Fishery Management Report No. 06-47

The 2005 Hidden Lake Sockeye Salmon Stocking Project and Related Monitoring Parameters

by

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and

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Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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The Kodiak Regional Aquaculture Association (KRAA) funds the general operations of the Hidden Lake sockeye salmon stocking project and Pillar Creek Hatchery. The Division of Commercial Fisheries provides biological oversight and evaluation in the management of returning adult runs to the enhanced or rehabilitated systems associated with hatchery stocking projects.

The Division of Sport Fish Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Since 2004, the Division of Commercial Fisheries has also used the Fishery Management Report series. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm. This publication has undergone regional peer review.

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ABSTRACT

A sockeye salmon *Oncorhynchus nerka* enhancement stocking project was initiated on the Hidden Lake systems in the early 1990s to provide increased harvest opportunities for fishermen in the Kodiak Management Area. Because Hidden Lake lies within the boundaries of the Kodiak National Wildlife Refuge (KNWR), the project is subject to U.S. Fish and Wildlife Service (USFWS) oversight and guiding principles. In an effort to ensure that the project remains compatible with the KNWR mission, the Alaska Department of Fish and Game (ADF&G) conducts monitoring projects and submits an annual summary to the USFWS.

As required in the Hidden Lake Management Plan (HLMP), ADF&G monitored and examined specific water quality parameters, zooplankton characteristics, smolt population, stocking density and commercial salmon harvest in 2005. Specific parameters were tested and compared to criteria established as guidelines for the stocking project to ensure that the project does not adversely affect the Hidden Lake system.

The 2005 water quality parameters that were measured resulted in: a total nitrogen to total phosphorus ratio of 54:1, a total ammonia level of 4.7 μg/L, and a Chlorophyll *a* of 0.48 μg/L. The zooplankton community parameters measured resulted in: a *Diaptomus* to *Cyclops* ratio of 0.01:1, a copepod biomass of 6.9 mg/m^3, a *Bosmina* to *Daphnia* ratio of 1.49:1, a cladoceran biomass of 3.1 mg/m^3, and a *Bosmina* size (average length) of 0.46 mm. An estimated 15,500 smolt emigrated from Hidden Lake in the spring of 2005 while a total of 188,342 juveniles were stocked in the summer and fall of 2005. A total of 7,401 adult sockeye salmon were harvested in the Hidden Lake Special Harvest Area (HLSHA) and reported on commercial fish harvest tickets.

The Hidden Lake Stocking Project met all of minimum criteria for each of the specified parameters in 2005 and has remained compatible with KNWR purposes.

Key words: Hidden Lake, Foul Bay, Special Harvest Area, *Oncorhynchus nerka*, sockeye salmon, stocking, Kodiak National Wildlife Refuge, U.S. Fish and Wildlife Service, Kodiak Regional Aquaculture Association, Special Use Permit, limnology.

INTRODUCTION

This report consolidates the 2005 and historical project data collected from the Hidden Lake sockeye salmon *Oncorhynchus nerka* stocking project. Hidden Lake and the activities associated with the sockeye salmon stocking project are located within the boundaries of the Kodiak National Wildlife Refuge (KNWR) and are therefore, subject to U.S. Fish and Wildlife Service (USFWS) and KNWR guiding principles and conditions. Such conditions are described in the Hidden Lake Management Plan (HLMP; Chatto 2002) and are permitted under the special conditions described in the Hidden Lake Special Use Permit (HLSUP). The intention of this report is to fulfill the Alaska Department of Fish and Game (ADF&G) reporting requirements as outlined in the HLMP and HLSUP. This report compares and contrasts the results of a series of concurrent ADF&G studies and monitoring programs to HLMP guidelines intended to assure compatibility with the KNWR purposes.

Prior to stocking, Hidden Lake did not support anadromous fish due to impassable falls that prevent lake access. The intent of the stocking project is to utilize the lake's freshwater rearing environment without upsetting the nutrient balance or forage base (macrozooplankton) of the lake (Honnold and Schrof 2001). In addition to the utilization of the lake's forage, stocking a barren lake also provides researchers and managers with the opportunity to thoroughly assess the response of the macrozooplankton community to predation by juvenile salmon while reducing possible interactions with wild stocks by directing harvest of adults to a specified (terminal) area (Kyle 1996).

In 1992 ADF&G in cooperation with Kodiak Regional Aquaculture Association (KRAA) submitted proposals to the USFWS to stock sockeye salmon into Hidden Lake in the Afognak Unit of the KNWR (White 1992; Chatto 2002). The KNWR prepared an Environmental

Assessment (EA) for the proposed project, which resulted in a finding of no significant impact (FONSI). A temporary HLSUP for the Hidden Lake project was issued to the ADF&G by the KNWR in 1992, to allow the project to continue until a thorough review of the baseline data could be completed and a comprehensive management plan developed that would contain parameters specific to Hidden Lake. In 2001, the ADF&G consolidated existing information (excluding brown bear and wildlife studies) from the Hidden Lake stocking project into one document (Honnold and Schrof 2001), which was then used for reference in writing the existing KNWR HLMP (Chatto 2002). The HLMP was authorized in April 2002 and the ADF&G was issued a 5-year renewable HLSUP to continue stocking and monitoring work in the KNWR.

Juvenile sockeye salmon have been stocked into Hidden Lake annually since 1992 (Schrof and Honnold 2003). The returning adult sockeye salmon are harvested in the Foul Bay Special Harvest Area (FBSHA; Figure 1). ADF&G has annually monitored the fishery and sampled a portion of the sockeye salmon commercial catch since the first adults returned in 1995.

This report compares and contrasts the 2005 results from a series of concurrent ADF&G studies and monitoring programs to HLMP guidelines intended to assure compatibility with the KNWR purposes.

MANAGEMENT PLAN MONITORING GUIDELINES

The purpose of the HLMP is to outline the various components of the lake stocking project to determine how the project will be managed to remain compatible with the KNWR's mission and to serve as a reference document to guide any proposed changes to project operations (Chatto 2002).

Monitoring guidelines were established from data collected at Hidden Lake from 1992–1999. Criteria for specific limnological and fishery parameters were developed for comparison purposes. If measurements were outside the criteria specified in the Management Plan for any given parameter for two or more years, then the stocking project may need adjustments to meet the guidelines and purposes of the KNWR (Chatto 2002). Specific parameters monitored include lake nutrient concentrations (total nitrogen, phosphorus, ammonia, and chlorophyll *a*), zooplankton density and biomass, juvenile stocking, smolt production and adult harvest estimates (Table 1).

DESCRIPTION OF STUDY AREA

Hidden Lake (58^{o} 23'N, 152^{o} 42'W) is located on the northwest side of Afognak Island (approximately 72 km northwest of the city of Kodiak). The lake is 4.4 km long, up to 0.6 km wide, and has a surface area 1.9 km^2. Hidden Lake is at an elevation of 68 m, has a mean depth of 10.8 m, and a maximum depth of 42.0 m. The Hidden Lake outlet stream (Hidden Lake Creek) is approximately 2.4 km long and empties into the north arm of Foul Bay. A waterfall impassable to anadromous fish is located approximately 1.6 km upstream from the ocean.

Resident fish in Hidden Lake include: rainbow trout *O. mykiss*, Dolly Varden char *Salvenlinus malma*, three spine stickleback *Gasterosteus aculeatus*, and freshwater sculpin *Cottus aleuticus* (Honnold and Schrof 2001).

METHODS

LAKE LIMNOLOGY MONITORING

The HLMP outlines minimum and maximum values and parameters for specific water quality and limnological characteristics that are used as guidelines to ensure that the Hidden Lake sockeye salmon stocking project remains compatible with KNWR objectives (Chatto 2002). Parameters to be measured include total nitrogen (TN) to total phosphorus (TP) ratio, total ammonia (TA), Chlorophyll *a* (Chl *a*), *Diaptomus* to *Cyclops* density ratio, copepod biomass, *Bosmina* to *Daphnia* density ratio, cladoceran biomass, and cladoceran (*Bosmina*) average size.

Lake Sampling Protocol

To obtain the limnology data, ADF&G personnel traveled to Hidden Lake in a fixed wing aircraft four times from May–September at six week intervals. An established sampling station in the deepest basin of the lake was identified by a buoy and the location was verified with Global Positioning Satellite (GPS) equipment. Prior to 2000, water samples were collected from the epilimnion (at a depth of 1 m) and the hypolimnion (at a depth ≥25 m). After 2000, water samples were only collected from the epilimnion (at a depth of 1 m). A vertical tow was hauled to collect zooplankton during each survey. Samples were collected following standard ADF&G sampling procedures (ADF&G 2005).

Water samples were collected with a 6-L opaque Van Dorn sampler, and the samples were emptied into pre-cleaned polyethylene carboys, which were kept cool and dark in the float of the plane until processed at the laboratory in Kodiak. Vertical zooplankton hauls were made at each station using a 0.2 m diameter conical net with 153 μm mesh. The net was pulled manually at a constant speed (~0.5 m sec^{-1}) from approximately 2 m off the lake bottom to the surface. The contents from each tow were emptied into a 125-ml poly-bottle and preserved in 10% neutralized formalin.

General Water Chemistry and Nutrients

For analysis of color and dissolved inorganic nutrients, a portion of each sample was filtered through a rinsed 47 mm-diameter Whatman GF/F cellulose fiber filter and stored frozen in phosphate free soap-washed poly bottles. Frozen filtered water was also used for analysis of total phosphorus (TP), total Kjeldahl nitrogen (TKN), and general water chemistry, and these measurements were also made for frozen unfiltered and refrigerated (4^{o} C) water stored in clean poly bottles (Koenings et al. 1987). The pH of water samples was measured with an Orion 499A meter, while alkalinity (mg/L as $CaCO_3$) was determined from 100-ml of water titrated with 0.02 N H_2SO_4 to a pH of 4.5 and measured with a pH meter (AHPA 1985).

Reactive silicon was determined using the method of ascorbic acid reduction to molybdenum-blue after Stainton et al. (1977). Total filterable phosphorus (TFP) and filterable reactive phosphorus (FRP) were determined by the molybdate blue-ascorbic acid method (Murphy and Riley 1962) modified by Eisenreich et al. (1975). TP was analyzed after potassium persulfate-sulfuric acid digestion using the FRP procedure (Eisenreich et al. 1975). Samples for nitrate + nitrite (NO_3^- + NO_2^-) and ammonia (NH_4^+) were analyzed on a Spectronic Genesys 5 Spectrophotometer using the cadmium reduction and phenylhypochlorite methods outlined in Stainton et al. (1977). Analysis of TKN was completed using the Macro-Kjeldahl/Phenate methods described in Clesceri et al. (1998) in converting nitrogen to ammonia. This determines the concentrations of organic nitrogen and total ammonia. Total nitrogen (TN), the sum of TKN and nitrate + nitrite, was calculated for each sample in addition to the ratio of TN to TP (TN:TP).

Chlorophyll *a*

For chlorophyll *a* (chl *a*) analysis, 1.0 L of water from each sample was filtered through a Whatman GF/F filter under 15 psi vacuum pressure. Approximately 2 ml of magnesium chloride ($MgCO_3$) were added to the final 50 ml of water near the end of the filtration process. Filters were stored frozen and in individual plexiglass slides until analyzed. Filters were then ground in 90% buffered acetone using a mechanical tissue grinder, and the resulting slurry was refrigerated in separate 15-ml glass centrifuge tubes for 4 hours to ensure maximum pigment extraction. Pigment extracts were centrifuged, decanted, and diluted to 15 ml with 90% acetone (Koenings et al. 1987). The extracts were analyzed fluorometrically with a Turner 112 fluorometer equipped with a F4T5B lamp and calibrated with purified chl *a* (Sigma Chemical).

Zooplankton

For zooplankton analysis, cladocerans and copepods were identified according to taxonomic keys in Pennak (1989) and Thorp and Covich (1991). Zooplankton samples were measured in triplicate 1 ml subsamples taken with a Hansen-Stempel pipette and placed in a Sedgewick-Rafter counting chamber. Lengths from a minimum of 15 animals of each species or group (typically animals are grouped at the genus level) were measured to the nearest 0.01 mm, and the mean was calculated. Biomass was estimated from species-specific linear regression equations between length and dry weight derived by Koenings et al. (1987).

STOCKING

Stocking densities for Hidden Lake were determined prior to the hatchery egg takes by estimating carrying capacity based on in-season zooplankton biomass (May through July) (Honnold and Byrne 2005). Malina Lake sockeye salmon eggs were collected in early August of 2004 by Pillar Creek Hatchery (PCH) personnel using standard fish culture procedures (ADF&G 1994). Eggs were flown back to Kodiak, incubated and reared at PCH, and then aerially released into Hidden Lake via fixed wing aircraft.

SMOLT MONITORING

Smolt monitoring was not conducted at Hidden Lake in 2005. A population estimate of juvenile sockeye salmon was determined by applying the number of smolt stocked in 2004 to an estimated freshwater survival rate of 25%. The 25% survival rate was based on an average freshwater survival from 15 years of stocking (1990-2004) into Spridion Lake (Table 1).

HARVEST MONITORING

ADF&G personnel monitored the commercial harvest within the FBSHA during the fishery opening while stationed on board the *M/V K-HI-C* (Figure 1). Monitoring activities included assessing sockeye salmon run strength, recording the fishing effort, estimating the commercial catch by species, and sampling a portion of the sockeye salmon catch for age data (Honnold and Schrof 2001; ADF&G 2005). The ADF&G fish ticket database was used to generate the end-of-season catch summaries and to confirm on-site estimates.

ESCAPEMENT MONITORING

No escapement surveys of Hidden Creek were conducted in 2005 as the commercial fishing activities in FBSHA were completed prior to pink salmon returns to Hidden Creek.

RESULTS AND DISCUSSION

LAKE LIMNOLOGY MONITORING

Total Nitrogen to Total Phosphorus Ratio

The total nitrogen to total phosphorus molar ratio (TN:TP) in Hidden lake was 54.0:1 in 2005 (Tables 2) and met the desired criteria ($\leq$ 106:1) specified in the HLMP (Table 1). The TN:TP ratio decreased to the historic low of 54.0:1 calculated in 2001. The lower ratio was due, in part, to an increased phosphorus concentration, which is typically beneficial in oligotrophic lakes, such as Hidden Lake.

Total Ammonia

The 2005 seasonal average concentration of ammonia in Hidden Lake was 4.7 μg/L (Table 3). This ammonia concentration was below the 1992-2004 average of 6.7 μg/L and below threshold of $\leq$16.2 μg/L specified in the HLMP (Table 1).

Chlorophyll *a*

The seasonal mean Chlorophyll *a* (Chl *a*) concentration in Hidden Lake was 0.48 μg/L (Table 3). As noted in Table 1, the Chl *a* concentrations met the minimum specified parameter of $\geq$0.17 μg/L (Table 1). The 2005 Chl *a* concentrations were greater than in years prior to stocking (1990) and Chl *a* levels were less in years when the lake was stocked with a greater number of juveniles. The higher concentrations of Chl *a* as compared to years of no stocking suggests that there is improved algal biomass which in turn provides an improved forage for zooplankton.

Total Zooplankton

The seasonal mean zooplankton density in Hidden Lake was 7,386 No./m^3 and the biomass was 9.9 mg/m^3 (Table 4; Figure 2). The 2005 zooplankton density is the second largest density recorded while the biomass is also greater than the 1992-2004 average biomass of 8.0 mg/m^3 (Table 4; Figure 2). Current zooplankton biomass levels are consistent with the lake's historical data in which there has been a direct relationship between the stocking numbers and zooplankton.

Diaptomus to Cyclops Density Ratio

The *Diaptomus:Cyclops* density ratio of 0.01:1 met the minimum criteria ($\geq$0.01:1) specified in the HLMP (Table 5; Table 1). The average ratio from 1992-2004 was 0.03:1. Since 1992, the density of *Diaptomus* has been very low and even reported as undetected in most years. Although the *Diaptomus:Cyclops* density ratio has not met the specified criteria in most years, the results indicate the current density has met the minimum requirements in 2004 and 2005 and suggest the *Diaptomous* are rebounding.

Copepod Biomass

The average copepod density in 2005 was 6,221 No./m^3 and the biomass was 6.9 mg/m^3. The 2005 Copepod biomass was within the HLMP criteria of $\geq$0.40 mg/m^3 (Table 4; Table 1). The average density of copepods from 1992-2004 was 2,019 No./m^3 and the average biomass was 3.6 mg/m^3.

Bosmina to Daphnia Density Ratio

The *Bosmina* to *Daphnia* density ratio of 1.49:1 was within the minimum criteria ($\geq$0.17:1) specified in the HLMP (Table 6; Table 1). The average ratio from 1992-2004 was 1.88:1.

Cladoceran Biomass

There were an average of 1,165 No./m^3 cladocerans in Hidden Lake for 2005 and an average biomass of 3.1 mg/m^3. The 2005 biomass was within the minimum criteria of $\geq$2.20 mg/m^3 (Table 4; Table 1). Average biomass in 2005 was slightly less than the average biomass (4.4 mg/m^3) from 1992-2004.

Cladoceran (Bosmina) Size

The cladoceran, *Bosmina*, averaged 0.46 mm in length which met the criteria (>0.40 mm) specified in the HLMP (Tables 7; Table 1). The average size of *Bosmina* from 1992-2004 was 0.47 mm.

STOCKING

Juvenile sockeye salmon at different life stages were stocked in Hidden Lake on two occasions in 2005. Approximately 74,700 pre-smolt (11.7 g) were stocked on June 23, and on October 7-8, approximately 113,700 fingerling (1.4 g) were stocked (Table 8). This stocking level is the largest since 2001, but substantially smaller than the average number of 303,812 sockeye salmon stocked from 1992-2004. This reduced level of stocked sockeye salmon should further enable zooplankton densities to stabilize (Figure 3).

SMOLT MONITORING

Based on the number of juveniles stocked into Hidden Lake in 2004 and using the 25% survival rate, the estimated emigrating population from Hidden Lake in 2005 was approximately 17,684 smolt. Hydroacoustic surveys were traditionally conducted in the spring at Hidden Lake to index the abundance of rearing juvenile sockeye salmon. Due to lack of assurance in counting target vs. non-target species, variations in schooling smolt, and depleted stocking numbers the confidence in obtaining a reliable population index with hydroacoustic equipment was determined inadequate and not justifiable. As a reliable substitute, the freshwater smolt population was estimated by using an average survival rate.

In years prior to 2003, the field crews have successfully collected smolt at the creek outlet for age, weight, and length data. In 2003, the field crew was unsuccessful in capturing or observing any sockeye salmon smolt. This may have been due to the limited number of smolt which were stocked. Smolt collection was not attempted in 2004 or 2005 when fewer smolt (7,800 and 17,700) were expected to have outmigrated than in 2003, it would have been difficult to obtain an adequate sample size of smolt. From 1993-2002, age 1. smolt, on average, have dominated the population (98.5%) with few age 2. smolt (1.5%) observed. The average size and weight of age 1. smolt has been 111.2 mm and 12.7 g while the age 2. smolt have averaged 140.8 mm and weighed 27.8 g (Table 9).

HARVEST MONITORING

Commercial salmon harvests in the FBSHA occurred from June 1 through June 19 in 2005 (Table 10). Approximately 4 chinook salmon *O. tshawytcha* and 7,401 sockeye salmon, were harvested in the FBSHA.

Age 1.3 sockeye salmon comprised the majority (74.1%) of the harvest while age 2.3 fish comprised 23.3% of the run (Table 11). Historical average harvests from 1995-2004 indicate that the age 1.2 component represents 65.2% and the age 1.3 component makes up 27.6%. Interestingly the 2005 age 1.2 component was low, making up 1.3% of the harvest.

The 2005 harvest (7,401) was the smallest harvest in the history of the special harvest area (Table 12). The number of non targeted salmon species was also significantly less than prior years. The last commercial harvest in the FBSHA occurred on June 19 and no pink salmon were harvested during the 2005 season (Table 10).

ESCAPEMENT MONITORING

Escapement data on Hidden Creek are unavailable for the 2005 season. Data from prior years are documented in Table 13. Stream surveys of Hidden Creek were not conducted in 2005 and discontinued starting in 2000. Pink salmon and steelhead trout *O. mykiss* had an unobstructed migration because the barrier weir was not installed in Hidden Creek in 2005. It is likely the pink salmon run occurred during its normal return timing in late July and August, after the FBSHA commercial sockeye salmon fishery. The Foul Bay SHA fishery or any other aspect of the Hidden Lake stocking project have not had an impact on the migration of natural fish stocks into Hidden Creek.

OUTLOOK FOR 2006

The brood source for Hidden Lake pre-smolt has historically been from Afognak Lake. This brood source was selected for the Hidden Lake stocking project because of the locality, the early run timing and the reduced detection of disease found in the Afognak Lake stock. Afognak Lake has had poor returns in recent years resulting in the Alaska Board of Fish designating the system as a stock of concern. As a result Afognak Lake was not permitted as a source for brood stock collection in 2004. Malina Lake was selected as a substitute brood stock. Malina Lake sockeye salmon and Afognak Lake sockeye salmon have identical run timing, returning early in the second week of June. Malina Lake sockeye salmon have never tested positive for infectious hematopoietic necrosis virus (IHNV). This alternate brood source is a deviation from the HLMP and should be evaluated by the KNWR. All other operations and monitoring programs in 2006 are expected to be consistent with the 2005 monitoring.

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TABLES AND FIGURES

Table 1.-Hidden Lake limnological and fishery monitoring parameters specified in the Hidden Lake Management Plan (HLMP), and the 2005 results.

Parameter	Criteria Specified in HLMP	2005 results
Lake Limnology Monitoring		
Total Nitrogen : Total Phosphorous Molar Ratio	≤ 106	54.0
Total Ammonia (µg/L)	≤ 16.2	4.7
Chlorophyl a (Chl a) (µg/L)	≥ 0.17	0.48
Diaptomus :*Cyclops* Density Ratio	≥ 0.01	0.01
Copepod Biomass (mg/m^3)	≥ 0.40	6.9
Bosmina :*Daphnia* Density Ratio	≥ 0.17	1.49
Cladoceran Biomass (mg/m^3)	≥ 2.20	3.1
Cladoceran (*Bosmina*) average size (mm)	>0 .40	0.46
Stocking		
Sockeye		188,342
Smolt Monitoring		
Sockeye Salmon Population Estimate		17,684
Harvest Monitoring		
Foul Bay SHA (251-41)		
Chinook		4
Sockeye		7,401
Coho		0
Pink		0
Chum		0
Escapement Monitoring		
Hidden Creek (251-406)		ns

ns - not surveyed

Table 2.-Seasonal mean total kjeldahl nitrogen (TKN), nitrate+nitrite (No_3+No_2), total phosphorus (TP) concentrations, and total nitrogen to total phosphorus ratio by weight (TN:TP) from the epilimnion (1m) and hypolimnion (>25m) of Hidden Lake, 1987, 1990-2005.

Year	Depth (m)	TKN (µg/L N)	No3+No2 (µg/L N)	TP (µg/L N)	TN:TP Ratio
1987	1	90.1	82.0	4.2	91
	25	80.7	90.9	4.0	94
1990	1	101.3	65.9	3.9	94
	29	79.2	88.7	2.1	177
1991	1	75.2	53.4	4.1	70
	30	82.9	70.4	3.1	110
1992	1	93.7	64.9	4.0	87
	27	98.8	74.3	5.1	76
1993	1	102.0	45.7	3.7	88
	42	84.2	90.4	3.1	124
1994	1	120.3	19.7	4.6	67
	40	88.2	54.9	4.3	74
1995	1	108.6	39.4	3.8	87
	43	91.7	64.2	3.6	95
1996	1	92.6	38.9	3.4	85
	42	80.4	72.5	3.7	91
1997		93.0	20.1	3.1	80
	43	87.7	47.7	3.3	91
1998	1	100.5	13.3	3.1	83
	42	98.2	17.2	3.2	80
1999	1	92.8	51.3	3.1	104
	42	81.0	73.0	3.2	107
2000	1	NA	48.2	4.9	NA
2001	1	99.5	25.8	5.1	54
2002	1	115.0	24.2	5.5	56
2003	1	102.7	57.1	4.7	75
2004	1	179.8	43.0	8.1	61
2005	1	152.0	37.0	7.7	54
Mean 87-91:	1	88.9	67.1	4.1	84.9
Mean 92-04:	1	108.4	36.9	4.3	77.3

Table 3.-Summary of seasonal mean (including standard deviation -SD) nutrient and algal pigment concentrations by station and depth for Hidden Lake, 1987, 1990-2005.

Year	Depth (m)	Total Phosphorus (µg/L)	SD	Total filterable-P (µg/L)	SD	Filterable reactive-P (µg/L)	SD	Total Kjeldahl nitrogen (µg/L)	SD	Ammonia (µg/L)	SD	Nitrate+nitrite (µg/L)	SD	Chlorophyll *a* (µg/L)	SD
1987	1	4.2	0.4	2.2	0.7	0.9	0.1	90.1	2.4	4.3	3.1	82.0	11.7	0.15	0.0
	25	4.0	1.6	2.9	0.9	1.1	0.2	80.7	11.4	4.6	3.2	90.9	5.7	0.06	0.1
1990	1	3.9	2.2	3.6	3.8	2.1	1.1	101.3	48.7	3.8	4.3	65.9	11.3	0.29	0.0
	29	2.1	1.2	1.4	0.3	1.2	0.2	79.2	34.0	6.1	2.3	88.7	16.4	0.11	0.0
1991	1	4.1	1.9	4.0	3.1	3.4	2.6	75.2	44.5	12.0	4.1	53.4	25.1	0.18	0.1
	30	3.1	0.7	2.5	0.7	1.9	0.8	82.9	19.1	13.6	3.4	70.4	13.7	0.07	0.1
1992	1	4.0	0.4	2.0	0.4	1.8	0.2	93.7	41.0	4.1	2.9	64.9	15.8	0.22	0.1
	27	5.1	3.8	2.5	0.9	2.4	1.1	98.8	34.3	3.7	2.5	74.3	16.0	0.11	0.1
1993	1	3.7	2.6	5.1	6.3	3.0	3.3	102.0	30.9	12.6	11.4	45.7	22.1	0.79	0.4
	42	3.1	1.6	2.4	1.1	1.9	1.1	84.2	23.4	16.2	9.0	90.4	16.1	0.20	0.2
1994	1	4.6	1.7	1.7	0.5	1.2	0.5	120.3	33.3	4.3	2.5	19.7	19.9	1.11	0.3
	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.87	0.9
	40	4.3	2.3	1.5	0.5	1.2	0.4	88.2	17.7	7.4	3.8	54.9	3.4	0.08	0.1
1995	1	3.8	2.2	2.2	1.6	1.7	1.2	108.6	24.6	9.7	3.0	39.4	15.8	0.77	0.3
	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.70	0.3
	43	3.6	2.2	2.0	0.8	1.3	0.7	91.7	12.9	10.2	1.9	64.2	3.6	0.22	0.2
1996	1	3.4	0.9	3.6	0.4	1.9	0.2	92.6	8.0	3.8	4.6	38.9	13.8	0.51	0.1
	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.46	0.1
	42	3.7	1.5	3.6	0.8	1.9	0.4	80.4	7.1	7.2	3.7	72.5	5.1	0.14	0.1
1997	1	3.1	1.4	1.9	0.4	1.6	0.3	93.0	8.8	7.8	8.3	20.1	13.2	0.39	0.1
	2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.41	0.1
	43	3.3	1.2	2.7	1.1	2.2	1.1	87.7	14.2	15.1	9.5	47.7	3.0	0.12	0.1

-continued-

Table 3.-Page 2 of 2.

Year	Depth (m)	Total Phosphorus (µg/L)	SD	Total filterable-P (µg/L)	SD	Filterable reactive-P (µg/L)	SD	Total Kjeldahl nitrogen (µg/L)	SD	Ammonia (µg/L)	SD	Nitrate+nitrite (µg/L)	SD	Chlorophyll *a* (µg/L)	SD
1998	1	3.1	1.0	2.4	0.8	1.7	0.9	100.5	11.5	5.5	4.5	13.3	4.8	0.45	0.2
	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.18	0.2
	42	3.2	0.5	2.5	0.8	1.8	0.8	98.2	16.6	6.4	3.8	17.2	5.8	0.38	0.2
1999	1	3.1	0.4	1.7	0.3	1.2	0.3	92.8	8.9	10.7	1.6	51.3	20.7	0.17	0.1
	42	3.2	0.3	1.9	0.2	1.3	0.3	81.0	7.3	15.1	4.4	73.0	10.3	0.09	0.1
2000	1	4.9	4.0	2.8	1.3	1.4	1.4	NA	NA	11.9	10.3	48.2	15.1	1.03	1.2
2001	1	5.1	1.8	4.1	2.6	3.3	3.7	99.5	19.7	5.5	4.4	25.8	12.3	0.64	0.2
2002	1	5.5	4.0	2.0	0.7	2.0	1.3	115	26.9	6.2	2.3	24.2	15.6	0.60	0.1
2003	1	4.7	2.3	1.6	1.0	3.2	0.6	102.7	21.3	3.7	3.2	57.1	18.6	0.70	0.2
2004	1	8.2	8.3	4.5	4.6	3.1	1.4	179.8	120.6	7.4	2.0	43.0	22.1	0.48	0.3
2005	1	7.7	2.3	NA	NA	NA	NA	152.0	22.0	4.7	2.3	37.1	22.2	0.48	0.2
mean 87-91:	1	4.1	1.5	3.2	2.6	2.1	1.3	88.9	31.9	6.7	3.8	67.1	16.0	0.21	0.0
mean 92-04:	1	4.5	2.4	2.5	1.2	2.0	1.0	109.0	29.5	6.7	4.1	37.1	15.6	0.59	0.3

SD - standard deviation
NA - not analyzed

Table 4.-Summary of the Hidden Lake weighted mean density and biomass of Cladocerans and Copepods and their density ratio, 1987, 1990-2005.

	Cladoceran		Copepod		Total		Cladoceran to Copepod ratio[a]	
Year	Density (No./m^3)	Biomass (mg/m^3)	Density (No./m^3)	Biomass (mg/m^3)	Density (No./m^3)	Biomass (mg/m^3)	Density (No./m^3)	Biomass (mg/m^3)
1987	2,056	7.5	3,820	9.3	5,876	16.8	0.54	0.45
1990	1,581	5.2	4,193	12.6	5,774	17.8	0.38	0.29
1991	818	3.8	3,526	9.0	4,344	12.8	0.23	0.30
1992	873	3.8	3,130	6.3	4,003	10.1	0.28	0.38
1993	829	2.7	309	0.7	1,138	3.4	2.68	0.79
1994	1,162	5.1	153	0.4	1,315	5.5	7.59	0.92
1995	1,215	4.8	1,171	2.9	2,386	7.6	1.04	0.62
1996	692	2.2	2,170	4.9	2,862	7.1	0.32	0.31
1997	683	3.8	373	0.8	1,056	4.6	1.83	0.83
1998	1,281	4.1	1,110	2.7	2,391	6.8	1.15	0.61
1999	618	2.9	3,357	6.0	3,975	8.9	0.18	0.32
2000	728	2.5	601	1.1	1,329	3.5	1.21	0.70
2001	1,156	2.7	339	1.1	1,495	3.8	3.41	0.72
2002	3,282	9.5	1,452	2.5	4,734	12.0	2.26	0.79
2003	1,631	5.7	8,517	12.3	10,148	18.0	0.19	0.32
2004	1,701	7.4	3,564	5.6	5,265	13.0	0.48	0.57
2005	1,165	3.1	6,221	6.9	7,386	10.0	0.19	0.31
mean 87-91:	1,485	5.5	3,846	10.3	5,331	15.8	0.39	0.35
mean 92-04:	1,219	4.4	2,019	3.6	3,238	8.0	0.60	0.55

[a] Means are not calculated; actual values based on mean density.

Table 5.-Hidden Lake weighted mean Copepod density and biomass by species and the Diaptomus to Cyclops density ratio, 1987, 1990-2005.

		Diaptomus		*Cyclops*		Totals		
	Sample	Density	Biomass	Density	Biomass	Density	Biomass	Diaptomus to Cyclops
Year	Dates	No./m^3	mg/m^3	No./m^3	mg/m^3	No./m^3	mg/m^3	Density Ratio
1987	3	803	2.4	3,017	6.9	3,820	9.3	0.27
1990	4	1,106	5.1	3,087	7.5	4,193	12.6	0.36
1991	5	782	2.7	2,744	6.3	3,526	9.0	0.28
1992	6	804	1.7	2,326	4.6	3,130	6.3	0.35
1993	6	0	0.0	309	0.7	309	0.7	0.00
1994	7	0	0.0	153	0.4	153	0.4	0.00
1995	7	0	0.0	1,171	2.9	1,171	2.9	0.00
1996	6	1	0.0	2,169	4.9	2,170	4.9	0.00
1997	6	1	0.0	372	0.8	373	0.8	0.00
1998	5	0	0.0	1,110	2.7	1,110	2.7	0.00
1999	5	0	0.0	3,357	6.0	3,357	6.0	0.00
2000	5	0	0.0	601	1.1	601	1.1	0.00
2001	5	0	0.0	339	1.1	339	1.1	0.00
2002	5	0	0.0	1,452	2.5	1,452	2.5	0.00
2003	4	6	0.0	8,511	12.3	8,517	12.3	0.00
2004	4	70	0.3	3,494	5.3	3,564	5.6	0.02
2005	4	57	0.1	6,164	6.8	6,221	6.9	0.01
mean 87-91:		897	3.4	2,949	6.9	3,846	10.3	0.30
mean 92-04:		68	0.2	1,951	3.5	2,019	3.6	0.03

Table 6.-Summary of the Hidden Lake weighted mean density and biomass of Cladocerans by species and the Bosmina to Daphnia density ratio, 1987, 1990-2005.

		Bosmina		*Daphnia*		*Holopedium*		Totals		*Bosmina to*
Year	Sample Dates	Density No./m^3	Biomass mg/m^3	Density No./m^3	Biomass mg/m^3	Density No./m^3	Biomass mg/m^3	Density No./m^3	Biomass mg/m^3	*Daphnia* Density ratio
1987	3	1,059	2.7	788	2.6	209	2.2	2,056	7.5	1.34
1990	4	1,028	3.0	502	1.7	51	0.5	1,581	5.2	2.05
1991	5	529	1.5	177	0.5	112	1.8	818	3.8	2.99
1992	6	614	1.6	86	0.2	173	2.0	873	3.8	7.14
1993	6	89	0.2	526	1.0	214	1.5	829	2.7	0.17
1994	7	574	1.2	389	1.0	199	2.9	1,162	5.1	1.48
1995	7	764	1.6	203	0.5	248	2.6	1,215	4.8	3.76
1996	6	535	1.1	20	0.0	137	1.1	692	2.2	26.75
1997	6	277	0.5	177	0.3	229	3.1	683	3.8	1.56
1998	5	724	1.3	454	1.5	103	1.3	1,281	4.1	1.59
1999	5	210	0.3	258	0.7	150	1.9	618	2.9	0.81
2000	5	376	0.9	53	0.1	299	1.6	728	2.5	7.09
2001	5	585	1.3	46	0.1	525	1.4	1,156	2.7	12.72
2002	5	1,639	3.7	1,218	3.8	425	2.0	3,282	9.5	1.35
2003	4	878	3.0	437	0.8	316	1.9	1,631	5.7	2.01
2004	4	847	3.7	442	1.3	412	2.4	1,701	7.4	1.92
2005	4	583	1.1	392	0.7	190	1.2	1,165	3.1	1.49
mean 87-91:		872	2.4	489	1.6	124	1.5	1,485	5.5	1.78
mean 92-04:		624	1.6	331	0.9	264	2.0	1,219	4.4	1.88

Table 7.-Seasonal weighted mean lengths (mm) of zooplankton taxa in Hidden Lake, 1987, 1990-2005.

Year	*Diaptomus*	*Cyclops*	*Bosmina*	*Daphnia*	*Holopedium*
1987	0.88	0.81	0.52	0.86	0.97
1990	1.02	0.83	0.55	0.87	0.96
1991	0.93	0.81	0.54	0.77	1.14
1992	0.77	0.76	0.52	0.81	1.00
1993	*	0.79	0.50	0.66	0.83
1994	*	0.90	0.47	0.76	0.92
1995	*	0.83	0.47	0.74	0.84
1996	1.10	0.81	0.47	0.62	0.83
1997	*	0.77	0.42	0.62	0.87
1998	*	0.82	0.44	0.86	0.90
1999	*	0.72	0.40	0.76	0.93
2000	*	0.71	0.49	0.59	0.71
2001	*	0.93	0.48	0.79	0.53
2002	*	0.71	0.49	0.83	0.70
2003	1.15	0.67	0.46	0.70	0.76
2004	1.16	0.69	0.48	0.84	0.75
2005	0.68	0.58	0.46	0.64	0.78
mean 87-91:	0.94	0.82	0.54	0.83	1.02
mean 92-04:	1.05	0.78	0.47	0.74	0.81

* Diaptomus were not identified in the samples collected.

Table 8.-Sockeye salmon stocking numbers, life stage, size and release date by year into Hidden Lake, 1992-2005.

	Fry	Fingerling	Pre-Smolt	Total Stocked
1992			260,000	260,000
Date/Size[a]			5-Sep/ 6.0 g	
1993	448,000	106,600		554,600
Date/Size[a]	29-Apr/ 0.25 g	4-Jun/ 0.5g		
1994	250,000			250,000
Date/Size[a]	5-May/ 0.25 g			
1995			98,650	98,650
Date/Size[a]			2-Nov/ 9.5 g	
1996	252,000		138,800	390,800
Date/Size[a]	14-May/ 0.4 g		15-Oct/ 9.0 g	
1997		287,700	167,500	455,200
Date/Size[a]		4-Jun/ 0.6 g	22-Oct/ 9.5 g	
1998	316,667		340,400	657,067
Date/Size[a]			4-Sep/ 7.0 g	
1999			310,000	310,000
Date/Size[a]			6-Oct/ 9.4 g	
2000	172,000		332,400	504,400
Date/Size[a]	20-Jun/ 0.7 g		24-Aug/ 5.0 g	
2001		66,500	249,000	315,500
Date/Size[a]		25-May/ 0.8 g	5-Oct/ 13.5 g	
2002			51,600	51,600
Date/Size[a]			2-Oct/ 11.0 g	
2003			31,006	31,006
Date/Size[a]			14-Sep/ 13.9 g	
2004			70,736	70,736
Date/Size[a]			7,8-Oct/ 9.0 g	
2005		113,679	74,663	188,342
Date/Size[a]		23-Jun/1.4 g	3-Oct/ 11.7 g	
mean 1992-2004:				303,812

[a] Fry are released from April to July at up to 200% of emergent size (normally 0.15 to 0.5 g depending on the stock). Fingerling are released from June to September at a size of >200% to <2100% of emergent size (normally 0.3 to 5.25 g depending on the stock). Pre-smolt are released from August to November at a size of >2100% of emergent size but not yet at the physiological stage of smolting (normally 5 to 13 g).

Table 9.-Mean length, weight, and condition coefficient by age of a portion of sockeye salmon smolt emigrating from Hidden Lake, 1993-2002.

				Age-1				Age-2			
Year	Statistical Weeks	Dates Collected	Number Sampled	No. and %	Mean Length (mm)	Mean Weight (g)	Condition Factor (K)	No. and %	Mean Length (mm)	Mean Weight (g)	Condition Factor (K)
1993	21	May 17-23	324	324 100.0%	100.5	8.5	0.83	0 0.0%			
1994	24-27	June 7-July 4	218	214 98.2%	122.9	16.2	0.87	4 1.8%	145.0	29.1	0.92
1995	23-26	May 31-June 27	153	148 96.7%	124.5	20.5	1.00	5 3.3%	164.3	45.8	1.02
1996	23-25	May 31-June 20	440	426 96.8%	125.3	18.4	0.94	14 3.2%	159.5	41.6	0.95
1997	23-26	May 31-June 27	442	439 99.3%	109.2	11.4	0.87	3 0.7%	120.0	14.7	0.78
1998	22-26	May 24-June 27	462	455 98.5%	111.1	12.3	0.89	7 1.5%	140.0	24.1	0.87
1999	23-26	May 31-June 27	262	262 100.0%	96.6	7.4	0.81	0 0.0%			
2000	23-25	May 31-June 20	521	509 97.7%	113.4	12.5	0.85	12 2.3%	146.8	28.6	0.88
2001	22-26	May 24-June 27	447	441 98.7%	95.5	7.4	0.85	6 1.3%	97.7	8.1	0.85
2002	23-24	May 31-June 13	243	240 98.8%	112.9	12.5	0.86	3 1.2%	153	30.2	0.84
mean 1993-2002:			3,512	3,458 98.5%	111.2	12.7	0.88	54 1.5%	140.8	27.8	0.89

Table 10.-Commercial harvest by species by day in the Foul Bay Special Harvest Area (statistical area 251-41), 2005.

Date	Chinook	Sockeye	Coho	Pink	Chum
1-Jun	3	3,240	0	0	0
2-Jun	0	1,422	0	0	0
3-Jun	0	25	0	0	0
4-Jun	0	0	0	0	0
5-Jun	0	0	0	0	0
6-Jun	0	540	0	0	0
7-Jun	0	31	0	0	0
8-Jun	1	550	0	0	0
9-Jun	0	206	0	0	0
10-Jun	0	869	0	0	0
11-Jun	0	0	0	0	0
12-Jun	0	0	0	0	0
13-Jun	0	98	0	0	0
14-Jun	0	55	0	0	0
15-Jun	0	0	0	0	0
16-Jun	0	68	0	0	0
17-Jun	0	0	0	0	0
18-Jun	0	0	0	0	0
19-Jun	0	297	0	0	0
Total	4	7,401	0	0	0

Table 11.-Estimated age composition of adult sockeye salmon harvest from Foul Bay Special Harvest Area (statistical area 251-41), 1995-2005.

Year	Sample Size		Ages 1.1	0.2	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	2.4	Total[a]
1995[b]	485	Numbers	1,067	0	44	41,988	0	756	44	0	0	578	0	0	44,479
		Percent	2.4	0.0	0.1	94.4	0.0	1.7	0.1	0.0	0.0	1.3	0.0	0.0	100
1996[b]	537	Numbers	292	0	0	9,165	117	18,039	1,459	0	0	117	0	0	29,189
		Percent	1.0	0.0	0.0	31.4	0.4	61.8	5.0	0.0	0.0	0.4	0.0	0.0	100
1997	562	Numbers	788	0	0	8,288	19	8,344	656	19	38	469	56	38	18,751
		Percent	4.2	0.0	0.0	44.2	0.1	44.5	3.5	0.1	0.2	2.5	0.3	0.2	100
1998	646	Numbers	2,447	0	0	3,949	365	1,054	397	0	0	58	0	0	8,270
		Percent	29.6	0.0	0.0	47.8	4.4	12.7	4.8	0.0	0.0	0.7	0.0	0.0	100
1999[b]	603	Numbers	68	0	0	36,414	0	1,906	2,450	0	0	204	0	0	41,042
		Percent	0.2	0.0	0.0	88.7	0.0	4.6	6.0	0.0	0.0	0.5	0.0	0.0	100
2000[b]	733	Numbers	376	0	0	16,768	0	8,022	1,100	0	27	536	0	0	26,829
		Percent	1.4	0.0	0.0	62.5	0.0	29.9	4.1	0.0	0.1	2.0	0.0	0.0	100
2001	551	Numbers	517	0	0	8,602	0	20,206	123	0	0	374	0	0	29,822
		Percent	1.7	0.0	0.0	28.8	0.0	67.8	0.4	0.0	0.0	1.3	0.0	0.0	100
2002	903	Numbers	2,361	37	0	22,160	84	8,588	214	0	0	0	0	0	33,444
		Percent	7.1	0.1	0.0	66.3	0.3	25.7	0.6	0.0	0.0	0.0	0.0	0.0	100
2003	669	Numbers	44	0	0	40,222	0	9,205	867	0	0	844	0	0	51,182
		Percent	0.1	0.0	0.0	78.6	0.0	18.0	1.7	0.0	0.0	1.6	0.0	0.0	100
2004	411	Numbers	0	0	0	9,949	0	7,314	2,343	0	0	123	0	0	19,729
		Percent	0.0	0.0	0.0	50.4	0.0	37.1	11.9	0.0	0.0	0.6	0.0	0.0	100
2005	232	Numbers	0	0	0	96	0	5,487	96	0	0	1,723	0	0	7402
		Percent	0.0	0.0	0.0	1.3	0.0	74.1	1.3	0.0	0.0	23.3	0.0	0.0	100
1995-2004	6,100	Numbers	7,960	37	44	197,505	584	83,435	9,653	19	65	3,303	56	38	302,737
		Percent	2.6	0.0	0.0	65.2	0.2	27.6	3.2	0.0	0.0	1.1	0.0	0.0	100.0

[a] Totals may not add exactly due to rounding.

[b] Includes fish reported for statistical area 251-40 that were actually harvested in Foul Bay SHA.

Table 12.-Commercial harvest by species by year in the Foul Bay Special Harvest Area (statistical area 251-41), 1995-2005.

Year	Chinook	Sockeye	Coho	Pink	Chum
1995	15	44,479	0	20	8
1996	6	29,889	15	7	63
1997	0	18,751	0	5	2
1998	17	8,270	0	55	57
1999	12	41,042	0	415	364
2000	5	26,829	0	1	23
2001	104	29,822	0	1,141	53
2002	196	33,444	0	120	1,243
2003	55	51,181	0	80	98
2004	27	19,729	0	0	29
2005	4	7,401	0	0	0
1995-2004	44	30,344	2	184	194

Table 13.-Peak salmon escapement counts and indexed total escapement estimates at Hidden Creek (stream no. 251-41-406), 1992-1999.

Date[a]	Sockeye[b]	Pink	Coho
10-Sep-92	1	1,259	1,019
23-Aug-93	1	6,000	500
29-Jul-94	420		
23-Aug-94		3,302	
7-Oct-94			1,500
3-Jul-95	575		
23-Aug-95		7,128	
13-Sep-95			49
7-Jun-96	471		
12-Aug-96		736	
22-Aug-96			15
10-Jun-97	7		
10-Sep-97		0	0
13-Aug-98		8,000	0
9-Aug-99	0	0	0

[a] ADF&G Salmon Escapement Database (all data are from foot surveys).

[b] Runs are a result of stocking juvenile salmon into Hidden Lake.

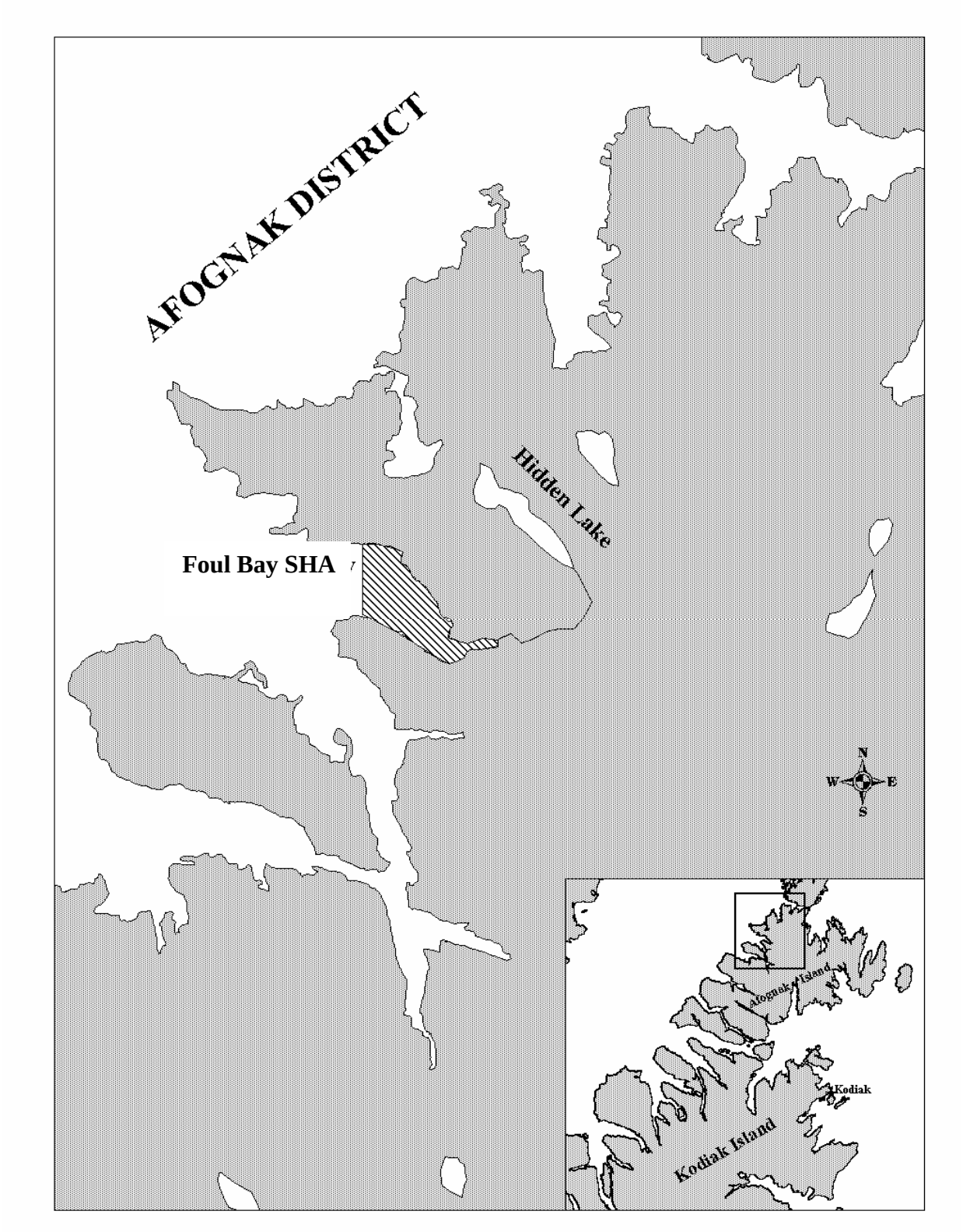

Figure 1.-Location of Hidden Lake and the Foul Bay Special Harvest Area on Afognak Island**.**

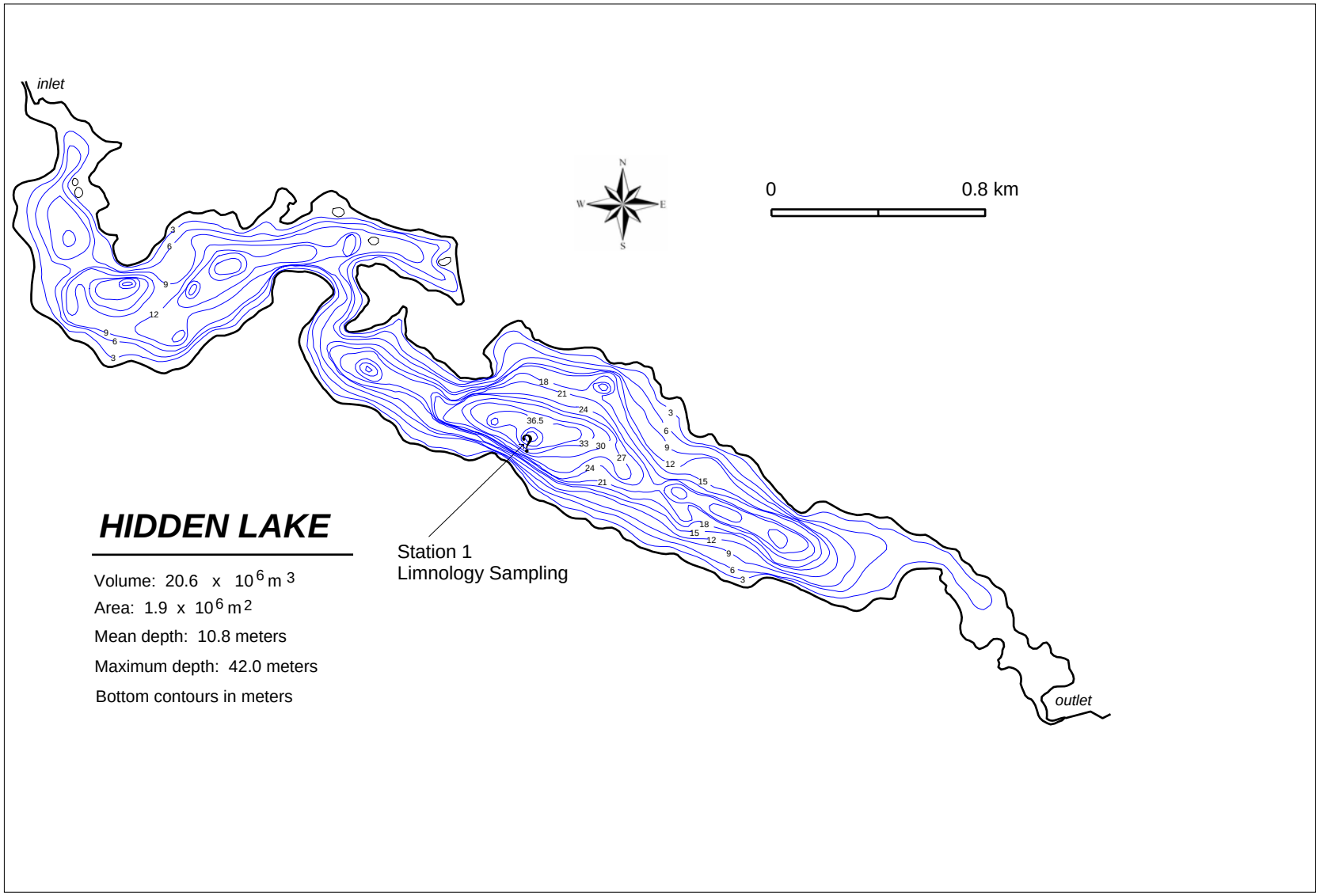

Figure 2.-Morphometric map showing the limnology sampling station on Hidden Lake.

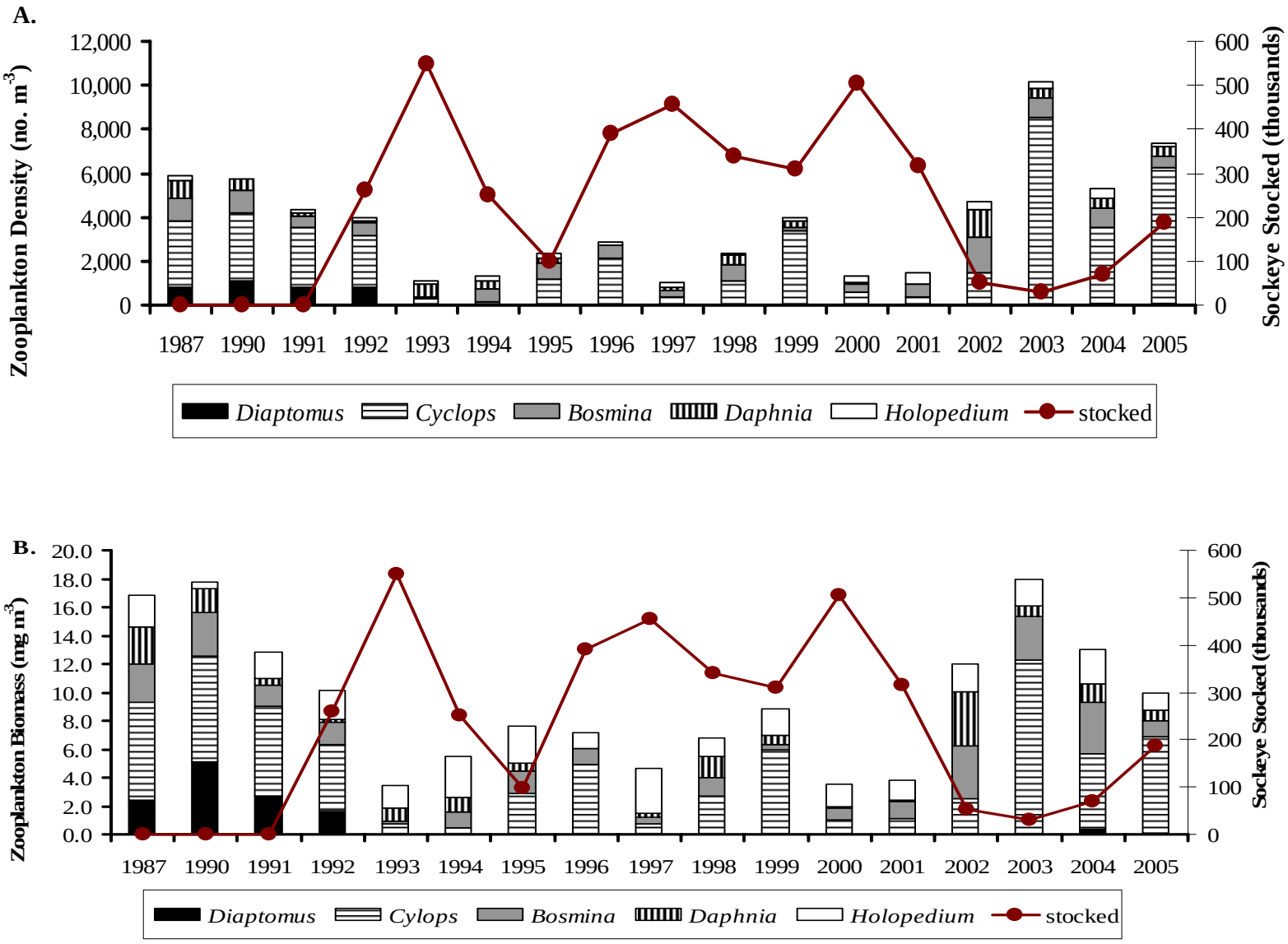

Figure 3.-Zooplankton density (A) and biomass (B) compared to sockeye salmon stocking levels for Hidden Lake, 1987, 1990-2005.