin clipped to evaluate the success of different stocking and rearing strategies, and to distinguish hatchery kokanee from wild kokanee. All fry were thermal marked at the WDFW Spokane Hatchery as eggs, and the band sequence on the otolith distinguished fish as "spring or fall released." The otoliths or vertebrae from all kokanee captured in the creel and fish sampling will be examined for the OTC and thermal marks.

2.2.4 Creel Survey

The creel study design was based on standard protocols from Malvestuto (1983) and Pollock et al. (1994). A non-uniform probability sampling design rove/access creel survey was used to estimate total fishing pressure, catch-per-unit-effort (CPUE), harvest-per-unit-effort (HPUE), and total catch and harvest of fish from Banks Lake. Ten permanent creeling stations were potentially surveyed from September 2002 through August 2003. The creeling stations were established by including all major boat ramps, and were named as follows (north to south orientation): 1) Coulee Playland Resort, 2) Sun Banks Resort, 3) Osborne Bay Park, 4) Jones Bay, 5) Northrup, 6) Steamboat Rock State Park, 7) Paynes Gulch, 8) the Pass, 9) Coulee City Park, and 10) Dry Falls Junction (Figure 5). Creel survey days were randomly chosen from a set number of weekdays and weekend/holidays each month, which varied depending on season. Each survey lasted 8 hours and consisted of a rove (generally 2 hours) and two access site visits (generally 3 hours each).

Rove surveys were used to estimate the total fishing pressure, while access site visits provided information on catch and harvest rates. During the rove surveys, each station was visited to count the total number of boat trailers and shore anglers and to interview anglers for catch information. The start time of the rove survey was randomly selected (the beginning vs. end of the 8 hour creel survey). The access surveys were conducted at 2 randomly selected stations per creel day, and were designed to collect completed trip information from anglers as they left the lake. Creel clerks asked anglers for information regarding party size, recreational activity, if their trip was completed, start and end times of activity, species targeted, species-specific catch and harvest, satisfaction with the fishing experience, and city from which they live. Access site randomization was based on the proportional use of each boat ramp for that month from the previous year. The creel survey start time was randomly selected with equal probability and based on 8 hours after sunrise or 8 hours prior to sunset.

Aerial flights were conducted during one weekday and one weekend day from May to August to establish a correction factor for the total angling effort (pressure) between fishing and recreation boats. The airplane traveled north along the east shoreline and south along the west shoreline, while a creel clerk recorded the total number of boat trailers at the access creel stations and the number of fishing boats, non-fishing boats, and shore anglers on and around the lake. To eliminate duplicate counts, the creel clerk counted boats from the center of the lake to either side of the shore, dependent on the direction of travel. A creel clerk simultaneously conducted a standard creel survey from the ground.

Creel Data Analysis

Monthly estimates of catch and harvest were stratified by weekend days vs. weekdays, and boat anglers vs. shore anglers. Values were then combined to determine monthly and annual totals. The following equations were modified from Cichosz et al. (1997), McLellan (2000), Pollock et al. (1994), and Malvestuto (1983) to estimate catch/harvest rates and total harvest.

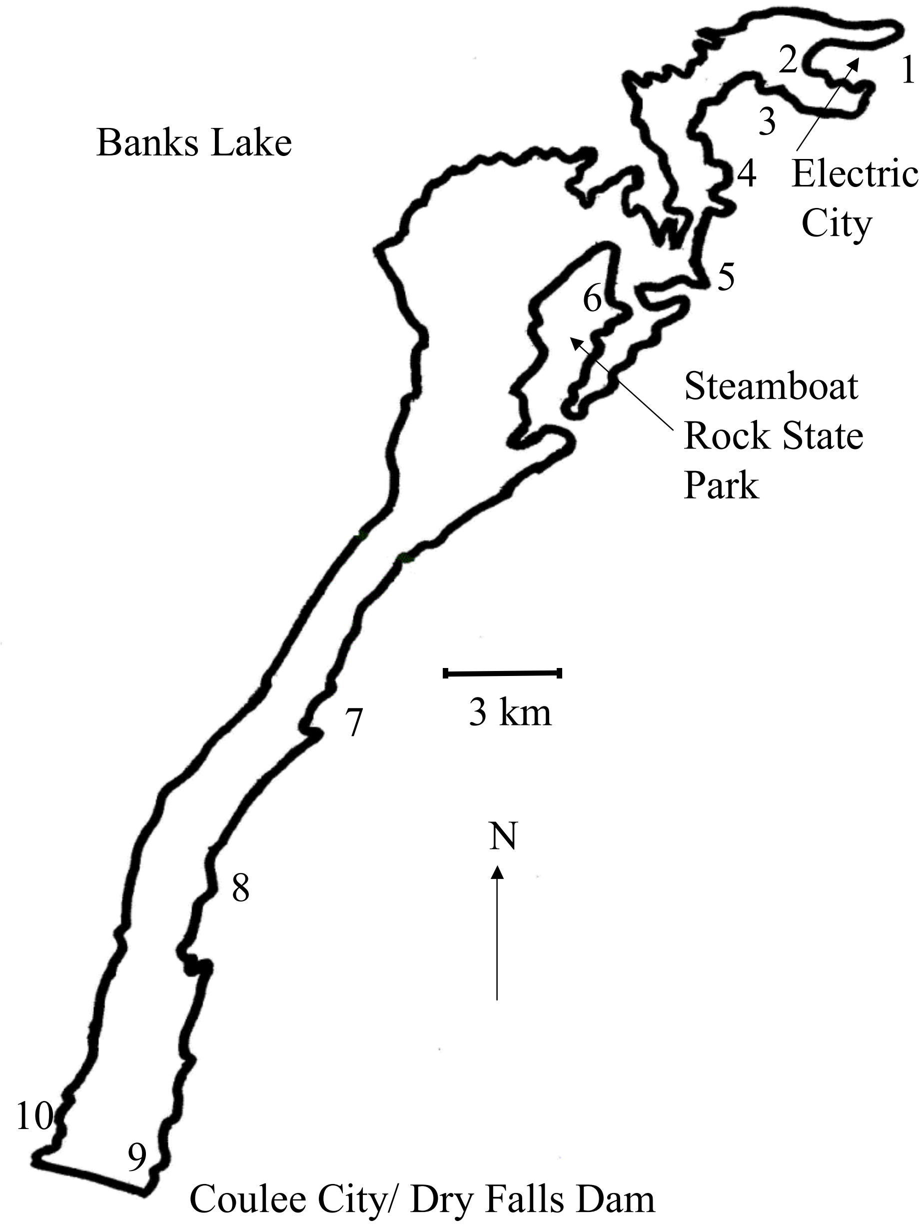

Figure 5. Creel sites on Banks Lake, Washington. 1) Coulee Playland, 2) Sun Banks Resort, 3) Osborn Bay, 4) Jones Bay, 5) Northrup, 6) Steamboat Rock State Park, 7) Paynes Gulch, 8) the Pass, 9) Coulee City Park, and 10) Dry Falls.

Mean number of anglers per day of fishing was estimated:

$$X_b = (A_d)(B_f)$$

Where:

X_b = the mean number of anglers per boat per day for each stratum,
A_d = mean number of anglers per boat for each stratum per month, and
B_f = mean number of boats fishing for each stratum per month.

Number of hours available for fishing (sunrise to sunset) was estimated:

$$N_s = (D_s)(H_d)$$

Where:

N_s = number of hours per weekend or weekday per month,
D_s = number of days per month (weekday or weekend), and
H_d = average number of hours per day for each stratum per month.

The number of hours sampled for each stratum per month was estimated:

$$n = \sum_{i=1}^{Ds} (H_{ci})$$

Where:

n = the total number of hours sampled for each stratum per month,
D_s = the number of days per month within each stratum per month, and
H_{ci} = mean number of hours creeled per day for each stratum per month.

The number of shore anglers per day for each stratum per month was estimated:

$$X_a = \sum_{i=1}^{Pd} S_{pi}$$

Where:

X_a = the mean number of shore anglers per day for each stratum per month from rove surveys,
P_d = the number of rove surveys conducted for each stratum per month, and
S_{pi} = the total number of shore anglers counted during rove surveys for each stratum per month.

The mean number of anglers ($boat_b$ or $shore_a$) for each stratum per month was estimated:

$$X_s = (X_{a,b})(D_s)$$

Where:

X_s = the mean number of anglers for each stratum per month,

$X_{a,b}$ = mean number of anglers for each stratum per day,
D_s = number of days per month.

The standard deviation of angler hours (boat or shore) for each stratum per month was estimated:

$$S_s = (S_d)(D_s)$$

Where:

S_s = the standard deviation of mean number of angler hours for each stratum per month,
S_d = the standard deviation of mean trip length per day for each stratum per month,
D_s = the number of days per month for each stratum per month.

The mean trip length for each stratum per month was estimated:

$$H_a = [T_h / (A_i * P_i)]$$

Where:

H_a = the mean trip length for each stratum per month,
T_h = the total hours spent fishing for each stratum per month,
A_i = the total number of parties interviewed for each stratum per month, and
P_i = the mean party size for each stratum per month.

Total angler pressure for each stratum per month was estimated:

$$PE_t = (N_s / n)(X_s)(H_a)$$

Where:

PE_t = the total pressure estimate for each stratum per month,
N_s = the number of hours for each stratum per month,
n = the number of hours sampled for each stratum per month,
X_s = the mean number of anglers for each stratum per month, and
H_a = the mean trip length for each stratum per month.

The species-specific pressure was calculated:

$$PE_{ss} = PE_t * \left(\sum spp_i / \sum spp_t \right)$$

Where:

PE_{ss} = the species specific pressure estimate for each stratum per month
PE_t = the total pressure estimate for each stratum per month,
spp_i = the total number of anglers who targeted a specific fish species for each stratum per month,
spp_t = the total number of anglers who targeted a specific fish species for each stratum per month

The variance of the pressure estimate for each stratum per month was calculated:

$$VPE_{ss} = (N_s / n)(S_s^2)$$

Where:

VPE_{ss} = the variance of the pressure estimate for each stratum per month,
N_s = the number of hours for each stratum per month,
n = the number of hours sampled for each stratum per month, and
S_s = the standard deviation of the mean number of angler hours for each stratum per month.

The ninety-five percent confidence intervals for each stratum per month were calculated:

$$C.I. = PE_{ss} \pm (\sqrt{VPE_s} * 1.96)$$

Where:

$C.I.$ = 95% confidence intervals for each stratum per month,
PE_{ss} = pressure estimate for each stratum per month, and
VPE_s = variance of the pressure estimate for each stratum per month.

Both complete and incomplete trips were used to calculate CPUE for each fish species for each stratum per month. CPUE was calculated from all caught fish, whereas HPUE was calculated only from fish that were kept by anglers.

$$CPUE = \frac{F_{c+h}}{T_h} \text{ and } HPUE = \frac{F_h}{T_h}$$

Where:

$CPUE$ = catch-per-unit-effort of a particular fish species for each stratum per month,
$HPUE$ = harvest-per-unit-effort of a particular fish species for each stratum per month,
F_{c+h} = the number of fish captured (includes harvest) for each stratum per month,
F_h = the number of fish harvested per each stratum per month, and
T_h = the total hours spent fishing for each stratum per month.

Harvest of each fish species for each stratum per month was calculated:

$$H_s = (HPUE)(PE_{ss})$$

Where:

H_s = harvest of a particular species of fish for each stratum per month,
$HPUE$ = the number of fish harvested of a particular fish species for each stratum per month, and
PE_{ss} = species specific pressure estimate for each stratum per month.

The total economic value of the fishery was estimated:

$$EV = \frac{PE_t}{H_a} * (\$)$$

Where:

- EV = the total economic value,
- PE_t = the total pressure estimate for each stratum per month,
- H_a = the mean angler trip length for each stratum per month, and
- $ = average dollar amount spent per angler trip.

Data compiled by the U.S. Fish and Wildlife Service in 1996 (USDI 1996) determined that the average inland Washington angler spent $25.00 per angling trip. This value was multiplied by the inflation rate from 1996 to 2003 (1.17) to determine the current dollar amount spent per angler trip (U.S. Department of Labor 2003).

2.3 Results

2.3.1 Limnology

Water Quality.—Banks Lake water temperatures began to increase in April, stratification was apparent by June at all 3 limnology collection sites (Figures 6). By late August the thermocline had dropped to nearly 20 m deep, with 19-20 °C temperatures throughout the epilimnion and very little thermal refuge for kokanee (Figure 6). Dissolved oxygen levels were generally above 10 mg/L until mid summer when dissolved oxygen dropped near or below 5 mg/L below 20 m deep; a critical level for fish survival and growth. Secchi depths ranged from 2.5-8.0 m and varied by location and date (Figure 7). All water quality parameters results can be seen in Appendix A.

Primary and Secondary Productivity.—Three replicate samples were collected at three limnology sites on 10, 24 September, 16 October, 20 November, 17 December, 13 January, 18 February, 13, 18 March, 23 April, 6, 20 May, 4, 18 June, and 2, 16, 31 July. Zooplankton, phytoplankton and periphyton biovolume data were not available from the contracted limnology laboratory at the time of this report.

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2.3.2 Fish Surveys

Littoral zone.—In October (Fall survey), 49 sites were electrofished for a combined total of 29,430 seconds (8.18 hrs), 48 sites were gill netted and 16 sites were sampled with fyke nets. In all, 113 of 464 sites were surveyed for 24% shoreline coverage. A total of 4,449 fish were collected during the littoral surveys (Table 1). Electrofishing, gill nets, and fyke nets accounted for 2,384, 1,759, and 306 fish, respectively. Catch rates were highest for electrofishing (291.6 fish/hour), intermediate for gill nets (36.6 fish/night), and lowest in fyke nets (19.1fish/net night) (Table 2).

In May, 48 sites were electrofished for a combined total of 28,871 seconds (8.02 hrs), 23 sites were gill netted and 16 sites were sampled with fyke nets. In all, 87 of 464 sites were surveyed for 19% shoreline coverage. A total of 1,366 fish were collected during the littoral surveys (Table 3). Electrofishing, gill nets, and fyke nets accounted for 936, 402, and 28 fish, respectively. Catch rates were highest for electrofishing (116.71 fish/hour), intermediate for gill nets (17.48 fish/night), and lowest for fyke nets (1.75 fish/net night) (Table 2).

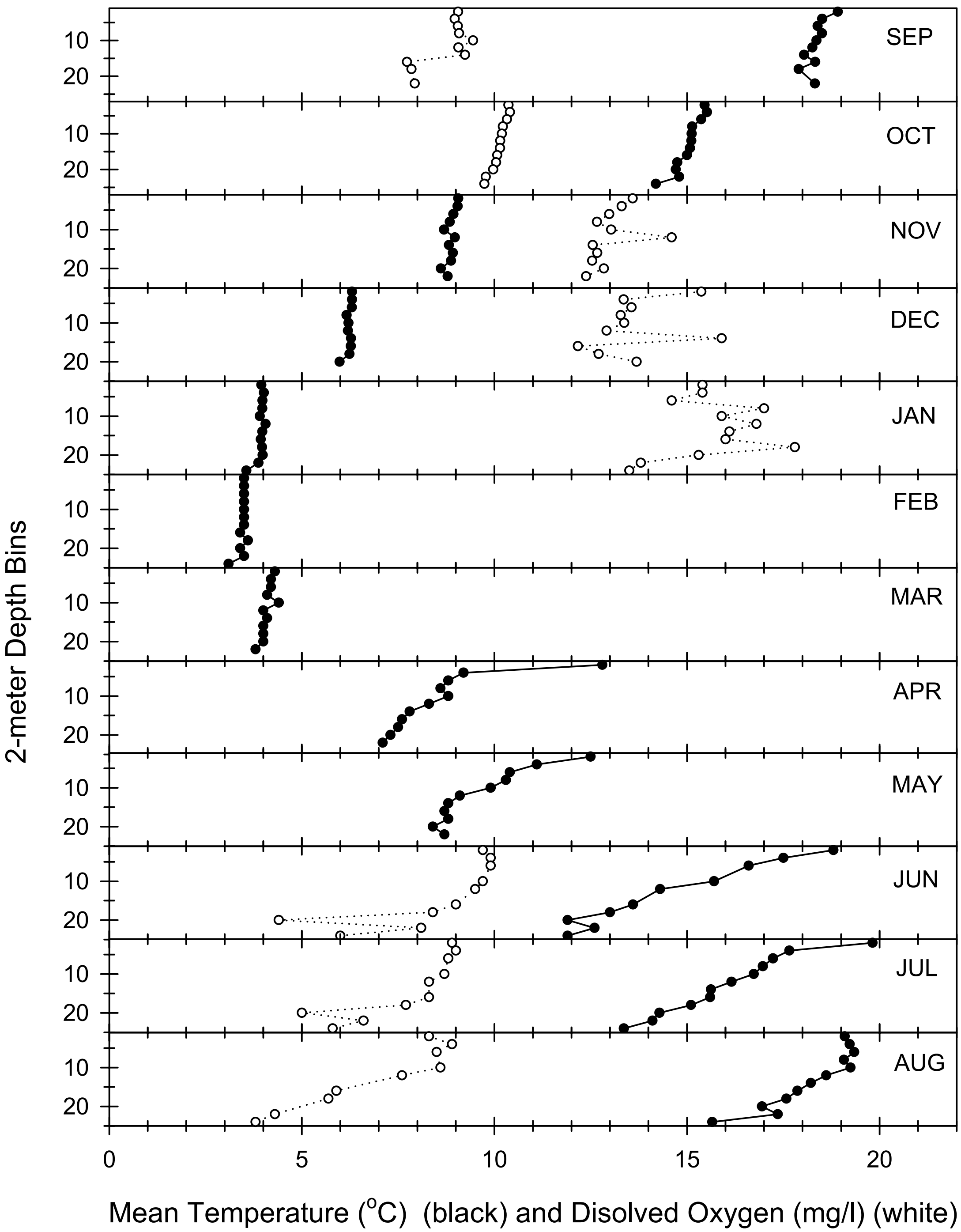

Figure 6. Mean monthly water temperatures (degrees celcius) and dissolved oxygen (mg/L) profiles from September 2002 through August 2003 for Banks Lake, WA.

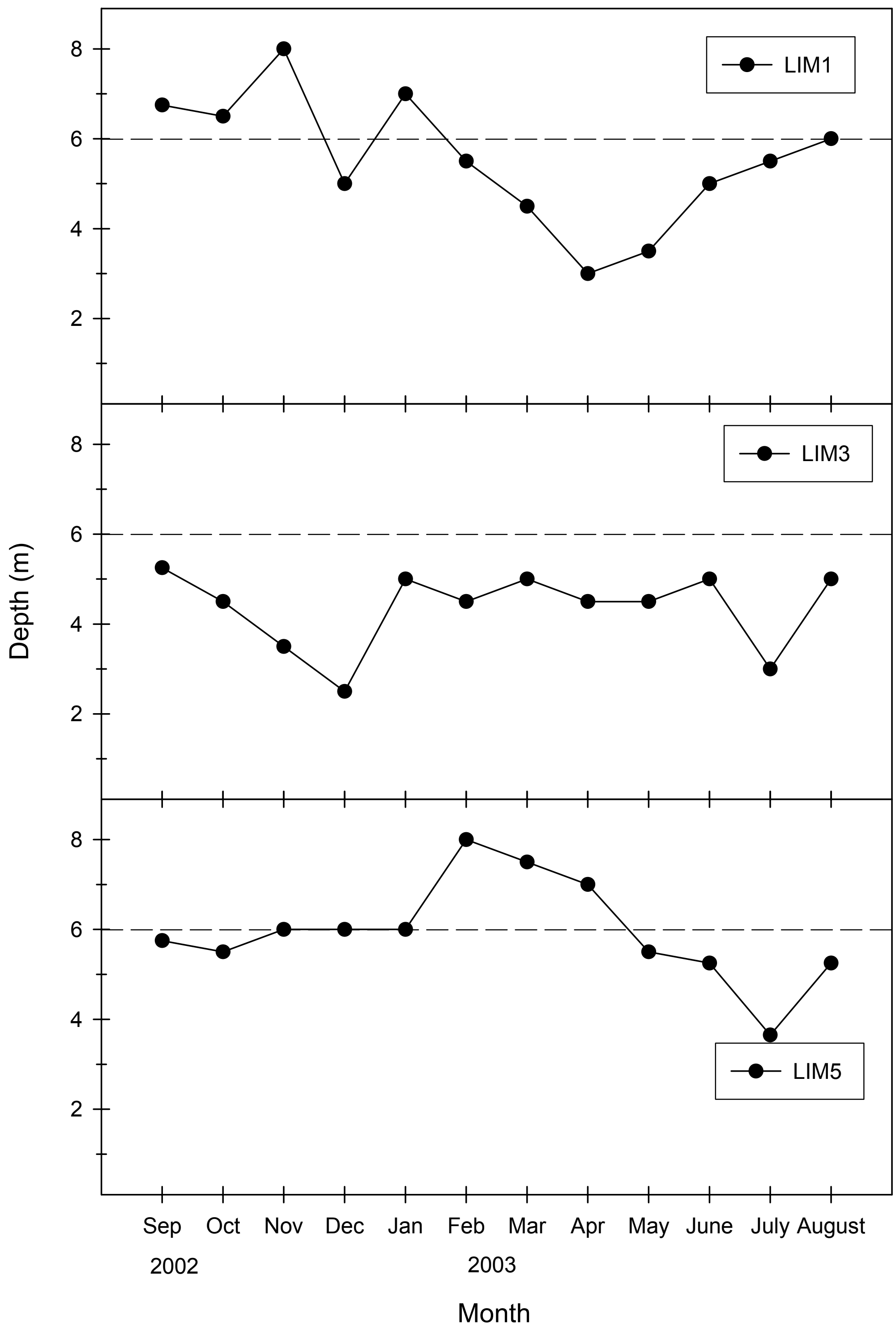

Figure 7. Mean monthly secchi disk depths (m) at each water quality site on Banks Lake from September, 2002 to August 2003. LIM1 was in the northern basin, LIM3 was in the basin west of Steamboat Rock, and LIM5 was in the southern arm near the Million Dollar Mile.

Table 1. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in littoral gill nets, fyke nets and boat electrofishing surveys in October 2002 on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	262	0.059	8	323
Bluegill	0	0.000	-	-
Bullhead spp.	77	0.017	52	324
Bridgelip Sucker	10	0.002	117	240
Burbot	5	0.001	512	682
Carp	154	0.035	78	683
Cottid spp.	960	0.216	36	210
Kokanee	90	0.020	95	490
Largemouth Bass	69	0.016	40	457
Longnose Sucker	4	0.001	241	496
Largescale Sucker	7	0.002	117	470
Peamouth	0	0.000	-	-
Pumpkinseed	30	0.007	69	153
Rainbow Trout	86	0.019	120	526
Smallmouth Bass	719	0.162	40	483
Tench	2	0.000	333	379
Walleye	99	0.022	133	683
Whitefish spp.	463	0.104	45	581
Yellow Perch	1412	0.317	51	332
Total	4449	1.000	-	-

Table 2. Catch-per-unit of effort by species for all littoral gear types for October 2002, May 2003 and July 2003 on Banks Lake, WA.

	Electrofishing Fish/hour			Fyke Nets Fish/net night			Littoral Gill Nets Fish/net night		
Species	Oct-02	May-03	Jul-03	Oct-02	May-03	Jul-03	Oct-02	May-03	Jul-03
Black Crappie	2.2	0.5	0.1	12.4	0.2	0.1	1.0	0.0	0.0
Bluegill	0.0	0.0	0.2	0.0	0.0	0.6	0.0	0.0	0.0
Bullhead spp.	1.8	4.2	7.9	0.4	0.8	0.4	1.2	0.4	0.5
Bridgelip Sucker	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Burbot	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0
Carp	6.6	10.8	9.6	0.1	0.1	0.0	2.1	1.2	3.5
Cottid spp.	116.8	24.3	36.8	0.3	0.1	0.1	0.0	0.0	0.0
Kokanee	0.4	0.1	0.0	0.1	0.0	0.0	1.8	0.1	0.1
Largemouth Bass	4.3	1.2	3.0	0.6	0.0	0.6	0.5	0.0	0.4
Longnose Sucker	0.0	0.4	0.0	0.0	0.2	0.0	0.1	0.0	0.0
Largescale Sucker	0.1	0.1	0.0	0.3	0.3	0.1	0.0	0.4	0.0
Peamouth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pumpkinseed	0.4	0.0	0.4	1.2	0.0	0.6	0.2	0.0	0.1
Rainbow Trout	2.7	6.5	0.0	0.0	0.1	0.0	1.3	0.4	1.0
Smallmouth Bass	57.2	49.1	33.1	0.1	0.1	0.0	5.2	2.9	5.2
Tench	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Walleye	0.5	2.1	2.9	0.0	0.0	0.3	2.0	2.7	4.4
Whitefish spp.	0.5	0.1	0.0	0.0	0.0	0.0	9.6	8.0	2.4
Yellow Perch	96.8	16.7	19.6	3.8	0.0	1.0	11.7	1.0	7.6
Total	291.6	116.7	114.0	19.1	1.8	3.9	36.6	17.5	25.5

Table 3. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in littoral gill nets, fyke nets and boat electrofishing surveys in May 2003, on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	7	0.005	81	206
Bluegill	0	0.000	-	-
Bullhead spp.	56	0.041	144	340
Bridgelip Sucker	3	0.002	181	445
Burbot	2	0.001	180	649
Carp	116	0.085	441	730
Cottid spp.	197	0.144	45	168
Kokanee	3	0.002	147	200
Largemouth Bass	10	0.007	341	440
Longnose Sucker	7	0.005	398	461
Largescale Sucker	15	0.011	366	635
Peamouth	1	0.001	349	349
Pumpkinseed	1	0.001	101	101
Rainbow Trout	63	0.046	98	442
Smallmouth Bass	462	0.338	46	680
Tench	1	0.001	430	430
Walleye	80	0.059	202	783
Whitefish spp.	184	0.135	85	709
Yellow Perch	158	0.116	17	348
Total	1366	1.000	-	-

In July, 48 sites were electrofished for a combined total of 29,556 seconds (8.21 hrs), 24 sites were gill netted and 16 sites were sampled with fyke nets. In all, 88 of 464 sites were surveyed for 19% shoreline coverage. A total of 1,610 fish were collected during the littoral surveys (Table 4). Electrofishing, gill nets, and fyke nets accounted for 936, 611, and 63 fish, respectively. Catch rates were highest for electrofishing (114.0 fish/hour), intermediate for gill nets (25.5 fish/night), and lowest in fyke nets (3.9 fish/net night) (Table 2).

Hydroacoustic surveys.—Results for the July survey were not available at the time of this report, but 18 transects were surveyed on 28 July 2003. A complete analysis of the survey will be completed during subsequent contracting periods.

Limnetic gill netting surveys.—In October 2002, 48 limnetic sites were sampled with a combination of vertical and horizontal gill nets. Our goal of 51 net sets was not accomplished due to inclement weather and associated safety hazards. Limnetic nets caught 144 fish during three nights. Vertical gill nets accounted for 30% of the total catch, primarily catching whitefish (86%). The floating horizontal net caught whitefish (85%), rainbow trout (12%), and kokanee (3%) and the sinking horizontal caught several species including whitefish (69%), yellow perch (12%), smallmouth bass (9%), and walleye (7%) (Table 5). A total of 5 kokanee were captured during the limnetic survey. The kokanee average 127 mm (± 10 SD), possibly belonging to the 2002 Spring plants. Catch rates were the highest in the sinking gill net (22.7 fish/net night) and lowest in the vertical gill nets (1.3 fish/net night)(Table 6).

In May 2003, 50 limnetic sites were sampled with a combination of vertical and horizontal gill nets. Limnetic nets caught 188 fish; however 81% were whitefish (n = 152) (Table 7). Five kokanee were captured in May, representing 2.7% of the total catch (Table 7). Catch rates were the highest for the sinking horizontal gill net (14.9 fish/net night) and lowest in the vertical gill nets (1.22 fish/net night)(Table 6).

In July 2003, 48 limnetic sites were sampled in the limnetic zone of Banks Lake. Limnetic nets caught a total of 128 fish, of which 117 were whitefish (83.6%). Kokanee comprised 7.8% of the total limnetic catch (Table 8). The sinking horizontal net had the highest catch rate (9.83 fish/net night), while the vertical gill nets had the lowest (1.64 fish/net night) (Table 6).

Aging structures, tissue samples, and stomach contents were taken from various fish during the three sample periods as shown in Tables 9 and 10. The WDFW fish scale and otolith laboratory was not able to analyze all of the samples in time for this report. All of the spring (n = 331), summer (n = 291), and fall (n = 417) 2002 stomach samples and a portion of the spring 2003 samples (110) have been analyzed in the laboratory for the proportional contribution of various prey taxon. The diet of juvenile fishes in Banks Lake contained primarily zooplankton and insects. Insects dominated the diet of rainbow trout, while whitefish consumed *Daphnia spp.* more frequently than any other prey type. The diet of adult smallmouth bass contained primarily cottids and insects. Adult walleye diets were comprised of 86%, 95%, and 100% prey fish in the spring, summer, and fall, respectively. The dominant prey fish in the diets of walleye were cottids in the spring and summer and yellow perch in the fall (Table 11).

Future technical reports will include complete analysis of age, growth, relative weight, diet, isotope food web structure, and fish bioenergetics.

Table 4. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in littoral gill nets, fyke nets and boat electrofishing surveys in July 2003, on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	7	0.005	81	206
Bluegill	0	0.000	-	-
Bullhead spp.	56	0.041	144	340
Bridgelip Sucker	3	0.002	181	445
Burbot	2	0.001	180	649
Carp	116	0.085	441	730
Cottid spp.	197	0.144	45	168
Kokanee	3	0.002	147	200
Largemouth Bass	10	0.007	341	440
Longnose Sucker	7	0.005	398	461
Largescale Sucker	15	0.011	366	635
Peamouth	1	0.001	349	349
Pumpkinseed	1	0.001	101	101
Rainbow Trout	63	0.046	98	442
Smallmouth Bass	462	0.338	46	680
Tench	1	0.001	430	430
Walleye	80	0.059	202	783
Whitefish spp.	184	0.135	85	709
Yellow Perch	158	0.116	17	348
Total	1366	1.000	-	-

Table 5. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in limnetic gill nets in October 2002, on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	0	0.000	-	-
Bluegill	0	0.000	-	-
Bullhead spp.	0	0.000	-	-
Bridgelip Sucker	0	0.000	-	-
Burbot	0	0.000	-	-
Carp	1	0.007	537	537
Cottid spp.	0	0.000	-	-
Kokanee	6	0.042	120	145
Largemouth Bass	0	0.000	-	-
Longnose Sucker	0	0.000	-	-
Largescale Sucker	0	0.000	-	-
Peamouth	0	0.000	-	-
Pumpkinseed	0	0.000	-	-
Rainbow Trout	4	0.028	-	-
Smallmouth Bass	6	0.042	360	396
Tench	0	0.000	-	-
Walleye	7	0.049	202	558
Whitefish spp.	112	0.778	374	535
Yellow Perch	8	0.056	100	180
Total	144	1.000	-	-

Table 6. Catch-per-unit of effort by species for all limnetic gill nets for October 2002, May 2003 and July 2003 on Banks Lake, WA.

	Floating Horizontzal Fish/net night			Sinking Horizontal Fish/net night			Vertical Fish/net night		
Species	Oct-02	May-03	Jul-03	Oct-02	May-03	Jul-03	Oct-02	May-03	Jul-03
Black Crappie	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Bluegill	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Bullhead spp.	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Bridgelip Sucker	0.00	0.00	0.00	0.00	0.56	0.0	0.00	0.00	0.0
Burbot	0.00	0.00	0.00	0.00	0.22	0.0	0.00	0.00	0.0
Carp	0.00	0.00	0.00	0.33	0.11	0.5	0.00	0.00	0.0
Cottid spp.	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Kokanee	0.33	0.67	0.33	0.33	0.22	0.2	0.13	0.03	0.2
Largemouth Bass	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Longnose Sucker	0.00	0.00	0.00	0.00	0.11	0.2	0.00	0.00	0.0
Largescale Sucker	0.00	0.00	0.00	0.00	0.22	0.2	0.00	0.00	0.0
Peamouth	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Pumpkinseed	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Rainbow Trout	1.33	1.67	0.00	0.00	0.00	0.2	0.00	0.13	0.1
Smallmouth Bass	0.00	0.00	0.00	2.00	0.00	0.0	0.00	0.00	0.0
Tench	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Walleye	0.00	0.33	0.00	1.67	0.33	0.2	0.06	0.13	0.1
Whitefish spp.	9.33	2.33	1.33	15.67	12.78	8.5	1.16	0.94	1.3
Yellow Perch	0.00	0.00	0.00	2.67	0.33	0.0	0.00	0.00	0.0
Total	11.00	5.00	1.7	22.67	14.89	9.8	1.34	1.22	1.6

Table 7. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in all limnetic gill nets in May, 2003, on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	0	0.000	-	-
Bluegill	0	0.000	-	-
Bullhead spp.	0	0.000	-	-
Bridgelip Sucker	5	0.027	324	461
Burbot	2	0.011	577	695
Carp	1	0.005	496	496
Cottid spp.	0	0.000	-	-
Kokanee	5	0.027	181	212
Largemouth Bass	0	0.000	-	-
Longnose Sucker	1	0.005	-	-
Largescale Sucker	2	0.011	356	448
Peamouth	0	0.000	-	-
Pumpkinseed	0	0.000	-	-
Rainbow Trout	9	0.048	209	469
Smallmouth Bass	0	0.000	-	-
Tench	0	0.000	-	-
Walleye	8	0.043	244	553
Whitefish spp.	152	0.809	189	585
Yellow Perch	3	0.016	104	321
Total	188	1.000	-	-

Table 8. Number of fish collected, species composition (%n) and the minimum and maximum lengths of fish captured in all limnetic gill nets in July 2003, on Banks Lake, WA.

			Length (mm)	
Species	Number	% n	Minimum	Maximum
Black Crappie	0	0.000	-	-
Bluegill	0	0.000	-	-
Bullhead spp.	0	0.000	-	-
Bridgelip Sucker	5	0.027	-	-
Burbot	2	0.011	-	-
Carp	1	0.005	537	575
Cottid spp.	0	0.000	-	-
Kokanee	5	0.027	104	385
Largemouth Bass	0	0.000	-	-
Longnose Sucker	1	0.005	-	-
Largescale Sucker	2	0.011	-	-
Peamouth	0	0.000	-	-
Pumpkinseed	0	0.000	-	-
Rainbow Trout	9	0.048	293	439
Smallmouth Bass	0	0.000	-	-
Tench	0	0.000	-	-
Walleye	8	0.043	419	598
Whitefish spp.	152	0.809	125	800
Yellow Perch	3	0.016	-	-
Total	188	1.000	-	-

Table 9. Number of scale and Otolith samples collected by species for the Fall 2002, Spring 2003 and 2003 surveys at Banks Lake, WA.

	Fall 2002				Spring 2003				Summer 2003			
Species	Otolith	Scale	Diet	Isotope	Otolith	Scale	Diet	Isotope	Otolith	Scale	Diet	Isotope
Black Crappie	16	25	42	25	2	2	1	3	2	2	3	3
Bluegill	0	0	0	0	0	0	0	0	1	1	6	8
Bullhead spp.	0	0	0	28	0	0	8	10	0	0	2	25
Bridgelip Sucker	0	0	0	2	0	6	0	2	0	0	0	0
Burbot	3	0	4	3	3	0	3	1	2	0	3	3
Carp	0	0	0	12	2	3	0	13	0	0	0	19
Cottid spp.	0	0	0	4	0	0	0	18	0	0	1	11
Kokanee	58	0	14	19	3	5	6	5	0	11	11	11
Largemouth Bass	12	40	40	26	0	8	8	1	10	16	23	17
Longnose Sucker	0	2	0	1	0	0	0	0	0	0	0	0
Largescale Sucker	0	5	0	1	0	0	0	0	0	0	0	2
Peamouth	0	0	0	0	0	0	0	1	0	0	0	0
Pumpkinseed	5	10	9	11	1	1	0	1	11	11	11	13
Rainbow Trout	40	62	56	23	14	37	47	28	17	26	26	25
Smallmouth Bass	75	156	148	56	47	248	225	53	95	34	137	78
Tench	0	0	0	2	0	0	0	0	0	0	0	0
Walleye	4	102	87	66	67	85	58	54	99	102	100	78
Whitefish spp.	95	98	58	41	109	112	105	116	31	31	84	59
Yellow Perch	41	95	84	33	14	51	24	22	93	72	79	72
Total	349	595	542	353	262	558	485	328	361	306	486	424

Table 10. Number of stomach samples analyzed by species for the Spring, Summer and Fall 2002, and Spring and Summer, 2003 surveys at Banks Lake, WA.

Species	Spring 2002	Summer 2002	Fall 2002	Spring 2003	Summer 2003
Black Crappie	0	3	37	0	0
Burbot	5	3	4	1	0
Kokanee	1	13	15	0	0
Largemouth Bass	9	6	38	5	0
Pumpkinseed	0	1	10	0	0
Rainbow Trout	30	34	26	20	0
Smallmouth Bass	169	116	106	39	0
Walleye	30	40	72	16	0
Whitefish	60	45	38	28	0
Yellow Perch	27	29	71	1	0
Total	331	290	417	110	0

Table 11. Proportion of prey items found in the diets of rainbow trout (RBT), largemouth bass (LMB), smallmouth bass (SMB), walleye (WAL), yellow perch (YP), and whitefish (WTF) in the fall 2002 and spring and summer 2003 on Banks Lake, WA. The zooplankton prey category includes all zooplankton except *Daphnia spp.* The osteicthyes prey category includes all prey fish that were unidentifiable. The dominant prey categories for each species are highlighted.

		FISH SPECIES									
	Prey Category	RBT ALL	LMB JUV	LMB ADULT	SMB JUV	SMB ADULT	WAL JUV	WAL ADULT	YP JUV	YP ADULT	WTF ALL
Fall	Daphnia	0.234	0.992	0.390	0.495	0.119	0.500	0.000	0.992	0.390	0.919
	Zooplankton	0.074	0.006	0.033	0.006	0.075	0.000	0.000	0.006	0.033	0.002
	Insect	0.607	0.002	0.098	0.430	0.354	0.000	0.000	0.002	0.098	0.023
	Snail	0.000	0.000	0.027	0.000	0.003	0.000	0.000	0.000	0.027	0.056
	Crayfish	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000
	Segmented Worm	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Cottidae	0.000	0.000	0.032	0.034	0.183	0.500	0.130	0.000	0.032	0.000
	Catastomidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Cyprinidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Centrarchidae	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000
	Percidae	0.000	0.000	0.290	0.034	0.096	0.000	0.551	0.000	0.290	0.000
	Salmonidae	0.009	0.000	0.000	0.000	0.000	0.000	0.041	0.000	0.000	0.000
	Ictaluridae	0.000	0.000	0.000	0.000	0.019	0.000	0.020	0.000	0.000	0.000
	Osteicthyes	0.076	0.000	0.129	0.001	0.072	0.000	0.258	0.000	0.129	0.000
Spring	Daphnia	0.192	0.447	0.000	0.095	0.009	1.000	0.000	0.447	0.000	0.663
	Zooplankton	0.032	0.036	0.018	0.576	0.119	0.000	0.000	0.036	0.018	0.004
	Insect	0.763	0.199	0.290	0.299	0.372	0.000	0.142	0.199	0.290	0.322
	Snail	0.000	0.000	0.362	0.000	0.000	0.000	0.000	0.000	0.362	0.012
	Crayfish	0.000	0.000	0.057	0.000	0.041	0.000	0.000	0.000	0.057	0.000
	Segmented Worm	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Cottidae	0.000	0.193	0.274	0.030	0.338	0.000	0.286	0.193	0.274	0.000
	Catastomidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Cyprinidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Centrarchidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Percidae	0.000	0.000	0.000	0.000	0.015	0.000	0.071	0.000	0.000	0.000
	Salmonidae	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000
	Ictaluridae	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	Osteicthyes	0.013	0.125	0.000	0.000	0.103	0.000	0.429	0.125	0.000	0.000
Summer	Daphnia	0.263	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.536
	Zooplankton	0.228	0.000	0.110	0.000	0.012	0.000	0.000	0.000	0.110	0.093
	Insect	0.451	0.750	0.446	0.672	0.285	0.000	0.050	0.750	0.446	0.098
	Snail	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Crayfish	0.000	0.000	0.111	0.000	0.011	0.000	0.000	0.000	0.111	0.000
	Segmented Worm	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
	Cottidae	0.056	0.250	0.111	0.328	0.558	0.000	0.681	0.250	0.111	0.182
	Catastomidae	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	Cyprinidae	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
	Centrarchidae	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Percidae	0.000	0.000	0.111	0.000	0.051	0.000	0.219	0.000	0.111	0.000
	Salmonidae	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000

Table 11: *cont.*

	FISH SPECIES									
Prey Category	RBT ALL	LMB JUV	LMB ADULT	SMB JUV	SMB ADULT	WAL JUV	WAL ADULT	YP JUV	YP ADULT	WTF ALL
Ictaluridae	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
Osteicthyes	0.003	0.000	0.111	0.000	0.051	0.000	0.050	0.000	0.111	0.091

2.3.3. Fish Tagging and Marking

During the 2003 Big Wally's Walleye Tournament (May 17-18), we tagged 211 walleye between 407 mm and 780 mm. We tagged a total of 1,465smallmouth bass and 117 largemouth bass during the 2003 Washington State B.A.S.S. Federation's Bass Jamboree (May 24-26). Tagged smallmouth bass and largemouth bass ranged from 225-501 mm and 222-480 mm, respectively. During the 2003 spring reservoir-wide fish survey, we tagged an additional 196 smallmouth bass, 7 largemouth bass, and 8 walleye (Table 12). During the bass tournament, anglers caught 58 smallmouth bass and 11 largemouth bass recaptures. No walleye recaptures were caught during the walleye tournament. A total of 33 bass and 25 walleye tags were returned to BLFEP staff in 2003 (Table 12). The predator abundance estimates will be reported in future reports.

Walleye that were held in the net pens to examine acute tag loss and tagging induced mortality were removed after 72 hours of captivity. Survival of the treatment group (handled and tagged) was 100% and all walleye (treatment and control groups) retained their tags. One walleye died from the control group (non-handled), however, heavy hemorrhaging was apparent near the walleye's mouth, ventral and caudal fin and peduncle. There was no significant difference in mortality between the control and treatment groups ($\chi^2 = 0.034$; df = 57; $P < 0.05$). Mean size of walleye in the control (503 mm ± 70 (SD)) and treatment group (495 mm ±40 (SD)) was not significantly different ($t = -0.517$; df = 57; $P > 0.05$). Net pen water quality results will be reported in future reports.

Approximately 689,113 kokanee were released into Banks Lake from the Ford State Hatchery in October 2002, and averaged 66 fish/lb. The Spokane Tribal Hatchery planted an additional 50,000 kokanee. All October released kokanee were OTC marked, and 115,596 kokanee were marked with an additional left pelvic fin clip. A total of 627,275 kokanee fry were planted in Banks Lake in the Spring 2003. A total of 96 and 5 kokanee were collected during the fall 2002 and spring 2003 surveys, respectively. However, due to size at release only 13 of the fall collected kokanee had the potential of possessing marks. Two of the spring kokanee had marks, one with an adipose clip and one with a left pelvic clip. None of the fall kokanee possessed external marks (fin clips). Heads from all of the kokanee were saved for OTC or thermal mark identification.

2.3.4 Creel Survey

Coulee Playland, Steamboat Rock State Park, Northrup and Coulee City Park were used more frequently by boat anglers than the other creel stations from September 2002 through August 2003 (Figure 8). Shore anglers used the Coulee City Park 77% of the time, and almost never used Osborne Bay, Jones Bay or Northrup. Annual effort (September 2002 to August 2003) was 254,877 (± 375 SD) hours for boat anglers and 1,974 (± 348 SD) for shore anglers. Weekday angling accounted for 68% of the total angling pressure. Rainbow trout, smallmouth bass, and walleye angling accounted for 40%, 23%, and 14% of the total pressure, respectively. Angling pressure was highest in July and lowest in January **(**Figure 9**)**. During the winter months, both boat and shore anglers primarily targeted rainbow trout and walleye. Boat anglers shifted efforts to smallmouth bass and continued to target walleye during the spring and

Table 12: The total number of bass (SMB and LMB) and walleye (WAL) marked (Mark) and recaptured (Recap) by various methods on Banks Lake during 2002 and 2003. The tagging and recapture event codes are as follows: BWWT - Big Wally's Walleye Tournament (May 18-19, 2002 and May 17-18, 2003), WSBFBJ - Washington State BASS Federation's Bass Jamboree (May 25-27, 2002 and May 24-26, 2003), WDFWSpring02 (May 27-June 6, 2002), WDFWSummer02 (July 22-August 2, 2002), WDFWFall02 (October 21-31, 2002), WDFWSpring03 (May 26-June 5, 2003), WDFWSummer03 (July 21-31, 2003), Anglers02 (angler tag returns in 2002), and Anglers03 (angler tag returns in 2003).

Tagging Event	SMB Mark	LMB Mark	WAL Mark	SMB Recap	LMB Recap	WAL Recap
BWWT02	0	0	526	0	0	0
BWWT03	0	0	211	0	0	2
WSBFBJ02	1,279	201	1	2	8	0
WSBFBJ03	1,450	117	0	57	11	0
WDFWSpring02	129	6	9	11	1	1
WDFWSummer02	77	1	5	2	3	2
WDFWFall02	21	5	1	9	1	1
WDFWSpring03	196	7	8	21	1	0
WDFWSummer03				7	1	0
Anglers02	--	--	--	36	5	29
Anglers03	--	--	--	32	1	25
TOTALS	3,152	337	761	170	31	54

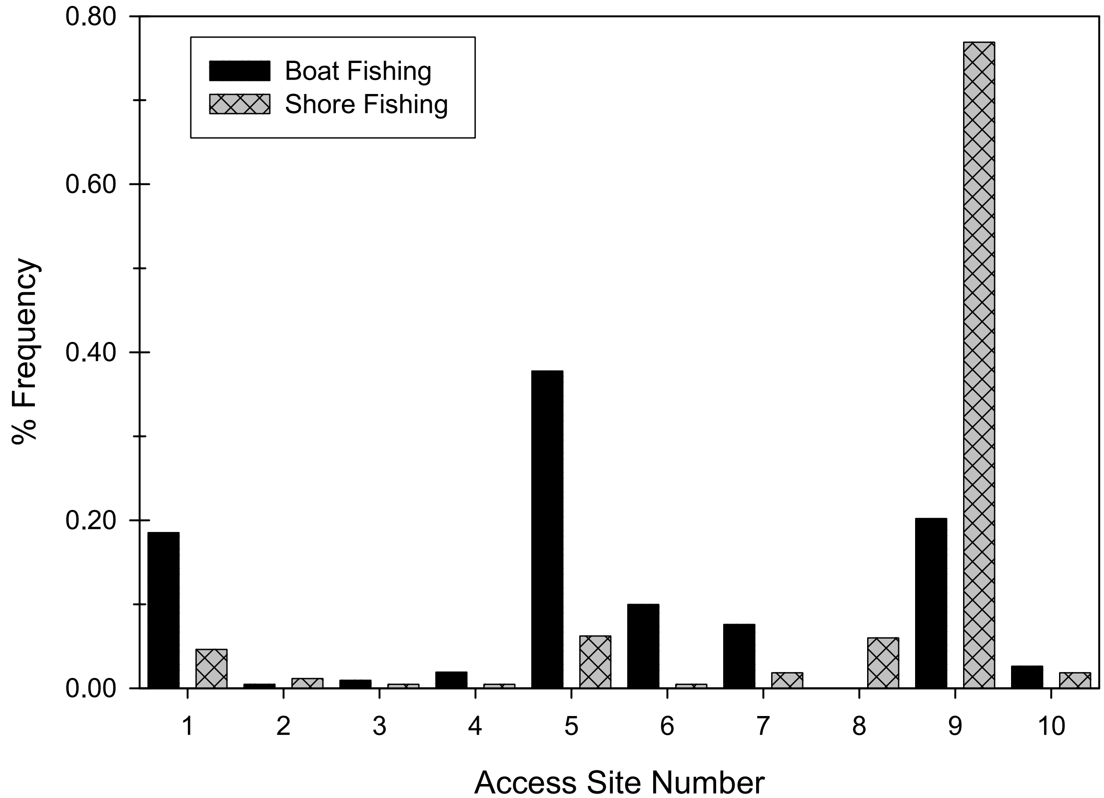

Figure 8. The frequency of site use by boat and shore anglers on Banks Lake, Washington from September 2002 through August 2003. Access site numbers correspond to site names as follows: 1) Coulee Playland, 2) Sun Banks Resort, 3) Osborn Bay, 4) Jones Bay, 5) Northrup, 6) Steamboat Rock State Park, 7) Paynes Gulch, 8) the Pass, 9) Coulee City Park, and 10) Dry Falls. *Jones Bay (4) was closed for fishing access until May 2003.

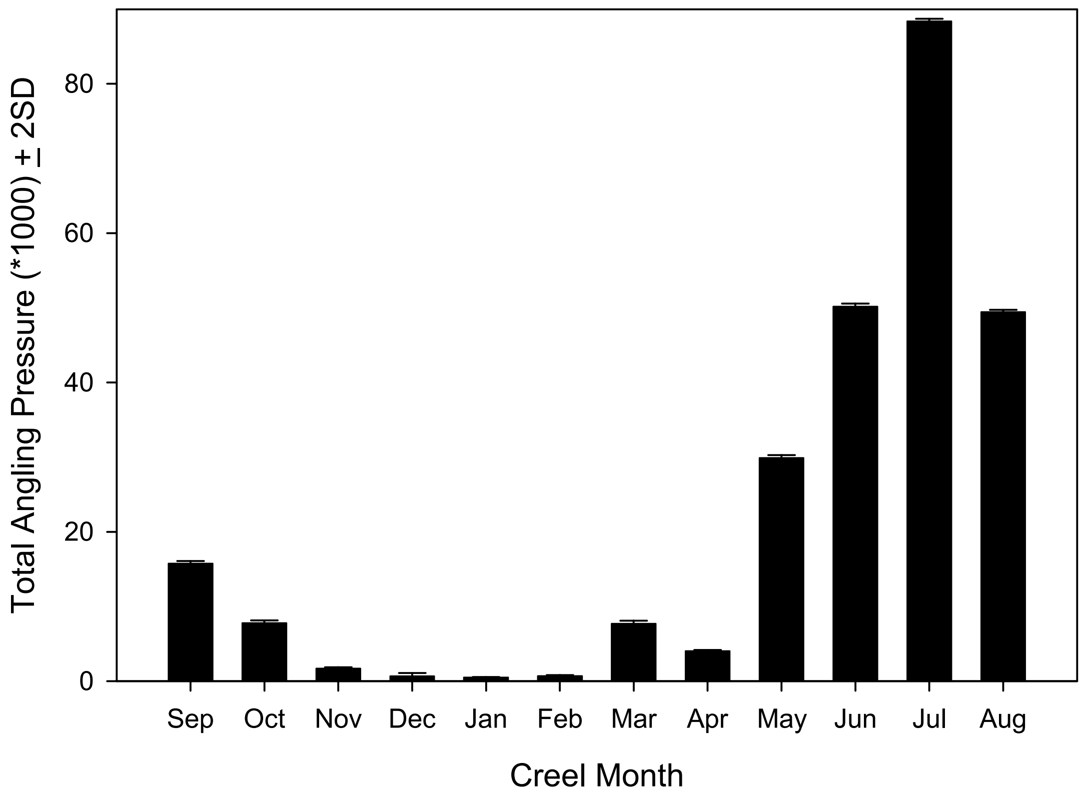

Figure 9. The monthly estimated angling pressure (± 2 SD) on Banks Lake, Washington from September 2002 through August 2003. The monthly pressure estimates include both boat and shore anglers.

summer months. Shore anglers continued to target rainbow trout until May, and generally targeted smallmouth bass or any specie from April through August (Figure 10). Shore and boat anglers caught four kokanee during May and June.

A total of 1,072 parties were interviewed for catch data. Boat and shore anglers caught one or more fish 70% and 43% of the time, respectively. Anglers indicated that they caught a total of 517 rainbow trout, 2,072 smallmouth bass, 160 walleye, and 193 yellow perch. The total CPUE was 0.22 (± 0.41 SD) for rainbow trout, 0.90 (± 1.31 SD) for smallmouth bass, 0.12 (± 0.21 SD) for walleye, and 0.82 (± 1.82 SD) for yellow perch (Table 13). Smallmouth bass anglers released a majority of the fish they caught (92%), resulting in harvest rates that were a minimum of five times less than catch rates. Rainbow, walleye, and yellow perch anglers released 10%, 27%, and 60% of the fish they caught, respectively. An estimated 5,470 (± 261 SD) rainbow trout, 11,915 (± 140 SD) smallmouth bass, 6,412 (± 59 SD) walleye, and 698 (± 58) yellow perch were harvested (Table 14), while an estimated 5,800 (± 420 SD) rainbow trout, 120,278 (± 815 SD) smallmouth bass, 9,259 (± 177 SD) walleye, and 6,870 (± 283) yellow perch were caught from Banks Lake from September 2002 through August 2003 (Table 15). Anglers who targeted smallmouth bass were the most satisfied with the fishery, while walleye anglers were the least satisfied (Table 16).

Aerial creel flights in May, June, July, and August indicated that a combined average of 51% of the boats on Banks Lake were associated with fishing activities (Table 17).

We estimated the value of the Banks Lake fishery to determine the economic benefit to the local economy. We determined that the average dollar amount spent per angler trip was $29.25, which yields a total economic value of the Banks Lake fishery from September 2002 through August 2003 of $6,035,764.

2.4 Discussion

This report represents the final deliverable for BPA contract number 00005860 for Fiscal Year 2002. Also, the 2000 WDFW warmwater survey report has been completed and a draft has been submitted to WDFW Fish Program-Fish Management Division staff for review and comment. A final report will be published in 2003 as a WDFW technical report.

The Statement of Work for this contract included 10 tasks labeled 1-a through 3-1. We have addressed tasks 1-b and 1-g in this report, which constituted the majority of data collection efforts for the contract. Data for tasks 1-a, 1-c, and 1-d was collected and results will be reported in future reports provided to BPA contract officers. Tasks 1-e and 1-f will be performed in FY 2003. Monies for these tasks were modified into a contract with Central Washington University for an in depth analysis of task 2-a and 2-b. Results from task 2-a and 2-b will be reported in future reports. Task 3-1 is continually evolving and is presented as needed.

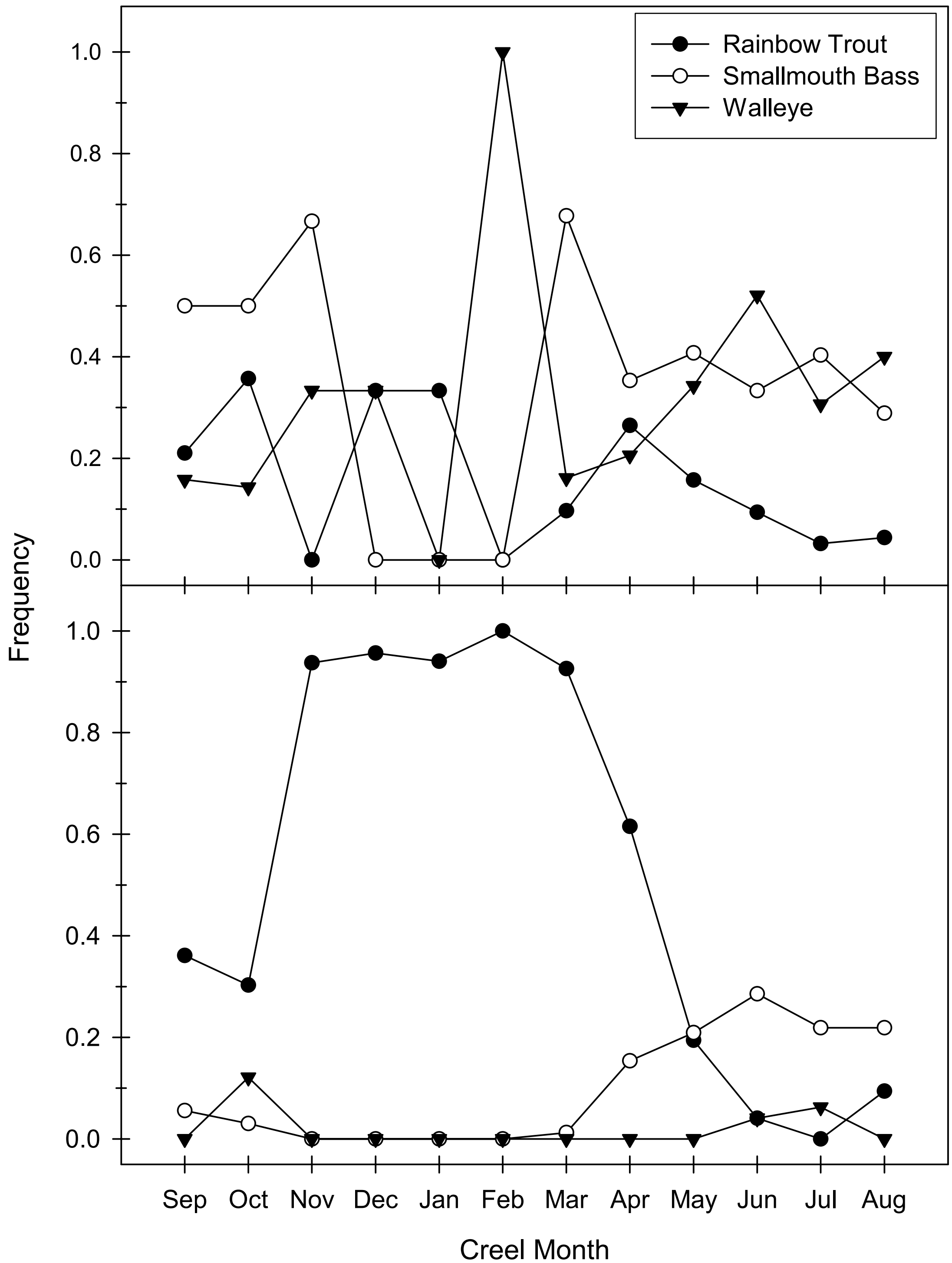

Figure 10. The relative proportion of anglers who indicated they were targeting rainbow trout, smallmouth bass, or walleye from September 2002 through August 2003 on Banks Lake, Washington.

Table 13. Monthly catch and release totals, catch and harvest per unit effort (± 1SD), and mean size of the most abundant fish species reported in the creel from September 2002 through September 2003 on Banks Lake, Washington. Harvest rates were calculated from completed trips only. Fish species codes are as follows: rainbow trout (RBT), smallmouth bass (SMB), walleye (WAL) and yellow perch (YP). All data is summarized from angler interviews.

Month	Species	Total # Caught	Total # Released	CPUE ± SD (fish/hr)	HPUE± SD (fish/hr)	Mean Size (mm) ± SD
September	RBT	40	3	0.16 ± 0.25	0.16 ± 0.27	396 ± 35
	SMB	174	165	0.88 ± 0.83	0.03 ± 0.06	278 ± 31
	WAL	3	1	0.05 ± 0.08	0.02 ± 0.03	540 ± NA
	YP	33	7	0.79 ± 0.67	0.00 ± 0.00	203 ± 16
October	RBT	56	3	0.45 ± 0.54	0.48 ± 0.60	385 ± 41
	SMB	148	141	1.03 ± 0.69	0.04 ± 0.12	270 ± 51
	WAL	0	0	--	--	--
	YP	92	74	2.06 ± 3.09	0.62± 1.16	187 ± 42
November	RBT	72	4	.035 ± 0.30	0.32 ± 0.09	407 ±50
	SMB	15	15	1.05 ± 0.64	0.00 ± 0.00	--
	WAL	1	0	0.10 ± --	0.10 ± --	722 ± NA
	YP	0	0	--	--	--
December	RBT	41	11	0.16 ± 0.34	0.12 ± 0.18	444 ± 50
	SMB	0	0	--	--	--
	WAL	0	0	--	--	--
	YP	0	0	--	--	--
January	RBT	42	1	0.17 ± 0.28	0.18 ± 0.25	447 ± 55
	SMB	0	0	--	--	--
	WAL	0	0	--	--	--
	YP	0	0	--	--	173 ± NA
February	RBT	48	3	0.23 ± 0.66	0.30 ± 0.83	437 ± 42
	SMB	1	1	0.38 ± --	0.00 ± --	--
	WAL	1	0	0.22 ± --	0.22 ± --	483 ± NA
	YP	0	0	--	--	--
March	RBT	69	9	0.18 ± 0.43	0.16 ± 0.46	425 ± 71
	SMB	96	96	0.25 ± 0.27	0.00 ± 0.00	382 ± 110
	WAL	2	0	0.03 ± 0.07	0.03 ± 0.07	502 ± 59
	YP	0	0	--	--	--
April	RBT	37	3	0.18 ± 0.31	0.15 ± 0.24	433 ± 351
	SMB	54	50	0.52 ± 0.90	0.02 ± 0.07	369 ± 60
	WAL	0	0	--	--	325 ± NA
	YP	1	0	0.12 ± NA	0.12 ± NA	--

Table 13.
continued

Month	Species	Total # Caught	Total # Released	CPUE ± SD (fish/hr)	HPUE± SD (fish/hr)	Mean Size (mm) ± SD
May	RBT	63	6	0.23 ± 0.32	0.20 ± 0.32	391 ± 71
	SMB	608	558	0.95 ± 1.20	0.07 ± 0.19	297 ± 58
	WAL	23	1	0.07 ± 0.11	0.07 ± 0.12	478 ± 49
	YP	14	6	0.12 ± 0.15	0.05 ± 0.08	277 ± 62
June	RBT	37	9	0.30 ± 0.42	0.26 ± 0.45	379 ± 83
	SMB	505	475	1.08 ± 1.42	0.08 ± 0.24	321 ± 58
	WAL	107	31	0.22 ± 0.30	0.16 ± 0.28	513 ± 58
	YP	10	3	0..11 ± 0.10	0.10± 0.11	330 ± 29
July	RBT	8	0	0.21 ± 0.12	0.22 ± 0.12	435 ± 88
	SMB	223	199	1.13 ± 2.10	0.10 ± 0.37	325 ± 58
	WAL	19	8	0.08 ± 0.16	0.05 ± 0.06	485 ± 69
	YP	20	10	0.65 ± 0.83	0.18 ± 0.33	205 ± 27
August	RBT	4	1	0.08 ± 0.08	0.07 ± 0.06	369 ± 67
	SMB	248	213	0.88 ± 1.19	0.16 ± 0.32	348 ± 88
	WAL	4	2	0.11 ± 0.10	0.02 ± 0.03	455 ± 63
	YP	20	15	1.15 ± 2.59	0.25 ± 0.50	145 ± 23
Totals	RBT	517	53	0.22 ± 0.41	0.07 ± 0.06	416 ± 70
	SMB	2072	1913	0.90 ± 1.31	0.16 ± 0.32	357 ± 102
	WAL	160	43	0.12 ± 0.21	0.02 ± 0.03	438 ± 103
	YP	193	115	0.82 ± 1.82	0.25 ± 0.50	217 ± 62

Table 14. Monthly harvest estimates (± 1SD) for rainbow trout, smallmouth bass, walleye and yellow perch from Banks Lake, Washington, 2002-03.

Month	Rainbow Trout	Smallmouth Bass	Walleye	Yellow Perch
September	485 ± 17	229 ± 5	34 ± 1	0
October	1,081 ± 52	185 ± 13	0	51 ± 71
November	56±19	0	43 ± 0	0
December	51 ± 11	0	0	0
January	57 ± 8	0	0	0
February	120 ± 40	0	22 ± 4	0
March	168 ± 37	0	43 ± 6	0
April	216 ± 19	34 ± 3	0	0
May	938 ± 24	858 ± 18	727 ± 8	19 ± 2
June	1,163 ± 27	1,289 ± 35	4,108 ± 34	40 ± 1
July	1,018 ± 3	4,048 ± 32	1,355 ± 4	1,827 ± 12
August	115 ± 3	5,273 ± 34	80 ± 1	12 ± 33
Total	5,470 ± 261	11,915 ± 140	6,412 ± 59	1949 ± 118

Table 15. Monthly catch estimates (± 1SD) for rainbow trout, smallmouth bass, walleye and yellow perch from Banks Lake, Washington 2002-03.

Month	Rainbow Trout	Smallmouth Bass	Walleye	Yellow Perch
September	494 ± 32	7,251 ± 76	100 ± 14	16 ± 26
October	1,017 ± 63	5,160 ± 94	0	170 ± 107
November	49 ± 32	1,160 ± 48	43 ± 0	0
December	69 ± 36	0	0	0
January	56 ± 17	0	0	0
February	90 ± 39	0	22 ± 11	0
March	182 ± 54	1,262 ± 35	43 ± 23	0
April	258 ± 44	765 ± 38	0	0
May	1,056 ± 43	12,049 ± 106	727 ± 24	50 ± 8
June	1,374 ± 39	18,206 ± 178	5,803 ± 67	49 ± 2
July	1,018 ± 8	44,542 ± 125	2,121 ± 27	6,530 ± 33
August	138 ± 15	29,882 ± 115	400 ± 11	54 ± 106
Total	5,800 ± 420	120,278 ± 815	9,259 ± 177	6,870 ± 283

Table 16. The percent of anglers who indicated that they were satisfied or dissatisfied with the fishery from September 2002 through August 2003 on Banks Lake. Data was only used if the angler specified a target fish species.

Species Targeted	% Satisfied	% Dissatisfied
ANY	73.7	26.3
Rainbow Trout	71.3	28.7
Smallmouth Bass	84.2	15.8
Walleye	64.6	35.4
Yellow Perch	73.3	26.7

Table 17. The percent of fishing boats vs. recreating boats (water skiers, jet skiers, etc.) during weekdays and weekend days from May to August 2003, determined from aerial creel flights. These percentages were used to correct for the number of boat trailers associated with fishing boats or other recreating boats.

Flight Date	Day Strata	Total # of Boats Counted	Fishing Boats (%)	Recreational Boats (%)
05/03/2003	Weekend	72	100.0	0.0
05/21/2003	Weekday	21	95.2	4.8
06/22/2003	Weekend	104	81.7	18.3
06/27/2003	Weekday	50	58.0	42.0
07/16/2003	Weekday	54	27.8	72.2
07/20/2003	Weekend	78	28.2	71.8
08/12/2003	Weekday	132	14.4	85.6

2.5 References

Bonar, S. A., B. D. Bolding, and M. Divens. 2000. Standard fish sampling guidelines for Washington State ponds and lakes. Washington Department of Fish and Wildlife Report # FPT 00-28. Olympia, WA.

Cichosz, T. A., J. P. Shields, K. D. Underwood, A. Scholz, and M. B. Tilson. 1997. Lake Roosevelt Fisheries and Limnological Research, Annual Report 1996. Project Number 94-043, Contract Number 94BI32148.

Duff, R. L. 1973. 1971-1972 Banks Lake creel census. Washington Department of Game, Olympia, Washington. Region 2. 39 pp. [unpublished]

Kubecka, J. 1994. Simple model on the relationship between fish acoustic target strengths and aspect for high-frequency sonar in shallow waters. Journal of Applied Ichthyology 10:75-81.

Horne, A. J. and C. R. Goldman, editors. 1994. Limnolgy. Mgraw-Hill Inc., New York.

Hydroacoustic Technology Incorporated. 2001. Echoscape Version 2.10, Seattle, Washington.

Love, R. H. 1971. Dorsal-aspect target strength of an individual fish. Journal of the Acoustical Society of America 49:816-823.

Love, R. H. 1977. Target strength of an individual fish at any aspect. Journal of the Acoustical Society of America 62:1397-1403.

Malvestuto, S.P. 1983. Sampling the recreational fishery. Pages 397-419 *in* L.A. Nielsen and D.L. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.

Maptech, Inc. 1998. Terrain Professional: Washington, Greenland, NH.

McLellan, H.J. 2000. Limnological and fisheries evaluation of Rock Lake, Whitman County, Washington, 1999. Master Thesis. Eastern Washington University, Cheney, WA.

Mous, P. J. and J. Kemper. 1996. Application of hydroacoustic sampling technique in a large wind-exposed shallow lake. Pages 179-195 *in* I. G. Cowx, editor. Stock Assessment in Inland Fisheries. Fishing News Books, London, England.

Nelson, A. 1954. Washington Department of Game Records, Ephrata. 2pp. [unpublished]

Pollock, K.H, C.M. Jones and T.L. Brown. 1994. Angler Survey Methods and their Application in Fisheries Management. Special Publication 25. American Fisheries Society, Bethesda, Maryland.

Spence, M. 1965. Washington Department of Game Records, Ephrata. 2pp. [unpublished]

Stober, Q. J., P. B. Roger, W. A. Karp, G. L. Thomas, R. E. Thorne, J. J. Dawson, D. T. Griggs and R. E. Nakatani. 1974. Preliminary assessment of the effects of Grand Coulee pumped/storage development on the ecology of Banks Lake, Washington. Annual Progress Report submitted to US Bureau of Reclamation, Contract # 14-06-100-7794.

Stober, Q. J., R. W. Tyler, G. L. Thomas, W. A. Karp, and R. E. Nakatani. 1975. Preliminary assessment of the effects of Grand Coulee pumped/storage development of the ecology of Banks Lake, Washington. Second Annual Progress Report submitted to US Bureau of Reclamation, contract No. 14-06-100-7794.

Stober, Q. J., R. W. Tyler, G. L. Thomas, L. Jensen, J. A. Kuntzen, D. L. Smith and R. E. Nakatani. 1976. Operational effects of irrigation and pumped/storage on the ecology of Banks Lake, Washington. Third Annual Progress Report submitted to US Bureau of Reclamation Contract No. 14-06-100-7794.

Stober, Q. J., R. W. Tyler, J. A. Knutzen, D. Gaudet, C. E. Petrosky, and R. E. Nakatani. 1977. Operational effects of irrigation and pumped storage on the ecology of Banks Lake, Washington. Fourth Annual Progress Report submitted to US Bureau of Reclamation Contract No. 14-06-100-7794.

Stober, Q. J., R. W. Tyler, C. E. Petrosky, K. R. Johnson, C. F. Cowman, Jr., J. Wilcock, and R. E. Nakatani. 1979. Development and evaluation of a net barrier to reduce entrainment loss of kokanee from Banks Lake. Final Report submitted to US Bureau of Reclamation Contract No. 7-07-10-S0023.

Thompson, Dick. 1952 Letter to Clarence Pautzke (Washington State Department of Game) concerning Eastern Brook Trout being discovered in the Equalizing Reservoir/Northrup Creek. December 8, 1952.

Thompson, Dick. 1953 Letter to Clarence Pautzke (Washington State Department of Game) concerning Rainbow Trout spawning in Northrup Creek. March 28, 1953.

United States Bureau of Reclamation (USBOR). 1964. The story of the Columbia Basin Project. United States Government Printing Office, Washington. 60 pp.

United States Fish and Wildlife Service (USFWS). 2002. Final Fish and Wildlife Coordination Act Report for the US Bureau of Reclamation's Banks Lake 10-foot drawdown study. Prepared for US Bureau of Reclamation, Ephrata, WA. 40 pp.

Washington Department of Fish and Wildlife (WDFW). 1974-1982. Unpublished Banks Lake creel data.

Yule, D. L. 2000. Comparison of horizontal acoustic and purse-seine estimates of salmonid densities and sizes in eleven Wyoming waters. North American Journal of Fisheries Management 20:759-775.

Appendix A. Water Quality parameters from Banks Lake between September 2002 and May 2003. Abbreviations are as follows: Dissolved Oxygen (DO), Saturation (Sat), and Specific Conductivity (SpCond).

Date	Section	Temp (°C)	DO (mg/l)	TDS (g/l)	Turb (NTUs)	Depth(m)	pH	SpCond (mS/cm)
9/10/2002	LIM1	18.87	9.71	0.0781	0.0	0.5	8.48	0.1221
9/10/2002	LIM1	18.80	8.79	0.0778	3.6	0.7	8.40	0.1215
9/10/2002	LIM1	18.73	8.48	0.0776	4.2	3.0	8.42	0.1212
9/10/2002	LIM1	18.72	8.64	0.0776	4.1	6.0	8.40	0.1213
9/10/2002	LIM1	18.71	8.51	0.0776	4.5	8.9	8.37	0.1213
9/10/2002	LIM1	18.69	9.23	0.0776	4.4	13.2	8.28	0.1214
9/10/2002	LIM1	18.67	8.38	0.0776	4.8	15.0	8.23	0.1213
9/10/2002	LIM1	18.65	8.37	0.0776	5.4	18.1	8.22	0.1213
9/10/2002	LIM1	18.62	8.47	0.0777	5.4	18.9	8.28	0.1213
9/10/2002	LIM3	20.01	8.72	0.0803	20.2	0.5	8.77	0.1253
9/10/2002	LIM3	19.90	8.69	0.0804	5.7	0.5	8.78	0.1254
9/10/2002	LIM3	19.55	8.68	0.0805	6.0	3.0	8.81	0.1257
9/10/2002	LIM3	19.46	8.68	0.0808	6.1	6.0	8.75	0.1262
9/10/2002	LIM3	19.39	9.85	0.0809	6.8	9.0	8.68	0.1264
9/10/2002	LIM3	19.29	8.40	0.0806	7.4	12.5	8.54	0.1260
9/10/2002	LIM3	18.27	6.38	0.0812	7.0	15.1	7.93	0.1263
9/10/2002	LIM3	17.30	3.36	0.0831	17.3	17.5	7.67	0.1299
9/10/2002	LIM5	19.18	8.72	0.0826	353.7	0.1	8.68	0.1293
9/10/2002	LIM5	19.19	8.69	0.0828	102.8	0.7	8.70	0.1294
9/10/2002	LIM5	18.79	8.63	0.083	6.1	3.0	8.70	0.1297
9/10/2002	LIM5	18.67	9.49	0.0831	6.3	7.2	8.66	0.1299
9/10/2002	LIM5	18.56	9.33	0.0829	6.1	10.4	8.59	0.1296
9/10/2002	LIM5	18.47	9.57	0.0823	6.7	12.0	8.46	0.1286
9/10/2002	LIM5	18.44	8.27	0.0826	7.0	15.1	8.45	0.1291
9/10/2002	LIM5	18.42	8.21	0.0825	7.6	18.0	8.40	0.1291
9/10/2002	LIM5	18.32	7.93	0.0832	9.6	21.1	8.30	0.1300
9/24/2002	LIM1	18.24	9.47	0.0774	4.3	0.7	8.68	0.1209
9/24/2002	LIM1	18.15	9.43	0.0778	5.5	3.1	8.71	0.1215
9/24/2002	LIM1	18.03	9.49	0.0779	5.0	5.8	8.72	0.1218
9/24/2002	LIM1	17.94	9.34	0.0779	4.5	9.2	8.57	0.1218
9/24/2002	LIM1	17.91	9.25	0.0779	4.7	12.4	8.50	0.1217
9/24/2002	LIM1	17.91	9.27	0.0779	4.9	14.5	8.58	0.1219
9/24/2002	LIM1	17.87	9.30	0.078	4.7	17.3	8.60	0.1217
9/24/2002	LIM1	17.85	9.28	0.0781	4.9	17.7	8.58	0.1219
9/24/2002	LIM3	18.43	9.42	0.0801	6.4	0.5	8.82	0.1248
9/24/2002	LIM3	18.23	9.31	0.0799	5.6	3.0	8.82	0.1249
9/24/2002	LIM3	18.17	9.19	0.0799	5.3	5.9	8.72	0.1247
9/24/2002	LIM3	18.13	9.25	0.0796	4.4	8.8	8.73	0.1254
9/24/2002	LIM3	18.07	8.87	0.0803	4.6	12.0	8.56	0.1262
9/24/2002	LIM3	17.94	7.88	0.0816	5.8	15.3	8.22	0.1274

9/24/2002	LIM3	17.46	5.59	0.0833	7.8	17.8	7.90	0.1292
9/24/2002	LIM5	17.62	9.32	0.0829	13.4	0.4	8.71	0.1295
9/24/2002	LIM5	17.59	9.28	0.083	4.3	3.0	8.71	0.1297
9/24/2002	LIM5	17.57	9.24	0.083	4.7	6.1	8.68	0.1294
9/24/2002	LIM5	17.55	9.25	0.0828	4.9	9.0	8.61	0.1294
9/24/2002	LIM5	17.53	9.24	0.0828	4.7	12.1	8.60	0.1291
9/24/2002	LIM5	17.51	9.21	0.0828	4.5	14.7	8.62	0.1294
9/24/2002	LIM5	17.47	9.06	0.0829	5.7	18.3	8.50	0.1295
9/24/2002	LIM5	17.45	8.99	0.0829	5.8	18.9	8.47	0.1295
10/16/2002	LIM1	16.83	10.62	0.0781	6.6	0.1	8.79	0.1222
10/16/2002	LIM1	16.15	10.63	0.0779	7.1	1.0	8.86	0.1217
10/16/2002	LIM1	16.03	10.57	0.0778	6.9	3.0	8.83	0.1216
10/16/2002	LIM1	16.01	10.57	0.0778	6.7	4.1	8.81	0.1216
10/16/2002	LIM1	16.02	10.55	0.0779	6.6	4.0	8.82	0.1218
10/16/2002	LIM1	16.00	10.47	0.0779	6.6	5.0	8.80	0.1216
10/16/2002	LIM1	16.00	10.46	0.0779	6.7	5.0	8.80	0.1218
10/16/2002	LIM1	15.96	10.36	0.0779	6.5	7.1	8.77	0.1218
10/16/2002	LIM1	15.93	10.29	0.0779	6.6	9.0	8.76	0.1218
10/16/2002	LIM1	15.91	10.28	0.0779	6.7	11.5	8.77	0.1218
10/16/2002	LIM1	15.82	10.32	0.0778	6.8	13.0	8.81	0.1213
10/16/2002	LIM1	15.65	10.23	0.0779	7.2	15.0	8.75	0.1217
10/16/2002	LIM1	15.59	10.11	0.0778	7.2	18.3	8.70	0.1217
10/16/2002	LIM1	15.54	10.01	0.0779	7.4	19.0	8.69	0.1217
10/16/2002	LIM1	15.32	9.68	0.0783	14.0	21.1	8.62	0.1224
10/16/2002	LIM3	15.19	10.27	0.0795	5.2	2.0	8.82	0.1242
10/16/2002	LIM3	15.12	10.26	0.0797	4.8	4.0	8.81	0.1245
10/16/2002	LIM3	15.09	10.22	0.0797	4.9	6.0	8.78	0.1246
10/16/2002	LIM3	15.08	10.15	0.0797	5.1	8.5	8.75	0.1245
10/16/2002	LIM3	15.08	10.18	0.0797	5.3	10.5	8.74	0.1245
10/16/2002	LIM3	15.08	10.07	0.0797	5.5	12.2	8.72	0.1246
10/16/2002	LIM3	15.07	10.05	0.0798	5.5	14.2	8.68	0.1247
10/16/2002	LIM3	15.00	9.93	0.0797	6.2	16.2	8.60	0.1245
10/16/2002	LIM3	14.34	10.00	0.0789	7.2	18.7	8.66	0.1232
10/16/2002	LIM5	14.59	10.22	0.0813	0.0	0.1	8.84	0.1269
10/16/2002	LIM5	14.51	10.07	0.0813	0.0	1.1	8.85	0.1271
10/16/2002	LIM5	14.41	10.07	0.0813	3.9	3.1	8.85	0.1271
10/16/2002	LIM5	14.38	10.14	0.0813	3.9	5.0	8.84	0.1270
10/16/2002	LIM5	14.36	10.15	0.0813	3.9	7.2	8.78	0.1272
10/16/2002	LIM5	14.35	10.11	0.0813	4.4	9.0	8.76	0.1270
10/16/2002	LIM5	14.35	10.10	0.0813	4.1	11.9	8.69	0.1270
10/16/2002	LIM5	14.34	10.06	0.0813	4.0	13.0	8.69	0.1270
10/16/2002	LIM5	14.34	10.06	0.0813	4.2	15.0	8.66	0.1270
10/16/2002	LIM5	14.31	10.02	0.0813	4.3	17.0	8.59	0.1271
10/16/2002	LIM5	14.29	9.95	0.0812	5.0	19.0	8.60	0.1268
10/16/2002	LIM5	14.29	9.94	0.0812	4.7	19.0	8.60	0.1268

10/16/2002	LIM5	14.27	9.87	0.0812	4.5	21.1	8.59	0.1268
10/16/2002	LIM5	14.19	9.74	0.0812	6.1	23.1	8.51	0.1268
11/20/2002	LIM1	8.89	13.92	0.0776	2.5	0.6	8.98	0.1212
11/20/2002	LIM1	8.88	13.52	0.0777	2.3	0.6	8.92	0.1213
11/20/2002	LIM1	8.78	13.53	0.0778	2	3.0	8.92	0.1213
11/20/2002	LIM1	8.73	13.23	0.0781	1.9	6.0	8.89	0.1214
11/20/2002	LIM1	8.69	13.03	0.0781	1.6	9.1	8.86	0.122
11/20/2002	LIM1	8.69	13.1	0.0782	1.4	12.0	8.84	0.1216
11/20/2002	LIM1	8.68	12.88	0.0781	1.5	15.1	8.81	0.122
11/20/2002	LIM1	8.67	12.74	0.0782	1.6	18.0	8.8	0.1222
11/20/2002	LIM1	8.61	12.84	0.0782	1.8	20.3	8.76	0.1222
11/20/2002	LIM3	9.34	13.98	0.0797	4.7	0.5	8.9	0.1245
11/20/2002	LIM3	9.31	13.85	0.0796	4.4	0.5	8.84	0.1247
11/20/2002	LIM3	9.28	13.69	0.0794	3.1	4.7	8.87	0.124
11/20/2002	LIM3	9.25	13.04	0.08	3.1	3.1	8.83	0.125
11/20/2002	LIM3	9.22	12.87	0.08	2.9	6.2	8.8	0.125
11/20/2002	LIM3	9.21	20	0.0798	3	11.0	8.8	0.125
11/20/2002	LIM3	9.16	12.6	0.0799	3	11.9	8.74	0.1248
11/20/2002	LIM3	9.16	12.46	0.08	3	15.0	8.72	0.1249
11/20/2002	LIM3	9.14	12.43	0.0801	3.2	17.7	8.7	0.1251
11/20/2002	LIM5	8.97	13	0.0818	1.7	0.6	8.76	0.1278
11/20/2002	LIM5	8.97	13.27	0.0817	2	0.8	8.76	0.1277
11/20/2002	LIM5	8.86	12.96	0.0819	1.6	3.0	8.77	0.1279
11/20/2002	LIM5	8.85	12.85	0.0818	1.6	6.0	8.77	0.1278
11/20/2002	LIM5	8.84	12.66	0.0819	1.9	8.9	8.7	0.1277
11/20/2002	LIM5	8.83	12.7	0.0819	1.9	12.5	8.66	0.1278
11/20/2002	LIM5	8.82	12.55	0.0819	2.1	14.9	8.62	0.1277
11/20/2002	LIM5	8.81	12.44	0.0821	1.9	17.8	8.6	0.1282
11/20/2002	LIM5	8.79	12.36	0.082	1.9	21.1	8.57	0.1281
11/20/2002	LIM5	8.78	12.4	0.0817	2.4	22.2	8.55	0.1276
12/17/2002	LIM1	6.55	12.45	0.0778	2.9	0.0	8.76	0.1215
12/17/2002	LIM1	6.54	13.09	0.0778	3.4	0.0	8.74	0.1215
12/17/2002	LIM1	6.57	13.2	0.0779	2.8	3.0	8.77	0.1217
12/17/2002	LIM1	6.57	14.54	0.0777	2.8	5.9	8.76	0.1215
12/17/2002	LIM1	6.56	11.75	0.078	3	9.0	8.73	0.1218
12/17/2002	LIM1	6.57	16.79	0.0778	2.9	13.3	8.71	0.1215
12/17/2002	LIM1	6.54	12.11	0.0778	3.2	15.3	8.69	0.1215
12/17/2002	LIM1	6.49	11.2	0.0779	3.7	17.9	8.66	0.1217
12/17/2002	LIM3	6.31	15.84	0.0788	7.3	0.1	8.76	0.1232
12/17/2002	LIM3	6.31	19.71	0.0792	7.5	0.1	8.77	0.124
12/17/2002	LIM3	6.32	14.22	0.0796	8.2	3.9	8.79	0.1244
12/17/2002	LIM3	6.33	13.63	0.0797	8.1	6.7	8.79	0.1246
12/17/2002	LIM3	6.33	12.39	0.0796	9.4	8.3	8.76	0.1244
12/17/2002	LIM3	6.32	12.21	0.0796	10.7	9.0	8.78	0.1244
12/17/2002	LIM3	6.31	15.47	0.0798	11.1	11.1	8.73	0.1243

12/17/2002	LIM3	6.3	11.06	0.0796	11.4	11.8	8.75	0.1246
12/17/2002	LIM3	6.3	11.49	0.0797	15.3	15.1	8.74	0.1246
12/17/2002	LIM5	6.08	13.2	0.0796	4.1	0.1	8.73	0.1244
12/17/2002	LIM5	6.02	17.95	0.0802	3	2.0	8.75	0.1253
12/17/2002	LIM5	6.02	12.65	0.0802	2.7	4.2	8.72	0.1257
12/17/2002	LIM5	5.99	12.51	0.0802	2.8	6.2	8.67	0.1253
12/17/2002	LIM5	5.99	14.16	0.0798	2.8	8.1	8.62	0.1248
12/17/2002	LIM5	5.98	15.91	0.0803	2.7	9.0	8.57	0.1256
12/17/2002	LIM5	5.98	13.6	0.0801	2.5	10.2	8.58	0.1252
12/17/2002	LIM5	5.98	12.2	0.0802	2.6	12.0	8.55	0.1252
12/17/2002	LIM5	5.98	15.01	0.0799	2.4	14.1	8.52	0.1248
12/17/2002	LIM5	5.97	12.91	0.0794	2.6	16.0	8.51	0.1241
12/17/2002	LIM5	5.98	14.21	0.0807	2.3	18.2	8.48	0.126
12/17/2002	LIM5	5.98	13.69	0.0801	3.2	20.0	8.47	0.1252
1/13/2003	LIM1	4.2	12.81	0.077	3.6	0.2	9.04	0.1203
1/13/2003	LIM1	4.22	13.61	0.0774	3.4	1.0	9.06	0.1206
1/13/2003	LIM1	4.22	12.96	0.0774	3.5	2.5	9.06	0.1209
1/13/2003	LIM1	4.22	13.77	0.0772	3.7	3.0	9.03	0.1206
1/13/2003	LIM1	4.21	12.91	0.0773	3.5	4.1	9.02	0.1207
1/13/2003	LIM1	4.22	12.49	0.0774	3.5	5.4	9	0.1209
1/13/2003	LIM1	4.21	13.82	0.0775	3.4	6.1	8.98	0.121
1/13/2003	LIM1	4.22	13.09	0.0773	3.3	7.0	8.98	0.1207
1/13/2003	LIM1	4.21	16.73	0.0765	3.4	8.0	8.97	0.1196
1/13/2003	LIM1	4.21	13.05	0.0771	3.5	8.9	8.94	0.121
1/13/2003	LIM1	4.21	14.51	0.0772	3.3	10.4	8.9	0.1206
1/13/2003	LIM1	4.21	13.34	0.0775	3.6	11.2	8.88	0.121
1/13/2003	LIM1	4.21	17.82	0.0769	3.5	12.1	8.87	0.1201
1/13/2003	LIM1	4.21	12.16	0.0775	3.5	13.0	8.87	0.121
1/13/2003	LIM1	4.22	18.43	0.0772	3.7	14.7	8.85	0.1206
1/13/2003	LIM1	4.21	12.2	0.0774	3.4	15.0	8.85	0.1209
1/13/2003	LIM1	4.21	13.37	0.0772	4.1	16.0	8.81	0.1207
1/13/2003	LIM1	4.2	15.28	0.0774	3.3	17.0	8.82	0.1209
1/13/2003	LIM1	4.21	13.04	0.0771	3.3	19.0	8.8	0.1204
1/13/2003	LIM1	4.2	13.9	0.0774	3.3	19.1	8.79	0.1209
1/13/2003	LIM1	4.2	14.69	0.0774	3.7	19.9	8.79	0.1204
1/13/2003	LIM1	4.2	12.88	0.0772	3.4	21.1	8.79	0.1206
1/13/2003	LIM1	4.23	11	0.0773	11.5	22.0	8.79	0.1211
1/13/2003	LIM3	4.14	17.73	0.0781	2.6	0.3	8.88	0.1218
1/13/2003	LIM3	4.14	15.62	0.0782	3.5	1.0	8.91	0.1228
1/13/2003	LIM3	4.15	16.82	0.0785	2.8	2.3	8.92	0.1227
1/13/2003	LIM3	4.15	16.97	0.0781	2.7	4.7	8.91	0.1221
1/13/2003	LIM3	4.15	18.56	0.0785	3.3	4.1	8.9	0.1227
1/13/2003	LIM3	4.15	18.18	0.0788	2.9	5.0	8.9	0.1231
1/13/2003	LIM3	4.15	17.45	0.0783	2.9	6.6	8.9	0.1224
1/13/2003	LIM3	4.16	19.02	0.0784	3	7.0	8.89	0.1224

1/13/2003	LIM3	4.15	17.88	0.0784	2.7	8.1	8.88	0.1225
1/13/2003	LIM3	4.15	17.37	0.0784	2.9	9.1	8.88	0.1225
1/13/2003	LIM3	4.15	18.44	0.0784	2.9	10.0	8.87	0.1225
1/13/2003	LIM3	4.16	18.1	0.0784	2.9	11.0	8.87	0.1225
1/13/2003	LIM3	4.16	17.11	0.0783	3	12.0	8.87	0.1224
1/13/2003	LIM3	4.16	18.99	0.0784	2.7	13.1	8.84	0.1227
1/13/2003	LIM3	4.16	18.76	0.0784	3	14.0	8.83	0.122
1/13/2003	LIM3	4.16	18.58	0.0783	2.9	15.0	8.84	0.1227
1/13/2003	LIM3	4.17	20	0.0784	3.2	17.4	8.81	0.1227
1/13/2003	LIM3	4.17	18.35	0.0785	3.1	17.0	8.83	0.1227
1/13/2003	LIM3	4.17	17.85	0.0784	3.5	18.0	8.82	0.1225
1/13/2003	LIM3	4.19	19.27	0.0787	3.8	19.4	8.75	0.1229
1/13/2003	LIM5	3.58	18.52	0.0795	2.2	0.4	8.92	0.1244
1/13/2003	LIM5	3.58	14.71	0.0797	2.2	1.1	8.94	0.1245
1/13/2003	LIM5	3.58	13.77	0.0796	2.3	2.1	8.95	0.1244
1/13/2003	LIM5	3.58	17.09	0.0795	2.1	3.0	8.95	0.1242
1/13/2003	LIM5	3.58	15.45	0.0798	2.1	4.7	8.96	0.1247
1/13/2003	LIM5	3.58	12.34	0.0792	2.1	5.7	8.94	0.1248
1/13/2003	LIM5	3.57	13.61	0.0799	28.2	6.5	8.95	0.1248
1/13/2003	LIM5	3.55	17.16	0.0796	2	7.0	8.93	0.1244
1/13/2003	LIM5	3.55	17.97	0.0795	2.1	7.9	8.94	0.1243
1/13/2003	LIM5	3.55	16.89	0.0799	2.2	9.6	8.93	0.1248
1/13/2003	LIM5	3.55	15.6	0.0799	2.1	10.1	8.93	0.1248
1/13/2003	LIM5	3.55	15.22	0.08	1.9	10.9	8.93	0.125
1/13/2003	LIM5	3.55	17.82	0.0798	2.3	12.1	8.91	0.1247
1/13/2003	LIM5	3.55	12.98	0.0799	2.1	13.7	8.9	0.1251
1/13/2003	LIM5	3.55	15.57	0.0799	2.3	14.0	8.91	0.1248
1/13/2003	LIM5	3.55	18.29	0.0793	2.1	15.0	8.9	0.124
1/13/2003	LIM5	3.55	17.62	0.0797	2.3	15.9	8.89	0.1246
1/13/2003	LIM5	3.55	17.87	0.0796	2.3	17.0	8.88	0.1244
1/13/2003	LIM5	3.55	17.44	0.0797	2.1	18.0	8.87	0.1246
1/13/2003	LIM5	3.55	17.12	0.0796	2	19.1	8.87	0.125
1/13/2003	LIM5	3.55	13.7	0.0799	2.2	19.9	8.87	0.1249
1/13/2003	LIM5	3.53	16.84	0.0796	2.1	21.9	8.85	0.1252
1/13/2003	LIM5	3.53	14.42	0.0799	1.9	22.1	8.86	0.125
1/13/2003	LIM5	3.53	12.16	0.08	2.7	23.0	8.85	0.125
1/13/2003	LIM5	3.59	14.85	0.0799	2.3	24.1	8.84	0.1248
2/18/2003	LIM1	3.87	4.63	0.0804	8.4	0.3	9.01	0.1256
2/18/2003	LIM1	3.9	2.53	0.0803	4.7	1	9.02	0.1254
2/18/2003	LIM1	3.86	2.97	0.0801	4.4	2.6	9.05	0.1252
2/18/2003	LIM1	3.81	3.36	0.0801	4.3	3	9.04	0.1251
2/18/2003	LIM1	3.81	3.3	0.0802	4.5	4.1	9.05	0.1251
2/18/2003	LIM1	3.8	3.23	0.0801	4.4	5	9.03	0.1251
2/18/2003	LIM1	3.8	3.2	0.0803	4.6	6	9.02	0.1254
2/18/2003	LIM1	3.8	3.22	0.0802	4.4	7.2	9.03	0.1253

2/18/2003	LIM1	3.8	3.17	0.0804	4.4	8	9	0.1256
2/18/2003	LIM1	3.79	3.17	0.0803	4.5	9	9	0.1254
2/18/2003	LIM1	3.79	3.12	0.0804	4.9	10	8.99	0.1256
2/18/2003	LIM1	3.79	3.17	0.0804	4.4	11.6	8.97	0.1254
2/18/2003	LIM1	3.79	3.15	0.0804	4.7	12.3	8.97	0.1257
2/18/2003	LIM1	3.81	3.22	0.0804	4.4	14	8.95	0.1257
2/18/2003	LIM1	3.81	3.13	0.0804	4.5	14.3	8.93	0.1257
2/18/2003	LIM1	3.82	3.07	0.0804	4.4	15.2	8.93	0.1257
2/18/2003	LIM1	3.81	3.07	0.0805	4.5	17.1	8.9	0.1258
2/18/2003	LIM1	3.82	3.05	0.0806	4.8	18.3	8.89	0.126
2/18/2003	LIM1	3.83	3.09	0.0805	4.8	18.4	8.91	0.126
2/18/2003	LIM1	3.84	3.11	0.0806	4.5	18.9	8.9	0.1259
2/18/2003	LIM1	3.85	3.02	0.0808	4.6	20.2	8.88	0.1262
2/18/2003	LIM1	3.86	3.09	0.081	4.9	21.8	8.86	0.1265
2/18/2003	LIM1	3.87	3.09	0.081	28.3	22.2	8.83	0.1265
2/18/2003	LIM3	3.7	2.16	0.0792	1.3	0.2	8.85	0.1238
2/18/2003	LIM3	3.67	3.08	0.0794	1.9	1	8.86	0.1241
2/18/2003	LIM3	3.67	3.46	0.0794	2	2.1	8.87	0.1241
2/18/2003	LIM3	3.65	3.56	0.0794	2.4	3	8.87	0.1241
2/18/2003	LIM3	3.64	3.75	0.0794	2.2	4	8.87	0.124
2/18/2003	LIM3	3.64	3.57	0.0794	2.2	5.2	8.87	0.1241
2/18/2003	LIM3	3.64	3.54	0.0794	1.9	5.9	8.87	0.124
2/18/2003	LIM3	3.63	3.52	0.0792	2.6	7.1	8.86	0.1237
2/18/2003	LIM3	3.63	3.55	0.0794	2.7	8	8.84	0.124
2/18/2003	LIM3	3.63	3.67	0.0794	2.5	9.7	8.83	0.124
2/18/2003	LIM3	3.63	3.67	0.0795	3.1	10	8.83	0.1242
2/18/2003	LIM3	3.62	3.67	0.0793	2.7	11.9	8.81	0.124
2/18/2003	LIM3	3.63	3.66	0.0795	3.1	12.4	8.83	0.1242
2/18/2003	LIM3	3.64	3.56	0.0794	4.3	13.2	8.81	0.124
2/18/2003	LIM3	3.58	3.53	0.0799	10	14	8.82	0.1244
2/18/2003	LIM3	3.59	3.57	0.0798	11.8	15	8.82	0.1247
2/18/2003	LIM3	3.59	3.55	0.0798	11.3	16.2	8.81	0.1248
2/18/2003	LIM3	3.59	3.57	0.0798	11.7	17	8.81	0.1247
2/18/2003	LIM3	3.6	3.52	0.0799	11.3	18	8.8	0.1246
2/18/2003	LIM3	3.61	3.43	0.0805	15.1	19.3	8.8	0.1258
2/18/2003	LIM3	3.66	3.54	0.0811	27.2	20	8.82	0.1267
2/18/2003	LIM5	3.13	3.57	0.0799	1.9	0.2	8.68	0.1254
2/18/2003	LIM5	3.07	5.12	0.0801	2.2	0.9	8.7	0.1252
2/18/2003	LIM5	3.06	6.57	0.0802	2.3	2	8.73	0.1253
2/18/2003	LIM5	3.03	6.75	0.0803	2.1	4	8.72	0.1255
2/18/2003	LIM5	3.02	6.66	0.0804	3.4	4.4	8.73	0.1257
2/18/2003	LIM5	3.03	6.28	0.0802	2.2	5	8.74	0.1256
2/18/2003	LIM5	3.03	5.99	0.0803	2.1	6	8.7	0.1255
2/18/2003	LIM5	3.03	5.82	0.0803	2.1	7.2	8.68	0.1255
2/18/2003	LIM5	3.04	5.67	0.0802	2.1	8	8.67	0.1254

2/18/2003	LIM5	3.02	5.71	0.0804	2.1	9	8.65	0.1255
2/18/2003	LIM5	3.02	5.59	0.0803	2.2	10	8.65	0.1255
2/18/2003	LIM5	3.03	5.5	0.0803	2	12.3	8.61	0.1255
2/18/2003	LIM5	3.03	5.36	0.0802	2.2	12	8.64	0.1254
2/18/2003	LIM5	3.01	5.29	0.0803	2.1	13	8.63	0.1255
2/18/2003	LIM5	3.01	5.26	0.0804	1.9	14	8.61	0.1257
2/18/2003	LIM5	3.01	5.16	0.0803	2.2	15	8.6	0.1258
2/18/2003	LIM5	3.01	5.22	0.0803	2.1	16	8.59	0.1255
2/18/2003	LIM5	3.01	5.12	0.0804	2	17	8.59	0.1257
2/18/2003	LIM5	3.02	5.01	0.0803	2.2	18	8.59	0.1255
2/18/2003	LIM5	3.02	4.99	0.0801	2.2	19	8.6	0.1252
2/18/2003	LIM5	3.03	4.94	0.0805	2	20	8.58	0.1258
2/18/2003	LIM5	3.04	4.85	0.0804	2	21	8.58	0.1253
2/18/2003	LIM5	3.05	4.85	0.0805	2.2	22	8.59	0.1258
2/18/2003	LIM5	3.06	4.78	0.0804	2.1	23	8.59	0.1256
2/18/2003	LIM5	3.06	4.71	0.0804	2.1	24	8.59	0.1256
3/13/2003	LIM1	0	0	0	0	0	0	0
3/13/2003	LIM1	4.33	2.83	0.0806	0	0.1	9.06	0.1259
3/13/2003	LIM1	4.2	4.33	0.0803	2.3	2.6	9.1	0.1255
3/13/2003	LIM1	4.16	4.4	0.0806	2.4	4.1	9.08	0.1259
3/13/2003	LIM1	4.16	4.26	0.0804	2.3	6	9.05	0.1259
3/13/2003	LIM1	4.13	4.3	0.0804	2.3	8.8	9.03	0.1256
3/13/2003	LIM1	4.11	4.13	0.0805	2.3	9.9	9.01	0.1258
3/13/2003	LIM1	4.1	4.08	0.0806	2.6	12	8.97	0.1259
3/13/2003	LIM1	4.09	4.08	0.0805	2.9	14.1	8.95	0.1259
3/13/2003	LIM1	4.08	4.06	0.0805	2.2	16.1	8.92	0.1258
3/13/2003	LIM1	4.09	4.02	0.0805	3.4	18	8.9	0.1258
3/13/2003	LIM1	4.08	3.99	0.0804	2.6	20	8.91	0.1259
3/13/2003	LIM1	4.09	4	0.0806	2.4	21.1	8.89	0.1259
3/18/2003	LIM3	9.06	1.61	0.0001	0	0	8.02	0.0001
3/18/2003	LIM3	5.43	2.37	0.0806	6.7	0.3	8.99	0.1263
3/18/2003	LIM3	4.96	2.81	0.0807	3.3	2.3	9	0.1263
3/18/2003	LIM3	4.84	3.2	0.0807	3.2	4	8.97	0.1261
3/18/2003	LIM3	4.76	3.29	0.0807	3.2	6	8.95	0.1262
3/18/2003	LIM3	4.72	3.21	0.0807	3.2	8.2	8.93	0.1261
3/18/2003	LIM3	4.7	3.18	0.0807	3.1	10	8.89	0.1261
3/18/2003	LIM3	4.65	3.13	0.0806	3.4	12	8.85	0.1259
3/18/2003	LIM3	4.56	3.08	0.0807	3.4	14	8.82	0.1261
3/18/2003	LIM3	4.38	3.05	0.0807	3.5	16.7	8.79	0.126
3/18/2003	LIM3	4.35	3.03	0.0806	3.4	18	8.77	0.1259
3/18/2003	LIM3	4.34	3	0.0807	3.6	20.2	8.76	0.1261
3/13/2003	LIM5	3.61	2.79	0.081	2	-0.1	8.81	0.1265
3/13/2003	LIM5	3.59	3.32	0.081	2.9	0.1	8.83	0.1265
3/13/2003	LIM5	3.57	4.3	0.081	1.8	2	8.82	0.1266
3/13/2003	LIM5	3.57	7.14	0.081	2.3	4	8.8	0.1266

3/13/2003	LIM5	3.53	5.19	0.0811	1.7	6.1	8.78	0.1266
3/13/2003	LIM5	3.53	5.17	0.081	1.7	8.1	8.76	0.1266
3/13/2003	LIM5	3.53	5.24	0.081	1.8	11.4	8.68	0.1266
3/13/2003	LIM5	3.52	5.13	0.081	1.9	12	8.69	0.1265
3/13/2003	LIM5	3.52	5.15	0.0809	1.9	14	8.66	0.1266
3/13/2003	LIM5	3.53	5.14	0.0809	1.6	16.1	8.63	0.1265
3/13/2003	LIM5	3.52	5.17	0.081	1.8	18.1	8.63	0.1266
3/13/2003	LIM5	3.53	5.16	0.081	2	20	8.59	0.1266
3/13/2003	LIM5	3.52	5.2	0.081	1.6	22	8.6	0.1266
4/23/2003	LIM1	14.74	0.23	0		0.4	9.07	0
4/23/2003	LIM1	9.02	1.75	0.0861	2.7	0.6	9.32	0.1345
4/23/2003	LIM1	8.9	2.43	0.0857	2.1	3.4	9.34	0.1341
4/23/2003	LIM1	8.76	2.79	0.0855	1.8	4	9.29	0.1336
4/23/2003	LIM1	7.21	3.11	0.085	2.2	5.9	9.16	0.1329
4/23/2003	LIM1	7.05	3.06	0.0851	2.1	8.6	9.11	0.133
4/23/2003	LIM1	6.97	2.98	0.0851	2.1	10	9.07	0.1329
4/23/2003	LIM1	6.79	2.92	0.0851	2.1	12.2	9.02	0.1329
4/23/2003	LIM1	6.7	2.95	0.0851	1.8	14.5	8.98	0.133
4/23/2003	LIM1	6.56	2.91	0.0854	1.9	16.6	8.95	0.1334
4/23/2003	LIM1	6.51	2.91	0.0854	1.7	18	8.91	0.1335
4/23/2003	LIM1	6.5	2.86	0.0854	1.7	20.5	8.9	0.1337
4/23/2003	LIM1	6.48	2.83	0.0855	10.8	21.1	8.89	0.1337
4/23/2003	LIM3	14.56	0.29	0	0	-0.2	8	0
4/23/2003	LIM3	11.15	1.53	0.0831	2.7	0.3	9.21	0.1299
4/23/2003	LIM3	10.39	2.36	0.0831	3.7	2.1	9.23	0.1298
4/23/2003	LIM3	10.25	2.8	0.0831	4	4	9.2	0.1299
4/23/2003	LIM3	10.12	2.79	0.0833	3.9	6	9.26	0.1301
4/23/2003	LIM3	10.09	2.73	0.0834	3.5	8.7	9.24	0.1303
4/23/2003	LIM3	9.97	2.67	0.0834	3.9	9.9	9.24	0.1303
4/23/2003	LIM3	9.4	2.68	0.0845	3.9	12.2	9.24	0.132
4/23/2003	LIM3	7.97	2.76	0.0858	4.4	14.1	9.13	0.134
4/23/2003	LIM3	7.92	2.73	0.0857	4.5	16	9.1	0.1335
4/23/2003	LIM3	7.86	2.7	0.0858	4.6	18	9.06	0.134
4/23/2003	LIM3	7.68	2.69	0.0857	5	19.4	9.01	0.1339
4/23/2003	LIM5	20.47	0.24	0	0	-0.2	8.23	0
4/23/2003	LIM5	9.6	3.1	0.0823	5.5	0.2	9.03	0.1283
4/23/2003	LIM5	9.16	3.45	0.0826	6.2	3.3	8.97	0.129
4/23/2003	LIM5	9.11	3.5	0.0825	6.3	4.2	8.98	0.1289
4/23/2003	LIM5	9.06	3.44	0.0825	6.3	6	8.96	0.1289
4/23/2003	LIM5	9.04	3.37	0.0825	5.6	9.3	8.96	0.1289
4/23/2003	LIM5	9.02	3.33	0.0825	5.8	10	8.94	0.1289
4/23/2003	LIM5	8.8	3.32	0.0825	5.7	12	8.89	0.1289
4/23/2003	LIM5	8.65	3.31	0.0825	6.6	14	8.85	0.1289
4/23/2003	LIM5	8.25	3.3	0.0825	6	16	8.81	0.1289
4/23/2003	LIM5	8.02	3.29	0.0825	6.2	17.9	8.77	0.1289

4/23/2003	LIM5	7.85	3.27	0.0825	6.5	20	8.73	0.1289
4/23/2003	LIM5	7.71	3.25	0.0823	6.3	22	8.71	0.1286
5/6/2003	LIM1	10.32	1.72	0.0845	19.6	0.3	9.3	0.1321
5/6/2003	LIM1	9.15	2.1	0.0844	2.9	1.9	9.3	0.1319
5/6/2003	LIM1	8.92	2.17	0.0844	2.7	4	9.29	0.1318
5/6/2003	LIM1	8.78	2.22	0.0844	2.2	6.5	9.24	0.1316
5/6/2003	LIM1	8.8	2.17	0.0842	2.4	8	9.17	0.1315
5/6/2003	LIM1	8.45	2.14	0.0845	2.1	10	9.09	0.1319
5/6/2003	LIM1	8.4	2.1	0.0843	3.2	12	9.04	0.1318
5/6/2003	LIM1	8.27	2.09	0.0844	3	14	9.01	0.1318
5/6/2003	LIM1	8.19	2.06	0.0843	2.9	16.1	8.99	0.1318
5/6/2003	LIM1	8.1	2.04	0.084	2.9	18	8.96	0.1313
5/6/2003	LIM1	7.91	2.03	0.0842	3.5	20.2	8.89	0.1316
5/6/2003	LIM3	18.24	0.06	0	0	-0.1	6.59	0
5/6/2003	LIM3	12.7	1.06	0.0845	640.5	0.3	9.42	0.132
5/6/2003	LIM3	12.23	1.99	0.0845	724.5	2.5	9.48	0.1319
5/6/2003	LIM3	12.02	2.71	0.0846	734.1	4.1	9.46	0.1322
5/6/2003	LIM3	12.03	2.6	0.0847	738.8	4	9.47	0.1324
5/6/2003	LIM3	12.02	2.5	0.0845	741.9	4.2	9.47	0.1321
5/6/2003	LIM3	11.8	2.46	0.0846	744.8	6	9.44	0.1321
5/6/2003	LIM3	11.67	2.36	0.0842	746.6	8.4	9.41	0.1318
5/6/2003	LIM3	11.06	2.29	0.0842	746.4	10.1	9.35	0.1312
5/6/2003	LIM3	9.15	2.38	0.0843	759.3	12	9.11	0.1317
5/6/2003	LIM3	8.7	2.36	0.0847	758.5	14.2	8.95	0.1324
5/6/2003	LIM3	8.63	2.35	0.0847	757.9	16	8.91	0.1323
5/6/2003	LIM3	8.33	2.31	0.0851	757.2	18.4	8.78	0.1329
5/6/2003	LIM5	16.15	0.19	0	0	0.3	8.4	0
5/6/2003	LIM5	10.83	2.74	0.0836	718.1	0.3	9.15	0.1307
5/6/2003	LIM5	10.76	3.88	0.0837	2.6	2.3	9.13	0.1308
5/6/2003	LIM5	10.71	3.52	0.0836	2.7	4.1	9.13	0.1304
5/6/2003	LIM5	10.58	3.45	0.0838	2.2	6.5	9.12	0.1309
5/6/2003	LIM5	10.49	3.39	0.0839	2.4	8.7	9.11	0.1309
5/6/2003	LIM5	10.23	3.34	0.0839	3	10.1	9.09	0.131
5/6/2003	LIM5	9.64	3.32	0.0843	2.8	12	8.96	0.1318
5/6/2003	LIM5	9.44	3.29	0.0845	4	14	8.92	0.1319
5/6/2003	LIM5	9.42	3.24	0.0845	2.6	16.1	8.89	0.1319
5/6/2003	LIM5	9.31	3.21	0.0846	2.4	18.1	8.88	0.1322
5/6/2003	LIM5	9.31	3.19	0.0845	3.5	18.1	8.89	0.1321
5/6/2003	LIM5	8.85	3.17	0.0848	3.8	20	8.81	0.1326
5/6/2003	LIM5	8.71	3.13	0.0849	5.1	21.4	8.77	0.1326
5/20/2003	LIM1	10.42	11.32	--	1.2	1.5	7.31	126.3
5/20/2003	LIM1	10.31	11.38	--	1.2	3.6	7.32	126.6
5/20/2003	LIM1	10.1	11.65	--	1.4	6.4	7.28	126.6
5/20/2003	LIM1	10.07	11.28	--	1.7	7.5	7.29	126
5/20/2003	LIM1	9.93	11.21	--	1.7	9.5	7.26	126.4

5/20/2003	LIM1	9.83	11.16	--	1.6	11.6	7.27	125.5
5/20/2003	LIM1	9.81	11.39	--	1.6	13.6	7.25	125.9
5/20/2003	LIM1	9.81	11.37	--	1.5	13.7	7.24	126.3
5/20/2003	LIM1	9.77	11.04	--	1.5	15.5	7.23	126.1
5/20/2003	LIM1	9.72	10.95	--	1.7	17.6	7.22	126.3
5/20/2003	LIM1	9.72	11.02	--	1.9	17.5	7.22	126.3
5/20/2003	LIM1	9.68	11.04	--	1.8	19.6	7.21	126.1
5/20/2003	LIM1	9.58	10.92	--	1.9	21.4	7.2	126.5
5/20/2003	LIM3	0	0	--	0	0	0	0
5/20/2003	LIM3	12.53	10.38	--	1.4	1.8	7.39	126.6
5/20/2003	LIM3	12.39	10.3	--	1.8	3.7	7.4	126.3
5/20/2003	LIM3	12.11	10.34	--	2	5.5	7.33	126.1
5/20/2003	LIM3	11.88	10.1	--	1.9	7.5	7.32	126.3
5/20/2003	LIM3	11.43	10.28	--	2.3	9.6	7.3	126
5/20/2003	LIM3	11.22	10.3	--	2	11.5	7.29	126.1
5/20/2003	LIM3	10.78	10.3	--	2.1	13.5	7.26	126
5/20/2003	LIM3	10.35	10.51	--	2.6	15.5	7.27	126.2
5/20/2003	LIM3	10.22	10.53	--	3.3	17.5	7.24	126.3
5/20/2003	LIM3	10.22	10.55	--	3.8	19.5	7.27	126.8
5/20/2003	LIM5	18.53	8.48	--	13.7	1.7	7.59	0
5/20/2003	LIM5	11.5	10.4	--	1.4	1.5	7.47	124.5
5/20/2003	LIM5	11.49	10.37	--	1.6	3.5	7.46	124.6
5/20/2003	LIM5	11.47	10.38	--	1.8	5.5	7.44	124.5
5/20/2003	LIM5	11.29	10.32	--	1.9	7.5	7.42	124.1
5/20/2003	LIM5	11.12	10.3	--	2	9.5	7.4	124.9
5/20/2003	LIM5	11.11	10.2	--	2.3	11.5	7.37	125
5/20/2003	LIM5	11.02	10.2	--	2.5	13.5	7.36	125.2
5/20/2003	LIM5	10.89	10.03	--	2	15.4	7.31	125.1
5/20/2003	LIM5	10.7	9.77	--	2.2	17.5	7.27	124.1
5/20/2003	LIM5	10.33	9.63	--	2.4	19.5	7.2	124.4
5/20/2003	LIM5	9.92	9.6	--	1.7	21.5	7.18	123.6
5/20/2003	LIM5	9.76	9.64	--	1.7	23.6	7.18	123.5
5/20/2003	LIM5	9.62	9.44	--	2.6	24.8	7.14	123.3
6/4/2003	LIM1	16.1	10.60	--	--	0	--	--
6/4/2003	LIM1	14.3	10.81	--	--	3	--	--
6/4/2003	LIM1	13.6	10.88	--	--	6	--	--
6/4/2003	LIM1	13.1	10.42	--	--	9	--	--
6/4/2003	LIM1	12.8	10.34	--	--	12	--	--
6/4/2003	LIM1	12.8	10.15	--	--	15	--	--
6/4/2003	LIM1	12.6	10.04	--	--	18	--	--
6/4/2003	LIM1	12.5	9.56	--	--	21	--	--
6/4/2003	LIM2	18.9	10.20	--	--	0	--	--
6/4/2003	LIM2	18.4	10.20	--	--	1	--	--
6/4/2003	LIM2	17.3	10.20	--	--	2	--	--
6/4/2003	LIM2	16.6	10.50	--	--	3	--	--

6/4/2003	LIM2	15.9	10.67	--	--	4	--	--
6/4/2003	LIM2	15.2	10.70	--	--	5	--	--
6/4/2003	LIM2	14.4	10.96	--	--	6	--	--
6/4/2003	LIM3	18.2	9.90	--	--	0	--	--
6/4/2003	LIM3	16.8	10.20	--	--	3	--	--
6/4/2003	LIM3	15.2	10.40	--	--	6	--	--
6/4/2003	LIM3	13.4	9.94	--	--	9	--	--
6/4/2003	LIM3	12.7	9.21	--	--	12	--	--
6/4/2003	LIM3	12.1	8.39	--	--	15	--	--
6/4/2003	LIM3	11.8	7.81	--	--	18	--	--
6/4/2003	LIM3	11.7	7.08	--	--	20	--	--
6/4/2003	LIM4	20.0	9.50	--	--	0	--	--
6/4/2003	LIM4	19.5	9.56	--	--	2	--	--
6/4/2003	LIM4	19.2	9.83	--	--	4	--	--
6/4/2003	LIM4	16.2	10.30	--	--	6	--	--
6/4/2003	LIM4	14.9	9.34	--	--	8	--	--
6/4/2003	LIM4	14.3	8.61	--	--	10	--	--
6/4/2003	LIM4	13.8	8.28	--	--	12	--	--
6/4/2003	LIM5	17.0	9.80	--	--	0	--	--
6/4/2003	LIM5	16.7	10.00	--	--	3	--	--
6/4/2003	LIM5	16.4	9.88	--	--	6	--	--
6/4/2003	LIM5	15.7	9.70	--	--	9	--	--
6/4/2003	LIM5	13.5	9.70	--	--	12	--	--
6/4/2003	LIM5	12.6	9.20	--	--	15	--	--
6/4/2003	LIM5	12.2	8.65	--	--	18	--	--
6/4/2003	LIM5	11.9	8.00	--	--	21	--	--
6/4/2003	LIM5	11.7	7.48	--	--	23	--	--
6/4/2003	LIM6	16.9	9.18	--	--	0	--	--
6/4/2003	LIM6	16.9	9.45	--	--	3	--	--
6/4/2003	LIM6	16.6	9.50	--	--	6	--	--
6/4/2003	LIM6	16.4	9.50	--	--	9	--	--
6/4/2003	LIM6	16.1	9.50	--	--	12	--	--
6/4/2003	LIM6	15.3	9.54	--	--	15	--	--
6/4/2003	LIM6	14.1	9.20	--	--	18	--	--
6/4/2003	LIM6	12.2	8.70	--	--	21	--	--
6/4/2003	LIM6	11.9	7.96	--	--	24	--	--
6/18/2003	LIM1	18.7	9.95	--	--	0	--	--
6/18/2003	LIM1	17.5	10.08	--	--	3	--	--
6/18/2003	LIM1	15.7	10.17	--	--	6	--	--
6/18/2003	LIM1	15.2	10.15	--	--	9	--	--
6/18/2003	LIM1	14.9	10.01	--	--	12	--	--
6/18/2003	LIM1	14.7	9.85	--	--	15	--	--
6/18/2003	LIM1	14.3	9.39	--	--	18	--	--
6/18/2003	LIM1	13.4	8.14	--	--	21	--	--
6/18/2003	LIM2	21.6	9.33	--	--	0	--	--

6/18/2003	LIM2	21.0	9.48	--	--	1	--	--
6/18/2003	LIM2	20.4	9.66	--	--	2	--	--
6/18/2003	LIM2	19.4	9.80	--	--	3	--	--
6/18/2003	LIM2	18.9	9.98	--	--	4	--	--
6/18/2003	LIM2	17.7	10.19	--	--	5	--	--
6/18/2003	LIM2	17.0	10.08	--	--	6	--	--
6/18/2003	LIM3	22.6	8.77	--	--	0	--	--
6/18/2003	LIM3	18.8	9.85	--	--	3	--	--
6/18/2003	LIM3	17.6	9.59	--	--	6	--	--
6/18/2003	LIM3	16.3	9.46	--	--	9	--	--
6/18/2003	LIM3	14.5	8.98	--	--	12	--	--
6/18/2003	LIM3	13.4	8.25	--	--	15	--	--
6/18/2003	LIM3	12.2	6.38	--	--	18	--	--
6/18/2003	LIM3	12.0	1.69	--	--	20	--	--
6/18/2003	LIM4	23.6	8.62	--	--	0	--	--
6/18/2003	LIM4	21.5	9.37	--	--	2	--	--
6/18/2003	LIM4	19.3	9.85	--	--	4	--	--
6/18/2003	LIM4	17.8	9.75	--	--	6	--	--
6/18/2003	LIM4	16.6	9.48	--	--	8	--	--
6/18/2003	LIM4	15.4	8.08	--	--	10	--	--
6/18/2003	LIM4	15.4	7.91	--	--	12	--	--
6/18/2003	LIM5	20.5	9.46	--	--	0	--	--
6/18/2003	LIM5	19.5	9.31	--	--	3	--	--
6/18/2003	LIM5	18.6	9.46	--	--	6	--	--
6/18/2003	LIM5	16.7	9.35	--	--	9	--	--
6/18/2003	LIM5	14.9	9.14	--	--	12	--	--
6/18/2003	LIM5	14	8.59	--	--	15	--	--
6/18/2003	LIM5	13.6	8.22	--	--	18	--	--
6/18/2003	LIM5	13.2	7.82	--	--	21	--	--
6/18/2003	LIM6	20.0	9.56	--	--	0	--	--
6/18/2003	LIM6	19.7	9.40	--	--	3	--	--
6/18/2003	LIM6	19.4	9.44	--	--	6	--	--
6/18/2003	LIM6	18.8	9.44	--	--	9	--	--
6/18/2003	LIM6	14.7	9.12	--	--	12	--	--
6/18/2003	LIM6	13.6	8.34	--	--	15	--	--
6/18/2003	LIM6	13.0	7.75	--	--	18	--	--
6/18/2003	LIM6	12.3	6.58	--	--	21	--	--
6/18/2003	LIM6	12.2	2.50	--	--	24	--	--
7/2/2003	LIM1	18.3	9.25	--	--	0	--	--
7/2/2003	LIM1	17.7	9.48	--	--	3	--	--
7/2/2003	LIM1	17.4	9.39	--	--	6	--	--
7/2/2003	LIM1	17.2	9.35	--	--	9	--	--
7/2/2003	LIM1	16.9	9.29	--	--	12	--	--
7/2/2003	LIM1	16.7	9.29	--	--	15	--	--
7/2/2003	LIM1	16.4	9.22	--	--	18	--	--

7/2/2003	LIM1	15.5	8.11	--	--	21	--	--
7/2/2003	LIM2	21.0	8.00	--	--	0	--	--
7/2/2003	LIM2	20.6	8.37	--	--	1	--	--
7/2/2003	LIM2	20.3	8.30	--	--	2	--	--
7/2/2003	LIM2	20.3	8.48	--	--	3	--	--
7/2/2003	LIM2	20.1	8.51	--	--	4	--	--
7/2/2003	LIM2	20.0	8.46	--	--	5	--	--
7/2/2003	LIM2	19.7	8.46	--	--	6	--	--
7/2/2003	LIM3	20.7	8.40	--	--	0	--	--
7/2/2003	LIM3	20.4	8.43	--	--	3	--	--
7/2/2003	LIM3	20.1	8.53	--	--	6	--	--
7/2/2003	LIM3	19.8	8.43	--	--	9	--	--
7/2/2003	LIM3	17.4	7.80	--	--	12	--	--
7/2/2003	LIM3	15.4	7.80	--	--	15	--	--
7/2/2003	LIM3	14.3	6.90	--	--	18	--	--
7/2/2003	LIM3	12.8	5.00	--	--	20	--	--
7/2/2003	LIM4	21.0	8.30	--	--	0	--	--
7/2/2003	LIM4	20.7	8.51	--	--	2	--	--
7/2/2003	LIM4	20.2	8.61	--	--	4	--	--
7/2/2003	LIM4	19.9	8.60	--	--	6	--	--
7/2/2003	LIM4	18.6	7.85	--	--	8	--	--
7/2/2003	LIM4	17.7	7.63	--	--	10	--	--
7/2/2003	LIM4	17.2	7.17	--	--	12	--	--
7/2/2003	LIM5	18.9	9.10	--	--	0	--	--
7/2/2003	LIM5	19.0	8.67	--	--	3	--	--
7/2/2003	LIM5	18.8	8.65	--	--	6	--	--
7/2/2003	LIM5	18.3	8.40	--	--	9	--	--
7/2/2003	LIM5	16.4	8.23	--	--	12	--	--
7/2/2003	LIM5	15.3	7.94	--	--	15	--	--
7/2/2003	LIM5	14.3	6.89	--	--	18	--	--
7/2/2003	LIM5	13.2	5.99	--	--	21	--	--
7/2/2003	LIM5	13.2	5.93	--	--	24	--	--
7/2/2003	LIM6	17.7	9.38	--	--	0	--	--
7/2/2003	LIM6	17.6	9.38	--	--	3	--	--
7/2/2003	LIM6	17.5	9.30	--	--	6	--	--
7/2/2003	LIM6	16.4	8.80	--	--	9	--	--
7/2/2003	LIM6	15.0	7.97	--	--	12	--	--
7/2/2003	LIM6	14.8	7.95	--	--	15	--	--
7/2/2003	LIM6	14.0	7.52	--	--	18	--	--
7/2/2003	LIM6	13.5	6.96	--	--	21	--	--
7/2/2003	LIM6	13.4	6.91	--	--	24	--	--
7/16/2003	LIM1	21.7	9.10	--	--	0	--	--
7/16/2003	LIM1	19.2	9.62	--	--	3	--	--
7/16/2003	LIM1	18.0	9.37	--	--	6	--	--
7/16/2003	LIM1	17.9	9.29	--	--	9	--	--

7/16/2003	LIM1	17.7	9.34	--	--	12	--	--
7/16/2003	LIM1	17.4	9.20	--	--	15	--	--
7/16/2003	LIM1	17.3	9.13	--	--	18	--	--
7/16/2003	LIM1	17.1	8.73	--	--	21	--	--
7/16/2003	LIM2	23.5	8.45	--	--	0	--	--
7/16/2003	LIM2	23.5	8.27	--	--	1	--	--
7/16/2003	LIM2	23.5	8.20	--	--	2	--	--
7/16/2003	LIM2	23.4	8.38	--	--	3	--	--
7/16/2003	LIM2	22.9	8.39	--	--	4	--	--
7/16/2003	LIM2	21.8	8.60	--	--	5	--	--
7/16/2003	LIM3	23.6	8.15	--	--	0	--	--
7/16/2003	LIM3	23.3	8.24	--	--	3	--	--
7/16/2003	LIM3	21.3	8.74	--	--	6	--	--
7/16/2003	LIM3	20.2	8.78	--	--	9	--	--
7/16/2003	LIM3	19.7	8.70	--	--	12	--	--
7/16/2003	LIM3	18.3	8.67	--	--	15	--	--
7/16/2003	LIM3	14.7	8.70	--	--	18	--	--
7/16/2003	LIM3	13.5	4.37	--	--	21	--	--
7/16/2003	LIM4	23.3	8.57	--	--	0	--	--
7/16/2003	LIM4	23.2	8.40	--	--	2	--	--
7/16/2003	LIM4	22.1	8.55	--	--	4	--	--
7/16/2003	LIM4	20.8	8.11	--	--	6	--	--
7/16/2003	LIM4	20.0	7.10	--	--	8	--	--
7/16/2003	LIM4	18.8	6.25	--	--	10	--	--
7/16/2003	LIM4	18.7	6.02	--	--	12	--	--
7/16/2003	LIM5	20.6	9.07	--	--	0	--	--
7/16/2003	LIM5	20.5	8.75	--	--	3	--	--
7/16/2003	LIM5	19.5	8.80	--	--	6	--	--
7/16/2003	LIM5	18.4	8.24	--	--	9	--	--
7/16/2003	LIM5	16.5	7.20	--	--	12	--	--
7/16/2003	LIM5	15.6	6.74	--	--	15	--	--
7/16/2003	LIM5	15.1	6.53	--	--	18	--	--
7/16/2003	LIM5	14.8	6.27	--	--	21	--	--
7/16/2003	LIM5	14.1	5.40	--	--	24	--	--
7/16/2003	LIM6	21.0	8.70	--	--	0	--	--
7/16/2003	LIM6	20.7	9.08	--	--	3	--	--
7/16/2003	LIM6	19.7	9.27	--	--	6	--	--
7/16/2003	LIM6	18.1	8.56	--	--	9	--	--
7/16/2003	LIM6	16.6	8.16	--	--	12	--	--
7/16/2003	LIM6	15.8	7.50	--	--	15	--	--
7/16/2003	LIM6	14.7	7.00	--	--	18	--	--
7/16/2003	LIM6	14.1	6.05	--	--	21	--	--
7/16/2003	LIM6	13.3	5.13	--	--	24	--	--
7/31/2003	LIM1	24.4	8.57	--	--	0	--	--
7/31/2003	LIM1	20.8	9.10	--	--	3	--	--

7/31/2003	LIM1	20.0	8.84	--	--	6	--	--
7/31/2003	LIM1	19.7	8.97	--	--	9	--	--
7/31/2003	LIM1	19.5	8.80	--	--	12	--	--
7/31/2003	LIM1	19.3	8.50	--	--	15	--	--
7/31/2003	LIM1	19.0	8.34	--	--	18	--	--
7/31/2003	LIM1	18.2	6.15	--	--	21	--	--
7/31/2003	LIM2	27.8	7.93	--	--	0	--	--
7/31/2003	LIM2	26.7	7.99	--	--	1	--	--
7/31/2003	LIM2	26.1	7.89	--	--	2	--	--
7/31/2003	LIM2	25.2	8.28	--	--	3	--	--
7/31/2003	LIM2	23.8	9.08	--	--	4	--	--
7/31/2003	LIM2	22.5	8.36	--	--	5	--	--
7/31/2003	LIM2	20.7	8.47	--	--	6	--	--
7/31/2003	LIM3	28.2	8.01	--	--	0	--	--
7/31/2003	LIM3	23.6	9.64	--	--	3	--	--
7/31/2003	LIM3	21.2	9.63	--	--	6	--	--
7/31/2003	LIM3	19.6	8.85	--	--	9	--	--
7/31/2003	LIM3	18.3	7.56	--	--	12	--	--
7/31/2003	LIM3	16.6	5.88	--	--	15	--	--
7/31/2003	LIM3	14.5	4.24	--	--	18	--	--
7/31/2003	LIM3	13.5	2.09	--	--	21	--	--
7/31/2003	LIM4	27.9	8.09	--	--	0	--	--
7/31/2003	LIM4	26.9	8.21	--	--	2	--	--
7/31/2003	LIM4	23.1	8.89	--	--	4	--	--
7/31/2003	LIM4	20.9	8.30	--	--	6	--	--
7/31/2003	LIM4	19.9	6.00	--	--	8	--	--
7/31/2003	LIM4	19.4	7.05	--	--	10	--	--
7/31/2003	LIM4	19.0	4.90	--	--	12	--	--
7/31/2003	LIM5	24.8	8.35	--	--	0	--	--
7/31/2003	LIM5	23.7	8.54	--	--	3	--	--
7/31/2003	LIM5	21.1	9.15	--	--	6	--	--
7/31/2003	LIM5	19.8	8.39	--	--	9	--	--
7/31/2003	LIM5	18.0	6.75	--	--	12	--	--
7/31/2003	LIM5	17.3	6.00	--	--	15	--	--
7/31/2003	LIM5	15.4	4.62	--	--	18	--	--
7/31/2003	LIM5	14.6	4.31	--	--	21	--	--
7/31/2003	LIM5	14.4	3.79	--	--	23	--	--
7/31/2003	LIM6	24.6	8.12	--	--	0	--	--
7/31/2003	LIM6	23.5	8.26	--	--	3	--	--
7/31/2003	LIM6	23.0	8.32	--	--	6	--	--
7/31/2003	LIM6	19.8	8.11	--	--	9	--	--
7/31/2003	LIM6	18.6	7.30	--	--	12	--	--
7/31/2003	LIM6	17.3	6.44	--	--	15	--	--
7/31/2003	LIM6	15.7	5.11	--	--	18	--	--
7/31/2003	LIM6	14.7	4.80	--	--	21	--	--

7/31/2003	LIM6	14.2	3.76	--	--	24	--	--