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APPLICATION
PRIVATE NONPROFIT SALMON HATCHERY PERMIT

STATE OF ALASKA
DEPARTMENT OF FISH AND GAME

I. **IDENTIFICATION OF APPLICANT**

A. Private Nonprofit Corporation

Name: Sitka Sound Science Center

Address: P.O. Box 1373 Sitka, Alaska 99835

Phone 907 747 8878
(Please attach a copy of Articles of Incorporation for the above nonprofit corporation organized in accordance with Alaska Statute 10.20)

B. Individual Completing This Form

Name: Lisa Busch /Jim Seeland

Address: P.O. Box 1373
Sitka, Alaska 99835

Phone: 907 747 8878

C. Relation to Above Nonprofit Corporation

Director of Sitka Sound Science Center/ Board ViceChair

II. STATEMENT OF APPLICANT'S GOALS AND OBJECTIVES

Explain why you have decided to apply for a hatchery permit and what you generally expect to accomplish by the operation of the proposed hatchery.

The Sitka Sound Science Center (SSSC) is applying for a permit to operate the Sheldon Jackson Hatchery (SJH). SSSC has been managing SJH since 2007 when the permit holder (PNP permit #3), Sheldon Jackson College, closed its doors.

SJH has been in operation since 1975 and has provided a base for instruction of various fisheries courses over the years. The hatchery was one of many training tools that SJC offered in their Environmental Sciences program. Additionally, funds from salmon cost recovery operations provided foundational funding for the hatchery.

For the past three years SSSC has occupied the Sage Building which houses, in part, the hatchery. The organization negotiated a 10 year lease on the building and has employed qualified professionals to staff the hatchery. Many needed repairs have been made to SJH along with daily maintenance under SSSC's watch.

This permit application will be an integral part of SSSC's mission of fostering fisheries education and research in the Sitka Sound area. SSSC has established strong relationships with NSRAA, UAS Fisheries Technology Program, local fish processors, the community of Sitka and government agencies and expects to develop and expand collaborative relationships in the future. The organization desires to continue operations of SJH into the foreseeable future, with an eye toward instruction of fisheries-related subjects, supporting research efforts, and utilizing cost recovery of returning adult salmon to help fund hatchery operations.

This permit is requesting an increase of pink salmon green egg numbers from 1 million to 3 million eggs. The increased release of pinks will allow for considerably higher cost recovery revenue in the coming years. The increased number of released fry will not require any increase in infrastructure costs and only a slight increase in operational costs. Local processors have expressed strong support for this increase and there is a ready market for these fish.

The other aspect of the new permit request that varies from the current PNP Permit #3 is that SJH would like to reduce chinook releases to 0, down from 100,000 in the current permit. SSSC would also like to see the coho egg numbers increased from the current 150,000 to 250,000. The reasoning behind this change is due to very poor returns of adult chinook over many years. Coho survivals have been considerably better than chinook, salmonid lifestage instruction is very similar for both species, and there is a ready market for coho through local processors.

Chum salmon production would remain the same as in PNP Permit #3. One million green eggs will be taken, incubated and released from SJH. An additional 9 million chum eggs will be taken at the Medvejie Hatchery, incubated there and then reared/released from the Deep Inlet remote rearing site. SSSC has negotiated a cost recovery contract with NSRAA which provides much-needed revenue for SJH hatchery operations and provides a substantial contribution to the common property fishery.

FTP's are in place which allow for the transfer of eggs from either SJH to Medvejie and vice versa should there be a shortfall of chum salmon eggs at either facility. This exchange offers an element of security for both sites.

III. PRODUCTION GOALS AND HATCHERY SITE INFORMATION

A. Egg Capacities by species

	Millions of eggs required for hatchery at start-up	at capacity
Pink Salmon	3,000,000	3,000,000
Chum Salmon	10,000,000	10,000,000
Coho Salmon	250,000	250,000

B. Location Description

1. Site (stream and/or lake name, ADF&G stream number, and exact geographical coordinates)

INDIAN RIVER: Geographic coordinates 57 °03'00'' N. latitude, 135° 019'13''W. longitude. Lot 7 of the Sheldon Jackson College subdivision located at 834 Lincoln Street Sitka, Alaska on Crescent Bay. The lot includes the hatchery tanks, raceways, the roe shed, The Mill Building and the Sage Building. Built in 1929, the Sage building is part of the Sheldon Jackson College National Historic Landmark, designated by the National Park Service.

2. Site Physical Description (attach topographic map and photographs of proposed site). Photos and maps are in Appendices G and I)

a. Topography

The hatchery occupies approximately 18,500 sq ft of filled waterfront lands. There is a 31,216 sq ft tidelands lease associated with the facility. The parcel is primarily rock with some fill, trees and vegetation to the waterside.

b. Geology

There is only a mild slope to the property but it is primarily level fill. Geology of the area is generally thin- to medium-bedded interstratified graywacke and argillite and slaty argillite" (ibid:13). Overlying the bedrock on northern Baranof Island are unconsolidated deposits of alluvium, glacial debris, and volcanic ash. In Sitka, the Indian River delta and much of Sitka National Historical Park is comprised of alluvium that has been reworked by marine processes (SNHP 1998:100).

c. Soils

Rip rap and shot rock fill covered by a thin layer of soil and vegetation. Soils in the Sitka area are typically classified as spodosols. Soils around Sitka have been classified by Rieger et al. (1979:152-154) as "typic cryohumods, loamy, hilly to steep humic cryorthods, and very gravelly. http://dnr.alaska.gov/parks/oha/castlehill/chpttwo.htm

C. Current Land Use and Ownership Status

1. Have the land or usage rights been acquired?

Yes, SSSC has a long term lease with Sheldon Jackson College for the Sage Building

2. What is (will be) the legal form of any usage rights?

Our legal lease for Sage building, which includes the hatchery, water rights and easements. The water rights for the Sheldon Jackson Hatchery are conveyed with the lease of the property (see Appendix A: Hatchery Water Line Easement).

3. List the additional state and federal permits needed by the applicant to build and operate the proposed hatchery. Examples may include: U.S. Army Corps of Engineers Permit; Department of Natural Resources Water Use, Land Use, and Tidelands Lease Permits; and U.S. Forest Service Land Use Permit.

Use Permits (land and water)

N/A

D. Water Supply

The water quantity, minimum and Maxim temperatures, and the amounts of silt loading will be critical factors in the evaluation of water supply adequacy. **Care should be exercised in the evaluation of these questions.**

1. Source (e.g., lake, stream, well, spring).

Indian River, 113-41-019

2. Water source characteristic (e.g., substrate, size of drainage area, gradient, ground water characteristics).

Measured values of suspended sediments in Indian River are quite low (USGS 2002) between 1.0 and 4.0 mg/L. Indian River flows through a large U-shaped post glacial valley, with elevations in the basin ranging from sea level to about 3,700 feet. A large portion of the upper basin drains alpine regions while the valley floors relatively wide, flat and covered by muskeg and spruce forest. In the distal reach, the river bisects Sitka National Historic Park. The lower 0.4 miles of the Indian River can be characterized as a low gradient gravel-cobble bed alluvial channel. The drainage area is 12.3 miles.

3. **Water quality characteristics (in every case, cite the qualifications of the individual making the assessment and the method(s) used). SEE PAGE 13, APPENDIX B**

   a. **Recommended parameters to measure for evaluating potential hatchery water supply. Either fill out the table below or attach a copy of the water quality analysis conducted.**

Water Qualities	Standards	Levels for the hatchery water source
Alkalinity	at least 20 mg/L as $caCO_3$	SEE APPRENDIX B Page 13
Arsenic	<0.05 mg/L	
Barium	<5.0 mg/L)	
Cadmium	<0.0005 mg/L (< 100 mg/L alkalinity	
	<0.005 mg/L (≥ 100 mg/L alkalinity)	
Carbon dioxide	<1.0 mg/L	
Chloride	<4.0 mg/L	
Copper	<0.006 mg/L (< 100 mg/L alkalinity)	
	<0.03 mg/L (≥ 100 mg/L alkalinity)	
Dissolved oxygen	>8.0 mg/L	
Hydrogen sulfide	<0.003 mg/L	
Iron	<0.1 mg/L	
Lead	<0.02 mg/L	
Magnesium	<15 mg/L	
Mercury	<0.0002 mg/L	
Nickel	<0.01 mg/L	
Nitrate (NO_3)	<1.0 mg/L	
Nitrate (NO_2)	<0.1 mg/L	
Nitrogen (N_2)	<110% total gas pressure	
	(<103% nitrogen gas)	
Petroleum (oil)	<0.001 mg/L	
pH	6.5 - 8.0	
Potassium	<5.0 mg/L	
Salinity	<5.0 ppt	
Selenium	<0.01 mg/L	
Silver	<0.003 mg/L (fresh water)	
	<0.003 mg/L (salt water)	
Sodium	<75.0) mg/L	
Sulfate SO_4^{-2}	<50.0 mg/L	
Total dissolved solids	<400.0 mg/L	
Total settleabel solids	<80.0 mg/L (25 JTU)	
Zinc	<0.005 mg/L	

Note: Synergistic and antagonistic chemical reactions must be considered when evaluating a water source against these criteria.

b. **Attach a temperature profile (minimum of one year of data) of the hatchery water source. Also, provide vertical profiles if a lake water source is proposed.**

See attached Appendix C.

c. **List monthly levels of dissolved oxygen in the hatchery water source. If a lake source, provide seasonal oxygen profiles.**

See attached Appendix D.

d. **If a lake source, provide information on surface area, depth, and water storage capacity.**

See attached Appendix N/A.

e. **Describe the silt load (include consideration of possible seasonal high water).**

Measured values of suspended sediments at Indian River were quite low with a minimum concentration of 1.0 mg/L and a maximum of 4.0 mg/L(USGS, Appendix A). Concentrations of suspended sediment generally coincided with greater discharges and suspended sediment load increases during high flow events.

4. **Water Flow Data**.

This information should be based on the equivalent of long-term USGS stream gauge data (10 years or more data) or the U.S. Forest Service Water Resources Atlas synthetic hydrograph model.

a. **Attach a seasonal profile, including yearly minimum and maximum flows.**

See attached Appendix E.

b. **List a historical range of water flow conditions, if available.**

See attached Appendix F.

5. **Water Distribution System**

Describe the water distribution system in at least the following dimensions:

a. **Type, size, elevation and locations of water intake, screening, and water use/reuse system.**

The water source for SJH is Indian River and is delivered to the hatchery through two distribution mechanisms. The primary source of water is pulled from the river through two, in-stream intakes. Both intakes are interconnected and are fitted with 1/8" well screen. The screened intakes connect to a 12" hdpe pipe which parallels Indian River to Sawmill Creek Road where it runs underneath the road and emerges on the SJC side of the road. The pipeline runs underground through the campus and emerges at the hatchery site where it is routed into a 20' x 50' aluminum headbox.

The elevation at the water intake is +48'. Elevation at the hatchery headbox is +28'.

A secondary water source exists in the form of the "flume" or open channel which runs directly from Indian River near the site of the above-mentioned screened intakes. Flume volume is controlled by a large gate valve located at the intake site. The open flume runs parallel to Indian River, runs underground briefly as it crosses Sawmill Creek Road, and then surfaces on the SJC side of SMC Road. It remains an open channel to the center of the SJC campus. At this point, the flume connects with an aged wooden stave pipeline which runs underground and emerges, once again, as a flume at the hatchery site.

The flume water has, in the past, been used almost exclusively for routing large quantities of water through the adult holding facility which is located just downstream of where the flume surfaces on the hatchery site. A diesel-powered backup pump has been used in emergency situations to draw water from the flume and routed into the headbox via 4" flexhose.

SJH recently installed a permanently mounted 3hp electric pump in the flume to act as a more reliable backup water supply for the hatchery. This pump is now activated by a low flow sensor in the headbox and will deliver an adequate flow should the primary water source fail. SSSC has two – 5hp pumps on order and intends to permanently install these in a similar fashion. The resulting flow should adequately secure water flow for full production in the future. Some simple, recirculation devices exist in incubation currently. Effluent from incubators is routed to a small sump and can be recirculated in an emergency. The hatchery also has a water chilling system which utilizes recirculation for otolith marking of pink and chum salmon eggs.

b. Size, length, and type of pipe, insulation, and distribution system. Include elevations of water surfaces at each point in the system from intake through incubation and rearing to fishladder or other discharge.

See attached Appendix: G.

c. If a hydroelectric generation system will be used, will effluent from this system be used in the hatchery? If so, describe plans to address possible problems with gas supersaturation.

n/a

d. Describe provisions for an emergency water system in the event of primary water system failure.

SJH has a backup water supply outlined in 5a above. Currently the facility has installed a 3hp pump into the flume delivery system . This pump is tied into a low flow sensor in the hatchery headtank which will automatically switch the pump on and deliver water to the headtank via a 4" flexhose. Future plans call for installation of two – 5hp pumps to replace this smaller pump but operate in a similar fashion.

6. Water Treatment System

Describe any water treatment facilities that you will employ to meet minimal water quality standards (influent or effluent).

The influent for the water treatment is a single 12" hdpe line from two 1/8inch barrel screens located in Indian river, the water then passes through a Hydrotech 40 micron drum filter and after that it passes

through an Emperor Aquatics 21 bulb COMC2550 2520-watt channell UV sterilizer unit, then on to the hatchery distribution. For the effluent, there are 2 8"pipes that drain the round ponds and 1 sump system that drains two concrete raceways and the incubation rooms. All systems drain directly to saltwater.

7. Annual Water Budget

Attach a graph showing seasonal variation in flow required for eyeing, incubation, freshwater rearing, freshwater lens in saltwater pens, adult holding, and fishladder operations.

See attached Appendix H.

IV. HATCHERY DESIGN AND CONSTRUCTION INFORMATION

A. Biocriteria for Design and Construction

Describe the critical operational assumptions and objectives which determine the design size and capacity of the proposed hatchery. Specific reference should be made to the following (for reference, a table of CFMD assumptions for salmon survival is provided, Table I):

BROOD STOCK - SPECIES Pink Salmon

1. Eggs per female spawner 1600
2. Brood stock requirements at 1:1 sex ratio 3750
3. Green egg requirements 3,000,000
4. Estimated holding mortality 50 , 1.5 %

HATCHERY FACILITY

5. Eyed eggs (10% loss from green egg stage) 2,700,000
6. Eyed egg density per incubation unit 150,000 per NOPAD incubator
7. Total number of incubation units 18
8. Number of cabinets per unit stacked 4 high, need 4.5 stacks
9. Water requirements at 60 L/min/unit= 270 L/min
10. Water requirements with 5 % loss = 260 L/min

FRESHWATER REARING UNITS

11. Number of emerging fry (____% loss from eyed stage)_____
12. Initial fry weight at ____/kg= ____ kg
13. Final Fry weight at ____/kg= ____ kg
14. Initial freshwater fry rearing space required at ____ kg/m^3 ____ m^3
15. Final freshwater fry rearing space required at ____ kg/m^3 ____ m^3
16. Maximum number of rearing units (____ m by ____ m by ____ m= ____
17. Maximum water requirements at ____ kg/L/min and 10% loss ____ L/min
18. Number of exchanges per hour (R-value) per raceway ____

MARINE REARING UNITS

19. Number of fry/fingerling/or smolts 2,309,000 (15% loss from table)____
20. Initial weight at 6700 /kg 344 kg

21. Final weight at _670_/kg =_____3446_____kg
22. Initial rearing space required at _____8__kg/m^3 =_____43_____ m^3
23. Final rearing space required at ___8__kg/m^3 _____430_____ m^3
24. Maximum number of rearing units = 1 (13_m by__13_m by__5m=____845___ m^3)

PROJECTED RETURN

25. Number of returning fish at __2__% ocean survival =46,200

A. Biocriteria for Design and Construction (continued)

BROOD STOCK - SPECIES Chum Salmon

1. Eggs per female spawner 2200
2. Brood stock requirements at 1:1 sex ratio 900
3. Green egg requirements 1,000,000 (+9,000,000 eggs will be taken and incubated at the Medvejie Hatchery)
4. Estimated holding mortality 15, 1.5 %

HATCHERY FACILITY

5. Eyed eggs (10% loss from green egg stage) 900,000
6. Eyed egg density per incubation unit 150,000/NOPAD
7. Total number of incubation units 6
8. Number of cabinets per unit stacked 4 high, need 1.5 stacks
9. Water requirements at 60L/min/unit= 90 L/min
10. Water requirements with 5 % loss= 86 L/min

FRESHWATER REARING UNITS

11. Number of emerging fry (_____% loss from eyed stage)_____
12. Initial fry weight at_____/kg=_____kg
13. Final Fry weight at _____/kg=_____kg
14. Initial freshwater fry rearing space required at _____kg/m^3 _____ m^3
15. Final freshwater fry rearing space required at_____kg/m^3 _____ m^3
16. Maximum number of rearing units (_____m by_____m by_____m= _____
17. Maximum water requirements at _____kg/L/min and 10% loss_____L/min
18. Number of exchanges per hour (R-value) per raceway_____

MARINE REARING UNITS

19. Number of fry/fingerling/or smolts 765,000 (15% loss, from table)
20. Initial weight at 2900/kg = 264 kg
21. Final weight at 500 /kg= 1530 kg
22. Initial rearing space required at 8 kg/m^3 = 33 m^3
23. Final rearing space required at 8 kg/m^3 191 m^3
24. Maximum number of rearing units = 1 (13 m by 6 m by 5 m= 390 m^3)

PROJECTED RETURN

25. Number of returning fish at 2 % ocean survival = 15,300

A. Biocriteria for Design and Construction (continued)

BROOD STOCK - SPECIES Coho salmon

1. Eggs per female spawner 2800
2. Brood stock requirements at 1:1 sex ratio 180
3. Green egg requirements 250,000
4. Estimated holding mortality 20, 10 %

HATCHERY FACILITY

5. Eyed eggs (10% loss from green egg stage) 225,000
6. Eyed egg density per incubation unit 10,000/Heath tray
7. Total number of incubation units 23
8. Number of cabinets per unit 7
9. Water requirements at 20L/min/unit= 80 L/min
10. Water requirements wiith 5 % loss= 76 L/min

FRESHWATER REARING UNITS

11. Number of emerging fry (5 % loss from eyed stage) 214,000
12. Initial fry weight at 6700 /kg = 32 kg
13. Final Fry weight at 67 /kg= 3200 kg
14. Initial freshwater fry rearing space required at 8 kg/m^3 4 m^3
15. Final freshwater fry rearing space required at 32 kg/m^3 100 m^3
16. Maximum number of rearing units = 8 (4m diam by 1m deep = 13m^3)
17. Maximum water requirements at 1.2kg/L/min and 10% loss 2400 L/min
18. Number of exchanges per hour (R-value) per raceway 1.5

MARINE REARING UNITS

19. Number of fry/fingerling/or smolts 193,000
20. Initial weight at 67 /kg= 2880 kg
21. Final weight at 50 /kg= 3860 kg
22. Initial rearing space required at 8 kg/m^3 = 360 m^3
23. Final rearing space required at 8 kg/m^3 483 m^3
24. Maximum number of rearing units = 2 (13m by 13m by 5m= 390 m^3)

PROJECTED RETURN

25. Number of returning fish at 10 % ocean survival = 19,300

Table 1. Salmon survival goals at various life stages and fecundities[1] to use in budget documents and hatchery planning.

	Hatchery				Lake	Marine
Species	Green to eyed egg	Eyed Egg to emergent fry	Emergent fry to fingerling	Fingerling to smolt	Fry/fingerling to smolt	Survival to adult
Chum	.90 (.90)[2] .90 (.90)	.95 (.855)[3] .95 (.855)	 .90 (.770)[4]			.007 (.006) .02 (.015)
Pink	.90 (.90) .90 (.90)	.95 (.855)[5] .95 (.855)	 .90 (.770)[4]			.007 (.006) .02 (.015)
Coho	.90 (.90) .90 (.90) .90 (.90)	.95 (.855)[5] .95 (.855) .95 (.855)	 .90 (.770)[6] .90 (.770)	 .80 (.616)[7]	.10 (.086) .20 (.154)	.10 (.009) .10 (.015) .10 (.062)
Chinook	.90 (.90) .90 (.90) .90 (.90)	.95 (.855)[5] .95 (.855) .95 (.855)	 .90 (.770)[6] .90 (.770)	 .80 (.616)[7]	.10 (.086) .20 (.154)	.03 (.003) .03 (.005) .03 (.018)
Sockeye	.90 (.90) .90 (.90) .90 (.90)	.95 (.855)[5] .95 (.855) .95 (.855)	 .90 (.770)[6] .90 (.770)	 .80 (.616)[7]	.10 (.086) .20 (.154)	.10 (.009) .10 (.015) .10 (.062)

[1] Fecundities by species (eggs per female spawner).

Chum	2,200
Pink	1,600
Coho	2,800
Chinook	6,500
Sockeye	3,000

[2] Cumulative survivals in parenthesis.
[3] Fry to ocean.
[4] Fingerling to ocean.
[5] Fry to lake/stream.
[6] Fingerling to lake/stream.
[7] Smolt to ocean.

B. GENERAL DESCRIPTION

Attach a written description of the proposed facility. This description should represent a solid concept of the proposed hatchery design. Also include preliminary sketches and drawings of at least the following in an appendix.

1. Incubation and rearing site plan.
2. Hatchery floor plan.
3. Water supply system.
4. Incubation/operation building.
5. Facility layout.

The site plan should include a plan view of all facilities at a scale of 1:100 or larger, a USGS 1:63360 scale topographical map showing the entire watershed and all facility locations, and a NOAA marine chart of the largest scale available showing all tidewater-based facilities and local data.

See Attached Appendix _I____.

C. PROPOSED CONSTRUCTION TIMETABLE

Prepare a timetable for the construction period which indicates the critical milestones for the project.

See attached Appendix: n/a

V. BROOD STOCK

A. Initial Donor Stock – N/A, hatchery returns already exist

1. Identification of source.

Indicate stream name, ADF&G number or geographic coordinates, and salmon species for each proposed donor stock.

a. Species _____

Stream name _____

ADF&G number or geographic coordinates _____

b. Species _____

Stream name _____

ADF&G number or geographic coordinates _____

c. Species_____

Stream name_____

ADF&G number or geographic coordinates_____

d. Species_____

Stream name_____

ADF&G number or geographic coordinates_____

If more sources are being requested, attach an additional list.

2. Capture techniques and holding facilities at the donor stream.

a. Capture techniques

Describe in detail the capture techniques you will use to harvest adults and take eggs.

Please provide a map identifying the exact location of the holding facilities.

_____

_____

_____

_____

_____

_____

b. Holding facilities

Describe the holding facilities to be used for donor stock spawners (include schematics).

List the loading rate [kg fish/ (L/min)] and density (kg fish/mg^3).

SEE APPENDIX G

3. Transportation

Discuss method planned for transporting live fish and/or eggs

_____

_____

_____

4. Spawning and fertilization

Discuss the spawning, fertilization, and disinfection procedures and the procedure for estimating percent fertilization.

_____

_____

_____

B. Brood Stock Returning to Hatchery

1. Capture techniques and holding facilities at the hatchery.

a. Capture Techniques

Describe in detail the techniques you will use to capture and ripen adults and take eggs.

All adult pink and chum salmon returning to the facility enter 2 @ 12' x 50' concrete adult holding raceways via two, short (10') sections of fish ladder. Fish are brailed from the raceways and anaesthetized in a sorting tank. Green females and an equal number of males are returned to the raceways. Ripe fish are euthanized and routed into the adjacent eggtake structure. Surplus males are sold for cost recovery revenue. Coho are captured in a similar manner to that outlined above but are transported to 12' circular ponds fed with freshwater and are held until sexually mature. Surplus coho are sold for cost recovery revenue.

b. Holding facilities

Describe the holding facilities to be used for hatchery brood stock spawners (include schematics) and give the loading rate [kg fish/ (L/min)] and density (kg fish/mg^3).

All adults are routed into two @ 12' x 50' x 3' deep concrete raceways. Coho are held in two @ 12' diameter x 3' deep circular ponds. Densities of holding adults will not exceed 32kg/cu.meter and Loading Rate will not exceed 0.85kg/L/minute.

2. Transportation

Discuss method planned for transporting live fish and/or eggs (if different from those described in Part A).

If eyed chum eggs are transported to or from the Medvejie Hatchery in case of a broodstock shortfall, they will be disinfected in 1:100 iodophor solution, placed into coolers lined with burlap and trucked the short (20 minute) distance to the receiving facility. All coolers, burlap and any other associated equipment will be disinfected with 1:100 iodophor prior to departure to the receiving facility.

NSRAA's Medvejie Hatchery staff will be responsible for transporting the approximately 9 million chum fry to the Deep Inlet remote rearing site.

3. Spawning and fertilization

Discuss the spawning and fertilization procedures (if different from those described in Part A).

Pink and chum salmon will be spawned using the dry spawning method. A 0.7% saline solution is used to facilitate the fertilization process. The spawning ratio will be approximately 6 males per every 10 females.

Coho eggtakes will incorporate the family tracking process to monitor adults for the presence of Bacterial Kidney Disease. Each adult will be disinfected with 1:100 iodophor solution. Kidney tissue samples will be taken from all adults and submitted to ADFG Fish Pathology once eggtaking is complete. Fertilized and rinsed eggs will be placed into individual Heath tray sections and water-hardened in 1:100 iodophor solution. Families found positive for BKD will be removed from the population prior to hatch.

VI INCUBATION AND REARING PLAN

A. Incubators and Rearing Units

Describe the type of incubators and rearing facilities to be used.

Chum and pink salmon will be eyed in R30 incubators and then transferred to NOPAD incubators until emergence. Coho will be eyed up in individual Heath trays until BKD results return. BKD positive families will be discarded. BKD negative families will be combined and seeded to Heath trays until emergence

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B. Egg Handling

Describe the method by which you plan to handle the eggs from the spawning process through planting them in incubators.

Pink and chum salmon are dry spawned into 3 gallon buckets containing 0.7% saline solution. Once fertilized, eggs are thoroughly rinsed to remove any foreign matter. Rinsed eggs are gently placed into R30 incubators for eyeing. Eyed eggs will be run through a Jensorter to remove dead eggs. The remaining live eggs will be enumerated volumetrically and seeded into NOPAD incubators containing Bioring substrate.

Coho eggs will be family-tracked for BKD. All adults are wiped down with 1:100 iodophor along with any tools involved. One male and one female will be spawned into a labeled ziplok bag containing 0.7% saline solution. Kidney tissue samples will be taken from each adult and sent to ADFG Pathology. Once fertilized, eggs are thoroughly rinsed and placed into individual Heath tray compartments containing 1:100 iodophor solution. When eyed, all BKD positive eggs will be discarded and negative eggs combined. The remaining eggs will be run through a Jensorter eggsorting machine, enumerated and placed into Heath trays containing Bioring substrate.

C Chemical Treatment

What chemicals and concentrations will be used for controlling fungus on eggs until the eyed stage?

All eggs will be treated with 37% formalin solution at 750ppm 3 times/week until eyed

D. Enumerations

Describe the method(s) to be used in estimating numbers of green eggs, eyed eggs, and fry.

Green eggs can be estimated initially by subsampling surplus females for fecundity during the eggtake process. Once eyed, all eggs are shocked, picked, and enumerated by taking random sample weights and weighing the entire biomass. Emergent fry numbers are calculated by enumerating incubation mortality at ponding and subtracting this number from the eyed egg number

E. Rearing Plans

Describe any plans to rear the salmon including type of food.

Pink and chum salmon will be ponded directly to 13mx13mx4m saltwater net pens. Initial feed will be either EWOS or Skretting starter #0 and switched to a #1 starter feed at 1gram.

Coho will be initially ponded to 2 start tanks which measure approximately 3m x1mx0.5m deep. At 0.5g all fry will be transferred to 2 – 4m diameter circular ponds and continually split to

additional circular containers to assure density never exceeds 32kg/cubic meter. Around May 1, coho pre-smolts will be transferred to saltwater netpens for 3 weeks of saltwater acclimation and then released.

Coho fry will initially be started on Skretting starter #0 and increased incrementally as they grow according to feed manufacturer's recommendations. At release, smolts will be fed Skretting 2.5mm feed.

F. Disease Control

Describe plans for preventing or controlling disease during rearing.

BKD concerns will be addressed through family tracking of all females during the eggtake process. Kidney samples will be taken and screened using the ELIZA protocol at ADFG Pathology Lab. All rearing equipment will be disinfected after use and each pond will have its own tools. All influent water will be u.v. sterilized. Routine fish health assessments will be performed as a preventative measure.

VII RELEASE PLAN

A. Release Site(s)

1. Give exact location and description of proposed release site(s), including maps.

RELEASE SITES INCLUDE SITKA SOUND AND DEEP INLET see APPENDIX I

2. List proposed number and age of each species to be released at each site.

Pink salmon: 2,309,000 fry (using ADFG-supplied loss values) from saltwater net pens located adjacent to SJH

Chum salmon: 765,000 fry (using ADFG- supplied loss values) from saltwater net pens located adjacent to SJH. An additional 6,900,000 fry will be released from NSRAA's Deep Inlet remote rearing site (again, using ADFG figures).

Coho salmon: 193,000 smolts (using ADFG figures) will be released from saltwater net pens located adjacent to SJH.

B. Transportation

Discuss the methods planned for transporting live fish from the hatchery to the release site(s).

All pink, chum, and coho will be transported to saltwater pen rearing by 4" flexhose running from the hatchery grounds (approximately 500' and an elevation difference of 15').

Chum fry at the Medvejie Hatchery will be transported by NSRAA-staffed seine vessel fitted with proper transfer equipment. NSRAA personnel will monitor all transfers.

VIII STAFFING

A. Technical Advisors

Attach information about each technical advisor to the nonprofit corporation, indicating that person's name, address, role and responsibilities, and a brief statement of technical qualifications.

Jim Seeland has over 30 years of aquaculture experience, 22 years of that time in Alaska. He has managed several other hatcheries for the Northern Southeast Aquaculture Association. He will be responsible for overseeing operations of the hatchery and for providing technical advice on a weekly and monthly basis. His resume is attached (APPENDIX I).

Steve Reifenstuhl, the executive director of NSRAA is also a technical advisor to SSSC. Steve has 30 years of experience working for NSRAA as a fisheries biologist and as operations manager for the non-profit that has a $4 million program budget. He is responsible for permitting, program development and overseeing operations. He worked as the fleet manager for one year for Silver Bay Seafoods.

B. Design and Construction

Attach a list of the names and qualifications of persons or corporations responsible for final design and construction of proposed facilities.
HATCHERY ALREADY EXISTS

C. Administrative Personnel

List the administrative personnel who will support this facility when operational.

Personnel Assigned (Titles)	Percentage of Time
1. Lisa Busch	40
2 Tory O'Connell	40

D. Operating Personnel

List the operating personnel who will be assigned to this facility when operational.

Personnel Assigned (Titles)	Percentage of Time
1Shannon McMillan, Hatchery Technician	100
2Grant Miller, Hatchery Technician	100

IX FINANCIAL PLAN

An estimate of hatchery construction and operating costs should be detailed here. These estimates would provide an indication of the cost recovery requirements of the proposed facility on an annual basis. Acceptance of this application by the Department of Fish and Game in no way implies agreement by the Department of Commerce and Economic Development to commit state loan funds for this project.

See attached Appendix ____J_____.

X. Basic Management Plan

The preparation of a draft Basic Management Plan will be completed prior to the public hearing. The applicant will be expected to work closely with ADF&G staff in developing the Basic Management Plan (see 5 AAC 40.820).
APPENDIX K – SJH has an Annual Management Plan in place currently.

XI DECLARATION AND SIGNATURE

I declare that the information given in this application is, to my knowledge, true, correct, and complete.

Sitka Sound Science Center
Name of Applicant

9/25/2010
Date Signed

Signature of Applicant

LIST OF APPENDIX

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APPENDIX A:

Water Rights Documentation

Recording Dist: 103 • Sitka
4/27/2009 11:38 AM Pages: 1 of 12

DECLARATION OF EASEMENTS AND ACCESS RIGHTS

RE SHELDON JACKSON CAMPUS SUBDIVISION

GRANTOR: SHELDON JACKSON COLLEGE

GRANTEE: SHELDON JACKSON CAMPUS SUBDIVISION

Record in the Sitka Recording District
After recording, return to:
Michael C. Geraghty
Delisio Moran Geraghty & Zobel, P.C.
943 West Sixth Avenue
Anchorage, AK 99501

DECLARATION OF EASEMENTS AND ACCESS RIGHTS
RE SHELDON JACKSON CAMPUS SUBDIVISION

THIS DECLARATION OF EASEMENTS AND ACCESS RIGHTS ("Oeclaration") for the Sheldon Jackson Campus Subdivision Is made this 24th day of April, 2009, by Grantor SHELDON JACKSON COLLEGE, by and through its authorized representatives, with an address of 801 Lincoln Street, Sitka, Alaska, 99835 ("Grantor").

I. RECITALS

A. Grantor is the Owner of certain real property in SItka, Alaska consisting of approximately 34,5 acres of land bordered by Davis Street on the west, Sawmill Creek Road on the north, Metlakatla Street and the Sitka National Monument on the east, and Lincoln Street on the south.

B. Grantor has submitted a plat to subdivide these propertles into various parcels for marketing and sale, entitled the Sheldon Jackson Campus Subdivision ("SubdivIsion"). Collectively the properties within the Subdivision shall be known as the "Subject Properties."

C. Grantor recognizes that for the most favorable development of the SUbject Properties, it is desirable that Grantor identify and convey certain easements and access rights as they are substantially depicted on the plat for the Subdivision dated April 8, 2009 ("SJC Plat"), along with the rights, obligations and duties relating to same, as more particularly descri.bed below.

II. SPECIFIC GRANTS

NOW, THEREFORE, for and in consideration of the Recitals herein, which are deemed a material and substantIve part of this Declaration, and TEN DOLLARS ($10) and other good and valuable consideration, Grantor hereby declares, grants, covenants and agrees as follows:

A. Sage Building/Hatchery.

1. Wood Stave Easement. Grantor hereby grants and conveys to the Owner of Lot 7 of the Subdivrsion (Where the Sage Building/Hatchery is located) an excusive use easement ("Wood Stave Easement") that crosses several of the Subject Properties. The Wood Stave Easement Is approximately 30 feet in width and runs In a southerly direction from the

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2 of 12
2009-000578-0

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Creek as depicted on the SJC Plat for a distance of approximately 600 feet until it crosses under Lincoln Street to Lot 7.

The easement, rights, and privileges conveyed with the Wood Stave Easement are exclusive to the Owner of Lot 7 and his successors in interest who shall not be authorized to convey any other easement or conflicting rights within the area covered by the Wood Stave Easement except as conditioned or described by this Declaration.

The Owner of Lot 7 shall have the duty to repair and maintain the Wood Stave Easement and keep it free and open for the benefit of Lot 7 including, without limitation, removing vegetation and cutting or trimming trees or vegetation that may encroach on the Easement or obstruct the flow of water through it.

2. Hatchery Water Line Easement. Grantor hereby grants and conveys a 20 foot Water Line Easement which starts at the edge of Sawmill Creek Road where it is encompassed, and Included Within, the course of the Water Canal Easement described below and as depicted on the SJC Plat. It continues southerly within the course of the Water Canal Easement for a distance of approximately 650 feet until it branches off at or *near* the location where the Water Canal Easement bends to the east. The Water Line Easement then continues south within its own course for approximately 700 feet where it crosses underneath Lincoln Street to serve Lot 7, as more particularly depicted on the SJC Plat. The Water Line Easement contains a 12 inch water line throughout its course that provides a source of water for the exclusive use and benefit of Lot 7.

The easement, rights and privileges conveyed with the Hatchery Water Line Easement are exclusive to the Owner of Lot 7 and his successors in interest who shall not be authorized to convey any other easement or conflicting rights within the area covered by the Hatchery Water Line Easement except as conditioned or described by this Declaration.

The Owner of Lot 7 shall have the duty to repair and maintain the water line within the Easement, including repair of leaks, mitigation and prevention of damage from flooding caused by disrepair, and shall at all times keep the Easement free and open for the benefit of Lot 7.

3. Water Canal Easement. The Creek has developed into an anadromous fish stream below the penstock intake. Grantor hereby grants

and conveys a 40-foot easement to protect the Creek and its status as an anadromous fish stream as more particularly depicted on the SJC Plat. The Creek shall serve as the mid-line of the Easement.

The Water Canal Easement is for the use and benefit of the Subject Properties affected Including, without limitation, Lot 7.

Unless otherwfse dictated by operation of law or the terms of this Declaration, the Subject Properties affected by the Water Canal Easement shall have the duty to maintain the Creek and the Water Canal Easement, including any necessary maintenance, clearing and cleaning of debris, organic or otherwise, and otherwise take such actions as may be necessary to protect the Creek's status and use as Bnadromous fish stream.

With respect to the Wood Stave Easement and the Hatchery Line Water Easement, The Owner of Lot 7 shall assume responsibility for such upkeep and maintenance of the Water Canal Easement as may be necessary to assure the integrity and flow of water through the aforementioned Easements.

4. Reservation of Riparian Rights. All of the easements providIng access to water including, without limitation, the grants described in subparagraph ILA.. along with all the rights. obligations and duties accompanying same. are subject to such pre-existing water rights that have been previously conveyed to the Grantor Including, without Ilmitation, that Certificate of Appropriation (Amended) bearing designation ADL 43671, dated December 31, 1996 and recorded at Book 123, Page 770 In the Sitka Recording DIstrict.

B. lincoln Street Properties.

1. LIncoln Electrical Line Easement. Grantor hereby grants and conveys a 12-foot utility easement along the southern edge of Lots 3, 4, 5 and 6 of the Subdivision which runs along Lincoln Street for a distance of approxImately 450 feet, for the benefit of CBS ("LIncoln Easement").

The Lincoln Easement Is made expressly for the use and benefit of CBS and shall be binding on its successors In interest and assigns,

It is expressly agreed that the rights and privileges conveyed with the Lincoln Easement are limited to construction, maintenance and repair of electrical power lines within the easement by CBS,

APPENDIX B:

USGS Water Quality and Streamflow of the Indian River

USGS
science for a changing world

Prepared in cooperation with the National Park Service

Water Quality and Streamflow of the Indian River, Sitka, Alaska, 2001-02

Scientific Investigation Report 04-5023

U.S. Department of the Interior
U.S. Geological Survey

25

Water Quality and Streamflow of the Indian River, Sitka, Alaska, 2001-02

By Edward G. Neal, Timothy P. Brabets, and Steven A. Frenzel

Prepared in cooperation with the National Park Service

Scientific Investigation Report 04-5023

U.S. Department of the Interior
U.S. Geological Survey

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Gale A. Norton, Secretary

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Conversion Factors

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	0.4047	hectare (ha)
square mile (mi^2)	2.590=	square kilometer (km^2)
	Flow rate	
foot per second (ft/s)	0.3048	meter per second (m/s)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
	Mass	
ton per day (ton/d)	0.9072	metric ton per day

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C=(°F-32)/1.8$$

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft^3/d)/ft^2]ft. In this report, the mathematically reduced form, foot squared per day (ft^2/d), is used for convenience.

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

NOTE TO USGS USERS: Use of hectare (ha) as an alternative name for square hectometer (hm^2) is restricted to the measurement of small land or water areas. Use of liter (L) as a special name for cubic decimeter (dm^3) is restricted to the measurement of liquids and gases. No prefix other than milli should be used with liter. Metric ton (t) as a name for megagram (Mg) should be restricted to commercial usage, and no prefixes should be used with it.

Water Quality and Streamflow of the Indian River, Sitka, Alaska, 2001-2002

By Edward G. Neal, Timothy P. Brabets, and Steven A. Frenzel

ABSTRACT

The Indian River Basin, located near Sitka Alaska, drains an area of 12.3 square miles. This watershed is an important natural resource of Sitka National Historic Park. At the present time, the watershed faces possible development on large tracts of private land upstream of the park that could affect the water quality of Indian River. Due to this concern, a study was conducted cooperatively with the National Park Service. The approach was to examine the water quality of the Indian River in the upper part of the watershed where no development has occurred and in the lower part of the basin where development has taken place.

Measurements of pH, water temperature, and dissolved oxygen concentrations of the Indian River were within acceptable ranges for fish survival. The Indian River is calcium bicarbonate type water with a low buffering capacity. Concentrations of dissolved ions and nutrients generally were low and exhibited little variation between the two study sites. Analysis of bed sediment trace element concentrations at both sampling sites indicates the threshold effect concentration was exceeded for arsenic, chromium, copper, nickel, and zinc; while the probable effect concentration was exceeded by arsenic, chromium and nickel. However, due to relatively large amounts of organic carbon present in the bed sediments, the potential toxicity from trace elements is low.

Discharge in the Indian River is typical of coastal southeast Alaska streams where low flows generally are in late winter and early spring and greater flows are during the wetter fall months. Alaska Department of Fish and Game has established instream flow reservations on the lower 2.5 miles of the Indian River. Discharge data indicate minimum flow requirements were not achieved during 236 days of the study period. Natural low flows are frequently below the flow reservations, but diversions resulted in flow reservations not being met a total of 140 days.

Thirty-five algae species were identified from the sample collected at Indian River near Sitka while 24 species were identified from the sample collected at Indian River at Sitka. Most species of algae identified in the Indian River samples were diatoms and the majority were pinnate diatoms; however, green algae and (or) blue-green algae accounted for much of the algal biomass at the two sites. The trophic condition of the Indian River is oligotrophic, and algal productivity likely is limited by low concentrations of dissolved nitrogen.

Few invertebrate taxa were collected relative to many high-quality streams in the contiguous United States, but the number of taxa in Indian River appears to be typical of Alaska streams. Ephemeroptera was the most abundant order sampled followed by Diptera.

INTRODUCTION

The Indian River is located in southeast Alaska, near the town of Sitka (fig. 1), and drains area of 12.3 mi^2 (fig. 2). Sitka National Historical Park (SNHP) is located near the mouth of the Indian River (fig. 1) and preserves historically and culturally significant sites and artifacts related to the 1804 Battle of Sitka, the Russian-American period in Alaska, and the Alaska Native people of southeast Alaska. Indian River is an important natural resource in SNHP and provides a critical link to understanding the cultural history and events that took place in the 1800's. The convergence of the Indian River, the coastal rainforest, and the Pacific Ocean provides a biologically rich environment for a variety of aquatic resources including pink, chum, chinook, and coho salmon; Dolly Varden and steelhead trout.

Until recently urban development within the Indian River watershed has been limited to relatively small areas in the lower reaches (fig. 1). Additional reaches upstream of the park may be developed in the future. City and Borough of Sitka (CBS) lands adjacent to the river have been rezoned from public to residential. Housing developments with large impervious areas have already been developed. An additional 180 acres of private land has been recently marketed for further development. It is necessary to document the current chemical and physical aspects of the Indian River to determine the potential effects of development on the water quality and habitat of the Indian River.

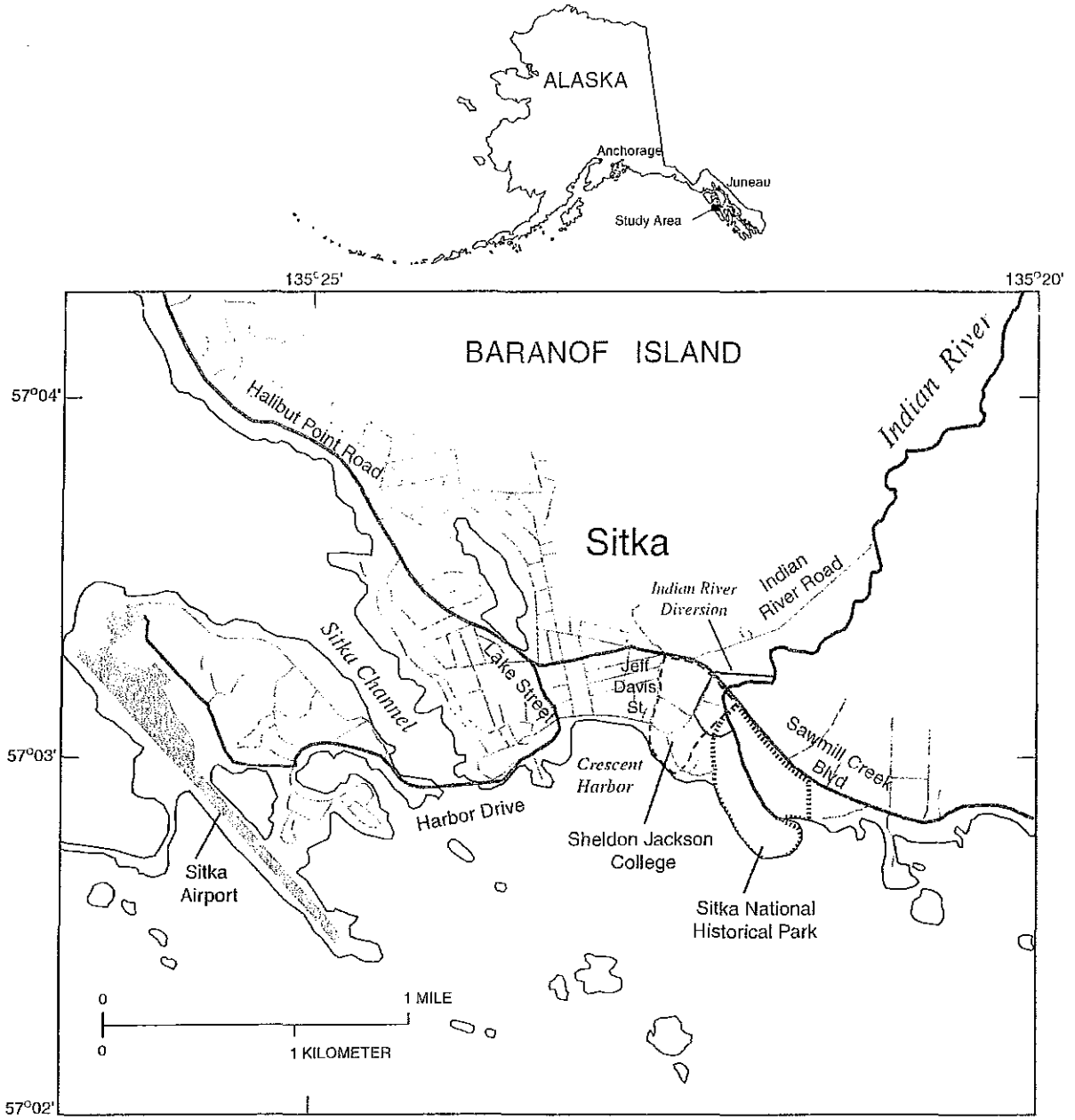

Figure 1. Location of Sitka and the Indian River

Acknowledgment

We thank many individuals with the National Park Service, particularly Geoffrey Smith who assisted us with logistical support, data collection, and review.

Purpose and Scope

This report summarizes the results of a cooperative study of the National Park Service (NPS) and the U.S. Geological Survey (USGS) to study the water quality of the Indian River. The purpose of this study was to (1) determine if the present water quality of the Indian River has been affected by development, and (2) establish a baseline water-quality data base for the Indian River that can determine potential effects of development on the water quality in the Indian River. In addition to the water quality of the Indian River, flow characteristics, streambed sediments, physical habitat, and benthic communities of the river are also assessed.

Description of Study Area

Sitka is located on the western side of Baranof Island (fig. 1), and is the largest population center on the island, and

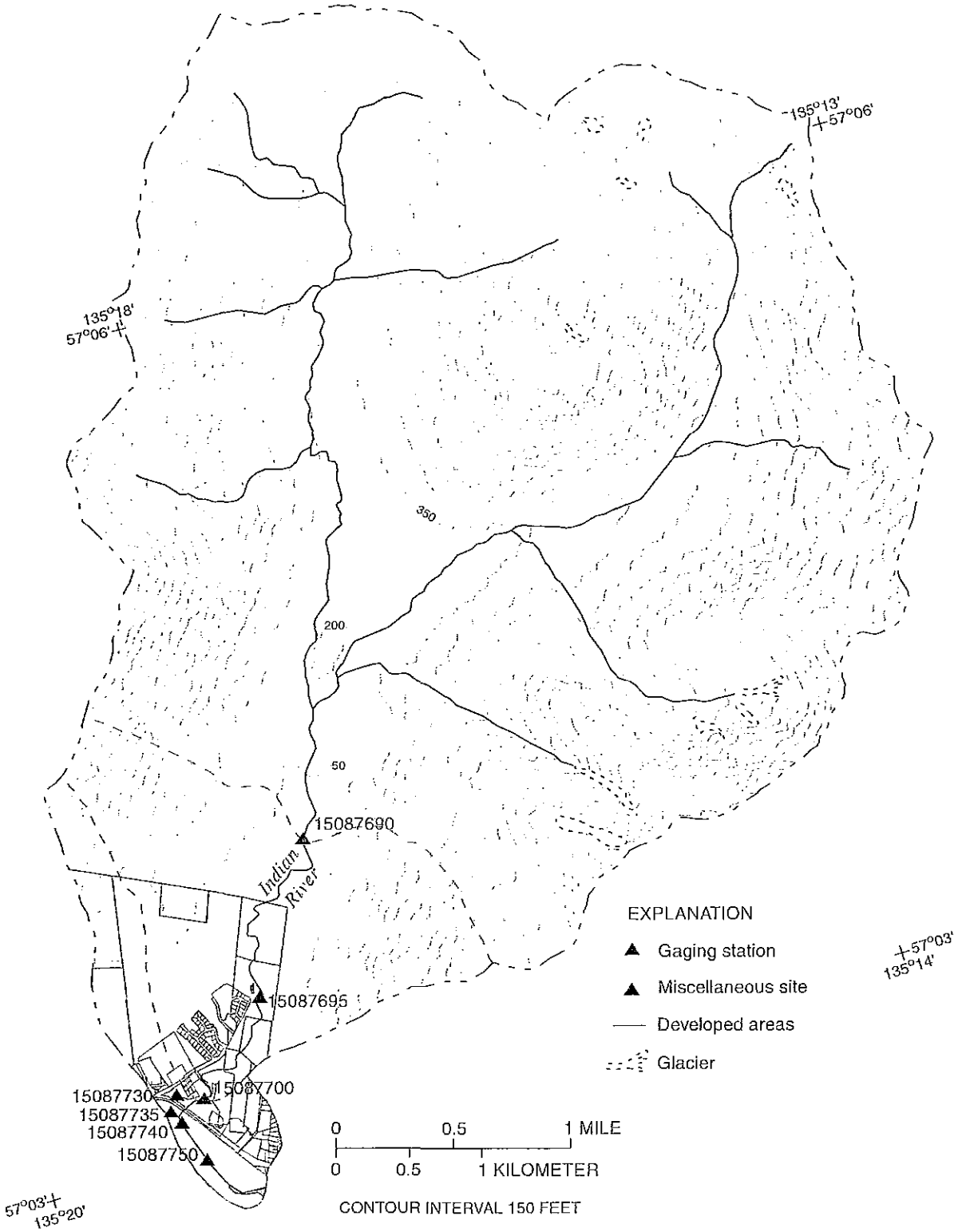

Figure 2. Indian River watershed, Alaska

third largest population center in southeast Alaska. Located within Sitka Sound, but near the outer coast of the Pacific Ocean, Sitka is about 100 miles southwest of Juneau. The community is accessible only by plane or boat. The population of Sitka is 8,835, which represents an increase of about 13 percent since the 1980 census (City and Borough of Sitka, 2002).

Indian River flows through a large U-shaped post-glacial valley, with elevations in the basin ranging from sea level to about 3,700 feet (fig. 2). A large portion of the upper basin drains alpine regions while the valley floor is relatively wide, flat, and covered by muskeg and spruce forest. As the Indian River flows toward the mouth it flows through a recently developed region with increasing road densities and housing developments. In the distal reach, the river bisects SNHP. The lower 0.4 miles of the Indian River can be characterized as a low gradient gravel-cobble bed alluvial channel.

Sitka has a maritime climate. Average daily temperatures in Sitka range from 34 °F (1 °C) in January to around 55°F (13 °C) in July and August. Average annual precipitation at the Sitka Airport averages about 90 inches with most precipitation occurring as rain. The steep topography in the upper reaches of Indian River likely accumulates considerably more precipitation including a substantial snow pack during some years. The Indian River near Sitka gaging station (fig. 2, No. 15087690) indicates the average annual runoff for the basin is 123 in. The driest months of the year are May, June, and July when high-pressure systems move through southeast Alaska. The late summer and early fall months are dominated by low-pressure systems generating frequent storms and large amounts of precipitation. September, October, and November are the wettest months with average October precipitation of about 13 in. (National Oceanic and Atmospheric Administration, 2002).

METHODS OF DATA COLLECTION AND ANALYSIS

To accomplish the objectives of the study, a site in the upper part of the Indian River watershed that represents an undeveloped area, and a site in the lower section of the river that represents development were chosen for study. Water quality, streamflow, streambed sediment, and biological data were collected, analyzed, and compared for these two sites.

Streamflow on the Indian River was measured at two sites during the study period (fig. 2). The upper site, Indian River near Sitka (USGS station number 15087690) drains an area of 10.3 mi^2 and was gaged by the USGS from 1980 through 1993. The gage was re-established in September 1998 and provides information on streamflow upstream of SNHP and two streamflow diversion structures operated by the CBS, and Sheldon Jackson College (SJC).

The USGS stream gage Indian River at Sitka (fig. 2, USGS station number 15087700) is located downstream of both the CBS and SJC diversions and drains an area of 11.8 mi^2. The gage was installed in September of 1998 and is located approximately 0.6 miles upstream from the mouth. This gage provides information on streamflow just upstream of SNHP.

At both streamflow sites, water-quality monitors were installed to collect continuous water temperature and specific conductance data. These water-quality data provide information on water-quality changes with flow or time of year and also aid in identifying differences in water-quality parameters between sites.

Water-quality sample collection began in January 2001. Eleven sample sets were collected at each of the two sites on Indian River. Figure 3 shows a flow duration curve for Indian River near Sitka for the 2001 and 2002 water years. Flow duration curves show the average percentage of time that specific daily mean flows are equaled or exceeded at sites where continuous records of daily flow are available. Sampling was conducted at approximately 6-8 week intervals and over a range of flows. Using this approach, the flows sampled ranged from five percent exceedance to 99 percent exceedance (fig. 3). Water samples were analyzed for field parameters, major ions, dissolved solids, nutrients, organic carbon, and suspended sediment. Sampling equipment was cleaned prior to use with a nonphosphate laboratory detergent and rinsed with deionized water and finally by stream water just prior to sample collection. Depth-integrated-water samples were collected across the stream using the equal-width-increment method (Edwards and Glysson, 1988) and processed within hours using methods and equipment described by Shelton (1994). Samples for organic carbon analysis were collected separately by dipping a baked glass bottle in the centroid of flow. Samples to be analyzed for dissolved constituents were filtered through 0.45-µm capsule filters. Water samples were sent to the USGS National Water-Quality Laboratory (NWQL) in Lakewood, Colorado, for analysis using standard USGS analytical methods (Fishman and Friedman, 1989; Patton and Truitt, 1992; Fishman, 1993). Suspended-sediment samples were sent to the USGS Sediment Analysis Laboratory in Vancouver, Washington for concentration and particle size analysis.

A Yellow Springs Instrument (YSI) meter was used for cross-sectional measurement of specific conductance, pH, water temperature, and dissolved-oxygen concentration at the time of sampling. On site water-quality probes were cleaned at the time of sampling and field measurements were compared with the water-quality probe reading to ensure accurate readings. Adjustments to continuous water-quality data were made when necessary to reflect the YSI reading using methods outlined by Wagner and others (2000). Discharge measurements were made at the time of sampling using methods outlined by Rantz and others (1982).

Streambed sediments were sampled in May 2001, at both sites. At each site, sediments were collected from the surface of the streambed using Teflon tubes or Teflon coated spoons and composited in glass bowls (Shelton and Capel, 1994). Two types of samples were obtained from this composite: samples

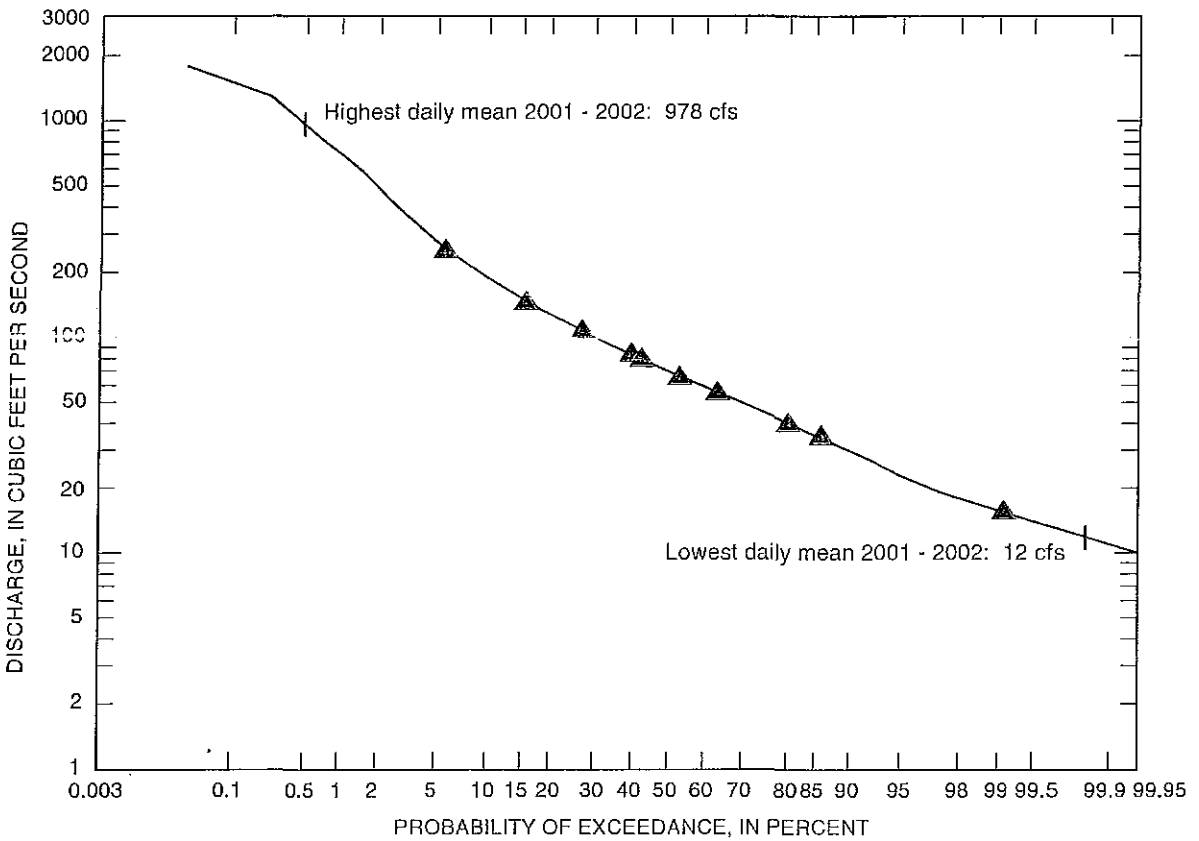

Figure 3. Flow duration curve for Indian River near Sitka showing flow distribution of water samples.

for semi-volatile organic compounds (SVOCs) were passed through a 2-mm stainless-steel sieve; and a sample for trace elements was passed through a 0.063-mm Nylon sieve. Up to 250 ml of stream water was used for sieving the trace-element sample. Samples for SVOCs and trace elements were chilled after sieving. Water included in the trace-element sample was decanted after very fine-grained sediments had settled.

Details of laboratory methods related to the analysis of SVOCs in streambed sediments are described by Furlong and others (1996). The analytical results for constituents are expressed as concentrations when they exceed a minimum-reporting limit (MRL), or estimated (E) when are detected, but they are less than the MRL. Arbogast (1990) describes laboratory procedures followed for processing streambed samples for trace element analysis. Trace elements in streambed sediments were analyzed following a total digestion procedure. As such, these data may be more useful for differentiating source areas of sediments than for detecting anthropogenic effects, or for determining bioaccumulation in fish.

Collection of stream physical characteristics data was attempted at 11 equally spaced transects along two established reaches of the Indian River. Stream conditions such as excessive depth or velocity prevented some of the physical data collection at all 11 transects at either reach. The data on physical characteristics of each stream reach were collected according to protocols described by Fitzpatrick and others (1998). Physical characterization of each stream reach included measurements of riparian and instream aquatic habitat features. Habitat features measured included flow, aspect, open-canopy angles, and canopy closure, and the presence of any submerged features such as boulders or woody debris. Physical characteristics of each stream reach were documented with a set of notes and photographs taken during site visits.

Protocols outlined by Cuffney and others (1993) were used in the collection of benthic macroinvertebrate samples. Each sample was a composite of five subsamples, each of which was collected by disturbing 0.25 m^2 of streambed to wash macroinvertebrates into a 425 µm mesh collection net. Samples were subsampled at the NWQL to achieve a 300-organism subsample. If fewer than 300 organisms were present in a sample, subsampling was not necessary.

The USGS NWQL identified samples to the lowest taxonomic level possible. To determine the taxa richness, or number of taxa in a sample, ambiguous taxa must be resolved. An example of ambiguous taxa is if an individual is identified as family A, genus B, and species C and within the same sample another individual is identified as family A, genus B, but could not be identified to species. In this case, it would be

determined that only one unique taxon of family A, genus B existed in the sample.

Two attributes, or metrics, of benthic macroinvertebrate communities that are sometimes used to describe water quality are diversity and evenness (Resh and McElravy, 1993). There are many possible ways to calculate diversity, and in this report the Shannon-Wiener diversity index was calculated using the Multi Variate Statistical package software (Kovach, 1998) to describe the information uncertainty within a sample. For example, if a sample containing 20 individuals that represent 19 unique taxa, the uncertainty in being able to predict the taxon of any single individual in that sample is very high (a high diversity). Evenness is a relative measure of the calculated diversity to the maximum possible diversity given the number of taxa and individuals in a sample.

Benthic algal communities were sampled September 2002 at the two Indian River sites in accordance with Porter and others (1993). Three additional samples of periphyton chlorophyll-*a* and biomass (both measures of algal standing crop) were collected at both sites in May and in September 2002. At each of the Indian River sites algae samples were collected from cobbles in riffle areas representing the taxonomically richest habitat in the stream. A quantitative sample was collected from known surface areas and composited to determine density and species composition. Algal samples were processed by the Academy of Natural Sciences of Philadelphia (Charles and others, 2002). Chlorophyll-*a* samples were analyzed by the USGS NWQL using the standard USEPA fluorometric method (Arar and Collins, 1997), and ash free dry mass (AFDM) was determined using methods described by Easton and others (1995).

WATER QUALITY OF THE INDIAN RIVER

In this study a number of physical properties such as specific conductance, pH, water temperature, and dissolved oxygen; and chemical constituents such as major ions, nutrients, organic carbon, and suspended sediment were measured 11 times at each of two sites on the Indian River during the 2001-02 water years. These data establish a water-quality baseline of the Indian River.

Specific Conductance

Specific conductance is a measure of the ability of water to conduct an electric current. As the concentration of ions in solution increases or decreases so does the conductance of the solution. It is a readily measured property that can be used to indicate the dissolved-solids or ion content of the water. Frequently a statistical relation can be developed between specific conductance and the ionic components making up the dissolved solids in water. On the Indian River an inverse relationship can be seen between discharge and specific conductance (fig. 4). During low flow the conductance of the Indian River is higher than during high flow. The periods of higher specific conductance during low flow indicate a greater component of ground-water inflow. Ground water has greater potential to dissolve minerals having spent more time in contact with rocks and soil materials than rainwater or snowmelt. Periods of low specific conductance reflect runoff of rain or snowmelt, which typically contain small amounts of dissolved ions. Values of specific conductance during the study period ranged from 15 to 54 µs/cm at Indian River near Sitka site and from 16 to 56 µs/cm at Indian River at Sitka site. Continuously recorded values of specific conductivities for both sites during the 2002 water year are shown in figure 5.

pH

The pH of water is a measure of its hydrogen-ion activity and can range from 0 (acidic) to 14 (alkaline) standard units. The pH of river water typically ranges between 6.5 and 8.0 standard units (Hem, 1985). During the study period, measured values of pH for sites on Indian River ranged from 6.5 to 7.7 at the upper site and from 6.5 to 8.1 at the lower site (table 1).

Water Temperature

Water temperature is important in both physiochemical and biological processes such as oxygen solubility and fish metabolism and growth rates. Water temperature at the Indian River sites (fig. 6) indicated slightly larger ranges in water temperature at the downstream site. Ranges in water temperature at the Indian River sites were seasonal. Temperatures at the downstream site ranged from 0.0°C on April 6, 2001 to 10.5°C on August 12, 2002. At the upper site the minimum temperature of 0.5°C occurred on February 11, 2001 and the maximum temperature of 10.5°C occurred on August 12, 2002. It is of interest to note that the maximum temperature for both sites was on August 12, 2002, which was also the date of the peak discharge during the study period.

Dissolved Oxygen

The dissolved-oxygen concentration in a stream is controlled by several factors, including water temperature, air temperature and atmospheric pressure, hydraulic characteristics of the stream, photosynthetic or respiratory activity of stream biota, and the quantity of organic matter present (Hem, 1985). Salmon and other species of fish indigenous to southeast Alaska streams require well-oxygenated water at every stage in their life history, as do many forms of aquatic invertebrates. Young fish tend to be more susceptible to oxygen deficiencies than adults; however, several incidences of adult salmon kills in southeast Alaska freshwater systems have been

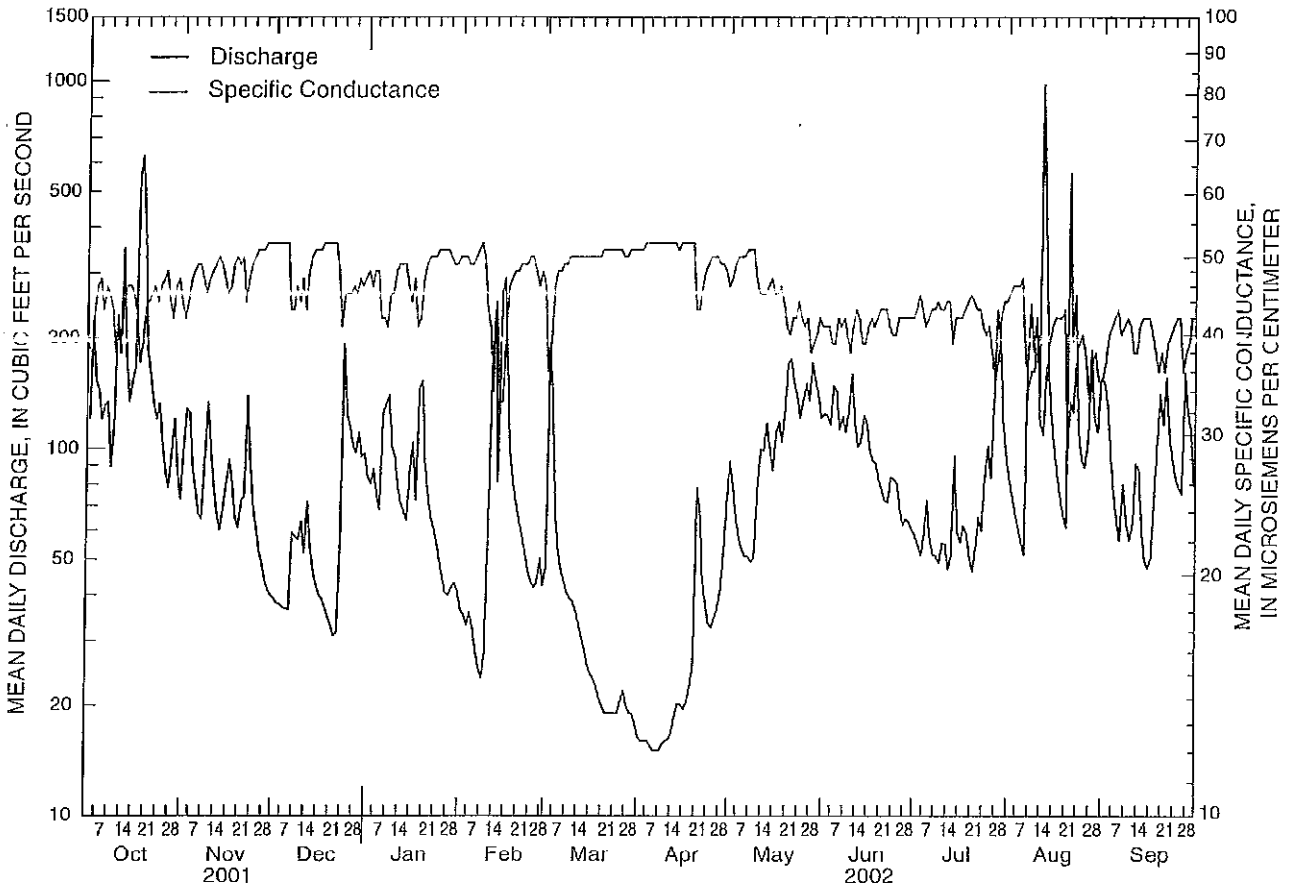

Figure 4. Daily discharge and specific conductance for Indian River near Sitka, Alaska, October 2001 through September 2002.

attributed to dissolved-oxygen depletion (Murphy, 1985). Measurements of dissolved oxygen at both Indian River sites during the study period ranged from 11.3 mg/L to 14.1 mg/L (table 1), the range of values being nearly identical at both stations. All measurements of dissolved oxygen levels indicate adequate concentrations to support populations of salmonids.

Alkalinity

Alkalinity is a measure of the capacity of the substances dissolved in water to neutralize acid. In most natural waters, alkalinity is produced mainly by bicarbonate and carbonate ions, which are formed when carbon dioxide or carbonate rocks dissolve in water (Hem, 1985). Alkalinity concentrations for the Indian River sites (reported as equivalent concentration of calcium carbonate ($CaCO_3$)) were essentially the same and ranged from 11 to 17 mg/L at Indian River near Sitka and from 10 to 15 mg/L at Indian River at Sitka (table 1). The range of pH measured at these sites indicates that all of the alkalinity can be attributed to dissolved bicarbonate. Alkalinity measurements of this magnitude indicate that Indian River has a low buffering capacity.

Major Ions and Dissolved Solids

Water samples collected from both Indian River sites were analyzed for major ions and dissolved solids (table 2). Major ions and dissolved solids in rivers consist of inorganic minerals derived primarily from soil and rock weathering. Dissolved cations that constitute a majority of the dissolved solids content in natural waters are calcium, magnesium, sodium, and potassium. The major anions are usually represented by sulfate, chloride, fluoride, nitrate and those making up the alkalinity (Hem, 1985). Streams draining basins with rocks and soils containing insoluble minerals contain lower concentrations of dissolved solids. Indian River samples indicated that dissolved solid concentrations were generally low, ranging from about 19 to 34 mg/L at both sites (table 2). Concentrations at low levels such as these are representative of basins containing shallow soils and rocks that are not easily dissolved or of brief contact time with more easily dissolved rocks.

Calcium and magnesium are both common alkaline-earth metals that are essential elements in plant and animal nutrition. Both calcium and magnesium are major components of positively charged ions in most natural waters (Hem, 1985). Concentrations ranged from about 4.5 to 6.3 mg/L for calcium

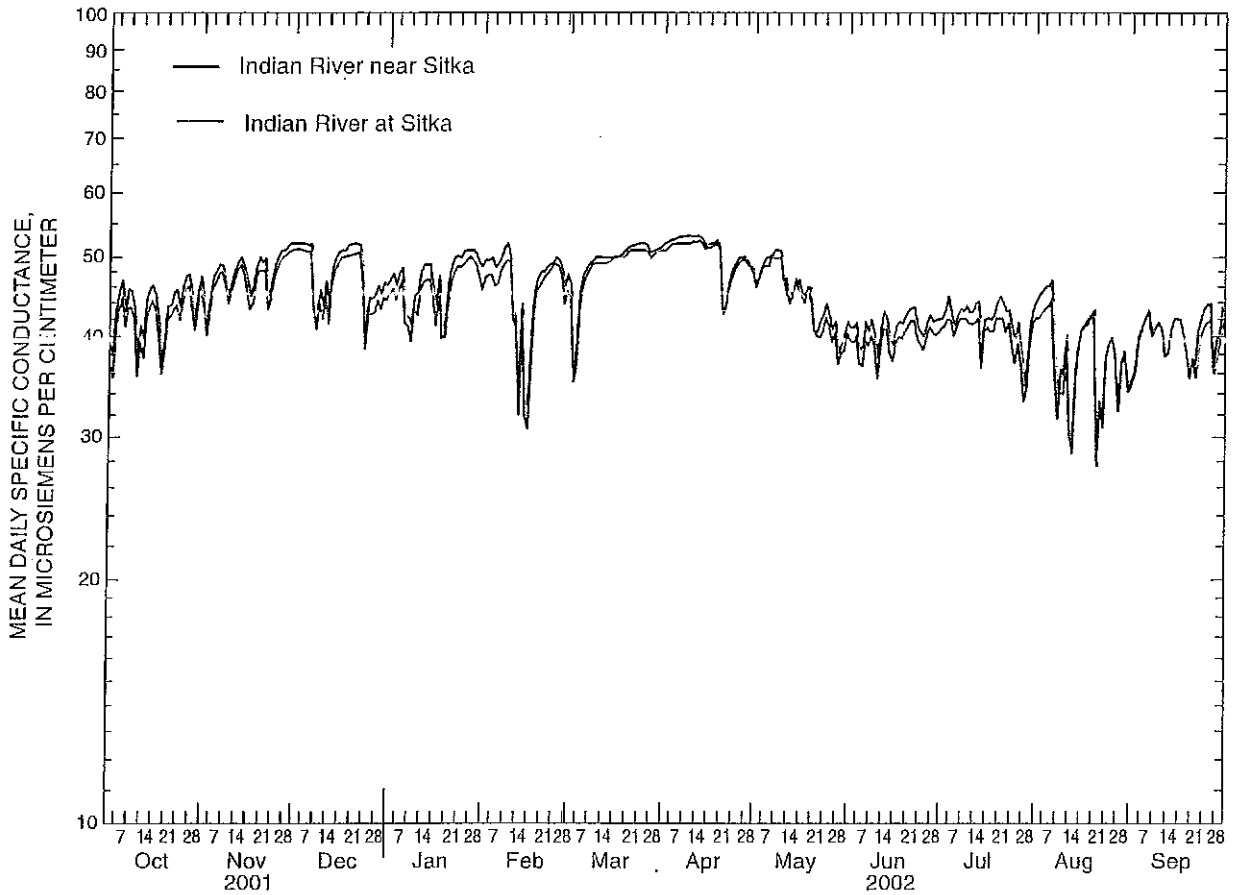

Figure 5. Mean daily specific conductance of Indian River near Sitka, (station 15087690) and Indian River at Sitka (station 15087700), October 2001 through September 2002.

Table 1. Physical properties measured during sample collection from Indian River near Sitka (station 15087690), and Indian River at Sitka (station 15087700), January 2001 through September 2002

[ft3/s, cubic feet per second; mg/L, milligrams per liter;— no data]

	Specific conductance (microsiemens/centimeter)		pH (standard units)		Water temperature (degrees Celsius)		Dissolved oxygen (mg/L)		Discharge (ft^3/s)		Alkalinity (mg/L as $CaCO_3$)	
Date (mm/dd/yy)	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka
01/04/01	42	42	7.4	7.4	—	—	—	—	86	76	—	—
04/04/01	40	40	7.2	7.3	2.5	3.0	14.1	14.1	65	78	11	11
05/15/01	—	42	—	7.6	—	5.5	—	12	—	75	—	14
05/16/01	42	—	7.7	—	5	—	12.4	—	78	—	14	—
07/25/01	40	40	6.6	7.1	7.5	8.5	12.7	12	88	63	15	14
10/02/01	36	36	7.7	7.7	7.5	7.5	11.9	11.8	270	222	12	11
11/28/01	53	—	6.5	6.5	—	2.0	—	—	41	29	16	14
02/01/02	48	47	7.1	7.2	3.5	2.5	12.2	12.5	38	22	17	14
04/06/02	51	53	7.1	8.1	1.50	2.0	12.1	12.3	16	9.2	14	15
0530/02	38	39	7.3	7.3	4.5	5.0	12.2	12.6	143	126	13	15
09/05/02	42	43	7.5	7.5	6.5	7.0	11.3	11.4	73	45	—	—
09/20/02	38	38	7.1	6.8	7.5	7.5	11.5	11.5	115	108	13	10

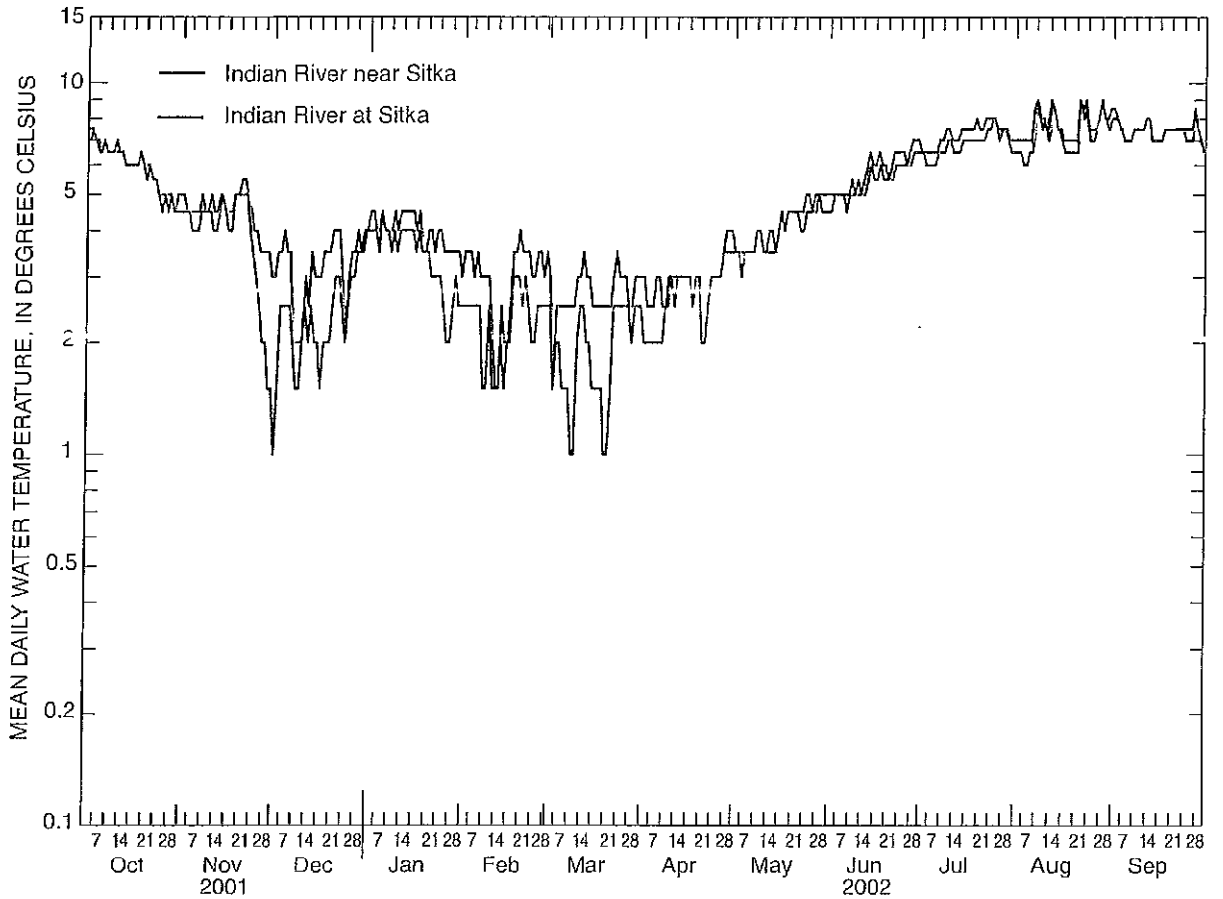

Figure 6. Mean daily water temperatures of Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700), October 2001 through September 2002.

and from 0.47 to 0.74 mg/L for magnesium. Concentrations of these constituents were similar at both Indian River sites (table 2). Sodium and potassium are both present in most natural waters, but usually in low concentrations in rivers. Sodium concentrations ranged from 1.7 to 2.3 mg/L in Indian River near Sitka and from 1.8 to 2.4 mg/L in Indian River at Sitka. Potassium concentrations ranged from values below detection limits of 0.09 mg/L to 0.18 mg/L at Indian River near Sitka. Potassium concentrations in the Indian River at Sitka site ranged from an estimated value of 0.10 mg/L to 0.82 mg/L.

Bicarbonate was the dominant anion at both of the Indian River sites. Concentrations ranged from 12 to 20 mg/L and were similar at both sites (table 2). Silica, which is dissolved from rocks and soils, is the next most abundant anion with concentrations ranging from about 2.7 to 4.4 mg/L; again concentrations were similar at both sites. Chloride concentrations ranged from 2.1 to 4.4 mg/L and sulfate concentrations ranged from 1.3 to 2.2 mg/L with similar concentrations at both sites (table 2).

Trilinear diagrams, similar to those developed by Piper (1944), were use to plot the major ions in milliequivalents per liter. The trilinear diagram permits the chemical composition of multiple samples to be represented on a single graph, and facilitates classification of the sample chemistry. Based on the samples collected during this study, the water of both Indian River sites can be classified as calcium bicarbonate water (fig. 7). Major ion chemistry will change as the sources of water generating streamflow changes. The trilinear diagram further demonstrates that major ion composition of Indian River exhibits minimal variation between the upstream and downstream site within the range of flows sampled.

Nutrients and Organic Carbon

Nitrogen is an important water-quality constituent as a component of the protoplasm in aquatic biota, and thus is an essential nutrient in lakes, streams, and rivers. In aquatic ecosystems, nitrogen commonly occurs in three ionic forms: nitrite (NO_2), nitrate (NO_3), and ammonium (NH_4). Nitrite and nitrate are oxidized forms of inorganic nitrogen that make up most of the dissolved nitrogen in well-oxygenated streams such as Indian River. Nitrate is generally more abundant than nitrite in natural waters because nitrite readily oxidizes to

Table 2. Major dissolved inorganic constituents measured in water samples collected from Indian River near Sitka (Station 15087700) and Indian River at Sitka (Station 15087690)

[all values in mg/L, milligrams per liter; E, estimated; <, less than; — not determined]

	Calcium		Magnesium		Sodium		Potassium		Bicarbonate	
Date (mm/dd/yy)	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka
01/04/01	4.8	4.7	0.50	0.53	1.8	2.0	<0.24	<0.24	—	—
04/04/01	4.9	4.7	0.54	0.55	2.1	2.2	<0.09	0.21	14	13
05/15/01	—	6.0	—	0.57	—	2.0	—	0.12	—	18
05/16/01	5.8	—	0.57	—	2.0	—	0.12	—	18	—
07/25/01	5.1	5.2	0.51	0.56	1.7	2.3	0.10	0.82	18	16
10/02/01	4.6	4.5	0.48	0.50	1.8	1.8	0.11	0.21	15	13
11/28/01	—	—	—	—	—	—	—	—	20	17
02/01/02	5.6	5.3	0.61	0.63	2.1	2.2	0.13	0.15	20	17
04/06/02	6.3	6.1	0.72	0.74	2.3	2.4	0.12	0.15	17	19
05/30/02	4.5	4.6	0.47	0.49	1.8	1.8	0.14	E0.10	15	18
09/05/02	5.3	5.2	0.55	0.57	1.9	2.0	0.12	0.16	—	—
09/20/02	4.7	4.6	0.49	0.50	1.9	2.0	0.18	0.18	16	12

	Sulfate		Chloride		Silica		Dissolved solids	
Date (mm/dd/yy)	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka
01/04/01	1.4	1.5	3.6	3.8	2.8	3.1	30	31
04/04/01	1.6	1.7	3.9	4.0	3.0	3.3	29	34
05/15/01	—	1.3	—	3.8	—	3.0	—	30
05/16/01	1.4	—	3.8	—	3.2	—	28	—
07/25/01	1.6	1.6	2.3	2.5	3.1	3.5	—	—
10/02/01	1.4	2.2	2.4	2.5	2.9	3.1	26	20
11/28/01	—	—	—	—	—	—	—	—
02/01/02	1.8	1.8	4.0	4.4	3.6	3.9	28	28
04/06/02	1.9	2.0	3.9	4.0	4.1	4.4	34	19
05/30/02	1.4	1.4	3.1	3.2	2.7	2.9	22	25
09/05/02	1.8	1.8	2.3	2.4	3.7	3.9	29	33
09/20/02	1.5	1.6	2.1	2.3	3.2	3.4	22	31

nitrate in oxygenated water. In the laboratory, ammonium is analyzed as ammonia (NH_3); thus nitrogen concentrations are reported as total and dissolved ammonia plus organic nitrogen, dissolved ammonia, dissolved nitrite plus nitrate, and dissolved nitrite. Total ammonia plus organic nitrogen concentrations represent the ammonium and organic nitrogen compounds in solution and associated with colloidal material. The dissolved concentrations represent the ammonium or nitrite plus nitrate in solution and associated with material capable of passing through a 0.45-µm-pore filter.

All concentrations of the various nitrogen forms were less than 1 mg/L (table 3). Due to its toxicity to freshwater aquatic organisms, the U.S. Environmental Protection Agency (USEPA) (U.S. Environmental Protection Agency, 1976) suggests a limitation of 0.02 mg/L of ammonia as unionized ammonia for waters to be suitable for fish propagation. Concentrations of ammonia (both ionized and unionized) were all below this level at both Indian River sites.

Phosphorus is an element vital to all forms of aquatic biota because it is involved in the capture and transfer of chemical energy and it is an essential element in nucleic acids (Gaudy and Gaudy, 1988). It occurs as organically bound phosphorus or as phosphate. Elevated concentrations of phosphorus in water are not considered toxic to human or

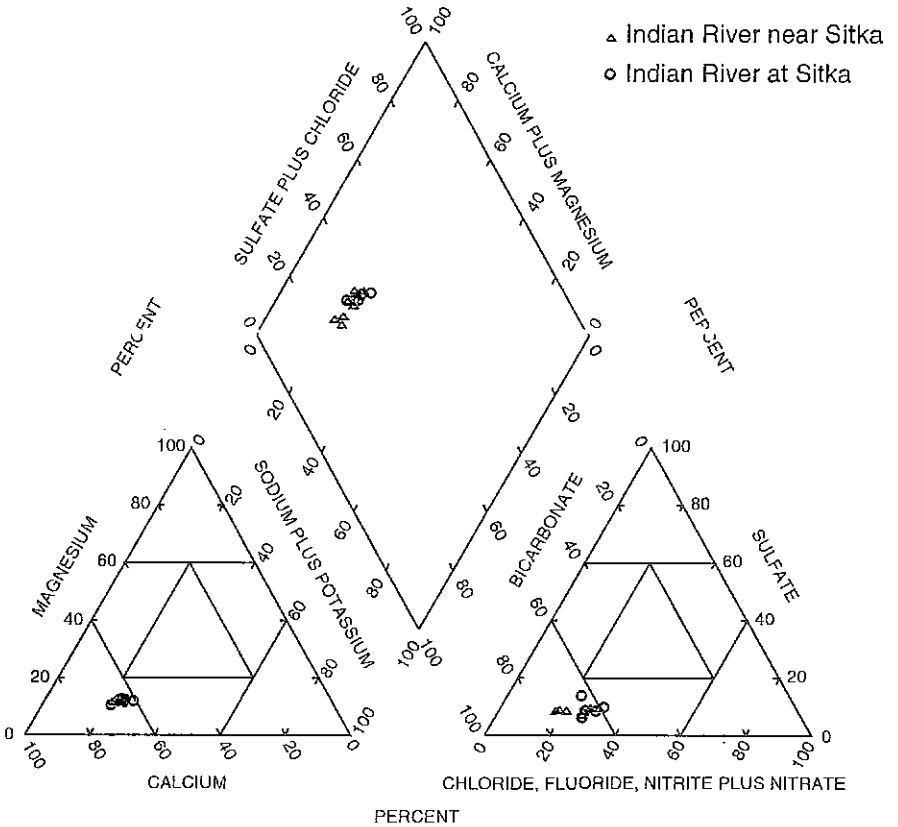

Figure 7. Trilinear diagram of 12 water samples collected on Indian River from January 2001 to September 2002.

aquatic life. Elevated concentrations, however, can stimulate the growth of algae in lakes and streams. Phosphorus concentrations are reported as total phosphorus and dissolved orthophosphate. Total phosphate concentrations represent the phosphorus in solution, associated with colloidal material, and contained in or attached to biotic and inorganic particulate matter. Dissolved concentrations are determined from the filtrate that passes through a 0.45 µm filter. The orthophosphate ion, PO_4, is a significant form of phosphorus because it is directly available for metabolic use by aquatic biota. Concentrations of total phosphorus, dissolved phosphorus and orthophosphate were typically low, with values near or below minimum detection levels in nearly all Indian River samples (table 3).

Dissolved organic carbon (DOC) is a major component of organic matter in aquatic ecosystems. DOC is defined as organic carbon in the filtrate (dissolved and colloidal phases) that has passed through a 0.45-µm filter. Generally, DOC is in greater abundance than particulate organic carbon (POC), accounting for about 90 percent of the total organic carbon of most waters (Aiken and Cotsaris, 1995). For the Indian River sites, concentrations of DOC and POC ranged from 0.5 mg/L to 3.3 mg/L, and less than 0.1 mg/L to 0.4 mg/L, respectively (table 3).

Suspended Sediment

Sediment in rivers is transported in suspension and as bedload. Suspended sediment generally consists of fine particles such as clay, silt, and fine sand that are transported in the stream while being held in suspension by the turbulence of flowing water. Bedload consists of coarse sediment particles such as sands, gravels, and sometimes boulders that are transported along or near the streambed.

Measured values of suspended sediment in Indian River (table 4) were quite low at both sites. The maximum concentration of suspended sediment for Indian River at Sitka was 4.0 mg/L. Minimum concentrations of less than 1.0 mg/L were measured on three occasions. Concentrations of suspended sediment at Indian River near Sitka were similar with maximum concentrations of 3.0 mg/L measured twice, and minimum concentrations less than 1.0 mg/L measured twice. Concentrations of suspended sediment generally, but not always, coincided with greater discharges measured at these sites. Suspended sediment concentrations were measured at discharges ranging from 9.2 to 270 ft^3/s, which represent 5-95 percent exceedance of flows (fig. 3).

A single sediment sample collected prior to the study, on October 12, 1982 indicates suspended sediment load increases on Indian River during high flow events. The 1982 sample

Table 3. Nutrient and organic carbon concentrations measured in water samples collected from Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700)

[all values in milligrams per liter; NO_2+NO_3, nitrate plus nitrite; E, estimated; <, less than; — not determined]

	Nitrogen nitrite, dissolved (as N)		Nitrogen NO_2+NO_3, dissolved (as N)		Nitrogen, ammonia, dissolved (as N)		Nitrogen ammonia + organic, total (as N)		Nitrogen ammonia + organic, dissolved (as N)	
Date (mm/dd/yy)	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka
01/04/01	<0.001	0.001	0.132	0.124	<0.002	<0.002	<0.08	<0.08	<0.10	<0.10
04/04/01	0.002	0.001	0.076	<0.005	0.003	0.004	<0.08	E0.06	<0.10	E0.07
05/15/01	—	<0.001	—	0.112	—	<0.002	—	<0.08	—	<0.10
05/16/01	<0.001	—	0.102	—	<0.002	—	<0.08	—	<0.10	—
07/25/01	<0.001	<0.001	0.055	0.088	0.002	0.004	<0.08	E0.04	<0.10	E0.06
10/02/01	<0.002	<0.002	0.025	0.031	<0.015	<0.015	0.15	E0.08	E0.07	E0.05
11/28/01	<0.002	<0.002	0.110	0.119	<0.015	<0.015	<0.10	E0.05	<0.10	<0.10
02/01/02	<0.002	<0.002	0.116	0.101	<0.015	<0.015	<0.10	<0.10	<0.10	E0.05
04/06/02	<0.002	<0.002	0.147	0.149	<0.015	<0.015	<0.10	<0.10	<0.10	<0.10
05/30/02	<0.002	<0.002	0.103	0.094	<0.015	<0.015	<0.10	<0.10	<0.10	<0.10
09/05/02	<0.002	<0.002	—	—	—	—	E0.06	0.13	—	—
09/20/02	<0.002	E0.002	0.073	0.077	<0.015	<0.015	E0.07	E0.10	<0.10	0.11

	Phosphorus, total (as P)		Phosphorus, dissolved (as P)		Phosphorus, ortho dissolved (as P)		Dissolved organic carbon (as C)		Particulate organic carbon (as C)	
Date (mm/dd/yy)	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka	near Sitka	at Sitka
01/04/01	0.009	<0.004	E0.004	<0.006	<0.007	<0.007	1.4	1.9	<0.1	<0.1
04/04/01	E0.002	E0.002	<0.006	<0.006	<0.007	0.009	1.8	2.4	<0.1	0.4
05/15/01	—	<0.004	—	<0.006	—	<0.007	—	0.7	—	<0.1
05/16/01	<0.004	—	<0.006	—	<0.007	—	0.5	—	0.1	—
07/25/01	E0.003	E0.003	E0.003	E0.003	<0.007	<0.007	3.2	2.4	<0.1	0.2
10/02/01	E0.003	0.005	E0.003	0.010	E0.006	0.013	—	—	—	—
11/28/01	<0.004	0.004	<0.004	<0.004	<0.007	<0.007	0.6	0.8	<0.1	<0.1
02/01/02	<0.004	<0.004	<0.004	<0.004	<0.007	<0.007	0.9	1.5	<0.1	<0.1
04/06/02	E0.003	E0.002	<0.004	E0.002	<0.007	<0.007	0.7	0.8	<0.1	<0.1
05/30/02	<0.004	<0.004	<0.004	<0.004	<0.007	<0.007	1.3	0.8	<0.1	<0.1
09/05/02	0.004	0.014	—	—	—	—	1.0	1.2	<0.1	<0.1
09/20/02	E0.002	0.006	E0.003	0.008	<0.007	E0.004	2.0	3.3	<0.1	<0.1

was collected at a discharge of 2,650 ft^3/s and the suspended sediment concentration was 176 mg/L. This sample was also analyzed for percentage of silt and clay (sediment size < 0.062 mm). The sample showed that 58 percent of the sediment was finer than 0.062 mm with the remainder of the sediment size falling between 0.062 mm and 2.00 mm. This sample may also indicate that much of the suspended sediment transport on the Indian River occurs at greater discharges.

Trace Elements in Streambed Sediments

Trace elements are often sourced from the natural environment, but may be redistributed by anthropogenic activities such as urbanization. Although some trace elements are essential micronutrients they may become toxic to exposed organisms at elevated concentrations. Concentrations of trace elements in the dissolved form are often low due to their tendency to adsorb to sediment particles; the concentrations

Table 4. Suspended-sediment concentrations measured in water samples collected from Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700), January 2001 to September 2002.

[mg/L, milligrams per liter; ft³/s, cubic feet per second; --, not determined]

	Suspended sediment concentration (mg/L)		Discharge (ft³/s)		Suspended sediment discharge (tons/day)	
Date (mm/dd/yy)	Indian River near Sitka	Indian River at Sitka	Indian River near Sitka	Indian River at Sitka	Indian River near Sitka	Indian River at Sitka
01/04/01	2.0	1.0	86	76	0.46	0.21
04/04/01	1.0	1.0	65	78	0.18	0.21
07/25/01	<1.0	1.0	88	63	--	0.17
10/02/01	3.0	4.0	270	222	2.20	2.40
11/28/01	1.0	1.0	41	29	0.11	0.08
02/01/02	1.0	<1.0	38	22	0.1	0.06
04/06/02	<1.0	<1.0	16	9.2	--	0.02
05/30/02	1.0	<1.0	143	126	0.39	0.34
09/05/02	--	1.0	73	45	--	0.12
09/20/02	3.0	3.0	115	108	0.93	0.87

of these same elements can be high in streambed sediments, which often serve as a sink for these elements.

Samples of the streambed were collected and analyzed for 39 trace elements and organic carbon at both Indian River sites on May 15 and 16, 2002 (table 5). Most of the trace elements analyzed in streambed sediment samples were present at both sites on the Indian River and at similar concentrations. Of the 39 trace elements analyzed only bismuth, gold, and thalium were not detected in bed sediments.

Studies of potential toxicity from trace elements in bed sediments to aquatic organisms have been limited to the following elements: arsenic, cadmium, chromium, copper, lead,

Table 5. Trace element concentrations measured in bed sediment samples collected from Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700)

[all values in micrograms per gram, dry weight; <, less than]

Station Name	Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Cadmium	Cerium
Indian River near Sitka	5/16/01	7.3	1.1	47	620	1.2	<1	0.2	31
Indian River at Sitka	5/15/01	7.6	1	33	630	1.1	<1	0.2	32
		Chromium	**Cobalt**	**Copper**	**Europium**	**Gallium**	**Gold**	**Holmium**	**Iron**
Indian River near Sitka	5/16/01	180	46	100	1	16	<1	1	7.7
Indian River at Sitka	5/15/01	180	41	84	1	16	<1	1	6.8
		Lanthanum	**Lead**	**Lithium**	**Manganese**	**Mercury**	**Molybdenum**	**Neodymium**	**Nickel**
Indian River near Sitka	5/16/01	15	14	38	2200	0.07	1.7	18	72
Indian River at Sitka	5/15/01	16	13	38	2000	0.06	1.5	18	68
		Niobium	**Scandium**	**Selenium**	**Silver**	**Strontium**	**Tantalum**	**Thalium**	**Thorium**
Indian River near Sitka	5/16/01	13	26	0.9	0.3	240	1	<1	3
Indian River at Sitka	5/15/01	13	26	0.8	0.3	260	1	<1	4
		Tin	**Titanium**	**Uranium**	**Vanadium**	**Ytterbium**	**Yttrium**	**Zinc**	**Organic carbon (percent)**
Indian River near Sitka	5/16/01	2	0.73	1.2	240	2	23	140	3.7
Indian River at Sitka	5/15/01	2	0.74	1.3	240	2	22	140	2.3

mercury, nickel, selenium, and zinc. Trace-element concentrations in streambed sediments from the two Indian River sites were compared to those of previous studies (table 6). The Canadian Council of Ministers of the Environment (1995) established guidelines for some trace elements in unsieved streambed sediment. These guidelines utilize two assessment values: the lower value is called the "interim freshwater sediment quality guideline" (ISQG); this is the concentration below which adverse effects are expected to occur rarely. The upper value, titled the "probable effect level" (PEL), is the concentration above which adverse effects are expected to occur frequently. Because trace-element samples from the Indian River are from sediments finer than 0.062 mm, where trace-element concentrations tend to be greatest, comparisons with the Canadian guidelines may overestimate the effects on aquatic organisms (Deacon and Stephens, 1998). However, the PEL would still be useful for comparative purposes when applied to the sediment samples analyzed for Indian River.

MacDonald and others (2000) established sediment quality guidelines (SQGs) for seven trace elements, and Van Derveer and Canton (1997) established guidelines for selenium. These guidelines define two levels of significance for each trace element, the threshold effect concentration (TEC) and the probable effect concentration (PEC). The TEC is the concentration below which adverse effects are not expected in sediment dwelling organisms. The PEC is the concentration above which toxicity is likely. MacDonald and others (2000) also developed a mean PEC quotient, which attempts to quantify the toxicity of combined trace element concentrations. The mean PEC Quotient is determined by dividing the concentration of each trace element by its consensus based PEC. The sums of the individual PEC quotients are then normalized to the number of PEC quotients that are calculated for each sediment sample. The PEC quotient is based on normalized values for organic carbon (1 percent dry weight) in the bed sediments. A PEC quotient value below 0.5 indicates absence of toxicity and a value greater than 0.5 indicates the presence of toxicity.

The trace element concentrations for the Indian River sites indicated that the concentrations were similar at both sites (table 5). Slight decreases in the concentrations of the nine trace elements in a downstream direction suggest they originated from natural sources with no indication of anthropogenic influences at the downstream site. Concentrations of arsenic, chromium, copper, nickel, and zinc were greater than the national median values determined by Gilliom and others (1998). Concentrations of arsenic, chromium, copper, and zinc all exceeded the ISQG limits at both sites. Concentrations of arsenic, chromium, copper, and nickel from the Indian River were substantially greater than the median concentrations from 47 sites in the Cook Inlet Basin, Alaska (fig. 8) (Frenzel, 2002). However, maximum concentrations for these elements in the Cook Inlet Basin were greater than Indian River. Comparisons also may be made to NAWQA sites sampled in specific land-use categories from 1992 to 2000 where reference sites represent relatively undisturbed basins and urban sites represent urban, residential, and commercial land uses (fig. 8). Only arsenic and chromium concentrations from the Indian River samples exceed the 75th percentile values for the three land-use categories shown.

Table 6. Concentrations of selected trace elements in bed material from various studies

[values in micrograms per gram; —, not determined]

Trace element	Gilliom and others (1998)[1]	Cook Inlet Basin[5]	Interim Freshwater Sediment Quality Guideline[2] (TEL)	Probable Effect Level[2] (PEL)	Threshold Effect Concentration (TEC)[3]	Probable Effect Concentration (PEC)[3]	Indian River near Sitka	Indian River at Sitka
Arsenic	6.4	16	5.9	17	9.8	33	47	33
Cadmium	0.4	0.3	0.6	3.5	0.99	5	0.2	0.2
Chromium	62	81.5	37.3	90	43.4	111	180	180
Copper	26	47	35.7	197	31.6	149	100	84
Lead	24	15	35	91.3	35.8	128	14	13
Mercury	0.06	0.2	0.17	0.486	0.18	1.06	0.07	0.06
Nickel	25	36	—	—	22.7	48.6	72	68
Selenium	0.7	0.7	—	—	[4]2.5	[4]4.0	0.9	0.8
Zinc	110	115	123	315	121	459	140	140

[1]Median values

[2]Canadian Council of Ministers of the Environment (1995)

[3]MacDonald and others (2000)

[4]VanDerveer and Canton (1997)

[5]Frenzel (2002)

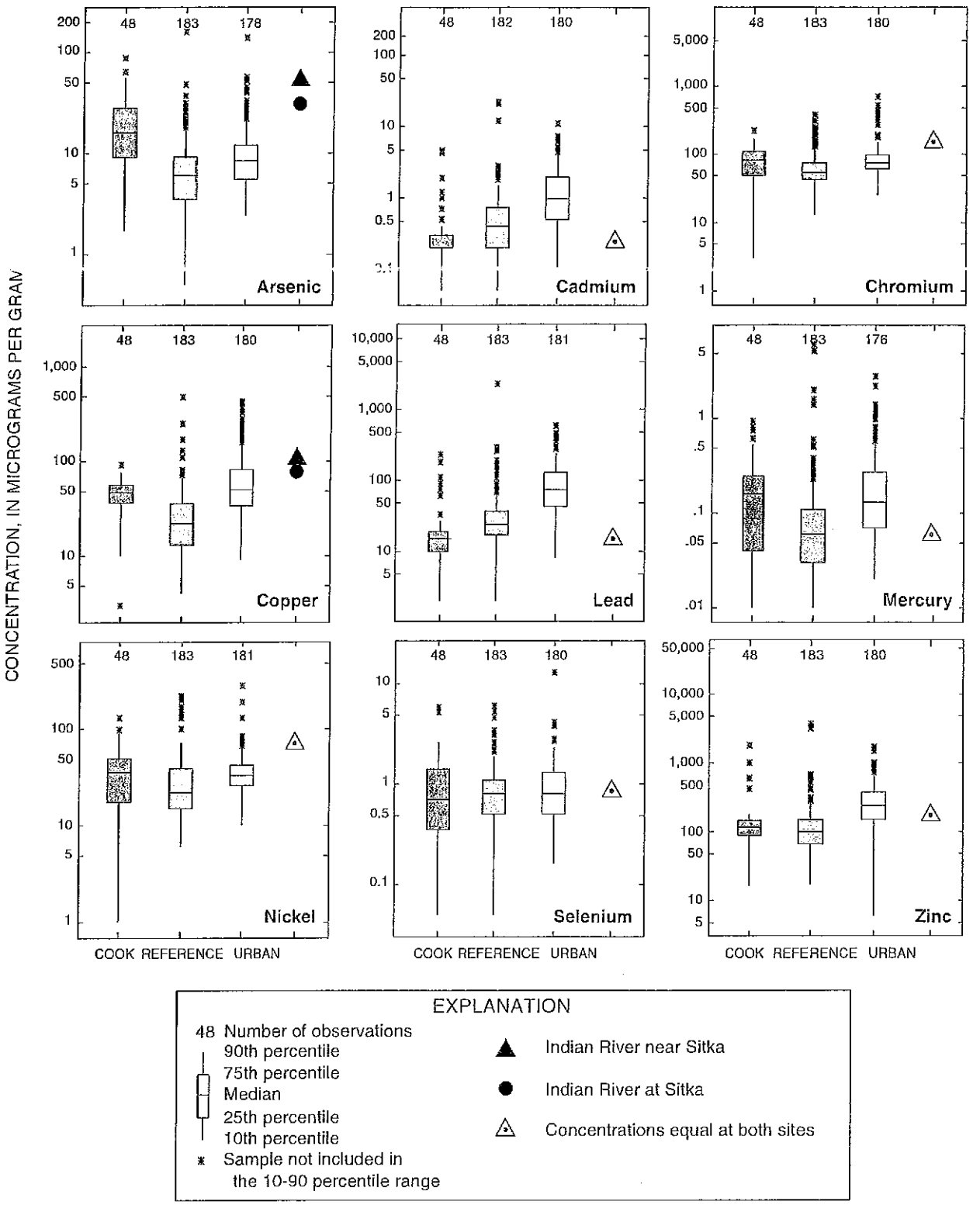

Figure 8. Concentrations of trace elements in streambed sediment samples from Indian River near Sitka and Indian River at Sitka and from USGS Cook Inlet Basin, Alaska NAWQA study unit and from reference streams in urban areas sampled nationally for the USGS NAWQA Program.

Comparison of the Indian River bed sediment trace element concentrations with the TEC, PEC, and mean PEC quotient indicated that the TEC was exceeded for arsenic, chromium, copper, nickel, and zinc while the PEC was exceeded by arsenic, chromium and nickel. However, the mean PEC quotients were 0.19 for Indian River near Sitka, and 0.28 for Indian River at Sitka. Both of these values are below the lower toxicity threshold of 0.5. The toxicity quotients for both sites were reduced due to relatively high concentrations of organic carbon in the bed sediments (table 5). MacDonald and others (2000) noted that sites with relatively high concentrations of organic carbon in bed sediments have lower potential for toxicity.

Organic Compounds

Streambed sediments at Indian River near Sitka and Indian River at Sitka were collected and analyzed for 65 organic compounds on May 15 and 16, 2001 (table 7). No compounds were detected above the Minimum Reporting Level (MRL) of 50 µg/kg. The compound butylbenzylphthalate was analyzed at an estimated concentration of 10 µg/kg, which is below the MRL. Concentrations of this compound were compared with blank samples analyzed at the NWQL and Gilliom and others (1998) suggested subtraction of 64 µg/kg of this analyte to obtain values that would correct for laboratory contamination. This suggests the detected values in the Indian River samples may be entirely due to sample contamination.

FLOW CHARACTERISTICS OF THE INDIAN RIVER

The principal flow source of Indian River is precipitation runoff, evidenced by hydrographs that closely track rainfall delivered by regional storm fronts. Discharge generally coincides with precipitation as measured by the National Weather

Table 7. Organic compounds analyzed for detections in bed sediments of Indian River near Sitka (15087690) and Indian River at Sitka (15087700)

1,2,4-Trichlorobenzene	Benzo[k]fluoranthene
1,2-Dichlorobenzene	Butylbenzyl phthalate
1,2-Dimethylnaphthalene	C8-Alkylphenol
1,3-Dichlorobenzene	Carbazole
1,4-Dichlorobenzene	Chrysene
1,6-Dimethylnaphthalene	Di-n-octyl phthalate
1-Methyl-9H-fluorene	Dibenz[a,h]anthracene
1-Methylphenanthrene	Dibenzothiophene
1-Methylpyrene	Dibutylphthalate
2,2-Biquinoline	Diethyl phthalate
2,3,6-Trimethylnaphthalene	Dimethyl phthalate
2,4-Dinitrotoluene	Fluorene
2,6-Dimethylnapthalene	Fluoranthene
2,6-Dinitrotoluene	Hexachlorobenzene
2-Chloronaphthalene	Indeno[1,2,3-cd]pyrene
2-Chlorophenol	Isophorone
2-Ethylnaphthalene	Isoquinoline
2-Methylanthracene	Naphthalene
3,5-Dimethylphenol	N-Nitrosodiphenylamine
4-Bromophenylphenylether	N-Nitrosodi-n-propylamine
4-Chloro-3-methylphenol	Nitrobenzene
4H-cyclopenta[def]phenanthrene	Pentachloroanisole
Acenaphthene	Pentachloronitrobenzene
Acenaphthylene	Phenanthrene
Acridine	Phenanthridine
Anthracene Anthraquinone	Phenol
Azobenzene	Pyrene
Benz[a]anthracene	Quinoline
Benzo[a]pyrene	bis(2-Chloroethoxy)methane
Benzo[b]fluoranthene	bis(2-Chloroethyl)ether
Benzo[c]cinnoline	bis(2-ethylhexyl) phthalate
Benzo[ghi]perylene	p-Cresol

Service at Sitka Airport (fig. 9). Discharge in the Indian River Basin responds quickly to rainfall events due to steep topography and shallow soils. Flood-peak durations are usually measured in hours rather than days. The flood of November 19, 1993 was the greatest flow on record and had a peak discharge of approximately 6,500 ft^3/s at the Indian River near Sitka gaging station. The greatest discharges are during the fall months in response to regional storms, however, rain-on-snow floods occur during the winter months in many southeast Alaska streams.

A monthly flow hydrograph depicts the maximum, minimum, and mean monthly discharge in Indian River near Sitka gaging station for the 17 years of record (fig. 10). Discharges generally are greatest during September and October when storms are most frequent, and exhibit a gradual decline through winter and early spring. Discharge typically increases in May and June in response to snowmelt in the higher elevations of the drainage.

Indian River Streamflow and Diversions

Flow diversions by SJC and CBS periodically conflict with water rights reserved by the Alaska Department of Fish and Game (ADF&G) for instream flows to protect salmon habitat in the Indian River. CBS maintains a diversion facility 1.4 miles upstream from the mouth of Indian River. The facility uses Indian River water as a backup potable water supply when the primary supply is not available. CBS demands for Indian River water usually only occur a few days each year. SJC maintains a diversion flume that withdraws water from the Indian River at a point approximately 0.8 miles upstream from the mouth. The water is diverted to the SJC campus for use at a fish hatchery.

In addition to the two gaging stations on the Indian River, miscellaneous measurement sites have also been used to assess discharge and diversions (fig. 2). Indian River near Sitka (station 15087690) was selected to evaluate natural flow conditions and Indian River at Sitka (station 15087700) was selected to evaluate flow reductions in the lower reaches due to flow diversions by the CBS and SJC. Indian River near Sitka was used primarily as a control in the analysis. Indian River at Sitka is located below the two diversions (CBS and SJC) on the Indian River and was used to provide information on flow reductions in the downstream reaches. An additional gage was installed on the Indian River diversion to SJC at Sawmill Creek Blvd (station 15087730) in October 1998 and

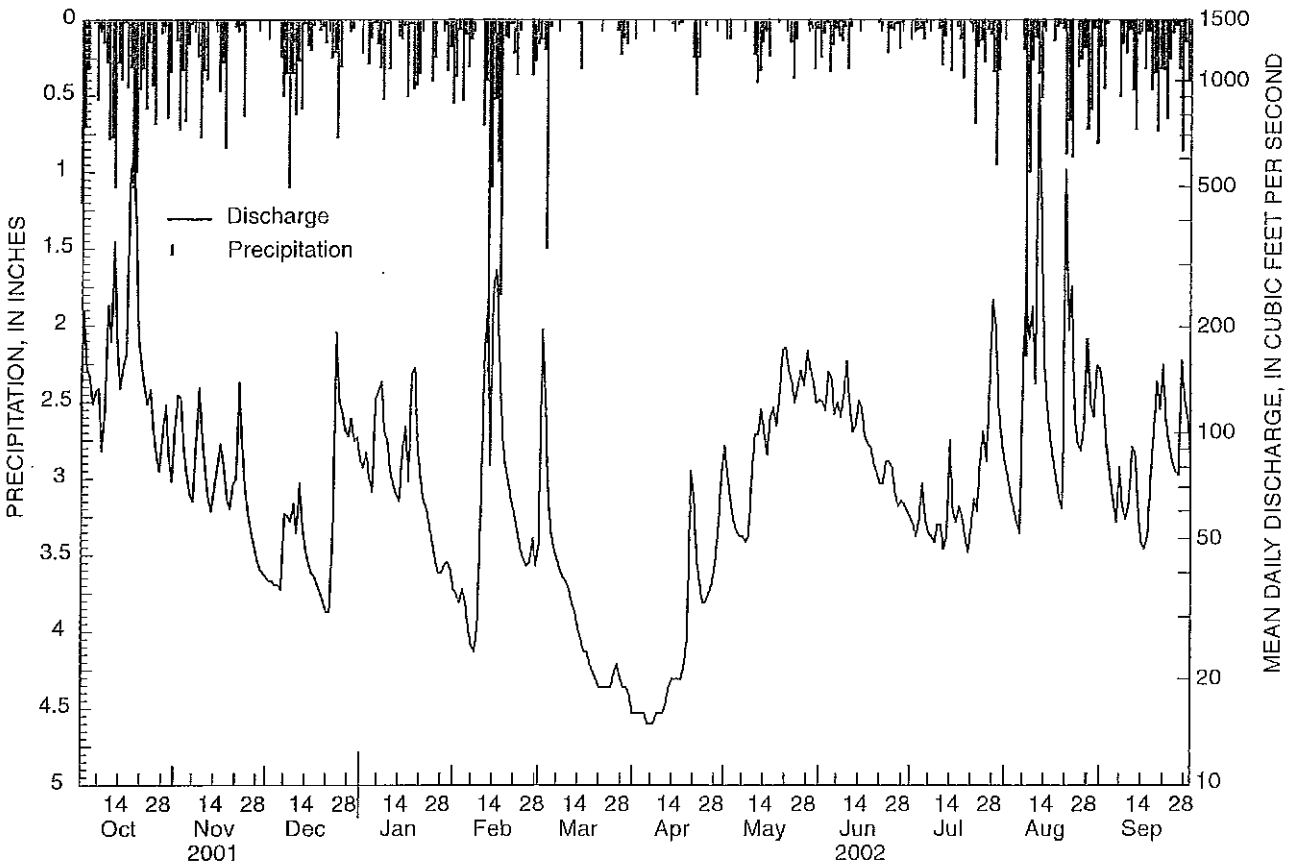

Figure 9. Mean daily discharge for Indian River near Sitka (15087690) and daily precipitation at Sitka Airport, October 2001 through September 2002

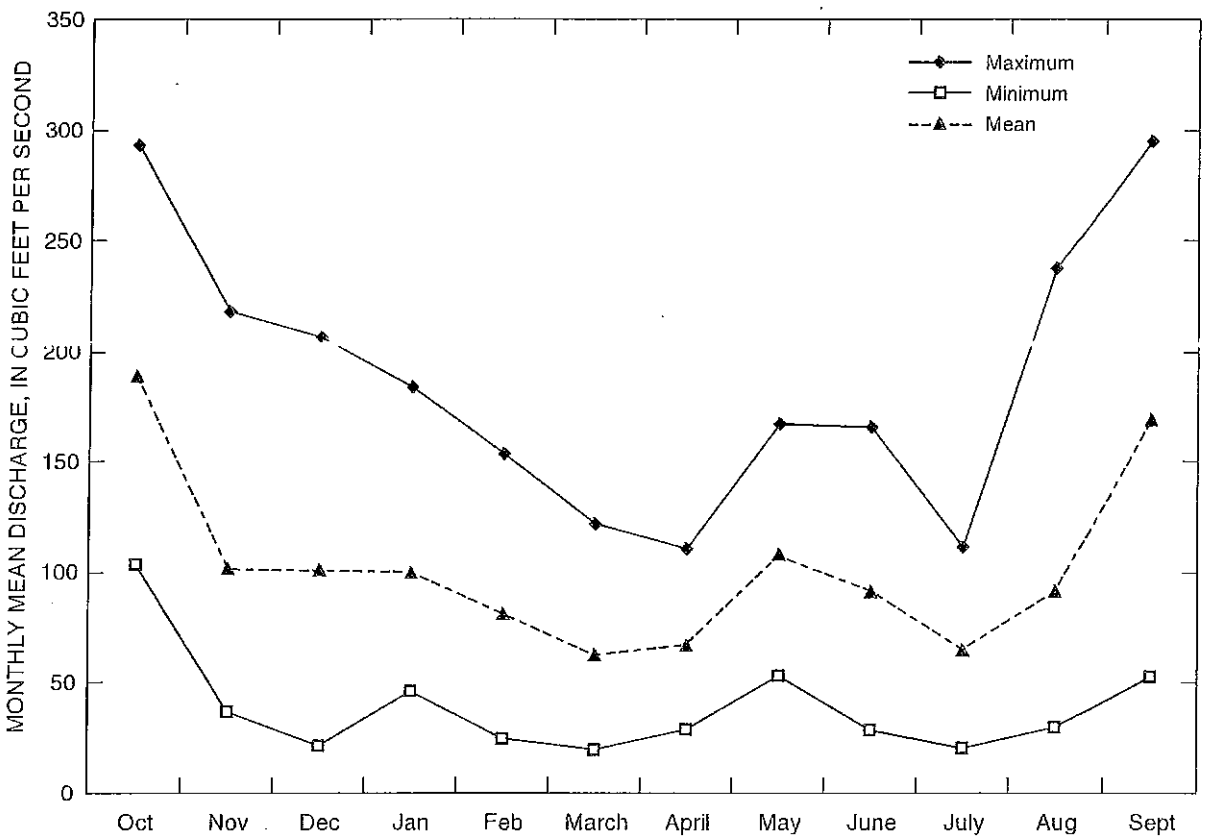

Figure 10. Monthly maximum, minimum, and mean discharges for Indian River near Sitka (station 15087690), for the period of record from August 1980 to September 1993, and October 1998 to September 2002.

discontinued September 2000. This site measured flow in the SJC diversion ditch, which originates approximately 0.2 miles upstream of the Indian River at Sitka gage. Flows in the diversion channel are regulated by a slide gate structure. The gage was installed and operated by the NPS from October 1998 to October 2000. Indian River Diversion Return Flow from Sheldon Jackson College at Sitka (station 15087735, fig. 2) was installed in October 1998 and discontinued in October 2000. This site measured diversion return flow from the SJC diversion to the lower reaches of the Indian River.

A brief analysis of discharge data since the removal of the diversion gages (stations 15087730 and 15087740) includes data from both Indian River gages. Calculations of discharge at the lower site are used to determine if ADF&G instream-flow reservations were maintained during the 2001 and 2002 water year. Calculation of flow differences between the upper and lower gaging sites were used to determine if diversions exceeded 30 ft^3/s (SJC's authorized withdrawal rate), downstream of the upper site. Because the Indian River at Sitka site accumulates an additional 1.5 mi^2 of drainage area, diversions exceeding 30 ft^3/s may have occurred during high flow when calculation of flow differences is complicated by additional flow entering Indian River between the sites. Four sets of concurrent discharge measurements at stations 15087690, 15087700, and 15087730 (fig. 2) were taken during the 1999 and 2000 water years (USGS, 2000 and USGS, 2001). The measurements ranged from 39 to 135 ft^3/s at station 15087690 and indicated that the reach between stations 15087690 and 15087700 typically gains streamflow throughout this range of discharges.

Figure 11 depicts the daily mean discharge at both stream gages on Indian River for the 2001 and 2002 water year. Also represented on these figures are the ADF&G flow reservations for the Indian River from the mouth upstream to river mile 2.5. The specific flow reservations, which vary seasonally, are tabulated in table 8. Figure 11a indicates that ADF&G flow reservations were not met at the Indian River at Sitka site on 106 days during the 2001 water year. ADF&G flow reservations were not met at the upper gage site for a total of 64 days during the 2001 water year, indicating that flow diversions downstream of the Indian River near Sitka reduced flows below ADF&G flow reservations a total of 42 days during the 2001 water year. Calculation of flow differences between the upper and lower gage sites on Indian River indicated that diversions exceeding 30 ft^3/s occurred on 32 days during the 2001 water year. During 9 of the 32 days, ADF&G flow reservations were maintained. Of the 32 days when calculated diversions exceeded 30 ft^3/s, 19 were between July 13 and August 3 when discharge was low and flow reservations were met on just three days.

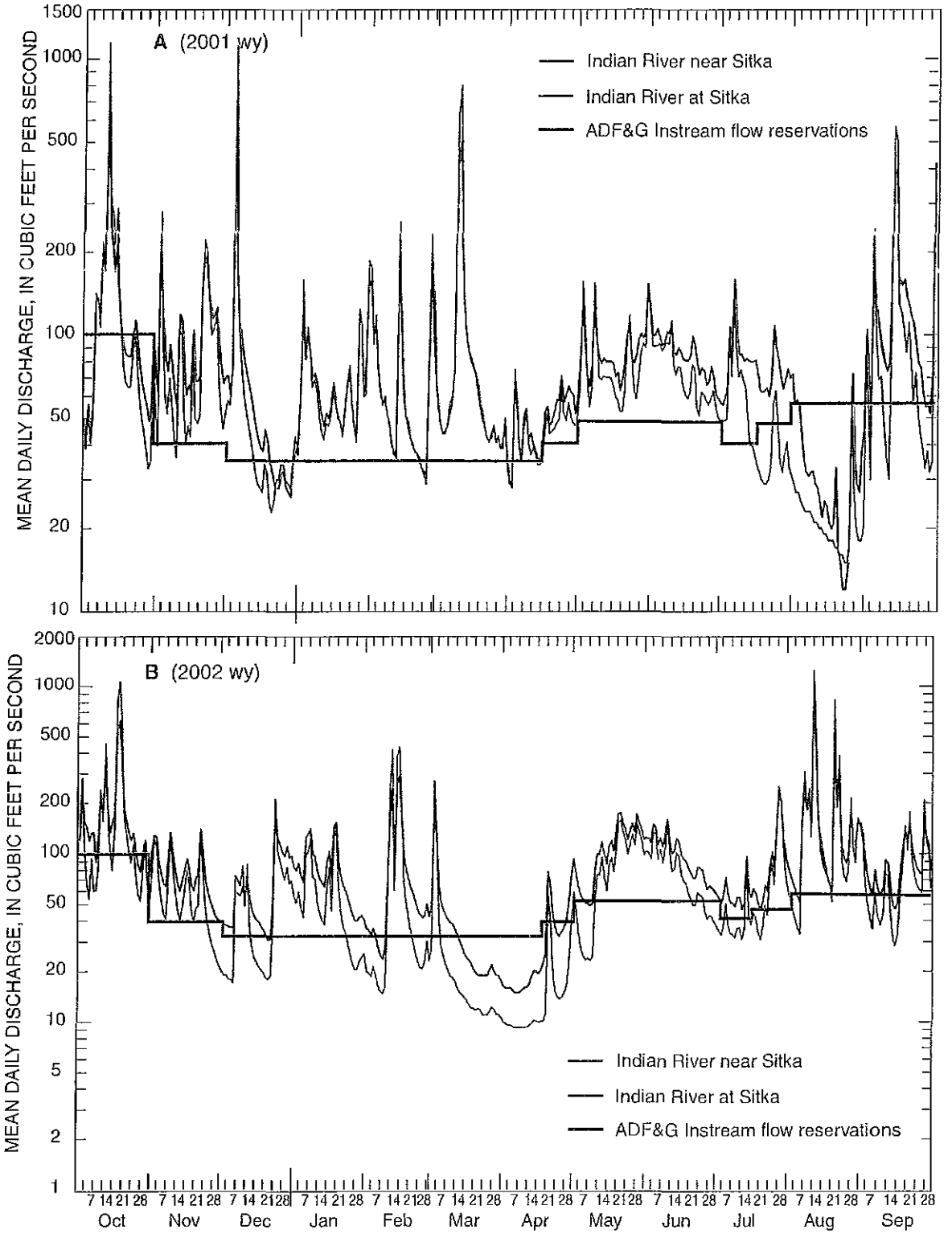

Figure 11. Daily mean discharge for Indian River near Sitka, Indian River at Sitka, and the Alaska Department of Fish and Game flow reservations for the lower 2.5 miles of Indian River, water years 2001 and 2002.

Table 8. Alaska Department of Fish and Game flow reservations on Indian River from the mouth upstream to river mile 2.5

[ft³/s, cubic feet per second]

Date Range	Alaska Department of Fish and Game Flow Reservations (ft³/s)
October 1 - October 31	101
November 1 - November 30	40
December 1 - April 15	35
April 16 - April 30	40
May 1 - June 30	51
July 1 - July 15	43
July 16 - July 31	51
August 1 - September 30	61

During the 2002 water year, ADF&G flow reservations were not met 172 days at the lower gage site (fig. 11b). Discharge at the upstream site was insufficient to meet instream flow reservations 74 days during the same time period indicating that diversions downstream of the upper site reduced flows below ADF&G reservations for a total of 98 days during the 2002 water year. Calculation of flow differences between the upper and lower site suggest flow diversions exceeded 30 ft³/s on 14 days during the 2002 water year with 9 of the 14 occurrences during October. During 4 of the 14 days when diversions exceeded 30 ft³/s, ADF&G flow reservations were maintained despite diversions.

PHYSICAL HABITAT AND BENTHIC COMMUNITIES OF INDIAN RIVER SITES

Physical Habitat

Two reaches, one near each of the Indian River gaging stations, were selected for physical habitat characterization (fig. 12). Habitat data collected at the two reaches are shown in table 9. The upper reach, near the Indian River near Sitka gaging station, was surveyed on September 17 and 18, 2002 and consisted of a series of riffles, runs, pools, and cascades with channel widths ranging from 42.0 to 50.5 feet. Channel widths could not be measured across cascading reaches. Both the left and right banks were bounded by spruce forest with open canopy angles ranging from 50 to 90 degrees on the left bank and 70 to 90 degrees on the right bank. Bank substrate was dominated by silt and clay at most transects with bank substrate bounding cascades consisting of boulders and bedrock outcrops. Mean flow velocities of the transects ranged from 1.5 to 4.0 ft/s, however, velocity measurements could not be obtained within transects that bisected cascades, as the depths and velocities were such that measurements were unsafe. Habitat cover in the form of undercut banks, boulders and woody debris was noted throughout the reach.

The Indian River at Sitka gaging station reach, was surveyed on September 17 and 19, 2002. This reach consisted of a series of riffles, runs, and pools with an extended series of cascades through the upper portion of the surveyed reach. Physical habitat measurements could not be obtained in the upper portion of the reach due to the presence of steep swift cascades. Where channel widths could be measured, widths ranged from 32 to 64 feet. The dominant riparian land use of the left bank was classified as urban residential/commercial while that of the right bank was predominantly forested woodland. Where measurements could be obtained the open canopy angles ranged from 65 to 90 degrees. Mean channel velocities ranged from 2.1 to 2.8 ft/s, however, velocities could only be obtained at the lower 4 of 11 transects due to a combination of excessive depths and velocities. Bank substrate ranged from coarse gravel to boulders and bedrock on both banks. Habitat cover in the form of boulders was present in most transects and woody debris was noted in transects 5 and 10.

Algae

Benthic algae are important primary producers in streams and a principle food source for many aquatic macroinvertebrates. Because they are attached to rocks and other submerged surfaces in streams, algae can be useful indicators of both physical and chemical disturbances to aquatic habitat. Algae are often useful indicators of stream quality because they integrate water-quality conditions over time, and the tolerance or sensitivity to changes in environmental conditions is known for many species.

Benthic algal communities were sampled at the two Indian River sites in September 2002 (tables 10 and 11). Algal taxa generally were identified to species and enumerated as cell density (cells per square centimeter, cells/cm²) and biovolume (cubic micrometers per square centimeter, μm³/cm²). Biovolume can vary greatly among species with similar cell density in a sample because the size and shape of cells differs among species. For example, although cell density for *Spirogyra* sp. and *Reimeria sinuata* is similar (table 10), the biovolume calculated for *Spirogyra* sp. is more than two orders of magnitude larger than *Reimeria sinuata*. Total periphyton algal biomass was estimated by summing the biovolume for all species in each sample and multiplying by 10^{-8} to convert units to cubic centimeters per square meter (table 12). Assuming near unit density for algal cells, these units are roughly equivalent to grams per square meter (g/m²), an estimate of algal biomass. At both Indian River sites algal communities were dominated, taxonomically, by pennate diatoms, however, blue-green algae (*Pseudanabaena* sp.) accounted for much of the algal biomass at Indian River near Sitka while both green

Figure 12. Physical habitat reach of (A) Indian River near Sitka, and (B) Indian River at Sitka. (Photographs by Robert T. Ourso, U.S. Geological Survey)

Table 9. Instream and riparian habitat variables measured at Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700).

[—, unreliable or missing data; E, estimated; LEW, left edge of water when looking downstream; REW, right edge of water when looking downstream; LB, left bank; RB, right bank, ft, feet; ft/s, feet per second; angles measured in degrees; SW, shrubs or woodland; UR, urban residential/commercial; %, percent; p, present; a, absent]

Site number (figure 2)	Date (Mmm-yy)	Transect	Habitat type	Wetted channel width (ft)	Mean velocity (ft/s)	Left bank canopy angle (degree)	Right bank canopy angle (degree)	Riparian canopy closure LEW (number of intersections)	Riparian canopy closure REW (number of intersections)	Riparian land use LEW	Riparian land use REW	Bank angle LB (degree)	Bank angle RB (degree)
15087690	Sep-02	1	run	42.0	1.7	80	80	17	17	SW	SW	80	90
15087690	Sep-02	2	run	45.0	2.1	75	70	17	15	SW	SW	90	100
15087690	Sep-02	3	riffle	46.0	3.4	65	75	16	17	SW	SW	90	90
15087690	Sep-02	4	riffle	49.0	2.0	85	75	17	13	SW	SW	85	90
15087690	Sep-02	5	pool	50.5	1.5	60	90	15	17	SW	SW	75	95
15087690	Sep-02	6	riffle	—	3.4	75	70	17	17	SW	SW	70	75
15087690	Sep-02	7	riffle	—	2.7	90	70	17	16	SW	SW	95	90
15087690	Sep-02	8	cascade	—	—	—	—	—	—	SW	SW	E90	E90
15087690	Sep-02	9	cascade	—	—	—	—	—	—	SW	SW	E90	E90
15087690	Sep-02	10	riffle	—	4.0	50	90	17	17	SW	SW	85	45
15087690	Sep-02	11	riffle	—	2.4	70	90	70	90	SW	SW	80	80
15087700	Sep-02	1	riffle	64.0	2.1	80	70	17	17	UR	SW	80	60
15087700	Sep-02	2	riffle	57.0	2.6	65	75	17	17	UR	SW	15	25
15087700	Sep-02	3	riffle	32.0	2.8	75	90	10	17	UR	SW	30	E45
15087700	Sep-02	4	run	47.0	2.1	75	75	17	17	SW	SW	45	60
15087700	Sep-02	5	pool	—	—	—	—	E17	17	SW	SW	E85	50
15087700	Sep-02	6	riffle	—	—	—	—	E17	17	UR	SW	E90	50
15087700	Sep-02	7	run	—	—	—	—	E17	17	UR	SW	E60	65
15087700	Sep-02	8	pool	—	—	—	—	E17	17	SW	SW	E70	50
15087700	Sep-02	9	cascade	—	—	—	—	—	—	—	—	—	—
15087700	Sep-02	10	cascade	—	—	—	—	—	—	—	—	—	—
15087700	Sep-02	11	cascade	—	—	—	—	—	—	—	—	—	—

Table 9. Instream and riparian habitat variables measured at Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700)--Continued

[—, unreliable or missing data; E, estimated; LEW, left edge of water when looking downstream; REW, right edge of water when looking downstream; LB, left bank; RB, right bank, ft, feet; ft/s, feet per second; angles measured in degrees; SW, shrubs or woodland; UR, urban residential/commercial; %, percent; p, present; a, absent]

Site number (figure 2)	Date (mm/yy)	Bank height LB (ft)	Bank height RB (ft)	Bank substrate LB	Bank substrate RB	Bank vegetative cover (%) LB	Bank vegetative cover (%) RB	Bank erosion LB	Bank erosion RB
15087690	Sep-02	4.2	4	silt/clay	silt/clay	90	100	p	a
15087690	Sep-02	4.5	5.2	silt/clay	smooth bedrock	100	0	a	p
15087690	Sep-02	5.5	3.4	smooth bedrock	smooth bedrock/silt/clay	100	70	a	p
15087690	Sep-02	4.5	4.8	silt/clay	silt/clay	100	100	a	a
15087690	Sep-02	6.5	4.8	silt/clay	silt/clay	100	50	a	p
15087690	Sep-02	4.5	5	silt/clay	large boulder	100	70	a	a
15087690	Sep-02	3.5	5.5	silt/clay	large boulder	100	90	a	a
15087690	Sep-02	—	—	large boulder/irregular bedrock	large boulder/irregular bedrock	90	20	a	a
15087690	Sep-02	—	—	large boulder/irregular bedrock	large boulder/irregular bedrock	80	90	a	a
15087690	Sep-02	4.2	3.5	silt/clay	silt/clay	100	100	a	a
15087690	Sep-02	3.5	4	silt/clay	silt/clay	100	100	a	a
15087700	Sep-02	10	7.5	very coarse gravel	large cobble	50	0	p	a
15087700	Sep-02	10	6.5	small cobble	large cobble	0	20	p	a
15087700	Sep-02	e10	e4.5	very coarse gravel	large boulder/irregular bedrock	40	50	a	a
15087700	Sep-02	e8	e15	small boulder	small boulder	70	60	a	a
15087700	Sep-02	e9	6.5	large boulder/irregular bedrock	small boulder	0	40	a	p
15087700	Sep-02	e20	7	large boulder/irregular bedrock	large boulder/irregular bedrock	70	10	a	a
15087700	Sep-02	e15	e15	large boulder/irregular bedrock	large boulder/irregular bedrock	20	20	a	a
15087700	Sep-02	e15	e20	large boulder/irregular bedrock	large boulder/irregular bedrock	80	90	a	a
15087700	Sep-02	—	—	—	—	—	—	—	—
15087700	Sep-02	—	—	—	—	—	—	—	—
15087700	Sep-02	—	—	—	—	—	—	—	—

Table 10. Taxonomic identification and enumeration of benthic algae collected from the Indian River near Sitka (15087690) September 2002.

Phylum	Family	Scientific Name	Cell Density (per cm²)	Biovolume (µm³ per cm²)
Chlorophyta	Zygnemataceae	*Spirogyra* sp.	1,534.7	123,830,511
Chrysophyta	Achnanthaceae	*Achnanthidium pyrenaicum* (Hustedt) Kobayasi	11.5	1,524
Chrysophyta	Diatomaceae	*Staurosirella lapponica* (Grunow) Williams et Round	11.5	9,864
Chrysophyta	Diatomaceae	*Tabellaria ventricosa* Kützing	23.0	198,458
Chrysophyta	Naviculaceae	*Cymbella hybrida* Grunow ex Cleve	11.5	21,340
Chrysophyta	Naviculaceae	*Cymbella mesiana* Cholnoky	23.0	49,367
Chrysophyta	Naviculaceae	*Encyonema silesiacum* var. *altensis* Krammer	11.5	21,340
Chrysophyta	Naviculaceae	*Gomphonema drutelingense* Reichardt	184.2	239,780
Chrysophyta	Naviculaceae	*Gomphonema mexicanum* Grun. in V. H.	46.0	64,304
Chrysophyta	Naviculaceae	*Gomphonema sarcophagus* Greg.	11.5	6,373
Chrysophyta	Naviculaceae	*Rhoicosphenia abbreviata* (Agardh) Lange-Bertalot	11.5	5,851
Cyanophyta	Pseudanabaenaceae	*Pseudanabaena* sp.	594,179.9	14,854,498
Chrysophyta	Achnanthaceae	*Achnanthidium minutissimum* (Kützing) Czarnecki	184.2	7,654
Chrysophyta	Achnanthaceae	*Cocconeis placentula* var. *pseudolineata* Geitler	34.5	69,041
Chrysophyta	Achnanthaceae	*Psammothidium bioretii* (Germ.) Bukht. et Round	23.0	26,479
Chrysophyta	Achnanthaceae	*Psammothidium grischunum f. daonensis* (L.-B. in L.-B. et Kram) Bukh. et Round	11.5	2,198
Chrysophyta	Diatomaceae	*Diatoma anceps* (Ehrenberg) Kirchner	241.7	134,634
Chrysophyta	Diatomaceae	*Diatoma mesodon* (Ehrenberg) Kützing	218.7	204,450
Chrysophyta	Diatomaceae	*Fragilaria capucina* Desmazières	23.0	2,258
Chrysophyta	Diatomaceae	*Fragilaria vaucheriae* (Kützing) Petersen	149.6	32,812
Chrysophyta	Diatomaceae	*Hannaea arcus* (Ehr.) Patr.	3,165.3	2,247,965
Chrysophyta	Diatomaceae	*Meridion circulare* var. *constrictum* (Ralfs) V. H.	11.5	2,203
Chrysophyta	Diatomaceae	*Staurosirella leptostauron* (Ehrenberg) Williams et Round	23.0	19,728
Chrysophyta	Diatomaceae	*Synedra ulna* (Nitz.) Ehr.	11.5	66,629
Chrysophyta	Eunotiaceae	*Eunotia minor* (Kützing) Grunow	218.7	209,568
Chrysophyta	Eunotiaceae	*Eunotia soleirolii* (Kützing) Rabenhorst	207.2	370,339
Chrysophyta	Melosiraceae	*Melosira varians* Ag.	11.5	57,796
Chrysophyta	Naviculaceae	*Brachysira brebissonii* Ross	23.0	172,675
Chrysophyta	Naviculaceae	*Encyonema reichardtii* (Krammer) Mann	23.0	42,680
Chrysophyta	Naviculaceae	*Encyonema silesiacum* (Bleisch) Mann	23.0	27,825
Chrysophyta	Naviculaceae	*Frustulia vulgaris* (Thwaites) DeT.	11.5	17,870
Chrysophyta	Naviculaceae	*Gomphonema minutum* (C.A. Agardh) C.A. Agardh	184.2	30,342
Chrysophyta	Naviculaceae	*Gomphonema olivaceoides* Hustedt	161.1	27,135
Chrysophyta	Naviculaceae	*Reimeria sinuata* (Greg.) Kociolek & Stoermer	1,588.4	266,531
Chrysophyta	Thalassiosiraceae	*Aulacoseira ambigua* (Grunow) Simonsen	11.5	3,894

Table 11. Taxonomic identification and enumeration of benthic algae collected from the Indian River at Sitka (15087700) September 2002.

Phylum	Family	Scientific Name	Cell density (per cm²)	Biovolume (µm³ per cm²)
Chrysophyta	Achnanthaceae	Achnanthidium pyrenaicum (Hustedt) Kobayasi	0.10	13.4
Chrysophyta	Achnanthaceae	Planothidium lanceolatum (Brébisson ex Kützing) Lange-Bertalot	0.03	4.6
Chrysophyta	Diatomaceae	Tabellaria ventricosa Kützing	0.07	580
Chrysophyta	Naviculaceae	Gomphonema drutelingense Reichardt	0.17	219
Cyanophyta	Pseudanabaenaceae	Pseudanabaena sp.	388,030.45	9,700,761.2
Chrysophyta	Achnanthaceae	Achnanthidium minutissimum (Kützing) Czarnecki	0.07	2.8
Chrysophyta	Achnanthaceae	Cocconeis placentula var. pseudolineata Geitler	0.27	539
Chrysophyta	Achnanthaceae	Psammothidium bioretii (Germ.) Bukht. et Round	0.13	155
Chrysophyta	Diatomaceae	Diatoma anceps (Ehrenberg) Kirchner	0.13	75.1
Chrysophyta	Diatomaceae	Diatoma mesodon (Ehrenberg) Kützing	0.30	284
Chrysophyta	Diatomaceae	Fragilaria vaucheriae (Kützing) Petersen	0.34	73.9
Chrysophyta	Diatomaceae	Hannaea arcus (Ehr.) Patr.	6.11	4,336.7
Chrysophyta	Diatomaceae	Staurosirella leptostauron (Ehrenberg) Williams et Round	0.03	28.8
Chrysophyta	Diatomaceae	Synedra ulna (Nitz.) Ehr.	0.17	975
Chrysophyta	Eunotiaceae	Eunotia minor (Kützing) Grunow	0.94	905
Chrysophyta	Melosiraceae	Melosira varians Ag.	0.03	169
Chrysophyta	Naviculaceae	Encyonema minutum (Hilse) Mann	0.13	28.1
Chrysophyta	Naviculaceae	Encyonema silesiacum (Bleisch) Mann	0.34	408
Chrysophyta	Naviculaceae	Gomphonema minutum (C.A. Agardh) C.A. Agardh	0.27	44.4
Chrysophyta	Naviculaceae	Gomphonema olivaceoides Hustedt	0.40	68.2
Chrysophyta	Naviculaceae	Gomphonema parvulum (Kütz.) Kütz.	0.03	8.5
Chrysophyta	Naviculaceae	Navicula lanceolata (Ag.) Ehr.	0.03	47.3
Chrysophyta	Naviculaceae	Reimeria sinuata (Greg.) Kociolek & Stoermer	0.84	142
Chrysophyta	Thalassiosiraceae	Stephanodiscus hantzschii Grunow	0.03	10.7

algae (*Spirogyra* sp.) and blue-green algae (*Pseudanabaena* sp.) accounted for much of the algal biomass at Indian River at Sitka (tables 10 and 11).

Thirty-five algal species were identified in a sample collected at Indian River near Sitka and 24 species were identified in a sample taken at Indian River at Sitka. Algal biomass at Indian River near Sitka was dominated by *Spirogyra* sp., *Pseudanabaena* sp., and *Hannaea arcus*. Indian River at Sitka had an algal biomass that was dominated by *Pseudanabaena* sp., and *Hannaea arcus*, a pollution-sensitive diatom species (Bahls, 1993). *Pseudanabaena* sp. is a blue-green algal genus capable of fixing elemental, atmospheric sources of nitrogen (Bold and Wynne, 1978). Nitrogen-fixing algae frequently dominate streams with low ambient concentrations of dissolved nitrogen and those in which nitrogen is the limiting factor controlling algal production (Borchardt, 1996).

Bahls (1993) published a water-quality index (Bahls's Pollution Index, BPI), based on Montana diatom data, to predict potential stream degradation resulting from nutrient and organic enrichment. The BPI value can range from 1, where only pollution tolerant diatoms are present, to a value of 3, where only pollution sensitive diatoms are present. The BPI value was 2.7 at the Indian River near Sitka and 2.5 at Indian River at Sitka, indicating that during September 2002, the quality of the Indian River was good and adverse effects from nutrient and organic enrichment were minimal.

Three samples of periphyton chlorophyll-*a* and biomass collected at Indian River near Sitka indicated an increase in algal biomass over the course of the summer, with values increasing from 1.6 mg/m^2 in May to 6.3 mg/m^2 in September (table 12). Periphyton chlorophyll-*a* values for Indian River at Sitka decreased from 5.3 mg/m^2 in June to 1.9 mg/m^2 in September. Periphyton ash-free dry mass (AFDM) was similar between sites and among dates; values ranged from 0.9 to 2.0 g/m^2 (table 12). During September, algal biovolume accounted for more than 87 percent (1.4/1.6) of periphyton AFDM in the Indian River near Sitka, but only about 11 percent (0.1/0.9) of AFDM in the Indian River at Sitka. Similarly, periphyton chlorophyll-*a* values were more than 3 times larger in the Indian River near Sitka than in the Indian River at Sitka. These between site relations may reflect proportional differences in the abundance of autochthonous (algae) and allochthonous (non-algal coarse particulate organic matter) food resources for macroinvertebrates and fish. Values for chlorophyll-*a*, AFDM, and periphyton algal biovolume in this study are indicative of oligotrophic water-quality conditions in temperate streams (Dodds and others, 1998) and are consistent with values for "unenriched," forested streams in New Zealand (Biggs, 1996) where chlorophyll-*a* typically was in the range of 0.5 mg/m^2 (lower quartile) to 3 mg/m^2 (upper quartile), with medians of 1.7 mg/m^2 for chlorophyll-*a* and 1.5 g/m^2 for AFDM.

Analysis of the benthic algae samples indicate that the quality of the Indian River where benthic algae samples were collected during 2002 is good to excellent and probably reflects background conditions in the region. The trophic condition of the river was oligotrophic, and algal productivity likely is limited by low concentrations of dissolved nitrogen. Although algal-community structure indicates some influence from concentrations of dissolved salts, no obvious adverse effects of nutrient or organic enrichment were noted in the composition or abundance of pollution-tolerant species.

Macroinvertebrates

Benthic macroinvertebrate samples were collected from the two sites on Indian River in May and September 2002. The taxonomic identification of the macroinvertebrates from these samples is shown in table 13. Mayflies (order Ephemeroptera) comprised the greatest number of individuals in each sample, ranging from 64 to 1,250 (table 14). There was little variability in the numbers of unique taxa between sampling sites or between seasons (table 14). Larger numbers of individuals were collected during the May sampling than during the September sampling, likely due to emergence of adult insects throughout the summer. Additional information on aquatic insects found in the Indian River is included in the appendix.

Although few taxa were collected relative to many high-quality streams in the contiguous United States, the numbers of taxa are fairly typical for streams in Alaska. Macroinverte-

Table 12. Periphyton and chlorophyll *a* data collected from Indian River near Sitka (station 15087690), and Indian River at Sitka (station 15087700), May through September, 2002

[cm^3/m^2; cubic centimeters per square meter, g/m^2, grams per square meter; mg/m^2, milligrams per square meter; —, no data]

	Periphyton chlorophyll *a* (mg/m^2)		Periphyton ash free dry mass (g/m^2)		Periphyton algal total biovolume (cm^3/m^2)	
Date (mm/dd/yy)	Indian River near Sitka	Indian River at Sitka	Indian River near Sitka	Indian River at Sitka	Indian River near Sitka	Indian River at Sitka
05/28/02	—	—	—	1.4	—	—
05/30/02	1.6	—	1.2	—	—	—
06/14/02	—	5.3	—	1.9	—	—
06/15/02	3.2	—	2.0	—	—	—
09/18/02	6.3	1.9	1.6	0.9	1.4	0.1

Table 13. Relative abundance (no. individuals/m²) and occurrence of macroinvertebrates at Indian River near Sitka (15087690) and Indian River at Sitka (15087700), adjusted among sites for ambiguous taxa.

Taxon	15087690		15087700	
	May	September	May	September
Turbellaria	5	0	9	1
Nematoda	0	0	0	9
Bivalvia				
Pisidium sp.	0	1	0	0
Oligochaeta				
Lumbriculidae	24	27	20	2
Naididae	0	0	56	1
Enchytraeidae	0	0	1	0
Arachnida				
Acari	10	15	32	18
Collembola	0	0	0	10
Ephemeroptera				
Leptophlebiidae	1	3	0	2
Ephemerellidae				
Drunella sp.	31	16	2	20
Baetidae	544	27	356	8
Heptageniidae				
Cinygmula sp.	607	21	288	10
Epeorus sp.	49	6	176	1
Rhithrogena sp.	18	147	8	23
Plecoptera				
Capniidae	0	1	4	0
Leuctridae				
Paraleuctra sp.	0	4	8	2
Nemouridae				
Zapada sp.	34	8	0	2
Taeniopterygidae				
Taeniopteryx sp.	0	68	0	0
Chloroperlidae				
Suwallia sp.	0	7	44	0
Sweltsa sp.	49	6	44	0
Perlodidae	6	1	1	3
Tricoptera				
Rhyacophilidae				
Rhyacophila sp.	3	7	12	2
Hydropsychidae	6	0	0	0
Brachycentridae				
Micrasema sp.	0	0	9	0
Limnephilidae	0	2	0	0
Coleoptera				
Carabidae	0	0	0	1
Diptera				
Ceratopogonidae	0	0	4	0
Simuliidae	34	0	5	2
Tipulidae				
Hesperoconopa sp.	0	0	62	0
Dicranota sp.	0	0	11	0
Empididae	62	1	4	2
Chironomidae				
Micropsectra/Tanytarsus sp.	38	0	29	0
Micropsectra sp.	70	0	23	0
Cricotopus/Orthocladius sp.	0	0	41	2
Brillia sp.	7	0	0	0
Corynoneura sp.	0	2	41	0
Eukiefferiella sp.	19	2	0	42
Parametriocnemus sp.	0	0	20	0
Rheocricotopus sp.	7	0	41	0
Stilocladius sp.	0	7	0	7
Thienemanniella sp.	0	0	20	0

Table 14. Relative abundances (no. individuals/m²) and occurrence of macroinvertebrate taxa in riffle habitats collected during May and September 2002 at Indian River near Sitka and Indian River at Sitka.

Taxon	15087690		15087700	
	May	September	May	September
NON-INSECTS				
Turbellaria	5		9	1
Nematoda				9
Bivalvia				
Pisidium sp.		1		
Oligochaeta				
Lumbriculidae	24	27	20	2
Naididae			56	1
Enchytracidae			4	
Arachnida				
Acari	10	15	32	18
INSECTS				
Collembola				10
Ephemeroptera		1		
Leptophlebiidae		1		
Paraleptophlebia sp.	1	1		2
Ephemerellidae	0	1		
Drunella sp.	5			
Drunella doddsi (Needham)	26	15		20
Drunella grandis (Eaton)			2	
Baetidae	254	4	24	
Baetis sp.	38		36	3
Baetis bicaudatus Dodds	252	13	296	5
Baetis tricaudatus Dodds		10		
Heptageniidae	72	56	12	6
Cinygmula sp.	542	14	281	8
Epeorus sp.	44	4	172	1
Rhithrogena sp.	16	100	7	19
Plecoptera				4
Capniidae		1	4	
Leuctridae				
Paraleuctra sp.		4	8	1
Nemouridae				
Zapada sp.	34	4		
Zapada cinctipes (Banks)		4		1
Taeniopterygidae				
Taeniopteryx sp.		68		
Chloroperlidae	34	4		
Suwallia sp.		5	44	
Sweltsa sp.	15	4	44	

Table 14. Relative abundances (no. individuals/m²) and occurrence of macroinvertebrate taxa in riffle habitats collected during May and September, 2002 at Indian River near Sitka and Indian River at Sitka--Continued

Taxon	15087690		15087700	
	May	September	May	September
Perlodidae				1
Skwala sp.		1		
Kogotus sp.	6		1	
Trichoptera		2	12	
Rhyacophilidae				
Rhyacophila sp.	1	5	4	2
Rhyacophila sibirica group	1		1	
Rhyacophila verrula group	1			
Hydropsychidae	5			
Parapsyche sp.	1			
Brachycentridae				
Micrasema sp.			4	
Limnephilidae		1		
Ecclisomyia sp.		1		
Coleoptera				
Carabidae				1
Diptera	5			
Ceratopogonidae			4	
Simuliidae			4	2
Prosimulium sp.	34		1	
Tipulidae			12	
Hesperoconopa sp.			52	
Dicranota sp.			9	
Empididae				
Oreogeton sp.	62	1		
Chelifera/Metachela sp.			4	
Chironomidae	10	2	32	6
Micropsectra/Tanytarsus sp.	34		24	
Micropsectra sp.	62		20	
Orthocladiinae	5	5	108	7
Cricotopus/Orthocladius sp.			8	2
Brillia sp.	5			
Corynoneura sp.		1	8	
Eukiefferiella sp.	10	1		31
Parametriocnemus sp.			4	
Rheocricotopus sp.	5		8	
Stilocladius sp.		2		5
Thienemanniella sp.			4	

brate samples collected and analyzed using identical methods as in this study identified 14 and 12 unique taxa from the Johnson River in Lake Clark National Park and Preserve and the Kamishak River in Katmai National Park and Preserve, respectively (Frenzel and Dorava, 1999). Three sites sampled in Denali National Park and Preserve using these methods had 18, 27 and 28 taxa (Brabets and Whitman, 2002). Again, using the same methods, between 21 and 34 unambiguous taxa were identified from 14 streams in Anchorage (Ourso, 2001).

Relatively few non-insect taxa were collected, although the sample from the Indian River at Sitka site in May had 80 individuals representing three distinct taxa of worms (class Oligochaeta), whereas worms are tolerant of poor water quality, they are often present in streams with excellent water quality. Macroinvertebrates in the orders Ephemeroptera, Plecoptera (stoneflies), and Trichoptera (caddisflies) are typically associated with good to excellent water quality. The number of taxa in these families is called EPT richness, and ranged from 10 to 15 in the Indian River samples (table 15). By comparison, EPT taxa richness ranged from 4 at the Johnson and Kamishak Rivers (Frenzel and Dorava, 1999), between 10 and 13 at sites in Denali National Park and Preserve (Brabets and Whitman, 2002), and between 7 and 14 at streams in Anchorage (Ourso, 2001). The streams in Anchorage had the greatest taxa richness and EPT taxa richness at sites with very low levels of development and the least taxa richness and EPT taxa richness at the most urbanized sites.

Table 15. Selected invertebrate metrics from samples collected at Indian River near Sitka (station 15087690) and Indian River at Sitka (station 15087700) in May and September 2002.

	15087690		15087700	
Metric	May	Sept.	May	Sept.
Total Taxa Richness	21	22	29	22
Total Abundance	1,624	379	1,374	170
Shannon Diversity	2.67	3.09	3.57	3.58
Shannon Evenness	0.61	0.69	0.74	0.80
EPT Richness	11	15	12	10

Shannon-Wiener diversity index and evenness values should be used only in conjunction with other information to interpret water-quality conditions with the small number of samples available from Indian River. The diversity index ranged from 2.67 to 3.58 (table 15), which compares well to the range of values from 140 undeveloped sites sampled as part of the NAWQA program from 1995 to 1998 (fig. 13) Cuffney (2002). Evenness in the Indian River samples ranged from 0.61 to 0.80 (table 15, and fig. 13). Evenness values from undeveloped sites reported by Cuffney (2002) ranged from 0.70 to 0.87.

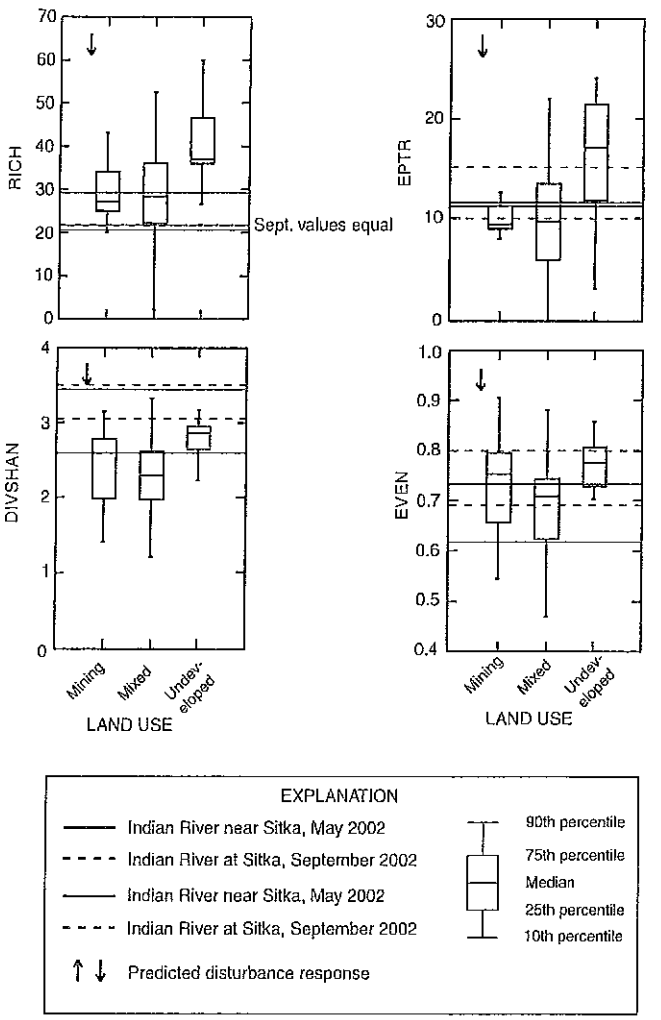

Figure 13. Total taxa richness (RICH), EPT richness (EPTR), Shannon-Wiener diversity index (DIVSHAN), and eveness values (EVEN) from Indian River near Sitka and Indian River at Sitka compared to national land-use values (Cuffney, 2002). (Classifications for mixed land use includes combinations of mining, agriculture, and urban uses.

SUMMARY AND CONCLUSIONS

Indian River is an anadromous fish stream that is an important natural resource element of Sitka National Historical Park. Stream reaches upstream of the park may be developed in the future. This may affect water quality of the Indian River. Due to concerns of the water quality and aquatic habitat in Indian River, two sites were studied during the 2001 and 2002 water years. One site represents an undeveloped area while the second site represents the developed area of the Indian River. Analysis of discharge, water chemistry, bed sediment, and biological data from both sites indicate that the Indian River has thus far suffered minimal effects from development.

Discharge in the Indian River is typical of coastal southeast Alaska streams where lowest flows generally are in late winter and early spring and greater flows are during the wetter fall months. Alaska Department of Fish and Game has established instream flow reservations on the lower 2.5 miles of Indian River. During the study period, ADF&G instream flow reservations were not achieved a total of 236 days. Of these 236 days, flow diversions upstream of Sitka National Historical Park were responsible for reducing flow below reservation levels a total of 140 days.

Measurements of pH, water temperature, and dissolved oxygen concentrations of the Indian River were within acceptable ranges for fish survival. Recorded values of specific conductance and discharge indicate values of specific conductance are highest during low flows. The ionic composition of the Indian River is a calcium bicarbonate water type with a low buffering capacity. Concentrations of dissolved ions and nutrients in both Indian River sites were generally low and showed little variation between the upper and lower sampling sites.

Concentrations of arsenic, chromium, copper, nickel, and zinc in the bed sediment of both Indian River sites exceeded the TEC and concentrations of arsenic, chromium, and nickel exceeded the PEC. However, calculated toxicity quotients were low due to relatively high concentrations of organic carbon in the bed sediments.

Thirty-five species were identified from the sample collected at Indian River near Sitka while 24 algae species were identified from the sample collected at Indian River at Sitka. Most species of algae identified in the Indian River samples were diatoms and the majority were pinnate diatoms; however, green algae and (or) blue-green algae accounted for much of the algal biomass at the two sites. The trophic condition of the Indian River is oligotrophic, and algal productivity likely is limited by low concentrations of dissolved nitrogen.

Few invertebrate taxa were collected relative to many high-quality streams in the contiguous United States, but the number of taxa in Indian River may be typical of Alaska streams. Ephemeroptera was the most abundant family sampled followed by Diptera.

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APPENDIX

Aquatic Insects Found in the Indian River, Baranof Island, Sitka, Alaska

List compiled by Geoffrey Smith, Biologist, Sitka National Historical Park. Collection Period April 4, 2002 through August 17, 2003

Mayflies (Ephemeroptera)

Flat-bodied Clingers

Heptageniidae (*Epeorus* (3), *Cinygmula*, *Rhithrogena*, *Cinygma*):
- *Epeorus longimanus*
- *Epeorus grandis*
- *Epeorus* sp. (Probably *E. deceptivus*, first set of gills are extended under the abdomen but do not meet to form a sucker-like structure)
- *Rhithrogena futilis*
- *Cinygmula* sp.
- *Cinygma lyriforme*

Swimmers

Baetidae (*Baetis*):
- *Baetis bicaudatus*
- *Baetis tricaudatus*
- *Baetis* sp.

Leptophlebiidae (*Paraleptophlebia*):
- *Paraleptophlebia debilis*

Ameletidae (*Ameletis*):
- *Ameletis validus*

Sprawlers, Clingers—Stout bodied

Ephemerellidae (*Drunella* (3), *Serratella*):
- *Drunella grandis flavitincta*
- *Drunella doddsi*
- *Drunella coloradensis*
- *Serratella tibialis* (Found early instars in moss 7/18/03 and mature nymphs in moss 8/17/03)

Stoneflies (Plecoptera)

Capniidae (*Capnia**): (Probably *C. nana*, *C excavate*, others?)

Leuctridae (*Paraleuctra*, *Despaxia*):
- *Paraleuctra occidentalis**
- *Despaxia augusta**

Nemouridae (*Zapada*, *Podmosta*):
- *Zapada cinctipes**
- *Zapada hays/oregonensis**
- *Podmosta decepta**

Taeniopterygidae (*Doddsia*):
- *Doddsia occidentalis**

Chloroperlidae (*Sweltsa*, *Kathroperla*, *Suwallia*):
- *Sweltsa** (Probably *S. borealis*, *S. oregonensis*, others?)
- *Suwallia starki**
- *Kathroperla perdita**

Perlodidae (*Megarcys*, *Kogotus*):
- *Kogotus nonus**
- *Megarcys signata**

* Identification verified by Dr. Kenneth Stewart. Megarcys signata verified by Robert Hood (USGS).

Caddisflies (Trichoptera)

Rhyacophilidae (*Rhyacophila*):
- *Rhyacophila verrula*
- *Rhyacophila* spp. (several species)

Glossosomatidae (*Glossosoma*):
- *Glossosoma penitum*

Limnephilidae (*Ecclisomyia*, *Ecclisocosmoecus*, *Psychoglypha*, *Dicosmoecus Onocosmoecus*):
- *Ecclisomyia conspersa*
- *Ecclisocosmoecus scylla*
- *Psychoglypha subborealis*
- *Dicosmoecus atripes*
- *Onocosmoecus unicolor*

Brachycentridae (*Micrasema*):
- *Micrasema gelidum/bactro*

Hydropsychidae (*Parapsyche*):
- *Parapsyche elsis*

Lepidostomatidae (*Lepidostoma*):
- *Lepidostoma roafi*
- *Lepidostoma* sp.

Collected specimens of the indicated species are kept at Sitka National Historical Park.

APPENDIX C:

Temperature Profile

Weekly avg. water temp for SJH for 2010

	Jan-10	feb.	march	April	May	June	July	Aug	Sept.
week 1	2.3c	4.2c	3.2c	4.2c	4.3c	6.8c	7.4c	7.9c	8.0c
week 2	3.7c	3.9c	2.5c	3.2c	5.1c	6.8c	7.5c	8.7c	7.8c
week 3	4.0c	3.4c	3.4c	4.0c	5.3c	7.1c	7.0c	8.8c	
week 4	4.4c	3.5c	4.6c	4.5c	6.4c	7.4c	7.5c	7.7c	

Weekly avg.water temp for SJH for 2009

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
Week 1	1.3c	2.4c	1.7c	2.1c	3.2c	4.1c	7.4c	9.3c	7.1c	6.4c	5.1c	3.6c
Week 2	1.1c	2.2c	1.0c	2.2c	3.6c	5.4c	8.3c	9.2c	7.7c	5.9c	4.7c	3.2c
Week 3	3.1c	2.4c	1.9c	2.8c	4.0c	5.5c	8.1c	9.4c	7.9c	6.0c	3.7c	2.5c
Week 4	2.5c	1.7c	1.6c	2.7c	4.7c	6.0c	8.8c	8.1c	7.1c	5.8c	3.7c	2.7c

APPENDIX D:

Dissolved Oxygen

Weekly Dissolved O2 in PPM O2 for SJH fresh water supply, 2010

	Jan	Feb.	March	April	May	June	July	Aug	Sept.
Week 1	12.9	12.5	11.7	11.6	12.6	10.8	11.3	12.3	12.2
Week 2	12.3	11.1	11.7	12.3	12.2	10.8	11.3	11.3	10.4
Week 3	11.7	11.3	12.1	12.1	11.5	10.7	12.2	11	
Week 4	10.9	11	11.8	10.8	11	10.9	12.7	12	

Weekly Dissolved O2 in PPM O2 for SJH fresh water supply, 2009

	Jan	Feb	March	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec
Week 1									10.2	11.3	10.9	12.6
Week 2									9.9	11.3	11.6	12.8
Week 3									10	9.8	11.7	12.8
Week 4									10.9	9.7	12.2	12.9

APPENDIX E:

Water Flow Seasonal Profile

15087690 INDIAN RIVER NEAR SITKA, AK—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2005 TO SEPTEMBER 2006
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	184	84	74	55	43	30	---	---	---	---	---	---
2	127	74	69	51	42	28	---	---	---	---	---	---
3	100	68	66	47	33	27	---	---	---	---	---	---
4	89	59	60	44	27	28	---	---	---	---	---	---
5	115	53	57	48	28	27	---	---	---	---	---	---
6	136	46	58	72	47	26	---	---	---	---	---	---
7	99	45	64	53	69	25	---	---	---	---	---	---
8	89	96	315	47	53	25	---	---	---	---	---	---
9	119	198	210	66	41	22	---	---	---	---	---	---
10	175	147	316	80	43	20	---	---	---	---	---	---
11	180	89	225	54	59	19	---	---	---	---	---	---
12	252	70	500	49	117	20	---	---	---	---	---	---
13	195	66	170	43	68	17	---	---	---	---	---	---
14	145	61	126	38	56	13	---	---	---	---	---	---
15	115	94	170	36	52	12	---	---	---	---	---	---
16	115	200	149	36	51	12	---	---	---	---	---	---
17	107	380	115	34	50	12	---	---	---	---	---	---
18	176	1,040	97	34	49	13	---	---	---	---	---	---
19	148	502	85	33	49	14	---	---	---	---	---	---
20	106	442	80	30	56	14	---	---	---	---	---	---
21	97	1,090	175	62	69	14	---	---	---	---	---	---
22	163	2,170	113	102	50	15	---	---	---	---	---	---
23	175	472	113	53	42	15	---	---	---	---	---	---
24	162	211	93	43	38	19	---	---	---	---	---	---
25	123	179	87	40	36	19	---	---	---	---	---	---
26	100	131	75	39	35	18	---	---	---	---	---	---
27	90	110	72	38	33	19	---	---	---	---	---	---
28	84	96	69	36	31	18	---	---	---	---	---	---
29	128	88	84	35	---	18	---	---	---	---	---	---
30	127	81	67	33	---	18	---	---	---	---	---	---
31	98	---	59	33	---	18	---	---	---	---	---	---
Total	4,119	8,442	4,013	1,464	1,367	595	---	---	---	---	---	---
Mean	133	281	129	47.2	48.8	19.2	---	---	---	---	---	---
Max	252	2,170	500	102	117	30	---	---	---	---	---	---
Min	84	45	57	30	27	12	---	---	---	---	---	---
Ac-ft	8,170	16,740	7,960	2,900	2,710	1,180	---	---	---	---	---	---
Cfsm	13.2	27.9	12.8	4.68	4.83	1.90	---	---	---	---	---	---
In.	15.17	31.09	14.78	5.39	5.03	2.19	---	---	---	---	---	---

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1980 - 2006, BY WATER YEAR (WY)*

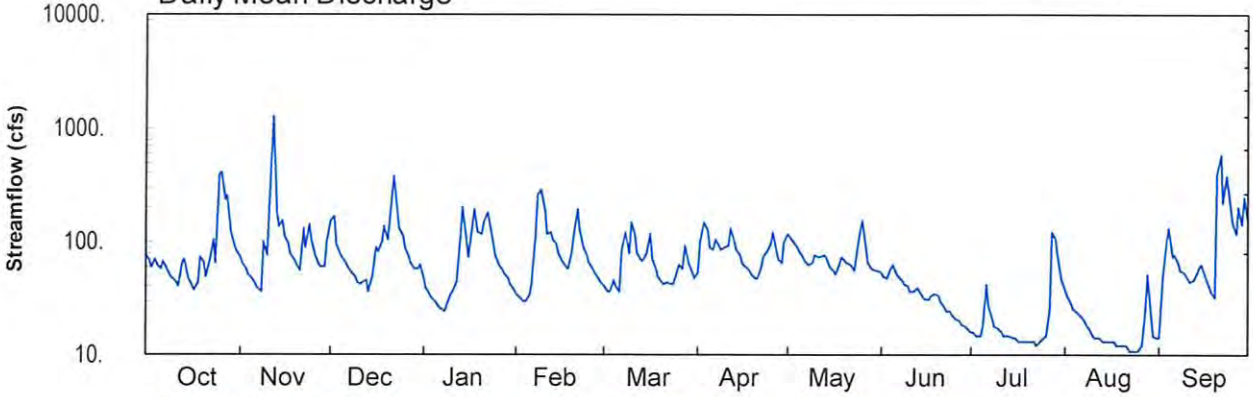
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	178	117	107	94.4	79.7	59.6	66.1	99.6	82.4	62.1	86.3	171
Max	293	281	226	184	154	122	111	167	166	111	238	295
(WY)	(1988)	(2006)	(2005)	(1984)	(1993)	(1986)	(1983)	(1983)	(1985)	(1985)	(1983)	(1991)
Min	97.1	37.0	21.7	46.3	24.8	19.2	29.0	37.1	17.9	20.6	18.3	52.8
(WY)	(2004)	(1999)	(1984)	(1988)	(1999)	(2006)	(2002)	(2003)	(2005)	(1993)	(2004)	(1986)

2004 Water Year
SOUTHEAST ALASKA

15087690 INDIAN RIVER NEAR SITKA ALASKA

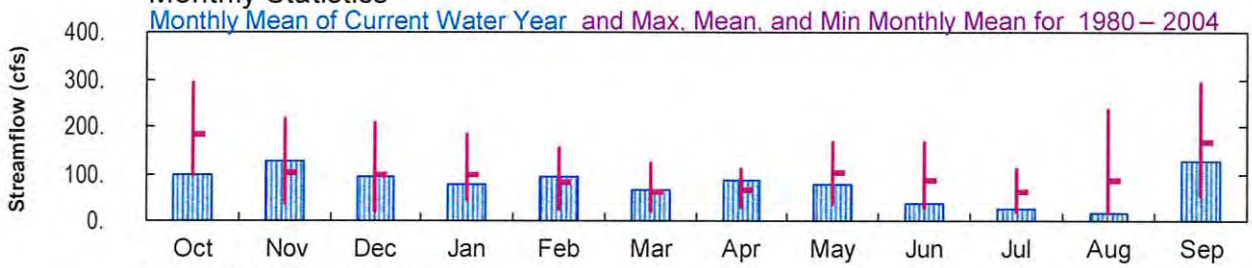
Latitude: 57° 04 ' 01" Longitude: 135° 17 ' 42" Hydrologic Unit Code: 19010203
Drainage Area: 10.1 mi^2

Daily Mean Discharge

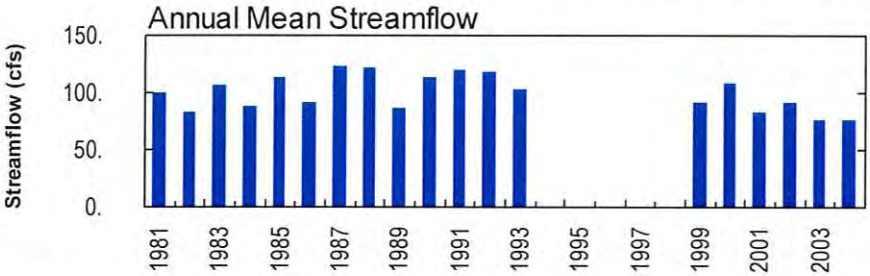


Monthly Statistics

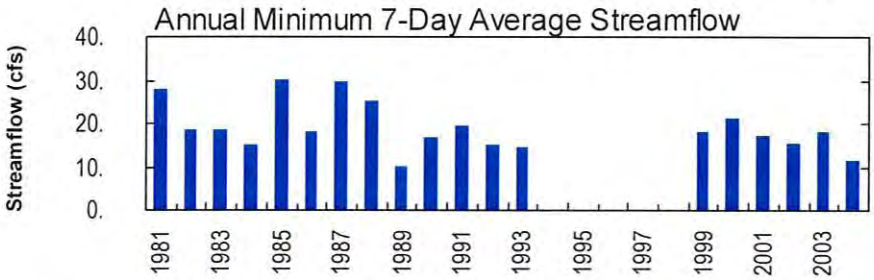
Monthly Mean of Current Water Year and Max, Mean, and Min Monthly Mean for 1980 – 2004



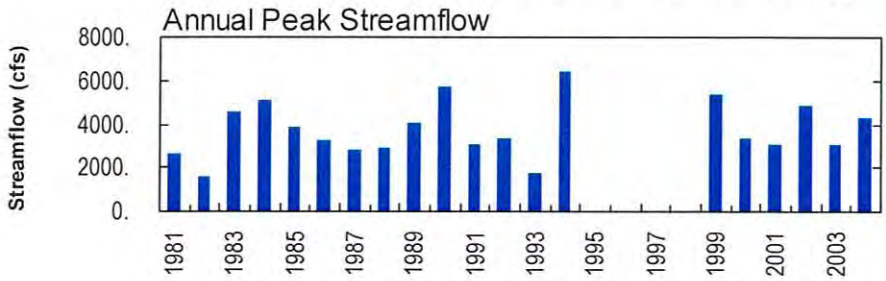
Annual Mean Streamflow



Annual Minimum 7-Day Average Streamflow



Annual Peak Streamflow



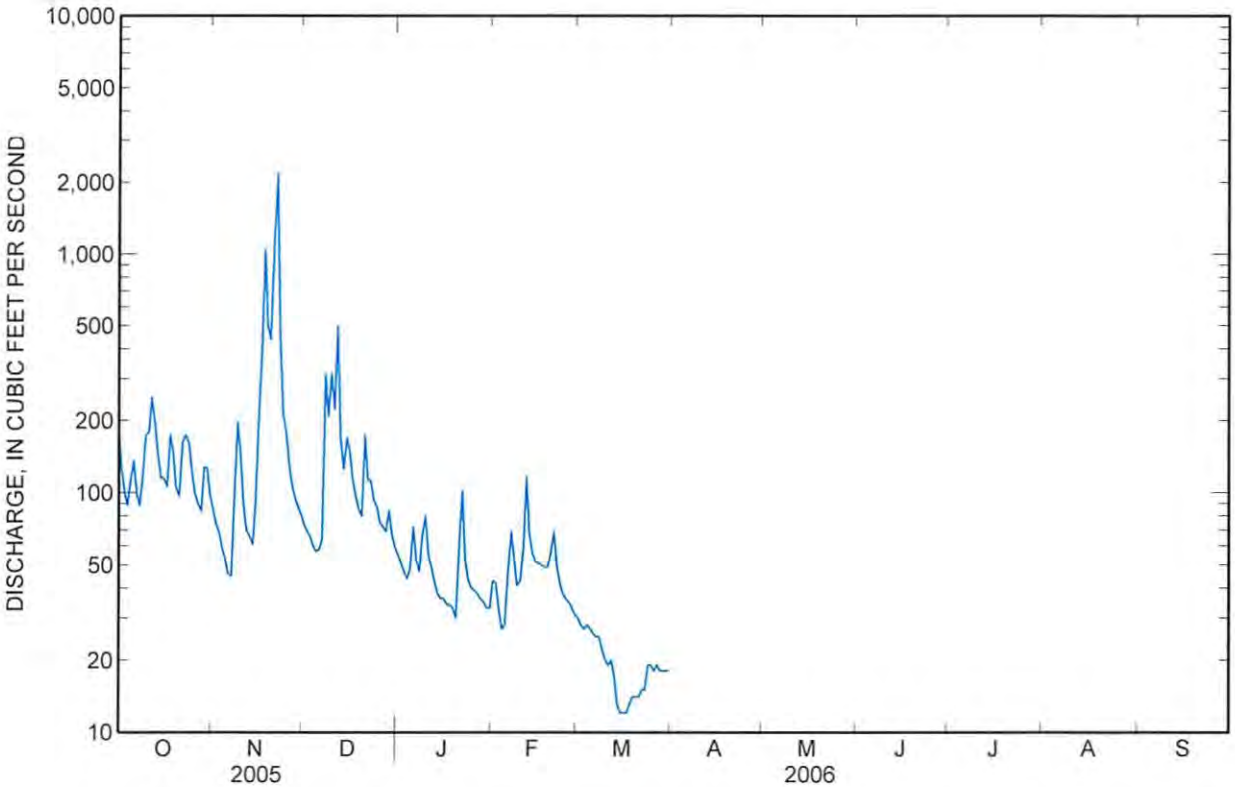
NO PHOTOS AVAILABLE FOR THIS SITE

15087690 INDIAN RIVER NEAR SITKA, AK—Continued

SUMMARY STATISTICS

	Calendar Year 2005		Water Years 1980 - 2006[a]	
Annual total	39,535			
Annual mean	108		100	
Highest annual mean			123	1987
Lowest annual mean			76.3	2003
Highest daily mean	2,170	Nov 22	2,170	Nov 22, 2005
Lowest daily mean	[a]14	Jun 13	8.6	Jan 18, 1989
Annual seven-day minimum	16	Jun 7	10	Jan 13, 1989
Maximum peak flow			[b]5,710	Sep 4, 1990
Maximum peak stage			[c]13.51	Sep 4, 1990
Instantaneous low flow			8.2	Jan 19, 1989
Annual runoff (ac-ft)	78,420		72,730	
Annual runoff (cfsm)	10.7		9.94	
Annual runoff (inches)	145.61		135.05	
10 percent exceeds	194		184	
50 percent exceeds	72		67	
90 percent exceeds	22		28	

[a] See Period of Record; partial year used in monthly statistics
[a] June 13 and 30.
[b] From rating curve extended above 3100 cfs at site and datum then in use.
[c] At site and datum then in use.



APPENDIX F:

Historical range of flow in Indian River

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category: Surface Water
Geographic Area: Alaska
GO

News New Real-Time and Site Web Services! - updated August 26, 2010

Peak Streamflow for Alaska

USGS 15087690 INDIAN R NR SITKA AK

Available data for this site Surface-water: Peak streamflow GO

City & Borough Of Sitka, Alaska
Hydrologic Unit Code 19010203
Latitude 57°04'01", Longitude 135° 17'42" NAD27
Drainage area 10.1 square miles
Gage datum 125 feet above sea level NGVD29

Output formats

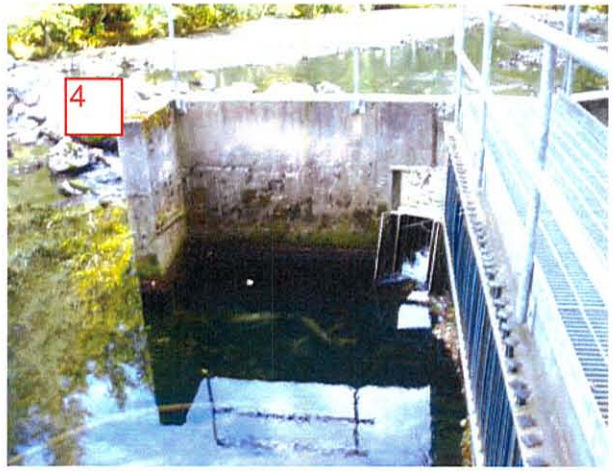
- Table
- Graph
- Tab-separated file
- peakfq (watstore) format
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1981	Sep. 07, 1981	10.48[3]	2,600
1982	Sep. 14, 1982	9.38[3]	1,580
1983	Oct. 12, 1982	12.58[3]	4,560
1984	Aug. 25, 1984	13.02[3]	5,080
1985	Feb. 26, 1985	11.94[3]	3,860
1986	Dec. 18, 1985	11.36[3]	3,270
1987	Oct. 04, 1986	10.88[3]	2,820
1988	Feb. 19, 1988	11.01[3]	2,940
1989	Nov. 29, 1988	12.13[3]	4,060
1990	Sep. 04, 1990	13.51[3]	5,710
1991	Oct. 08, 1990	11.17[3]	3,090
1992	Oct. 19, 1991	11.41[3]	3,320
1993	Jan. 29, 1993	9.68[3]	1,780
1994	Nov. 19, 1993	14.04[3]	6,460[7]
1999	Oct. 19, 1998	13.90	5,390
2000	Sep. 04, 2000	12.92	3,320
2001	Oct. 11, 2000	12.78	3,080
2002	Aug. 12, 2002	14.23	4,840
2003	Oct. 16, 2002	13.03	3,090
2004	Nov. 12, 2003	13.93	4,350
2005	Nov. 20, 2004	14.06	4,560
2006	Nov. 22, 2005	13.95	4,380

? Peak Gage-Height Qualification Codes.

APPENDIX G:

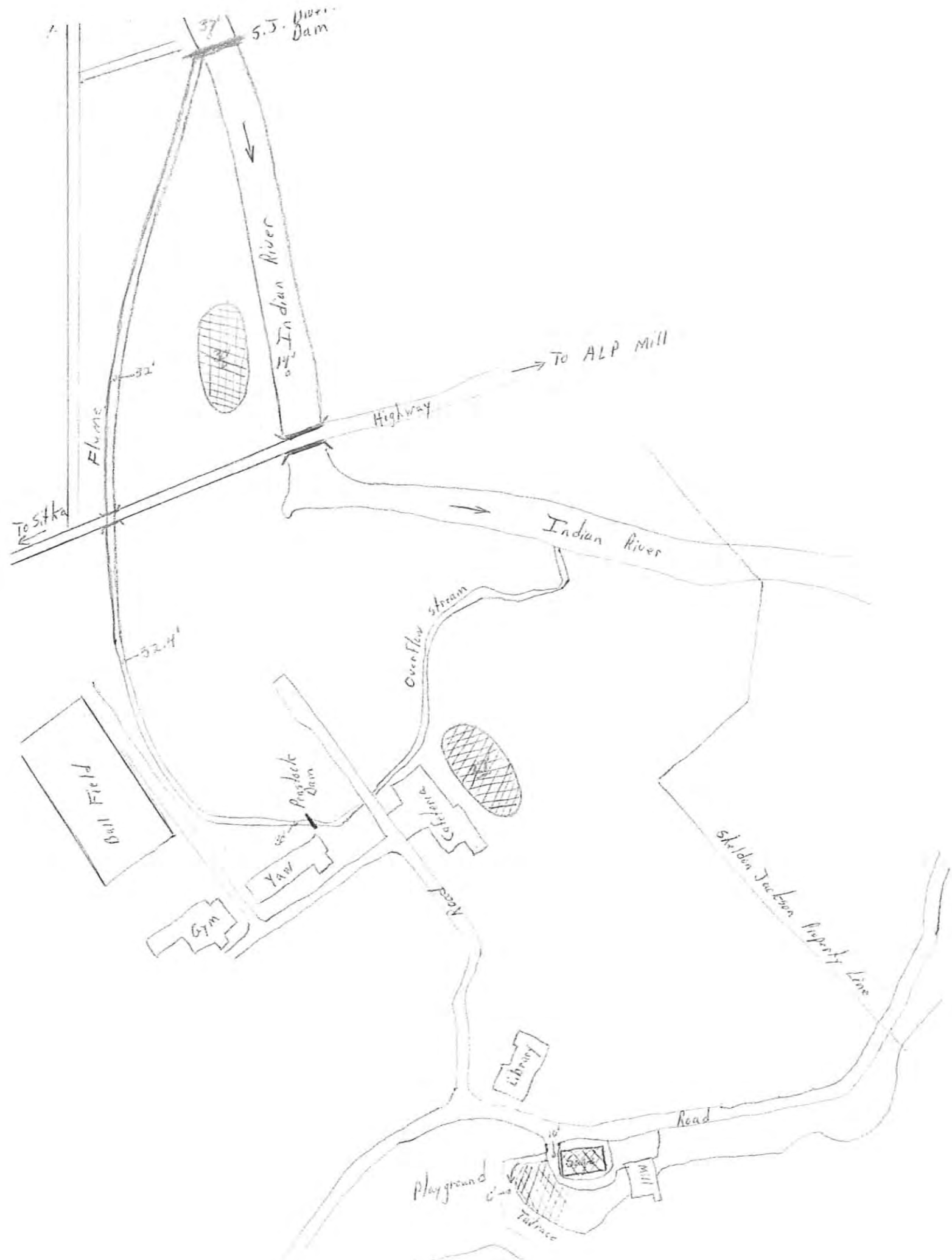
Water distribution system (photographs and diagrams)

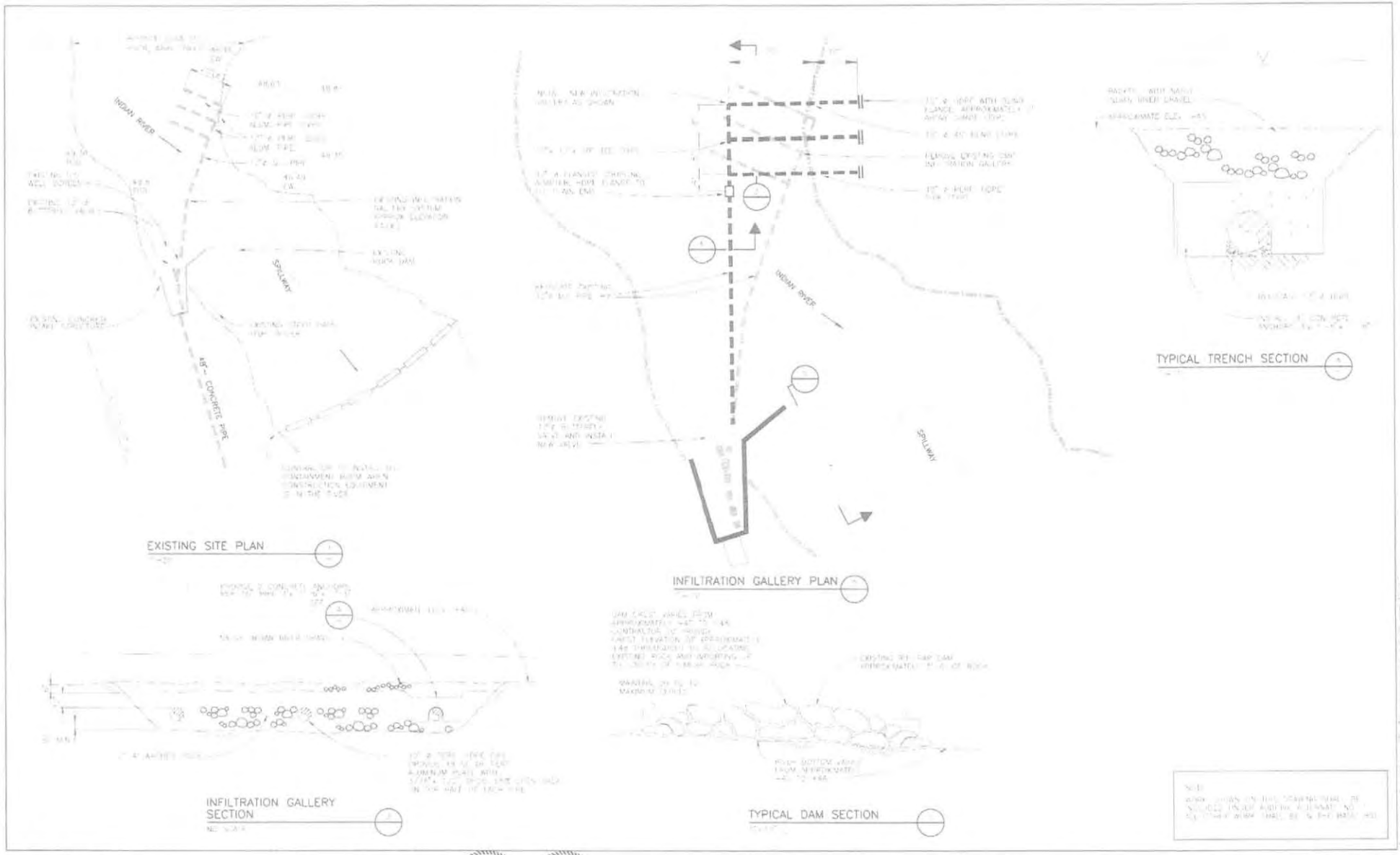


Photos:
1. view of general intake area looking upstream
2. intake 2 at Indian River
3. intake 1 at Indian River
4. end of fish ladder at Indian River
5. 1st ladder at hatchery
6 2nd ladder at hatchery

1. 36" pipe carrying flume water
2. vault where water goes into concrete pipe
3. view of flume pipe at Indian River
4. flume opening into open Sawmill Creek Road
5. upriver view of pipe from SMC
6.12 downstream pipe

1. flume with gauge at hatchery
2. Chapel dam grate
3. Chapel Dam
4. 12" influent line at hatchery


37'
S.J. River Dam
Indian River
14'
To ALP Mill
Highway
32'
Flume
To Sitka
Indian River
Overflow stream
32.4'
Ball Field
Ponstock Dam
Cafeteria
Yard
Gym
Road
Sheldon Jackson Property Line
Library
Road
Playground
Tailrace
Mill



KCM

KCM, Inc.
1917 First Avenue
Seattle, Washington 98101

SHELDON JACKSON COLLEGE
FLUME REPLACEMENT
SITKA, ALASKA

HATCHERY INTAKE AND DAM
RENOVATIONS

C05

6 of 9

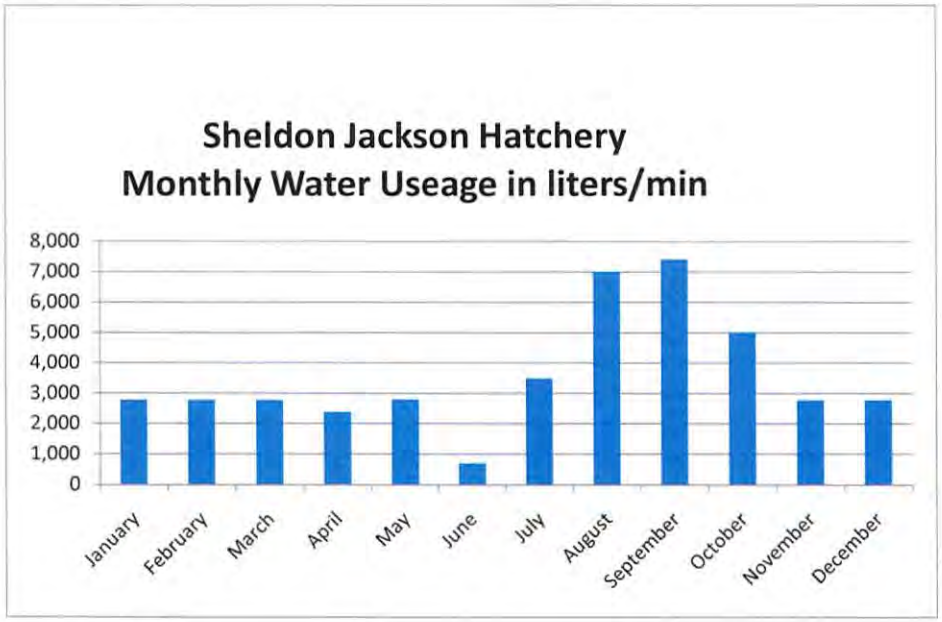
APPENDIX H:

Annual water budget for SJ Hatchery

9/23/2010
Sheldon Jackson Hatchery Water Useage Table
All water flow values are in liters per minute

Month	Incubation pink	Incubation chum	Incubation coho	Incubation Total	Freshwater Rearing	Adult Holding/fish ladder	Total Monthly Water Useage
January	270	90	80	440	1900	0	2780
February	270	90	80	440	1900	0	2780
March	270	90	80	440	1900	0	2780
April	0	0	80	80	2240	0	2400
May	0	0	0	0	2800	0	2800
June	0	0	0	0	700	0	700
July	0	0	0	0	1100	2400	3500
August	240	120	0	360	1500	4800	7020
September	240	120	0	360	1900	4800	7420
October	240	120	0	360	1900	2400	5020
November	270	90	80	440	1900	0	2780
December	270	90	80	440	1900	0	2780

January	2,780
February	2,780
March	2,780
April	2,400
May	2,800
June	700
July	3,500
August	7,020
September	7,420
October	5,020
November	2,780
December	2,780



SJ Hatchery adult returns

Year	Pink	Chum	Coho	Chinook
2002	44,444	2,337	627	80
2003	101,110	9,109	1,962	132
2004				
2005	1,456	18,233	94	42
2006	41,460	34,811	6,957	34
2007	102,915	61,747	6,957	87
2008	112,211	100,948	5,460	179
2009(proj)	98,600	165,692	6,366	448

Appendix I:

General Description of facility diagrams

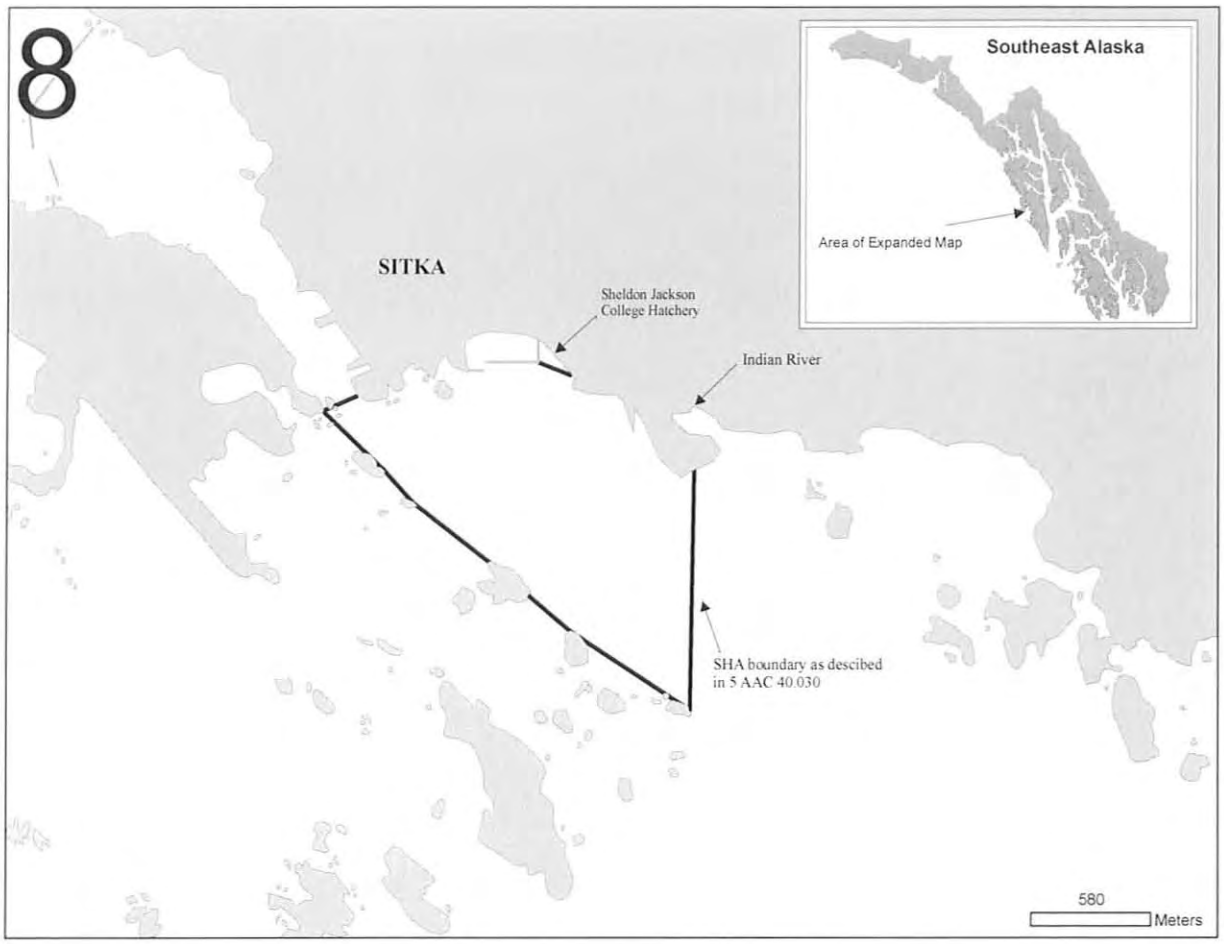
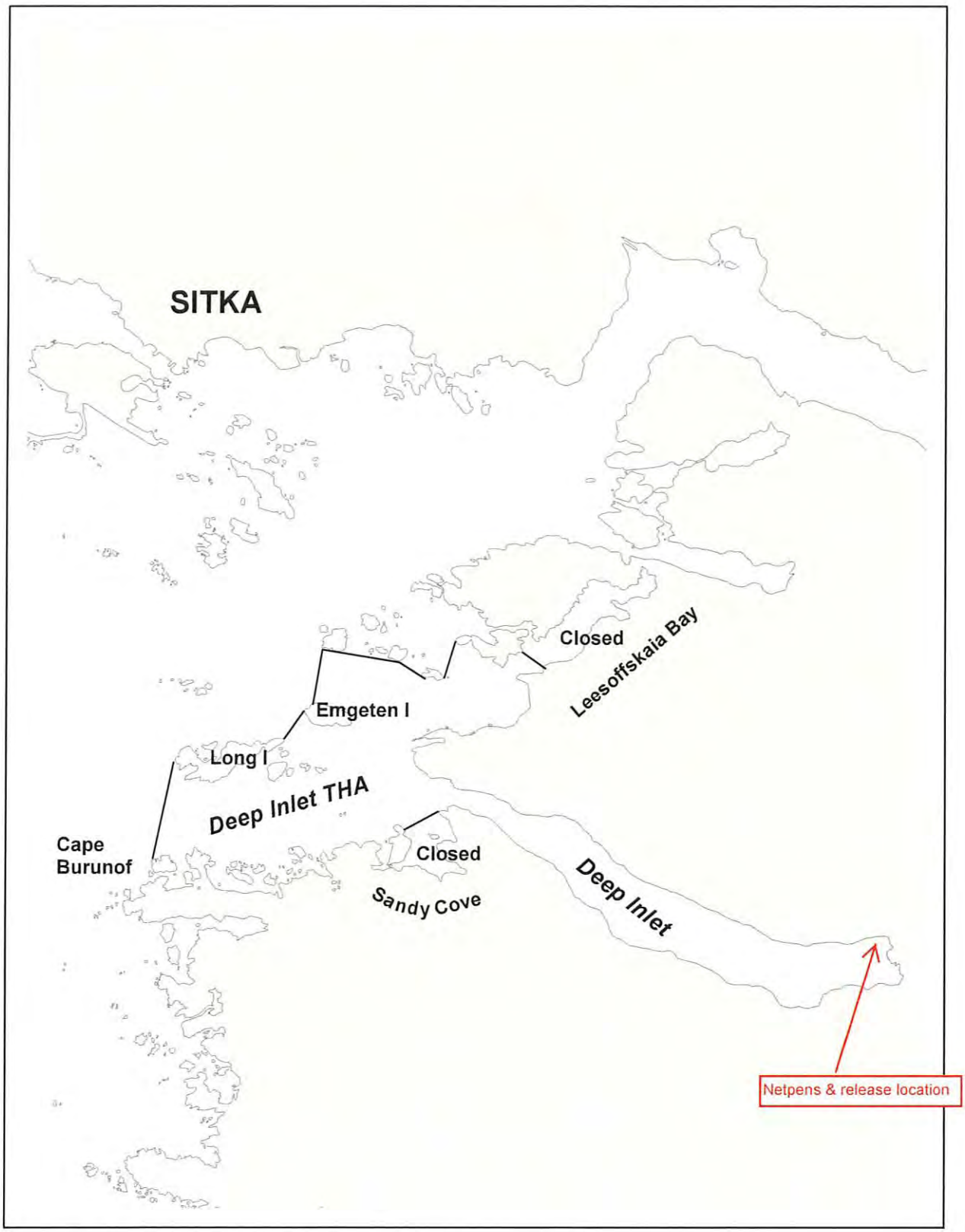
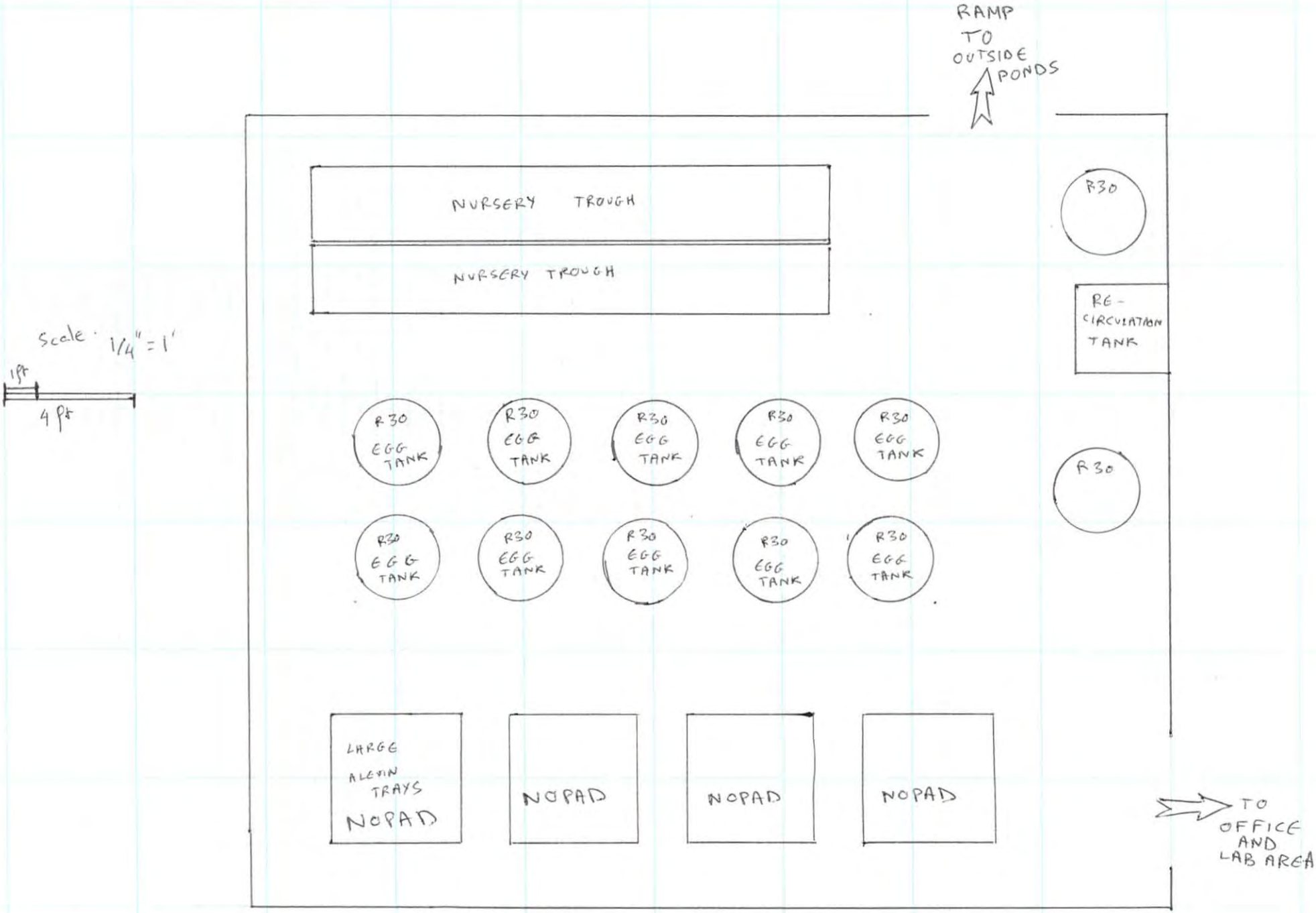

8
Southeast Alaska
Area of Expanded Map
SITKA
Sheldon Jackson
College Hatchery
Indian River
SHA boundary as descibed
in 5 AAC 40.030
580
Meters

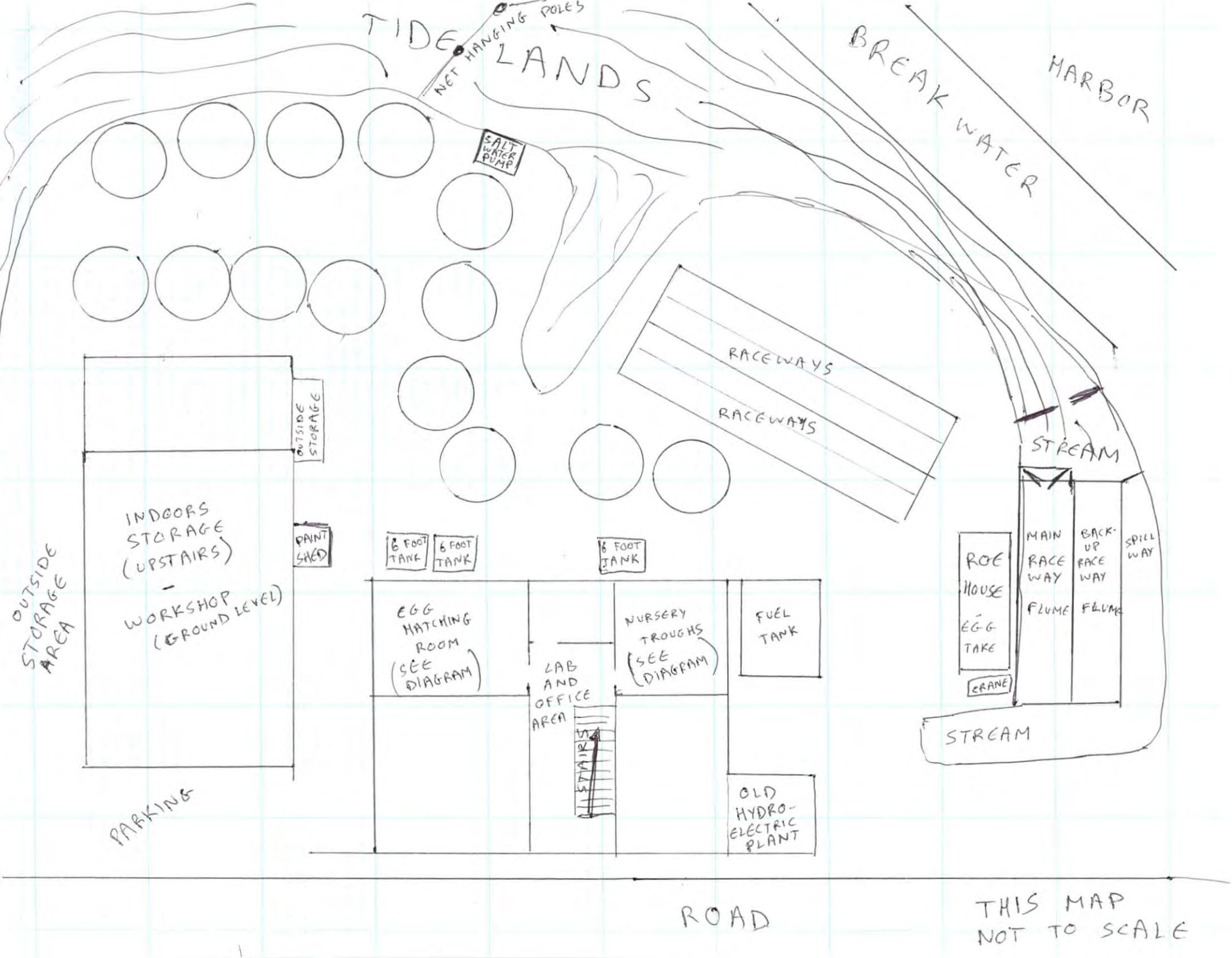
Figure 2. Indian River watershed, Alaska

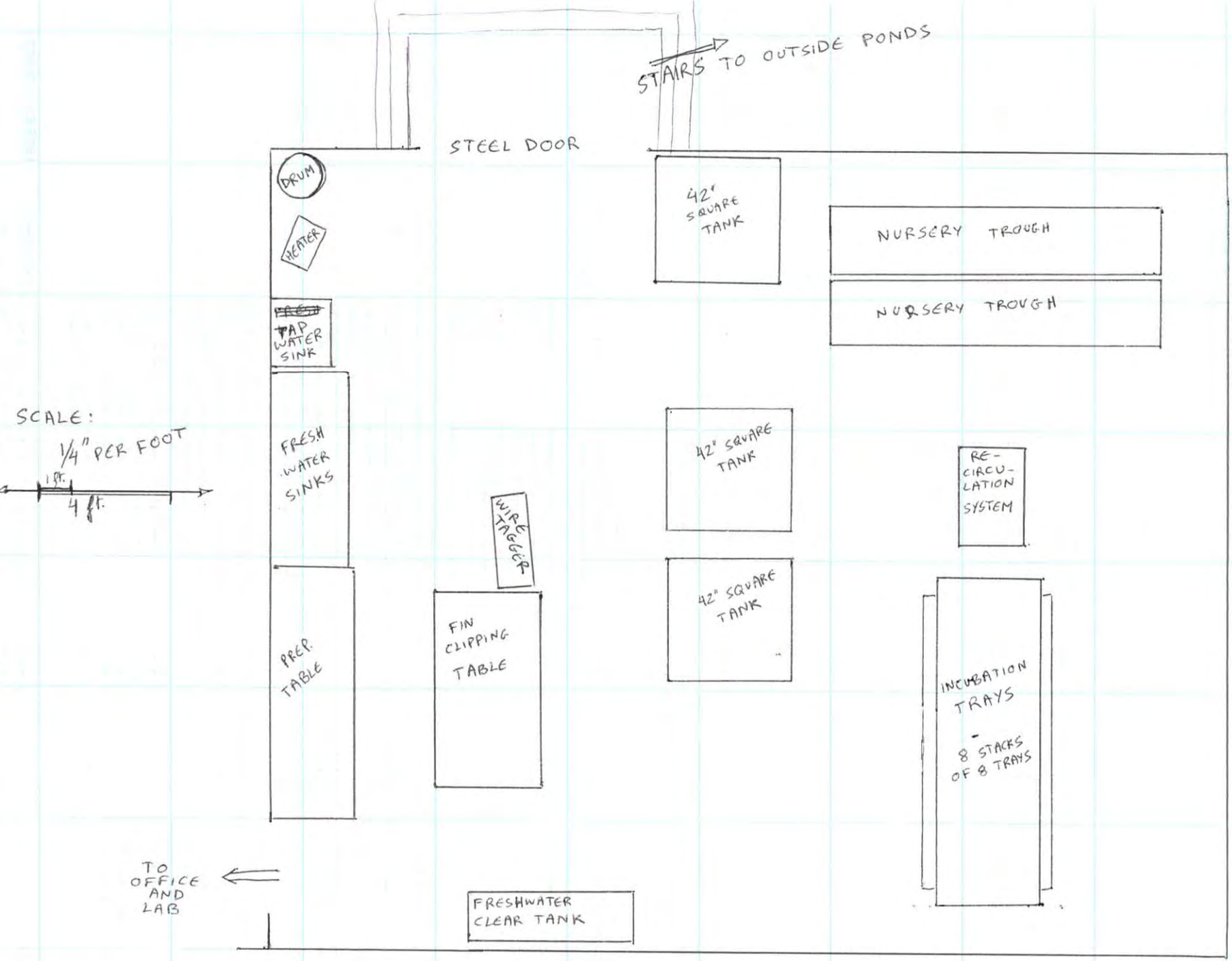


Deep Inlet Terminal Harvest Area

Printed with FinePrint - purchase at www.fineprint.com
PDF created with FinePrint pdfFactory trial version www.pdffactory.com


RAMP TO OUTSIDE PONDS
NURSERY TROUGH
NURSERY TROUGH
R30
RE-CIRCULATION TANK
Scale: 1/4" = 1'
1 ft
4 ft
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
R30
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
R30 EGG TANK
LARGE ALEVIN TRAYS NOPAD
NOPAD
NOPAD
NOPAD
TO OFFICE AND LAB AREA


TIDE LANDS
NET HANGING POLES
BREAK WATER
HARBOR
SALT WATER PUMP
RACEWAYS
RACEWAYS
STREAM
OUTSIDE STORAGE
INDOORS STORAGE (UPSTAIRS) - WORKSHOP (GROUND LEVEL)
PAINT SHED
OUTSIDE STORAGE AREA
6 FOOT TANK
6 FOOT TANK
6 FOOT TANK
EGG HATCHING ROOM (SEE DIAGRAM)
LAB AND OFFICE AREA
STAIRS
NURSERY TROUGHS (SEE DIAGRAM)
FUEL TANK
OLD HYDRO-ELECTRIC PLANT
ROE HOUSE - EGG TAKE
CRANE
MAIN RACE WAY FLUME
BACK-UP RACE WAY FLUME
SPILL WAY
STREAM
PARKING
ROAD
THIS MAP NOT TO SCALE


STAIRS TO OUTSIDE PONDS
STEEL DOOR
DRUM
HEATER
~~FRESH~~ TAP WATER SINK
FRESH WATER SINKS
PREP. TABLE
WIRE TAGGER
FIN CLIPPING TABLE
42" SQUARE TANK
42" SQUARE TANK
42" SQUARE TANK
NURSERY TROUGH
NURSERY TROUGH
RE-CIRCU-LATION SYSTEM
INCUBATION TRAYS
8 STACKS OF 8 TRAYS
FRESHWATER CLEAR TANK
TO OFFICE AND LAB
SCALE:
1/4" PER FOOT
1 ft.
4 ft.

Appendix J:

Resume of Technical Advisors

James A. Seeland

312 Cascade St., Sitka, AK 99835
907-738-1190
jseeland@gci.net

SUMMARY OF QUALIFICATIONS

- 2.5 years as adjunct professor of fisheries for UAS/Ketchikan Fisheries Tech Program
- 22 years as hatchery manager/assistant manager at a large salmon production facility
- 2 years living and working at a remote salmon production facility
- 3 years self-employed as a wildlife naturalist on boat tours and running a small business
- 3.5 years as a laboratory assistant in virology, serology, and pesticide laboratories
- 2 years as adjunct professor at Sheldon Jackson College instructing mariculture courses and providing program development
- 3 years as self-employed fisheries consultant

EDUCATION

B.S. in Fish and Wildlife Biology, University of Missouri, Columbia, MO

RELEVANT SKILLS AND EXPERIENCE

Instruction

- Work with UAS staff to promote Alaska Tech Prep programs and other outreach to Southeast Alaska schools.
- Develop and implement "Alaska Fish Culture Techniques", a college-level course designed to instruct students in hatchery techniques.
- Instruct college level fisheries students using distance-delivered methods, specifically Elluminate through the UAS system. Help develop FT122/222, Fin Fish Culture course. Work includes monitoring student progress, communicating with students through email, phone, and live/online in class.
- Instructed 300 level mariculture courses at Sheldon Jackson College. Develop curriculum, evaluate student progress, work with industry professionals to develop the program. Course was instructed on campus and included lab sessions as well as lecture.

Fish Culture

- Extensive knowledge of fresh and saltwater culture of pink, chum, coho, and Chinook salmon.
- Knowledge of specialized equipment associated with salmon and trout culture including coded wire tag machines, egg picking machines, size grading equipment, vaccination and enumeration equipment and all manners, and others.
- Knowledge of record-keeping associated with a fish production facility including: growth, feeding, environmental, and inventory.
- Actively involved in carrying out fish culture duties from planning to implementing.

Supervisory

- Oversee annual and ongoing project planning
- Responsible for scheduling, hiring, and supervising 5 permanent employees as well as up to 6 seasonal employees.
- Work with employees to provide a safe workplace. Develop various policies and procedures to assure workplace safety and comply with OSHA standards.
- Communicate with employees about personal and workplace concerns on both personal and group levels.
- Act as a team leader whose job is to provide employees with the tools and training they need to get their job done, encourage teamwork and recognize individual achievements.

- Develop and maintain an annual hatchery budget in excess of one million dollars.
- Develop new programs and assess the performance of existing programs.
- Oversee the maintenance of facilities and assure that materials are purchased, scheduled work is done, and projects are completed on time.

Personal Skills

- Operation of all manners of power tools, backhoe, diesel forklift, various hoists, many types of boats up to 27 feet.
- Help to set up and operate remote field camps and live/work in the camps.
- Open Water Diving Certification is used extensively for hatchery work in repairing structures, retrieving mortalities from net pens and other work as needed.
- Proficient in the use of various computer programs such as: MS Word, Excel, PowerPoint.
- Provide written and oral presentations to the NSRAA Board of Directors twice yearly. Other reports include: Annual Report to the Dept. of Fish and Game, reports to the Dept. of Environmental Conservation, and Dept. of Natural Resources.
- Attend and make presentations to the State of AK Hatchery Managers Meeting each year.
- Maintain open communication with other NSRAA project leaders as well as peers employed with other aquaculture associations.
- Encourage tourism and public relations through: commercially-operated tours, annual community Open House, working with Sheldon Jackson College students and staff, working with local elementary schools, educating all visitors to the hatchery site regarding NSRAA and AK salmon fisheries issues.
- USCG 50 ton Masters License
- Communicate well with students to help them succeed in college-level courses by listening to their needs and providing necessary resources.
- Problem-solving skills include program development, budget development, public interactions, college-level instruction, boat mechanical issues as well as helping to raise two adult children.

Personal Interests

- Fishing, hunting, camping, seafood harvesting of all manners.
- Diving
- Educating visitors about Alaska's natural resources and, in particular, salmon fisheries issues.
- Helping to educate children
- Reading

WORK HISTORY

University of Alaska Southeast	2005 - present
Northern Southeast Regional Aquaculture Assn.	1982 – 2005
Sheldon Jackson College	Winter/Spring 2005
Prince Wm. Sound Aquaculture Assn.	1980 - 1982
Troutlodge Inc.	1977 - 1980
University of Missouri Medical Center	1974 – 1977

Lisa Busch
834 Lincoln Street
Sitka, Alaska
(907) 747 8878
lbusch@sitkasoundsciencecenter.org

EDUCATION

University of Alaska. Fairbanks 2005-08. MA. Northern Studies
University of Colorado. Boulder, Colorado 1999-2000. Ted Scripps Fellow for Environmental Journalism: History and Philosophy of Science.
Tufts University. Medford, Massachusetts 1984-1988. B.S. Geology, Environmental Studies

WORK EXPERIENCE

Executive Director
Sitka, Alaska. Direct Manager and direct programs and facility for Sitka Sound Science Center, a 501c3 non profit that operates an educational fish hatchery, an aquarium and scientific research programs funded by state, federal and private foundations. Fundraise and operate non -profit organization. Work with board of directors; develop community and regional partnerships to ensure the science education and research mission of the organization is carried out.

Executive Producer
Sitka, Alaska. Fundraise, produce, edit, and manage weekly national public radio program called *Encounters: Radio Experiences in the North* hosted by cultural anthropologist Richard Nelson and featuring NPR reporter Elizabeth Arnold. The program highlights science, natural history and native ways of knowing and is funded by the National Science Foundation, North Pacific Research Board and private foundations. www.encountersnorth.org . 2006 – Present.

Cadmus Professional Writing Services
Sitka, Alaska. Owner of private grant writing business. Wrote successful grants to state, federal and private foundations including Rasmuson Foundation, the National Endowment for the Arts, National Science Foundation and the State of Alaska for Sitka non-profit agencies. 2002-2006.

Executive Producer
Sitka, Alaska. Executive producer of a ten-part series for public radio entitled *Common Knowledge: Science and Tradition in Native America,* profiling issues where science and traditional Native ways of knowing intersect and overlap and funded by Sloan Foundation, National Science Foundation and CPB. Producer of *Alaskan Women in Science*, profiling women working in diverse sciences in Alaska. Distributed by PRI and Voice of America.1994-1998.

Associate Producer
Sitka, Alaska. Discovery Channel Online and OnHealth.com. Organized experts on a wide range of scientific topics to participate in regular forums for online magazines. 1997-1999.

Science Writer
Washington, D.C. *U.S. News and World Report* magazine in science and society section. 1993.

COMMUNITY SERVICE

Co-Founder Sitka Trail Works – created the community coalition, participated in the planning and creation of the non-profit, secured initial funding, helped to hire staff and crew, and worked with local, state and federal officials on capital project funding. Helped created the Sitka Trail Plan and oversee staff and policy making.

Founder Sitka Tree and Landscape Committee for City and Borough of Sitka – conceptualized the committee, gathered local experts, lobbied Assembly members to make the group a city-sanctioned organization that produces high profile beautification projects for downtown Sitka. As a current member of the committee I write grants for small planting projects, work with city staff and help maintain existing projects(by weeding and watering!) Conceptualized the Wild Fish project and helped to raised money for the mural project on Marine Services Building on Katlian Street.

Mini Sitka Fine Arts Camp Cofounder, K-5th graders- Co-founded the camp in conjunction with the Sitka Fine Arts Camp (SFAC). As director I raised funds for scholarships, organized counselors, set-up the program in partnership with the executive director of the SFAC .

Mt. Edgecumbe Preschool Board of Directors-Director of Building Committee- Worked to secure a new facility and funding for the Mt. Edgecumbe Preschool after it was evicted from its Japonski Island location. Successfully lobbied the FAA for major funds to renovate the Pioneers Home Nurses Quarters for the new base for the school.

Artist in Residence program- Program creation and fundraise successfully through private donations and the State Arts Council to institute an annual visiting artists program in the Sitka School District and Mt. Edgecumbe High School.

CHUMS program founder for Sitka High School. Develop a program that trains high school students how to help kids new to Sitka network and feel more comfortably socially in school. Designed and performed trainings and helped to institutionalize the program at the school.

Communication Badge Instructor for the Boy Scouts 7-9 grade boys. Lead toastmaster-like exercises to help boys gain confidence in public speaking.

HONORS

1988 AAAS Science in the Mass Media Fellowship
1989 Best News Cast-- Awarded by the Alaska Press Club
1991 Best Daily News Cast- awarded by the Public Radio News Directors Association
1992 Best Health and Science Documentary--awarded by the American Association for Professional Journalists
1992 Best Documentary-- awarded by the Alaska Press Club for half-hour piece on the acoustics of Whales.
1995 Best Documentary Series- awarded by the Alaska Press Club for series on Alaskan Women in Science.
1999-2000 Ted Scripps Fellowship for Environmental Journalism
2001- Best Science Feature Alaska Press Club
2005- Volvo For Life Award for environment.
2009 Ocean Media Award, North Pacific Research Board, COSEE

218 Shotgun Alley, Sitka Alaska 907-738-3509 steve.reifenstuhl@gmail.com

Steve Reifenstuhl

Objective Fisheries professional

Experience

February '10 to current | **Northern S.E. Regional Aquaculture Association** | Sitka Alaska

General Manager

- Senior executive of non-profit organization reporting to board of directors
- Strategic planning, budget development, legislative, science, community outreach
- Participate in Board of Fisheries and committee work

March '09 to current | **Southeast Herring Conservation Alliance** | Sitka Alaska

Executive Director

- Senior executive reporting to board of directors
- Initiate non-profit organization, manage membership, budgeting, manage programs
- Participate in Board of Fisheries representing best science

---

February '09 to Jan '10 | **Silver Bay Seafoods** | Sitka Alaska

Fleet Manager

- Manage 65 seine boats and 25 tenders for large seafood producer
- Assist CEO in program development and program execution
- Represent company at Board of Fisheries

Aug1979 to Jan 2009 | **Northern Southeast Regional Aquaculture** | Sitka Alaska

Operations Manager

- Program operations, $4 million program budget
- Permitting and program development
- Board of directors communication, fishermen interactions
- Regional planning for fisheries, scientific presentations
- Board of Fisheries and committee work

---

218 Shotgun Alley, Sitka Alaska 907-738-3509 steve.reifenstuhl@gmail.com

Steve Reifenstuhl

June 1990 to current **Patagonia Inc.** Ventura CA

Product Tester/Product Development

- Test products for performance
- Promote product in race venues
- Ambassador 1999

2006 to current **Montrail Inc.** Portland, OR

National Ultra Endurance Race Team

- Race in National and International venues

April 1975 to Aug 1979 **U.S.F.S** Sitka, Petersburg, Ketchikan, Alaska

Fisheries Biologist

- Stream surveys for salmon habitat inventory
- Environmental Education
- Biological assessment of lakes for coho rearing

Education

1969 to 1975 West Virginia University Morgantown WV

B.S., M.S. program

- Full research scholarship to graduate school

Committees

State of Alaska Science panel for cruise ship waste water – February 2010 - present

EPA National Rule for Hatchery effluents – represented Alaska 2002 -2004

State of Alaska Water Quality – fisherman seat approx. 1990 - 1992

State of Alaska Forest Practices – fisherman seat approx. 1995 – 1997

City of Sitka Air and Water Quality Commission – approx. 1988 - 1991

Interests

Mountain climbing, racing, snowboarding, ocean kayaking, surfing, hunting, reading, friendship

218 Shotgun Alley, Sitka Alaska 907-738-3509 steve.reifenstuhl@gmail.com

Steve Reifenstuhl

References Rich Riggs, CEO Silver Bay Seafoods

Kevin McDougall, President NSRAA

Bob Thorstenson , Executive Director SEAS

John Barry, VP NSRAA, Board member SHCA,

Appendix K:
Financial Plan

Updated: 9/23/2010

Sheldon Jackson Hatchery Budget

Category	Item		
Employee Salaries	Hatchery Mgr	$40,000	(+housing)
	Fish Culturist	$37,440	
	Other labor	$10,000	
Payroll Taxes	EIS/WC (12%)	$9,293	
Contract Labor		$1,000	
Supplies	Fish Food	$20,000	
	Other	$5,000	
Postage/shipping		$500	
Travel		$500	
Utilities (electrical, heating oil)		$7,200	
Insurance		$2,600	
boat, truck		$1,400	
building			
liability, DO		$2,000	
Fuel		$1,000	
Moorage		$650	
Equipment maintenance and repair		$5,000	
Equipment purchases		$2,000	
Taxes, permits		$1,000	
		$146,583	

Cost recovery revenue - fish returning to SJH

Species	released	% adult return	returning adults	fish remain after interception @ 60%	broodstock
pink	2,800,000	2	56,000	22,400	3800
chum	980,000	2	19,600	7,840	1200
coho	230,000	8	18,400	7,360	300

Species	t recovery (	pounds per fish	pounds CR	price per pound	alue after CR expens	Net revenue
pink	18,600	3.5	65,100	$0.38	0.26	$16,926
chum	6,640	7	46,480	$0.50	0.38	$17,662
coho	7,060	8	56,480	$0.90	0.78	$44,054
						$78,643

APPENDIX L:

ADF&G Management Plan

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

DEPARTMENT OF FISH AND GAME

Division of Commercial Fisheries

P.O. BOX 115526
JUNEAU, AK 99811-5526
PHONE: (907) 465-4210
FAX: (907) 465-2604

July 7, 2010

Jim Seeland
Sheldon Jackson Hatchery
801 Lincoln Street
Sitka, AK. 99835

Dear Mr. Seeland,

Enclosed please find the final signed 2010 Annual Management Plan for Sheldon Jackson Hatchery.

Sincerely,

Bruce White
PNP Hatchery Program

MEMORANDUM

State of Alaska
Department of Fish and Game

TO: David Bedford
Deputy Commissioner
Juneau

DATE: June 24, 2010

THRU: Sue Aspelund
Deputy Director
Comm. Fish – Juneau

TELEPHONE NO: (907) 465-6152
FAX (907) 465-4168

Sam Rabung
PNP Hatchery Program Coordinator
Comm. Fish – Juneau

SUBJECT: Sheldon Jackson College Hatchery Annual Management Plan

FROM: Bruce White BW
PNP Hatchery Program
Comm. Fish – Juneau

The enclosed 2010 Salmon Hatchery Annual Management Plan has been prepared by the hatchery operator and the department, and has been approved by the appropriate Area Management Biologists and Regional Supervisors for the Commercial and Sport Fish Divisions, as well as the Regional Resource Development Biologist.

Sheldon Jackson College Hatchery

This plan fulfills the requirements of 5 AAC 40.840., and I would recommend that it be approved with your signature.

RECEIVED
JUN 10 2010
COMM FISH

2010

Annual Management Plan

For
Sheldon Jackson College Hatchery
Sitka

PRODUCTION SUMMARY SHELDON JACKSON HATCHERY 2010

	2009	2010	2011
	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A
SPECIES **PINK SALMON**	BY 2009 E 1 M SJC Thermal Marking	R 1 M SJC	BY 2010 E 1 M SJC Thermal Marking R 1 M SJC
SPECIES **CHUM SALMON**	BY 2009 E 1 M SJC Thermal Marking E 9 M Med.	Release 1 M SJC (fed) R 9 M Deep Inlet (fed)	BY 2010 E 1 M SJC Thermal Marking E 9 M MED. R 1.0 M SJC (fed) R 9 M Deep Inlet (fed)
SPECIES **COHO SALMON**	BY 2009 E 150 K SJC BY 2008 SJC Coho	Tag 20K in March, 2010 Release Smolts	Tag 20 K in March, 2011 BY 2010 E 150 K SJC Release smolts Tag 20 K in March, 2012
SPECIES **CHINOOK SALMON**	BY 2009 E 100 K Med / SJC BY 2008 Med / SJC Chinook	Tag 20 K in March, 2010 Release Smolts	Tag 20 K in March, 2011 BY 2010 E 100 K Med / SJC Release smolts Tag 20 K in March, 2012

E= EGG TAKE
I = INCUBATION
R = REARING
T = TAGGING
R = RELEASE

Sheldon Jackson College Hatchery

2010 Annual Management Plan

This plan remains in effect until superseded by the next year's Annual Management Plan (AMP). The AMP serves as an instruction manual for hatchery operations and adult return management; it is incumbent upon the local ADF&G and hatchery staff to share information with each other regularly for successful adherence to this plan. Anticipated departures from the plan should be communicated as soon as possible in the event an amendment is necessary. Unintended and unexpected changes should be disclosed immediately. In the event that changes are necessary, the ADF&G PNP Coordinator will determine whether an amendment, exception report, or other action is warranted.

Introduction

Sheldon Jackson College Hatchery (SJ Hatchery) is located at the Sitka Sound Science Center (Sage Building), 834 Lincoln St., on Crescent Bay, Sitka, Alaska. The hatchery was an integral part of the Environmental Science Program at Sheldon Jackson College (SJC) until academic programs ceased in July 2007. Since that time Sitka Sound Science Center Inc. (SSSC) has continued hatchery programs under an agreement with the SJC Trustees. SSSC is a 501c3 non-profit agency established by former SJC faculty. SJC and SSSC signed a 10-year lease of the Sage building and associated facilities in 2009. SJ Hatchery uses Indian River as its water source and Crescent Bay as the Special Harvest Area for cost recovery harvest of pink, chum, coho, and Chinook salmon. Projected returns for the 2010 season are listed in Table 1. Historical production for pink, chum, coho, and Chinook salmon are presented in Tables 2 - 5.

The permitted capacity of SJ Hatchery is 10 million green chum salmon eggs, 1 million green pink salmon eggs, 150,000 green coho salmon eggs, 100,000 green Chinook salmon eggs, and 20,000 green steelhead eggs. The intent of SSSC is to continue fish culture operations at SJ Hatchery in order to provide other institutions such as University of Alaska Southeast (UAS)-Ketchikan, UAS-Sitka, and secondary schools with a venue for training students in fisheries and hatchery science, while at the same time contributing salmon to the common property fisheries of Sitka Sound and Southeast Alaska. SSSC, under agreement with NSRAA, is providing on-the-job training for seasonal hatchery technicians.

I. New This Year: (production, harvest management, culture techniques, etc.)

1. Build an adult return facility to allow more efficient cost recovery operations, allow for full utilization of adult carcasses, and provide infrastructure for training programs.
2. Formalize a contract between NSRAA and SSSC regarding Deep Inlet chum salmon releases and cost recovery revenue.
3. SJ Hatchery will be seeking a fish transport permit (FTP) to allow the transfer of excess chum salmon eggs from the SJ Hatchery to Medvejie Creek Hatchery, if chum salmon returns to Medvejie are inadequate to achieve egg-take goals.

New FTPs or Amendments Needed This Year:

82-19 Pink salmon egg take at SJ Hatchery. Expires 12/31/10.
84J-1010 Chum salmon egg take at SJ Hatchery. Expires 12/31/10.
87J-1044 Chum salmon egg transfer from Medvejie Creek Hatchery to SJ Hatchery. Expires 12/31/10.
06J-1020 Chum salmon egg take Indian River to SJ Hatchery. Expires 11/01/10.
02J-1020 Chum salmon transfer of fry from SJ Hatchery to Deep Inlet. Expires 12/31/12.
82-20 Coho salmon egg take at SJ Hatchery. Expires 12/21/10.
06J-1012 Coho salmon egg take Indian River to SJ Hatchery. Expires 12/01/10.
88J-1123 Chinook salmon egg take at SJ Hatchery. Expires 12/31/10.
06J-1031 Chinook salmon egg take Indian River to SJ Hatchery. Expires 12/01/10.

FTPs

Species	FTP#	Eggtake, Transfer or Release	From to	Maximum #/ life stage	Sources	Expires
Pink salmon	82-19	Egg take	SJC to SJC	20,000,000 / eggs	SJC Hatchery	12/31/10
Chum salmon	84j-1010	Egg take	SJC to SJC	5M, eggs	SJC Hatchery	12/31/10
Chum salmon	87j-1044	Transfer	Medvejie to SJC	5M, eggs	Medvejie	12/31/10
Chum salmon	06j-1020	Egg take	Indian River to SJC	1 M, eggs	Indian River	11/01/10
Chum salmon	02J-1020	Transfer	SJC to Deep Inlet	4M, fry	Medvejie	12/31/12
Coho salmon	82-20	Egg take	SJC to SJC	150,000, eggs	SJC Hatchery	12/21/10
Coho salmon	06j-1012	Egg take	Indian River to SJC	150,000, eggs	Indian River	12/01/10
Chinook salmon	88j-1123	Egg take	SJC to SJC	100,000, eggs	SJC Hatchery	12/31/10
Chinook salmon	09J-1015	Transfer	Medvejie to SJC	100,000, eggs	Medvejie	3/31/14
Chinook salmon	06J-1031	Egg take	Indian River to SJC	100,000, eggs	Indian River	12/01/10

1.0 Operational Plans for 2010

1.1 Egg Take Limits and Goals

Species	Egg take limits	Egg take goals	Females needed
Pink salmon	1,000,000	1,000,000	650
Chum salmon[1]	10,000,000	10,000,000	4,600
Coho salmon[2]	150,000	150,000	60
Chinook salmon[3]	100,000	100,000	25

[1] In the event hatchery returns are not adequate to meet broodstock needs, chum salmon brood may be supplemented from Medvejie Creek hatchery returns if they are available.
[2] Coho salmon brood may be supplemented from Indian River.
[3] Chinook salmon brood may be supplemented from Indian River or Medvejie Creek hatchery.

2010 Annual Management Plan
FISH PRODUCTION

I. Species: *Pink salmon* Run: *Summer*

A. Egg Takes

Program Name	Ancestral Stock(s)	Egg take site Stat Area	Primary or Alternative Source?	Current year Goal	Permitted Maximum
Sheldon Jackson	Indian River	113-36	Primary	1 Million	1 Million
Species / Run Totals				1 Million	1 Million

1. Egg Take Site: Sheldon Jackson College (113-36)
___ Enhanced return __X__Mixed wild / enhanced return ___ Wild return

A) Broodstock capture:
Pink salmon will be captured at the hatchery weir, held in concrete raceways for maturation, and spawned in the adjacent building.

B) Egg take schedule:
Pink salmon eggs are usually taken after the third week of August until last week of September. Fish are spawned as they ripen by a routine dry-spawning method with a 0.7% saline solution. The spawning ratio is ten females to six males per bucket. Buckets of fertilized eggs are rinsed prior to being loaded into R-30 upwelling eyeing incubators. Pink salmon carcasses will be sold, given away, or disposed in the ocean.

B. Planned Releases

Pink salmon will be ponded directly to marine net pens for 1-3 months of short term rearing prior to their release in May. Release weight goal will be 1.5 gram fish.

Program Name	Brood Year	Release Date	Number to Release	Type of Mark % Marked
SJ Hatchery Pink salmon	2009	May, 2010	1,000,000	(Otolith) 100%
Species/Run Totals			1,000,000	

C. Previous brood years that will remain in culture

None.

D. Program details

1. Operational diagram for pink salmon

Egg take at SJ Hatchery

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Incubation and Rearing at SJ Hatchery for 9 months.

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Rearing in marine net pens for 1-3 months and release at SJ Hatchery

2. Evaluation:

All pink salmon released from SJ Hatchery are thermally marked (otolith). Evaluation of survival and fishery contributions are estimated based on total cost recovery harvest of pink salmon within the SJ Hatchery Special Harvest Area (SHA), total escapement to the hatchery, and an estimate of interception in common property fisheries in Eastern Channel. Based on tagging studies with pink salmon returning in 1985, a seine fishery in Eastern Channel would probably intercept some SJ Hatchery returns. The 1985 studies showed that 40% of recovered tagged fish from south Sitka Sound areas returned to the SJC SHA, and 17.5% of these tagged fish escaped to Indian River and the hatchery. Of fish tagged in northern Sitka Sound, only 3% returned to the SHA, and 4.6% escaped to Indian River and the hatchery. In recent years high production of pink salmon from Indian River has complicated evaluation of hatchery success.

3. Performance standards for the program:

- Achieve 90 % (or above) freshwater survival.
- Release fry at 1.5 grams.

II. Species: *Chum salmon* Run: *Summer*

A. Egg Takes

Program Name	Ancestral Stock(s)	Egg take site Stat Area	Primary or Alternative Source?	Current Year Goal	Permitted Maximum
Sheldon Jackson College	Hatchery	113-36	Primary	1 Million	1Million
Medvejie Hatchery	Medvejie	113-35	Primary	9 Million	9Million
Species / Run Totals				10 Million	10Million

1. Egg Take Site: Sheldon Jackson College (113-41)
_X_ Enhanced return____Mixed wild / enhanced return ___ Wild return

A) Broodstock capture:

4. Chum salmon will be captured at Medvejie Creek Hatchery and SJ Hatchery. If broodstock are available at SJ Hatchery, staff and volunteers will take as many as 1 million eggs. In the event hatchery returns are not adequate to meet broodstock needs, chum salmon brood may be supplemented from Medvejie Hatchery returns if they are available. The hatchery manager at SJ Hatchery will keep the hatchery manager of Medvejie Creek hatchery informed on the progress of adult collections and egg takes. SJ Hatchery will be seeking a FTP to allow the transfer of excess chum salmon eggs from the SJ Hatchery to Medvejie Hatchery if chum salmon returns to Medvejie are inadequate to achieve egg-take goals.

B) Egg take schedule:

Chum salmon eggs may not be taken until August 21. This date is necessary to prevent the propagation of early returning Hidden Falls Hatchery chum salmon ancestral stock released in Deep Inlet that may have strayed to the SJ Hatchery. Fish are spawned as they ripen by a routine dry-spawning method with a 0.7% saline solution, the spawning ratio will be 6 females to 3 males per bucket. If broodstock are available at SJ Hatchery, then staff and volunteers will take 1 million chum salmon eggs and incubate these eggs in R-30 incubators until eyed. The eyed eggs will be picked and loaded onto hatch screens in NOPAD incubators.

If broodstock are not available at SJ Hatchery, then staff and volunteers will assist the staff at Medvejie Hatchery to take a maximum of 10 million green chum salmon eggs for SJ Hatchery. One million of these eggs will be transported as gametes, fertilized, and incubated at SJ Hatchery. The remaining eggs, a maximum of 9 million, will be incubated at Medvejie and then transported to Deep Inlet as fry to be reared and released. Chum salmon carcasses will be sold, given away, or disposed in the ocean.

B. Planned releases

Chum salmon incubated at SJ Hatchery will be ponded directly into marine net pens for short-term rearing prior to their release into Crescent Bay in May, with a target release size of 2.0 grams. Chum salmon incubated at Medvejie Creek hatchery will be transported to Deep Inlet for rearing prior to release in May. The target release size in Deep Inlet is 1.5 to 2.0 grams.

Program Name	Brood Year	Release Date	Number to Release / Location of Release	Type of Mark / % Marked
Sheldon Jackson College chum salmon	2009 2009	May, 2010 May, 2010	1,000,000 / Crescent Bay 8,900,000 / Deep Inlet	Otolith / 100 %
Species/Run Totals			9,900,000	

C. Previous brood years that will remain in culture

None.

D. Program details

1. Operational diagram for chum salmon

Medvejie Creek Hatchery and SJ Hatchery chum salmon egg take. A maximum of 1 million chum salmon eggs will be taken at SJ Hatchery for incubation, rearing, and release at Crescent Bay. Nine million additional chum salmon eggs will be taken and incubated at Medvejie Creek Hatchery. The resultant fry will be reared and released at Deep Inlet for SJ Hatchery.

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If SJ Hatchery does not have sufficient broodstock returning to the SJ Hatchery, then a maximum of 1 million chum salmon eggs may be taken at Medvejie Creek Hatchery and transported as gametes to SJ Hatchery. Staff and volunteers will fertilize, incubate, pick, and seed these eggs onto hatch screens inside NOPAD boxes. One million fry will be hatched and then transferred into a 20 ft. x 40 ft. Wavemaster net pen at SJ Hatchery.

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A maximum of 9 million eggs will be incubated and hatched at Medvejie Creek Hatchery, and the resultant fry will be transported to Deep Inlet for short term rearing and release. The 9 million fry will be reared by NSRAA employees. Target release size for SJ Hatchery and Deep Inlet reared fish will be 1.5 to 2.0grams.

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Chum salmon fry will be released from Wavemaster net pens at Deep Inlet and SJ Hatchery in May.

2. Evaluation:

All SJ Hatchery chum salmon eggs have been thermally marked beginning with brood year 2005. Evaluation of the total adult return will be based on the chum salmon harvest in the Special Harvest Area, enumeration of returns to the hatchery, and enumeration of returns of adult chum salmon that stray to Indian River. Currently 35-40 million chum salmon originating from Medvejie Hatchery are released in the Eastern Channel area. SJ Hatchery chum salmon releases account for approximately 2-3% of Medvejie Hatchery releases. It might be assumed that 2-3 % of the total chum salmon harvested in the traditional troll and seine fisheries in Eastern Channel originated from the SJ Hatchery.

In 2007, Sheldon Jackson Hatchery continued a study previously conducted by Northern Southeast Aquaculture Association (NSRAA) as a condition for increasing chum salmon fry releases in Deep Inlet (2002-2006). The chum salmon releases in Deep Inlet increased by 9

million fry. The study was required as a permit condition for NSRAA's last chum salmon increase at Deep Inlet. This study was to examine the potential impacts of rearing additional chum salmon fry in Deep Inlet with special regard to predation on, or competition with, juvenile herring or herring spawn. Stomach samples of chum salmon fry did not contain herring larvae or fry. During the course of the study little herring spawning had occurred in the vicinity Deep Inlet and Eastern Channel, where most of the chum salmon fry were sampled. Limited sampling did occur north of Sitka where herring spawning was more prevalent. Given these factors it is unclear whether the scope of the study was adequate to address the concern. The Northern Southeast Regional Planning Team would like SJ Hatchery to continue the study in 2010, and report the results at the fall Regional Planning Team Meeting.

3. Performance standards for the program:

- Achieve 90 % or above freshwater survival.
- Release fry at 2.0 grams.

III. Species: *Coho salmon* Run: *Fall*

A. Egg Takes

Program Name	Ancestral Stock(s)	Egg take site Stat Area	Primary or Alternative Source?	Current year Goal	Permitted Maximum
Sheldon Jackson	Indian River	113-36	Primary	150,000	150,000
Indian River	Indian River	113-36	Alternative		
Species / Run Totals				150,000	150,000

It is expected that broodstock needs will be met with returning hatchery fish captured at the hatchery weir.

If supplemental broodstock is needed, FTPs and plans are in place to capture adults from Indian River and transport them live to the hatchery holding ponds for maturation, spawning, and incubation. If broodstock is taken from Indian River, SJ hatchery staff will monitor returns and comply with the following sliding scale egg take:

Coho Salmon Egg Take (Sliding Scale)

Coho salmon will not be removed from Indian River if 50 or fewer adult coho salmon are counted. No more than half the number of adult coho salmon in excess of 50 may be taken for broodstock at any time with a maximum removal of 125 coho salmon (e.g., if the instream count is 110 coho salmon, then the hatchery may remove 30 [(110-50)/2 = 30]. Adult coho salmon may be captured by gillnet or beach seine. Adult escapement counts will be reported to both Sitka Area Management Biologists prior to removal for the hatchery.

Broodstock will be screened for BKD in cooperation with the ADF&G Fish Pathology Laboratory and BKD positive fish will be discarded.

1. Egg Take Site: Sheldon Jackson College (113-36)
___ Enhanced return _X_ Mixed wild / enhanced return ___ Wild return

A) Broodstock capture:
Coho salmon will be captured at the hatchery weir, held in adult raceways for maturation, and spawned in the adjacent building.

B) Egg take schedule:
Coho salmon eggs are usually taken after the third week of September until the last week of November. Fish are spawned as they ripen by a routine dry-spawning method with a 0.7% saline solution. The spawning ratio is one female to one male per spawning tray. Coho salmon carcasses will be sold, given away, or disposed in the ocean.

B. Planned releases

There are approximately 135,000 coho salmon smolts that will be released in late May, 2010.

Program Name	Brood Year	Release Date	Number to Release	Type of Mark % Marked
Sheldon Jackson College Coho	2008	May, 2010	Approximately 135,000	Adipose clipped CWT 20,000 tagged
Species/Run Totals			Approximately 135,000	

C. Previous brood years that will remain in culture

100,000 coho salmon eggs from brood year 2009 will remain in culture.

D. Program details

1. Operational diagram for coho salmon:

Egg take at SJ Hatchery or collection of adult coho salmon in Indian River.

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Incubation and rearing at SJ Hatchery for 21 months.

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Release from circular ponds following saltwater acclimation at SJ Hatchery.

2. Evaluation:

SJ Hatchery staff will coded wire tag a minimum of 20,000 coho salmon smolt annually in March of each release year. Target smolt size is 16 to 18 grams at the time of marking. Tags will be recovered from commercial and sport fisheries through the ADF&G port sampling and creel programs.

3. Performance standards for the program:

Coho salmon at SJ Hatchery will be ponded during May in small start tanks or troughs and then transferred to fiberglass tanks or concrete raceways for rearing. Target release weight is 20 grams in mid-May of the following year.

IV. Species: *Chinook salmon* Run: *Summer*

A. Egg Takes

Program Name	Ancestral Stock(s)	Egg take site Stat Area	Primary or Alternative Source?	Current year Goal	Permitted Maximum
Sheldon Jackson	Andrew Creek	113-36	Primary	100,000	100,000
Medvejie Creek	Andrew Creek	113-35	Alternative		
Indian River	Andrew Creek	113-41-019	Alternative		
Species/Run Totals				100,000	100,000

It is expected that broodstock needs may not be met with returning hatchery fish captured at the hatchery weir. Medvejie Creek Hatchery is a back up source for eggs or fry if a surplus of broodstock at Medvejie Creek Hatchery exists. In the event of a short-fall, hatchery Chinook salmon strays in Indian River could be used as a backup source. Broodstock will be screened for BKD in cooperation with the ADF&G Fish Pathology Laboratory; and, BKD positive fish will be discarded.

1. **Egg Take Site:** Sheldon Jackson College (113-36)
   __X_ Enhanced return____Mixed wild / enhanced return ___ Wild return

   A) Broodstock capture:
   Chinook salmon will be captured at the hatchery weir, held in prepared circular ponds for maturation, and spawned in the adjacent building.

   B) Egg take schedule:
   Chinook salmon eggs are usually taken after the first week of August to the first week of September. Fish are spawned as they ripen by a routine dry-spawning method with a 0.7% saline solution. The spawning ratio is one female to one male per spawning tray. Chinook salmon carcasses will be sold, given away, or disposed in the ocean.

B. Planned releases

SJ Hatchery plans to release 100,000 Chinook salmon smolts into Crescent Bay near the end of May, 2010.

Program Name	Brood Year	Release Date	Number to Release	Type of Mark % Marked
Sheldon Jackson College Chinook	2008	May, 2010	Approximately 95,000	Adipose clipped CWT 20k tagged
Species/Run Totals			Approximately 95,000	

C. Previous brood years that will remain in culture

100,000 Chinook salmon alevins from brood year 2009 will remain in culture.

D. Program details

1. Operational diagram for Chinook salmon:

Egg take at SJ Hatchery, NSRAA's Medvejie Hatchery, or collection of adult fish in Indian River

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Incubation & Rearing at SJ Hatchery for 21 months

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Release from circular ponds following saltwater acclimation at the SJ Hatchery

2. Evaluation:

SJ Hatchery staff will coded wire tag a minimum of 20,000 Chinook salmon smolt annually, in spring of each release year. Target smolt size is 16 to 18 grams at the time of marking. Tags will be recovered from commercial and sport fisheries through the ADF&G port sampling and creel programs.

3. Performance standards for the program:

Chinook salmon at SJ Hatchery will be ponded during February in small start tanks or troughs, and then transferred to fiberglass tanks or concrete raceways for rearing. Target weight for Chinook salmon is 20 grams by late May.

HARVEST MANAGEMENT

I. **Release Location**: Sheldon Jackson College Hatchery SHA

A. Projected return this year

Species	Return site	Total return	Common Property Harvest	Return to Hatchery	Broodstock Required	Available Cost Recovery
Pink	Hatchery	43,171	19,427	23,744	1,500	22,244
Chum	Hatchery	13,422	6,711	6,711	1,000	5,711
Coho	Hatchery	5,900	2,655	3,245	120	3,125
Chinook	Hatchery	555	250	305	50	255

B. **Cost Recovery Harvest Management:**

The Special Harvest Area (SHA) for pink, chum, and Chinook salmon is defined in 5 AAC 40.030 as all waters of Crescent Bay and Eastern Anchorage enclosed by a line beginning from the northernmost end of the John O'Connell Bridge to the southernmost end of the bridge to the northeastern most tips of Aleutski Island, Turning Island, Kutkan Island, Morne Island, to the Twin Islands Light, to a point on the Baranof Island shore at 57° 02.68' N. lat., 135° 18.90' W. long. The SHA for pink, chum, and Chinook salmon was modified by the Alaska Board of Fisheries in 2009 to remove the area around the mouth of Indian River (113-41-019) to protect escapements of wild fish returning to the river. The SHA for coho salmon is defined as all waters enclosed by a line from the southeast corner of the Crescent Harbor breakwater (57°02'58" N. lat., 135°19'16" W. long.) to a point on the beach approximately 150 yards southeast of the hatchery stream outlet (57°02'58" N. lat., 135°19' 16" W. long). These areas are both shown in Figure 1.

A cost recovery harvest is planned based on projected pink salmon returns of 23,744 to the SHA. To meet the 1 million egg-take goal, 1,500 pink salmon are needed for SJ broodstock. The ten year average escapement index for pink salmon returning to Indian River is 125,000 fish. Pink salmon releases from SJ Hatchery have declined from an average of 5.1 million fry during the five year period 1996-2000, to 1.3 million during the five year period 2001-2005. SJ Hatchery did not conduct cost recovery harvests during the period 2002-2005, but did conduct a cost recovery harvest of surplus pink and chum salmon from 2006-2009. This trend triggered the department to re-evaluate the SHA boundaries to allow common property harvest of surplus Indian River pink salmon, while protecting SJ Hatchery broodstock and cost recovery harvesting opportunity.

The projected 2010 chum salmon return to the SJ Hatchery SHA is 13,422, based on recent marine survival rates. Approximately 250,000 SJ Hatchery chum salmon are projected to return to the NSRAA SHA, based on recent NSRAA chum salmon marine survival rates. Approximately one-half of returning adults will likely be intercepted in common property fisheries in the Sitka Sound area. This leaves 6,711 expected to return to the SJ Hatchery SHA. SJ Hatchery plans on taking 1.0 million eggs at the facility, which will require 1,000 adult chum

salmon for broodstock. SJ Hatchery does have the option to conduct chum salmon cost recovery on an estimated 5,711 surplus hatchery-produced chum salmon in the SHA, providing that permits, markets, and plans are in place. The harvest of surplus hatchery chum salmon is encouraged to avoid the straying of hatchery produced chum salmon into natural river systems.

SJ Hatchery is expecting 3,245 coho salmon to return to the hatchery, based on 4.0 % marine survival and a 45% interception rate by offshore commercial troll fisheries. About 120 coho salmon are needed for broodstock to meet the 150,000 egg-take goal. SJ Hatchery does have the option to conduct coho salmon cost recovery on an estimated 3,125 surplus hatchery-produced coho salmon in the SHA.

SJ Hatchery is expecting a return of about 305 Chinook salmon to the hatchery. About 50 Chinook salmon will be needed for broodstock to meet the 100,000 egg-take goal. A cost recovery harvest of Chinook salmon is not planned.

SJ Hatchery plans to conduct cost recovery harvests of pink, chum, and coho salmon. However, if the facility does not conduct cost recovery and a surplus to escapement and broodstock occurs, then the department may open portions of the SHA for common property harvest of surplus pink and chum salmon. The department will advise hatchery staff of aerial survey counts inseason when they are available, and will coordinate any openings to allow the hatchery the opportunity to obtain necessary broodstock and carry out planned cost recovery within the SHA.

C. **Common Property Fisheries Management:**

SJ Hatchery Chinook, coho, and chum salmon returns are subject to offshore and terminal area troll fisheries in the spring and summer seasons. SJ Hatchery pink and chum salmon returns are subject to harvest in the Sitka Sound purse seine fishery from mid-July through August. To a lesser extent SJ Hatchery returns may be harvested in the Deep Inlet THA gillnet and seine fisheries, in NSRAA cost recovery fisheries in Eastern Channel and Deep Inlet, and in terminal area sport fisheries. Common property fisheries can be expected to harvest around 45% of SJ Hatchery-produced coho and Chinook salmon.

The department may open waters adjacent to the SJC SHA to common property purse seining to harvest surplus Indian River pink salmon returns. The department will consult with the SJ Hatchery manager prior to such openings, to ensure that hatchery cost recovery and broodstock needs are not compromised.

In consultation with the local Sport Fish Division area management biologist, a small area directly off the hatchery at the bottom of the earthen fish ladder, will be closed to sport fishing to protect broodstock. This area will be posted with signs specifying a "Broodstock Protection Zone."

APPROVAL

Drafting Team Members	**Date**
John Stein, Sitka Sound Science Center, Inc	5/19/10
Dave Gordon. Area Management Biologist – Commercial Fisheries	5-18-10
Troy Tydingco, Area Management Biologist – Sport Fish Robert Chadwick for Troy Tydingco	5-18-10

ADF&G Regional Staff	**Date**
Flip Pryor, Regional Resource Development Biologist– Commercial Fisheries	5/28/10
Scott Kelley, Regional Supervisor – Commercial Fisheries	6/7/10
Brian Frenette, Regional Supervisor – Sport Fish	6-1-10

The 2010 Annual Management Plan for **Sheldon Jackson College Hatchery** is hereby approved:

Deputy Commissioner, ADF&G — 7/6/2010

Table 1. Projected returns to Sheldon Jackson Hatchery for the 2010 season.

Species	Age	Brood Year	Number Released	Previous 10 year % Marine Survival	Projected %Marine Survival	% Return by Age	Projected Return by Age	Total Projected Return	Common Property Interception % Rate	Projected Return to SHA
Pink	2	2008	1,079,283	2.35	4.00%	100%	43,171	43,171	45%	23,744
Chum	5	2005	1,066,200	0.27%	1.25%	20%	2,665			
Chum	4	2006	1,095,094	0.27%	1.25%	70%	9,582	13,422	50%	6,711
Chum	3	2007	939,800	0.27%	1.25%	10%	1,175			
Coho	3	2007	147,502	2.31%	4.00%	100%	5,900	5,900	45%	3,245
King	6	2004	8,875	0.81%	1.25%	1%	1			
King	5	2005	37,288	0.76%	1.25%	10%	47	555	45%	305
King	4	2006	45,427	0.78%	1.25%	69%	392			
King	3	2007	45,940	0.78%	1.25%	20%	115			

Projected returns to Deep Inlet for the 2010 season

Species	Age	Brood Year	Number Released	Previous 10 year % Marine Survival	Projected %Marine Survival	% Return by Age	Projected Return by Age	Total Projected Return	Common Property Interception % Rate	Projected Return to Deep Inlet
Chum	6	2004	3,249,000			1%	307			
Chum	5	2005	5,098,000			10%	11,784	143,000	50%	71,500
Chum	4	2006	8,818,000			69%	104,799			
Chum	3	2007	8,083,000			20%	26,532			

Table 2. Pink salmon egg take, release, and survival data for Sheldon Jackson Hatchery, 1975-2009.

Brood Year	Egg Source	Egg Take	Number Released	Size (mg.)	Date	Freshwater Survival %	Ocean Survival %
1975	Indian river 91% Katlian River 9%	1,747,935	1,653,666	275	3/24-5/22	95	7.9
1976	Starrigavan 97% Indian River 3%	1,949,664	1,593,184	317	3/4-4/15	81.72	0.40
1977	Hatchery	10,226,500	7,147,974	292	2/7-5/8	69.90	1.00
1978	Hatchery	2,477,472	2,376,944	278	3/17-5/15	95.94	0.20
1979	Hatchery	9,551,000	7,883,250	274	3/1-4/30	82.54	2.60
1980	Hatchery	2,248,968	2,062,139	296	4/1-4/24	91.69	2.00
1981	Hatchery	13,697,711	10,689,600	289	4/19-5/17	78.04	1.60
1982	Hatchery	13,774,600	9,993,123	255	3/29-4/21	72.55	1.80
1983	Hatchery	15,117,000	14,536,624	240	3/19-5/8	96.16	2.30
1984	Hatchery	12,102,000	11,070,423	275	4/19-5/4	91.48	0.50
1985	Hatchery	11,340,010	10,050,822	250	4/4-5/17	88.63	0.60
1986	Hatchery	15,015,110	14,200,000	250	4/2-5/1	94.57	0.06
1987	Hatchery	14,783,715	14,250,000	388	5/1	96.39	0.07
1988	Hatchery	3,264,000	2,950,000	550	5/12	90.38	0.25
1989	Hatchery	5,846,000	5,400,000	534	4/2-5/8	92.37	0.30
1990	Hatchery	2,940,000	2,700,000	583	5/10	91.84	0.63
1991	Hatchery	9,517,109	9,146,735	470	4/19-28	96.11	0.04
1992	Hatchery	7,236,522	6,954,339	240	5/3	96.10	4.38
1993	Hatchery	916,619	348,000	680	4/27	79.43	6.80
1994	Hatchery	10,800,604	7,134,674	960	4/19	66.00	5.40
1995	Hatchery	8,911,063	8,067,280	350	4/23	89.00	5.54
1996	Hatchery	12,518,798	10,000,000	890	4/18	86.87	3.62
1997	Hatchery	5,651,192	4,500,000	480	5/7	79.76	2.8
1998	Hatchery	10,182,193	3,779,737	360	4/27	37	4.82
1999	Hatchery	6,778,092	1,650,234	540	5/25	26.43	4.0
2000	Hatchery	5,888,519	5,327,708	800	5/31	90	4.0
2001	Hatchery	900,000	861,422	900	5/24	96	.4
2002	Hatchery	2,345,661	2,300,000	1185	4/21	98	4.0
2003	Hatchery	803,200	37,000	710	5/25	4.6	4.0
2004	Hatchery	1,891,790	1,749,500	1850	5/18	92.5	4.0
2005	Hatchery	1,526,081	1,155,000	2380	5/9	94.2	8.9
2006	Hatchery	1,171,848	1,154,284	2990	5/9	94.2	9.7
2007	Hatchery	1,064,909	1,016,500	1510	5/27	95.5	3.2
2008	Hatchery	1,131,859	1,079,283	1630	5/29	95.4	
2009	Hatchery	1,040,102					

Table 3. Chum salmon egg take, release and return data for the Sheldon Jackson Hatchery, 1975- 2009.

Brood Year	Stock	Number Eggs	Number Released	Date	Size (mg)	% Return (1)	Comments
1975	Katlian	75,185	70,000	6/28/76	775	0	Fed
1976	Nakwasina	206,821	176,887	4/19-5/13/77	443-678	0.12	Half fry fed 25%adultsto hatchery/75% I.R.
1977	No egg take						
1978	Nakwasina	691,340	646,852	4/9/79	410	0.04	Unfed
1979	Sandy bay	56,127	53,174	5/23/80	656	0.43	Unfed
1980	Nakwasina	118,000	84,072	5/15/81	607	0.53	Fed
	Hatchery						69.7% N&H
1981	Hatchery	50,761	34,671	5/18-6/5/82	530	0.6	Fed 0-3 Weeks
	Sandy cove	83,107	50,299	4/22-5/10/82			Fed 0-3 Weeks
1982	Hatchery	80,236	69,144	5/29/83	598	0.40	Stocks Marked
	Sandy cove	118,000	75,070	4/3-5/29/83	598		
	Nakwasina	980,740	791,403	5/23-5/29/83	568		
1983	Hatchery	155,147	114,551	3/26-5/17/84	400	1.00	Most fed
	Sandy cove	31,246	27,315	4/11-5/7/84	900		Stocks Marked
	Nakwasina	587,427	486,854	5/7-5/29/84	500		
1984	Hatchery	275,000	244,867	4/28-5/21/85	441	0.03	Stocks Marked
	Sandy Cove	1,492,352	1,386,657	4/5-5/21/85	676		
	Nakwasina	1,000,000	683,089	4/28-6/3/85	514		
1985	Hatchery	363,011	301,708	4/4-5/17/86	400	0.06	Not marked
	Sandy cove	1,930,468	1,610,002	4/4-5/2/86	400		Not fed
	Nakwasina	466,923	332,845	4/4-5/1/86	400		
1986	Hatchery	1,884,662	1,600,000	4/3-5/1/87	500	0.04	
1987	Hatchery	691,840	450,000	5/1/88	685	0.02	Marine net pens
1988	Hatchery	939,517	827,000	5/12/89	900	0.02	Marine net pens
1989	Hatchery	386,000	270,000	5/8/90	1,125	0.02	Marine net pens
1990	Hatchery	348,000	280,000	5/10/91	1,232	0.02	Marine net pens
1992	Hatchery	95,064	88,000	5/3/93	1,800	0.56	Marine net pens
1993	Hatchery	298,765	201,000	4/27/94	1,400	0.01	Marine net pens
1994	Hatchery	217,672	182,000	4/19/95	1,050		Marine net pens
1995	Hatchery	84,642	80,000	4/23/96	730	0.4	Marine net pens
	Medvjie	3,542,655	3,540,000				
1996	Hatchery	20,794	3,400,000	4/18/97	1,500	0.4	Marine net pens
	Medvejie	3,434,455					
1997	Hatchery	263,521	1,670,00	5/1/98	1.14	0.4	Marine net pens
	Medvejie	1,460,875					
1998	Hatchery	295,488	167,760	4/27/99	680	0.4	Marine net pens
	Medvejie	1,400,000					
1999	Hatchery	3,258,500	3,379,480	5/25/00	1,018	0.4	Marine net pens
	Medvejie	1,200,000					
2000	Hatchery	4,292,727	3,861,739	5/31/01	2,480	0.4	Marine net pens
	Medvejie	0					

Table 3, continued.
Chum salmon egg take, release, and return data for the Sheldon Jackson College Hatchery, 1975-2009

Brood Year	Stock	Number Eggs	Number Released	Date	Size (mg)	% Return (1)	Comments
2001	Hatchery	719,000	954,387 at	5/24/02	unknown	0.4	Marine net pens
	Medvejie	3,000,000	SJC				
2002	Hatchery	427,500	182,225 at	4/21/03	2,270	unknown	Marine net pens
	Medvejie	0	SJC				
2003	Hatchery	23,783	1,023,358 at	5/12/04	2,120	unknown	Marine net pens
	Medvejie	5,100,000	SJC	4/26/04	2,200	unknown	
			3,257,000 at				
			Deep Inlet				
2004	Hatchery	1,232,409	1,081,718 at	5/11/05	2,410	unknown	Marine net pens
	Medvejie	4,185,317	SJC	4/21/05	2,020	unknown	
			3,249,000 at				
			Deep Inlet				
2005	Hatchery	1,206,402	1,066,200 at	5/30/06	2,810	unknown	Marine net pens
	Medvejie	5,100,000	SJC	4/26/06	2,080	unknown	
			5,098,000 at				
			Deep Inlet				
2006	Hatchery	1,349,498	1,095,094	5/27/07	2,320	unknown	Marine net pens
	Medvejie	9,201,936	8,818,000	4/29-5/20	2,070	unknown	Marine net pens
2007	Hatchery	986,069	939,800	5/21	1,640	unknown	Marine net pens
	Medvejie	8,443,311	8,083,000	5/15-5/25	2,030	unknown	Marine net pens
2008	Hatchery			5/29	2,180	unknown	Marine net pens
		1,143,049	1,075,190				
	Medvejie	7,123,437	6,746,000	5/17 – 6/1	2,250		Marine net pens
2009	Hatchery	1,184,400					
	Medvejie	7,926,789					
2010	Hatchery						
	Medvejie						
2011	Hatchery						
	Medvejie						
2012	Hatchery						
	Medvejie						

Table 4. Coho salmon egg take, release and return data for the Sheldon Jackson hatchery, 1975-2009.

Brood							% Return	% Marine
1975	6	12,622	8,000	7/31/76	1.1	None	Unknown	Unknown
1976	7	24,150						
1977	3	10,500	2,723	6/5/79	11.3	100.0		0.57
1978	10	33,430	12,045	6/30/80	11.6	34.1		2.38
1979	1	3,000	2,523	5/15/81	10.5	100.0		1.50
1980	13	32,983	8,769	6/6/82	10.5	100.0		0.40
1981	21	687,529	2,930	6/1/83	15.1	100.0		5.30
1982	22	72,935	54,695	5/25/84	15.0	96.3		5.70
1983	7	21,000	6,623	5/30/85	15.3	98.3		5.00
1984	27	103,519	86,366	5/20/86	13.6	31.6	29.0	1.30
1985	50	176,165	111,213	5/15/87	15.6	44.5	45.0	2.10
1986	54	184,165	97,942	5/18/88	15.8	39.1	43.0	2.50
1987	41	131,000	81,248	5/22/89	17.1	51.4	57.0	1.50
1988	44	141,000	43,863	5/21/90	17.7	37.1	60.0	4.00
1989	36	115,000	49,787	5/14/91	12.9	39.9	83.0	3.49
1990	34	105,400	70,669	6/8/92	16.3	28.7	65.0	1.02
1991	35	127,649	31,071	6/8/93	16.9	31.6	57.2	2.50
1992	39	142,499	96,134	6/1/94	19.1	10.9	38.4	3.20
1993	35	125,548	70,398	5/2/95	18.2	15.7	73.0	1.70
1994	38	92,607	46,468	6/11/96	18.9	16.8	26.0	0.40
1995	55	181,764	74,000	6/5/97	11.3	13.9	30.7	0.03
1996	38	131,000	50,355	5/21/98	14.9	34.4	2.3	0.5
1997	1	2,856	19,690[c]	6/10/99	20.89	50.0	1.1	0.5
1998	38	263,521	84,000	5/25/00	16.98	0	unknown	unknown
1999	28	84,000	43,540	5/31/01	28.27	10	unknown	unknown
2000	36	87,476	560	7/22/02	17		unknown	unknown
2001[a]	0	0	0	0	0	0	unknown	unknown
2002	38	150,000	940	6/4/04	23.2	0	unknown	unknown
2003	24	77,043	67,329	5/25/05	16.34	0	unknown	unknown
2004[b]	16	52,141	69,569	6/9/06	22.5	0	unknown	unknown
2005	31	74,400	121,222	5/16 – 6/5	21.3	15.8	unknown	4.5
2006	50	150,000	141,460	5/14-5/24	16.88	13.8	unknown	unknown
2007	59	153,400	147,502	5/23 – 5/27	14.9	13.4		
2008	60	180,000						
2009	40	104,000						
2010								
2011								

(A) Insufficient return of brood stock, we were unable to take any eggs. (B) Eggtake at the Medvejie Hatchery, Nov. 11, 2004. No broodstock were available at SJC. (C) includes 17,715 fry transferred from Medvejie.

Table 5. Chinook salmon egg take, release and return data for the Sheldon Jackson Hatchery, 1984-2009

Brood Year	Eggs or Fry	Released	Date	Size (gm)	%CWT	Return 4	At 5	Age 6	Total Return	% Marine Survival	% Return to CPF
1984	72,472	54,200	5/20/86	12.00	54.5	15	31	21	67	0.12	7.0
1985	62,712	46,650	5/15/87	18.00	59.9	101	154	37	292	0.63	25.0
1986	48,753	332,280[a]	5/18/88	28.00	96.7	176	137	45	358	1.11	26.0
1987	101,202	96,692	5/22/89	20.00	22.2	129	127	398	654	0.68	55.0
1988	125,254	100,482	5/21/90	21.00	9.9	29	35	148	212	0.21	45.0
1989	58,173	50,538	5/3/91	22.0	40.0	126	430	112	668	1.33	59.0
1990	155,000	94,092	5/26/92	18.00	21.5	1220	512	110	742	0.79	78.0
1991	129,696	89,443	5/26/93	15.00	11.1	295	385	64	744	0.83	45.0
1992	130,917	103,391	5/17/94	18.00	10.1	219	383	12	614	0.4	38.2
1993	128,000	78,358	5/2/95	14.65	12.4	191	341	53	585	0.71	45.0
1994	113,860	57,792	6/11/96	18.61	21.7	128	292	47	467	0.80	45.0
1995	127,659	79,070	5/16/97	16.30	12.1	189	341	17	547	0.42	45.0
1996	100,000	41,323	5/21/98	15.4	22	98	230	31	359	0.78	45.0
1997	34,014	13,048	6/10/99	25.49	100	20	165				
1998	199,245	88,124	5/25/00	17.2	0	360					
1999	100,635	53,170	5/24/00	25.7	10						
2000	38,987	28,320	7/19/02	17.2	0						
2001	42,300	0									
2002	75,200	0									
2003	10,000	7,545	5/18/05	58.5	0						
2004	10,000	8,875	5/23/06	64.72	0						
2005	74,181	37,288	5/7-5/14	20.2	53.1						
2006	71,193	45,427	5/5-5/9	18.0	46.3						
2007	103,603	45,940	5/21-22	16.7	46.6						
2008	140,184										
2009											
2010											
2011											
2012											

[a] includes a transfer from Medvejie Hatchery

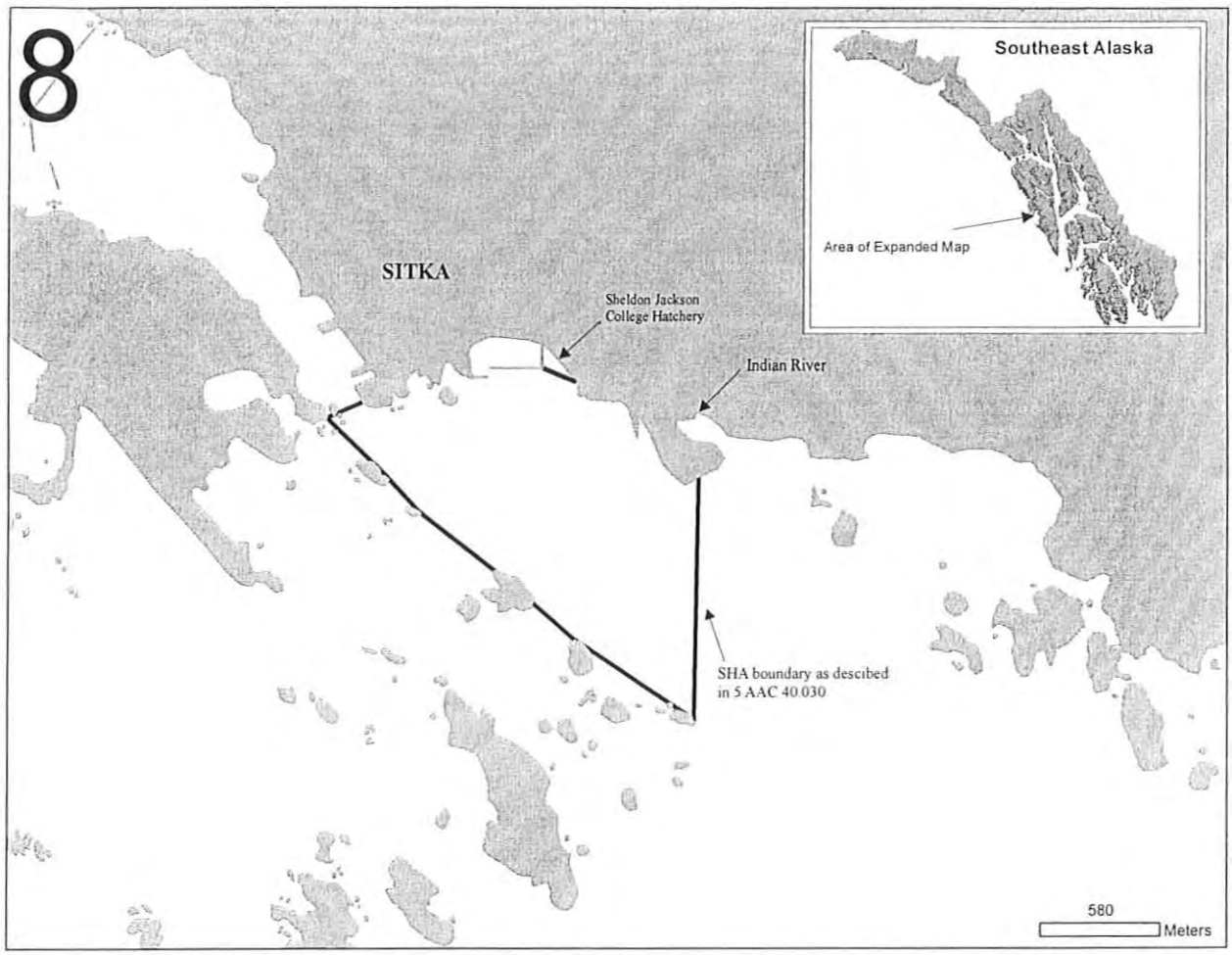

Figure 1. Sheldon Jackson Hatchery (Crescent Bay) SHA.

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Subject: Management Feasibility Analysis for Sheldon Jackson College Hatchery

From: Dave Gordon
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Per your request, and as specified by **5 AAC 40.130 Management Feasibility Analysis**, the following is a management feasibility analysis (MFA) for a hatchery permit being applied for by the Sitka Sound Science Center (SSSC). The application is for the transfer of operation of the currently permitted private non-profit (PNP) salmon hatchery at Sheldon Jackson College in the City of Sitka, Alaska.

Background Information

Sitka Sound Science Center, a 501c3 not-for-profit organization, is applying to acquire a PNP hatchery permit for operation of Sheldon Jackson College Hatchery (SJ Hatchery) located in Sitka, Alaska. PNP hatchery permit #3 was issued in 1975 to Sheldon Jackson College to operate a hatchery on their campus. SJ Hatchery is currently permitted to take and incubate 1,000,000 pink salmon (*Oncorhynchus gorbuscha*) eggs, 10,000,000 chum salmon (*Oncorhynchus keta*) eggs, 150,000 coho salmon (*Oncorhynchus kisitch*) eggs, and 100,000 Chinook salmon (*Oncorhynchus tshawytscha*) eggs. Sheldon Jackson College ran SJ Hatchery until the college closed down in 2007. SJ Hatchery was operated by SSSC starting in 2008 under a management contract with the Sheldon Jackson Board of Trustees, who continue to hold the hatchery permit. Under **AS 16.10.400 Permits for Salmon Hatcheries (c)** A hatchery permit is nontransferable. If a permit holder sells or leases a

hatchery for which a permit is issued, the new operator shall apply for a new permit under this section. On July 6, 2010 the Sheldon Jackson Board of Trustees submitted a letter to the department supporting the acquisition of the SJ Hatchery permit by SSSC and requested that PNP permit #3 be revoked concurrent with approval of SSSC's new hatchery permit. On August 1, 2010 SSSC sent a letter to the department with the necessary information to begin the MFA process.

The SSSC production plan for SJ Hatchery is as follows:

- 3 million green pink salmon eggs will be taken from returns to SJ Hatchery, incubated, then short term reared in saltwater net pens to a target weight of 1.5g. Assuming 6% mortality from green egg stage, a potential 2,820,000 fry will be released from SJ Hatchery in early to mid-May. Based on a 4.3% average marine survival of SJ Hatchery pink salmon, a return of 120,000 adult pink salmon would be anticipated each year. There is no data available to accurately estimate the harvest rate of SJ Hatchery pink salmon and common property harvests are assumed to be around 45%. The program will require 5,000 fish for broodstock and the rest of the return to SJ Hatchery will be harvested for cost recovery. SJ Hatchery utilizes Indian River stock pink salmon. Pink Salmon return timing is late July to late August. All pinks will be otolith marked.
- One million green chum salmon eggs will be taken from returns to SJ Hatchery, incubated, then short termed reared in saltwater net pens to a target weight of 2g. Assuming 6% mortality from green egg stage, a potential 940,000 fry will be released from SJ Hatchery in mid-May. SJ Hatchery marine survival for chum salmon has been 3%. Return of chum salmon from the SJ Hatchery project is anticipated to be 30,000 chum salmon per year. Common property harvest should be 55% of the return. The program will require 1,500 fish for broodstock and the rest of the return to SJ Hatchery will be harvested for cost recovery. SJ Hatchery utilizes a late-summer chum salmon stock commonly known as Medvejie Hatchery stock, which has an ancestral history of Nakwasina River stock, Salmon Lake stock and Medvejie Creek stock. Medvejie Hatchery (located in Bear Cove south of Sitka and operated by Northern Southeast Regional Aquaculture Association) stock chum salmon have a return timing of late-July to early September. SJ Hatchery and Medvejie Hatchery will continue to use each other as a backup egg source. All SJ Hatchery chum salmon releases will be otolith marked.
- Nine million green chum salmon eggs will be taken from returns to Medvejie Hatchery and incubated at Medvejie Hatchery. Assuming 6% mortality from green egg stage, an estimated 8,460,000 fry will be transported to Deep Inlet for short term rearing in saltwater net pens. Fry will be released in Deep Inlet in mid-May with a target weight of 2g. All SJ Hatchery chum salmon releases will be otolith marked.
- Two hundred-fifty thousand (250,000) green coho salmon eggs will be taken from returns to SJ Hatchery, incubated, and reared long term at SJ Hatchery. Based on a 90% hatchery survival, a potential 225,000 smolts with a target weight of 20g will be released from SJ Hatchery between May 15 and June 1. Given historic marine survival of 5%, an estimated 11,250 coho salmon will return annually. Common property harvest is estimated at 55%. Approximately 300 coho salmon will be required for broodstock. The remaining coho salmon returning to SJ Hatchery will be used for cost recovery. SJ Hatchery uses Indian River broodstock. Return timing is mid-September thru October. A minimum of 20,000 coho smolts will be coded-wire-tagged before release.

The SSSC production plan differs from the currently permitted SJ Hatchery production plan as follows:

- Pink salmon production is increased from 1 million green eggs to 3 million green eggs taken. This will help provide increased revenue from cost recovery operations in the existing Special Harvest Area (SHA). The infrastructure already exists to accomplish this increase. SJ Hatchery previously was permitted to take 20 million pink and chum salmon eggs. Releases of pink salmon fry topped out in the late 1980's at 14 million pink salmon fry. A strong market exists for pink salmon and SSSC is collaborating with local fish processors to assure there is an aggressive harvest to returning adults to provide full utilization. The common property fishery will greatly benefit from the increased pink production as well.
- Elimination of the Chinook salmon program. The Chinook salmon returns to SJ Hatchery for the last ten years have been 0.7%. The backup broodstock source, Medvijie Hatchery, has to be continually utilized in order to meet egg-take goals. Tag recovery data suggests there is very little contribution to common property fisheries from the current SJ Hatchery Chinook salmon program.
- Increase production of coho salmon from 150,000 green eggs to 250,000 green eggs taken. Coho returns to SJ Hatchery have experienced about 5% marine survival in recent years. The increase in production will not lead to any production cost because the increase coincides with the elimination of the Chinook salmon program. Common property fisheries will benefit from increased returns of coho salmon to SJ Hatchery. Local processors have expressed interest in increasing coho returns to SJ Hatchery and are willing collaborators in assisting the programs with cost recovery operations.

Common Property Fisheries Management

Contributions to the Sport Fisheries

Contributions of coho to the marine boat sport fishery are estimated through the recovery of coded wire tags (CWT) placed in Sheldon Jackson College hatchery coho salmon. Sampling of marine boat anglers recovered a total of 169, successfully decoded, CWT's originating from Sheldon Jackson College hatchery from 1999 until 2009. When expansions are applied, Sheldon Jackson College hatchery contributions to the Sitka marine boat sport fishery vary in relation to the numbers of coho tagged and released per year. Estimated annual harvest of coho originating from Sheldon Jackson College hatchery have ranged from 23 up to 610 and average 223 annually (Table 1). The Sitka sound sport fishery harvested an average of 26,000 coho annually from 1999 until 2009. In addition, pink and chum originating from the SJ hatchery are likely harvested in the marine boat sport fisheries in the Sitka area.

Sheldon Jackson College hatchery releases of coho, pink, and chum salmon also contributed to the Sitka area shoreline sport fisheries. Although the contribution of these releases is not estimated for the Sitka area shore sport fishery, some portion of this fishery is likely comprised of fish originating from the SJ Hatchery. One of the largest Sitka shoreline sport fisheries occurs in the vicinity of the SJ Hatchery and adjacent to the outlet of Indian River. Estimated shoreline harvest by sport anglers adjacent to the Sitka road system has averaged 162 coho and 1,049 pink salmon annually from 2000 until 2009 (Statewide Harvest Survey).

Table 1.- Coho Salmon originating from Sheldon Jackson College hatchery and corresponding harvest by the Sitka marine boat sport fishery between 1999 and 2009.

Year Harvested	Total Released*	Total CWT*	Recovered CWT's	Expanded Harvest
1999	28,034	9,631	15	185
2000	16,840	16,672	75	242
2001	84,000	0	-	-
2002	33,540	3,354	19	610
2003	560	560	6	23
2004	10,000	10,000	18	92
2005	940	0	-	-
2006	67,329	0	-	-
2007	69,569	11,071	20	300
2008	121,222	19,140	12	245
2009	141,460	19,585	4	86
			Average	223

*Coho salmon smolt tagged and released have been listed by year harvested rather than year released.

Management of the Sport Fishery

Currently the Sitka area coho, pink, and chum salmon marine sport fishery is managed under a regional bag limit of 6 fish and possession limit of 12 fish for each species. Indian River, near the SJ hatchery, is closed to sport fishing for salmon except that pink salmon may be taken above the Sawmill Creek road bridge and king salmon may be taken anywhere in the drainage. Historically, in consultation with the local Sport Fish Division area management biologist, a small area directly off the hatchery fish ladder has been closed to sport fishing to protect broodstock. These current management strategies will likely remain the same under proposed production levels.

Contributions to the Commercial Fisheries

Pink Salmon

SJ hatchery pink salmon are subject to harvest in the Sitka Sound traditional purse seine fishery that occurs in the Eastern Channel area immediately adjacent to the SJ Hatchery SHA. This fishery occurs from late-July through August to target wild stock pink salmon returning to Indian River and other productive streams in the Silver Bay/Eastern Channel area. Also, SJ Hatchery pinks are likely harvested in significant numbers in the Deep Inlet THA chum salmon rotational net fishery that occurs throughout the summer. There is no specific data for determining the harvest rate of SJ Hatchery pink salmon in these common property fisheries and it is assumed to be roughly 45% of the total return.

Chum Salmon

Chum salmon returning to SJ Hatchery are subject to harvest in the same fisheries as are SJ Hatchery pink salmon. Additionally, from late July through mid-August, significant troll effort occurs in Eastern Channel and approaches specifically to target hatchery chum salmon returning to Deep Inlet and Medvejie Hatchery. Also, chum salmon are of greater value than pink salmon and are targeted in traditional purse seine fisheries in Eastern Channel. Consequently, SJ Hatchery chum salmon are likely subject to a higher harvest rate than pink salmon.

The Deep Inlet release of the SJ Hatchery chum salmon program will be primarily harvested in the common property rotational fishery in the Deep Inlet THA, and in the traditional seine and troll fisheries in Sitka Sound. The return of chum salmon released in Deep Inlet from the SJ Hatchery project is anticipated to be 270,000 chum salmon per year based on 3% marine survival. NSRAA's cost recovery harvest of Deep Inlet chum salmon has averaged 17% of the total return leaving 83% of the return for common property harvest. Based on this, it is expected that chum salmon released in Deep Inlet under the SJ Hatchery permit, on average, will contribute 224,000 chum salmon to common property fisheries each year.

Coho Salmon

Intense commercial troll effort occurs in offshore areas as well as in Sitka Sound through the summer season. Small numbers of hatchery coho would also be expected to contribute to the common property net fisheries in Eastern Channel and Deep Inlet. A 45% harvest rate of SJ Hatchery coho salmon in common property fisheries is expected.

For all species of salmon historically released at the SJ hatchery, it has not been necessary to alter the management of traditional or hatchery commercial salmon fisheries in Eastern Channel in order to protect SJ Hatchery broodstock. The exception is a small area directly in front of the hatchery raceway that has typically been closed to sport fishing for the purpose of protecting broodstock. Proposed changes in production levels are not expected to change current management practices.

Cost Recovery Harvest Management

The Special Harvest Area (SHA) for pink, chum, and Chinook salmon is defined in **5 AAC 40.030** as all waters of Crescent Bay and Eastern Anchorage enclosed by a line beginning from the northernmost end of the John O'Connell Bridge to the southernmost end of the bridge to the northeastern most tips of Aleutski Island, Turning Island, Kutkan Island, Morne Island, to the Twin Islands Light, to a point on the Baranof Island shore at 57° 02.68' N. lat., 135° 18.90' W. long. The SHA for pink, chum, and Chinook salmon was modified by the Alaska Board of Fisheries in 2009 to exclude waters directly off the mouth of Indian River (113-41-019) to protect escapements of wild fish returning to the river. The SHA for coho salmon is defined as all waters enclosed by a line from the southeast corner of the Crescent Harbor breakwater (57°02.95' N. lat., 135°19.50'W. long.) to a point on the beach approximately 150 yards southeast of the hatchery stream outlet (57°02.92' N. lat., 135°19.38' W. long). These areas are both shown in Figure 1.

Wild Salmon Stocks

Protection of wildstocks is a primary consideration in the assessment of proposed salmon enhancement projects and there are wild salmon stocks in the immediate vicinity of Sheldon

Jackson College and SJ Hatchery. Indian River (also the water source for the hatchery and the nearest anadromous stream) contains chum, coho, and pink salmon , as well as rainbow trout and Dolly Varden and the river mouth is about 2/3 of a mile from the hatchery.

Cost Recovery

Historically, the SJ Hatchery SHA included waters directly off the mouth of Indian River. Beginning in 2007, by emergency order, the department modified the SJ Hatchery SHA excluding waters directly off the mouth of Indian River to protect wild stocks returning to Indian River and facilitate the separation of common property harvest management and hatchery cost recovery harvests. In 2009, the Board of Fisheries adopted the reduced SHA into regulation. This change effectively minimizes the harvest of Indian River wild stock pink salmon in SJ Hatchery cost recovery harvests. As currently defined in regulation, the SJ Hatchery SHA for coho salmon confines cost recovery harvest to a small area immediately in front of the hatchery minimizing the potential to harvest wild stock coho salmon.

Potential Straying

The ancestral stock for both SJ hatchery coho and pink salmon is Indian River. Because Indian River is the water source for the SJ Hatchery and the hatchery is located in close proximity to Indian River, high levels of straying into the river is likely. Despite SJ Hatchery's long history of salmon production, there have been no formal studies to determine what level of straying is occurring into Indian River. There are two records in the department's Alexander IFDB database of coho escapement surveys that show significant numbers of adipose clipped coho were counted. In 1986, 33 of 126 coho salmon counted had clipped adipose and in 1989, 96 of 603 coho salmon counted had clipped adipose. It can be assumed that the numbers of hatchery produced salmon straying into Indian River, whatever the level might be under current production levels, will increase proportionally with the proposed increases in production for both pink and coho salmon. SJ Hatchery's long history of operation and possible high levels of straying into Indian River would suggest that "wild" Indian River salmon might already be genetically integrated, at some level, with hatchery production. Because of this, what level of straying into Indian River might be of concern under the proposed production increases is unclear.

The application letter from SSSC states that all chum and pink salmon releases will be otolith marked and approximately 9% of the coho salmon will be coded wire tagged. An increase in production may warrant efforts to sample pink, chum and coho salmon in Indian River to determine the rate of straying. If excessive straying rates are encountered, hatchery production may be curtailed or release strategies reevaluated.

The Department's genetic policy states,

> "The magnitude of straying relative to the size of the wild run is the most important criterion, as massive spawning by hatchery strays may jeopardize a wild population by displacement on spawning habitat and superimposition of redds, as well as, genetic influx. A conservative management approach dictates avoiding release sites where large numbers of hatchery strays can be expected to interact with significant or unique wild stocks. This approach can be achieved by spatial or temporal isolation of the hatchery and wild stock."

Interactions with Other Species

Another concern with increasing production is possible negative consequences associated with interspecific and intraspecific competition with local salmon stocks and other marine species during the early-marine phase of salmon production and growth. Releases of salmon in Sitka Sound have increased steadily over the past decades to nearly 60,000,000 fish. Effects on wild stocks of large quantities of foraging hatchery released salmon smolt and fry are unknown but is a concern. Initial growth and forage studies were required of the Medvejie and Sheldon Jackson Hatchery for 10 million chum salmon increments with specific concern of predation on herring larvae. Initial results did not indicate a shortage of prey items or specific predation on herring larvae in the areas studied.

Indian River Water Rights

The Alaska Department of Natural Resources (DNR) administers water rights in Alaska. At present, DNR has granted three water rights (issued a certificate of appropriation) for the Indian River (one water right is in application status pending adjudication) (Table 2). Additionally, the National Park Service (NPS) has informally claimed water rights on Indian River as part of the establishment of the Sitka National Historical Park in 1890, but has not officially filed for water rights. Sheldon Jackson College (SJC) has a water right to appropriate 30 cubic feet per second (cfs) year round to operate a salmon hatchery and a hydroelectric facility. The point of diversion is located at approximately River Mile (RM) 0.8 (RM refers to the distance upstream from the mouth of the river). The City and Borough of Sitka (CBS) has a water right to appropriate 3.87 cfs for public water supply. The point of diversion is located at approximately RM 1.4. ADF&G has a water right (called a reservation of water) to reserve flows from RM 0.0 to 2.5 for the purpose of protecting fish habitat, migration, and propagation. The flows reserved are shown in Figure 1 in relation to the annual hydrograph for the Indian River near Sitka.

Table 2. Existing water rights for the Indian River, Sitka Alaska.

File Type and No.	Applicant	Priority Date	Status	Amount (cfs)	Type of Use
ADL 43671	SJC	12/31/1914	Certificate	30	Hatchery/Hydro
ADL 43672	CBS	12/31/1914	Certificate	3.9	Public Water Supply
ADL 101686	CBS	9/23/1980	Application	5.4	Public Water Supply
LAS 12236	ADF&G	1/12/1989	Certificate	35-101	Fish Habitat

Alaska water law is based on the doctrine of prior appropriation, giving the first appropriator of water from a given water source a priority of right over subsequent appropriators on a "first-in-time, first-in-right" basis. With an established water right, the permittee has a legal standing to assert that right against conflicting uses of water from others who do not have water rights or who are junior in priority. ADF&G's reservation of water is junior to CBS's and SJC's certified water rights.

DNR is currently reviewing the water right for the SJC hatchery to determine actual water use to meet the water needs of the hatchery. Once this review is complete, the amount of water that can be appropriated under this water right will likely be amended to remove any water use for hydroelectric power and certify the actual water use by the hatchery by seasons. If SSSC acquires the hatchery facility and the land it sits on, SJC's hatchery water right will transfer to SSSC (Gary Prokosch, DNR Water Resources Section Chief, August 26, 2010, personal communication).

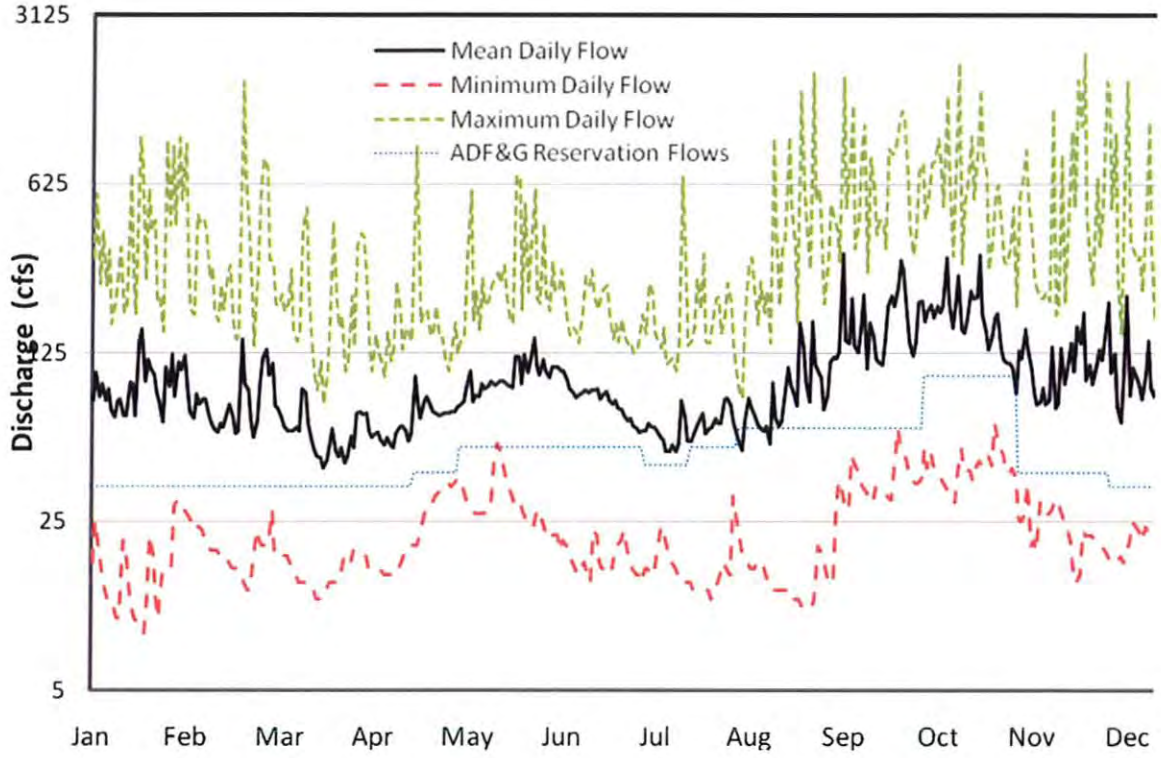

Figure 2. ADF&G's reservation of water flows in relation to mean, minimum, and maximum daily flows for the Indian River near Sitka based on data from USGS gage 15087690 (period of record: 1980-1993, 1998-2006). Note: this gage is located upstream of the diversion points for SJC's and CBS's water rights. There is also a gage (USGS gage 15087700) located downstream of the CBS and SJC diversion points.

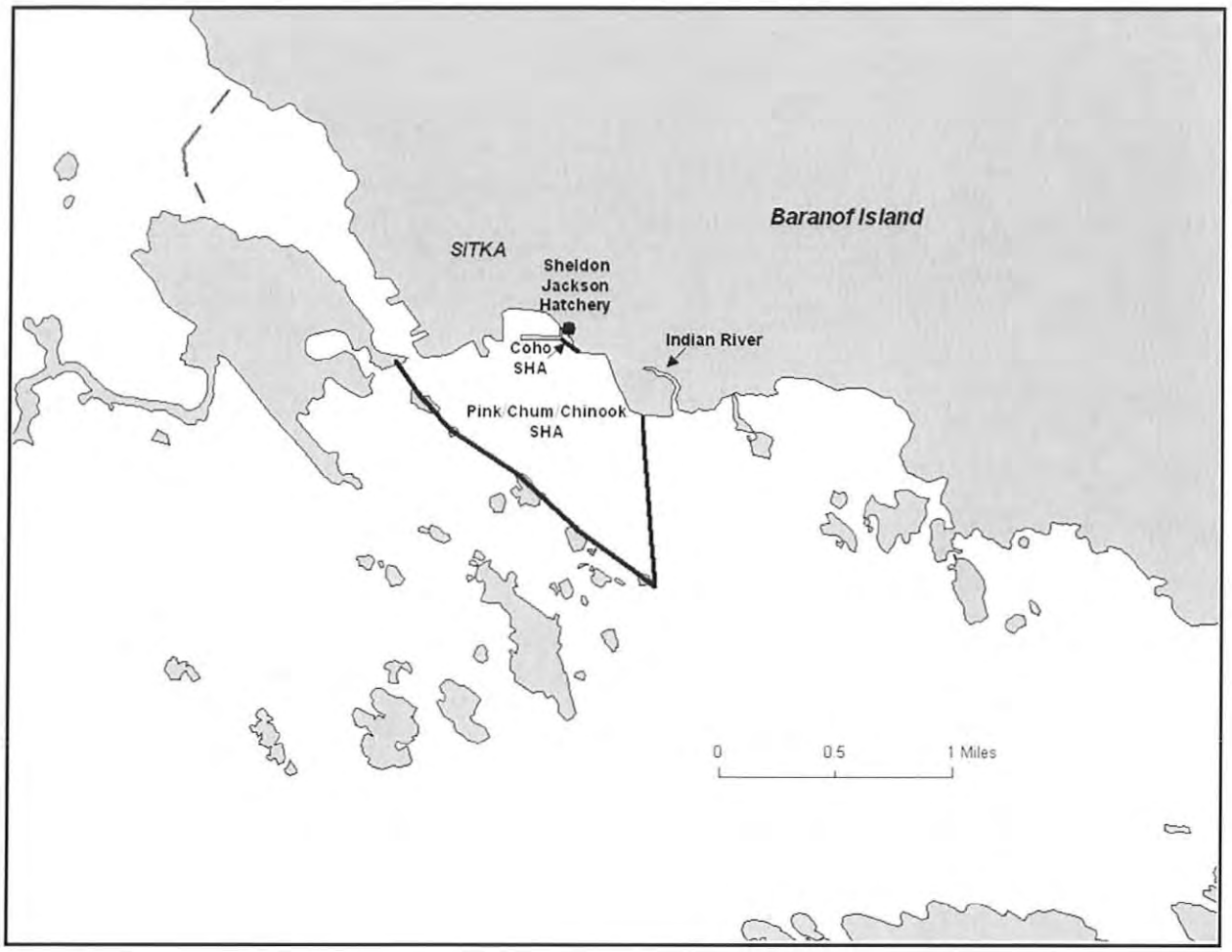

Figure 1– Sheldon Jackson Hatchery (Crescent Bay) Special Harvest Area.

STATE OF ALASKA

SEAN PARNELL / GOVERNOR

P.O. BOX 115526
JUNEAU, AK 99811-5526
PHONE: (907) 465-4210
FAX: (907) 465-2604

DEPARTMENT OF FISH AND GAME

Division of Commercial Fisheries

October 20, 2010

Ms. Lisa Busch
Sitka Sound Science Center
PO Box 1373
Sitka, AK 99835

RE: Sheldon Jackson Hatchery application

Dear Ms. Busch:

Thank you for your recent application for a hatchery permit for the Sheldon Jackson Hatchery in Sitka. This letter is to serve as an official request for further information that will be required in order to make a completeness determination and accept the application per 5 AAC 40.160.

The answers to the following application questions need further clarification and/or elaboration:

1. ***III.B.2.a Topography***
The answer for this section mentions a tidelands lease associated with the facility, but no further information on the lease is provided in the application. Please provide additional information on that tidelands lease in section III.C.

2. ***III.C.2. What is (will be) the legal form of any usage rights?***
The easement for the hatchery main water line is described in Appendix A of the application. There also appears to be an incomplete description of an easement for the wood stave pipeline ("Wood Stave Easement") in this Appendix. Please provide the full text of the description of this easement.

3. ***III.C.3. List the additional state and federal permits needed by the applicant to build and operate the proposed hatchery. Examples may include: U.S. Army Corps of Engineers Permit, Department of Natural Resources Water Use, Land Use, and Tidelands Lease Permits; and U.S. Forest Service Land Use Permit.***
The application listed "N/A" for this question, but it is likely that there are existing state and/or federal permits needed to operate the hatchery. It's possible that this question was interpreted to ask only for any *new* state and federal permits that would be needed. Please list the existing state and federal permits for the operation of the hatchery and its facilities as well as any new ones that would be needed. For example, permits from the Department of Natural Resources and the Corps of Engineers might be required for pilings or net pen anchoring on tidelands. You should also determine if any of those permits would be affected by the change to SSSC as the hatchery operator.

4. ***IX. Financial Plan.***
The information provided in Appendix K of the application lists estimated annual expenses in excess of the estimated cost recovery income. The income from the cost recovery contract with NSRAA is not shown. Please provide more information about the expected income from the contract with NSRAA and any other sources of income used to fully fund the operating expenses shown in the plan.

Once you have provided a response to each of these questions, and that response is determined to be adequate, a completeness determination may be made and the application accepted. Following that, the review process will commence per 5 AAC 40.190.

Sincerely,

Jake Musslewhite for:
Sam Rabung
PNP Hatchery Program Coordinator
Alaska Department of Fish and Game
Division of Commercial Fisheries
1255 W 8th St.
P.O. Box 115526
Juneau, AK. 99811-5526
tele: 907-465-4235
fax: 907-465-4168
email: samuel.rabung@alaska.gov

cc: Ron Josephson

SITKA SOUND SCIENCE CENTER, INC.

834 LINCOLN ST. SAGE BUILDING #20
P.O. BOX 1373
SITKA, ALASKA 99835-1373 907-747-8878

SITKA SOUND SCIENCE CENTER IS DEDICATED TO INCREASING UNDERSTANDING AND AWARENESS OF TERRESTRIAL AND AQUATIC ECOSYSTEMS OF THE GULF OF ALASKA THROUGH EDUCATION AND RESEARCH.

October 25, 2010

Dear Mr. Rabung,

Thank you for your questions regarding our permit application. Below are the answers to the questions from your October 20th letter.

1. Topography
   Attachment 1 shows the diagram of the Tidelands lease and includes the text description of the tidelands for Lot 7.
2. What is the legal form of any usage rights? Please provide full description of the Wood Stave easement:

   Attachment 2 is the legal description of the Wood Stave easement from the Sitka Recording District 2009-000578-0
3. List of permits needed by the applicant to build and operate the proposed hatchery.

1970 State of Alaska Certificate of Appropriation of Water No. 657
1975 Fish and Game non profit salmon hatchery permit No. 3 FTP 84J-1062
1985 Army Corps of Engineers Permit for infiltration system. 071-OYD-M-840032
Raceway U.S. Army Corps of Engineers Permit Number D-1932-008
Title 16 permit for new intake at Indian River

Potential Permits

A U.S. Army Corps Permits would be necessary for a possible small boat float in the tidelands area that are leased or deeded.

4. Financial Plan
   Attachment 3 is our annual budget. It includes our income from NSRAA which was accidentally omitted from the original attachment K. Also shown is income we received that is generated from the City of Sitka's fish box tax. This also contributes to the operations of the hatchery.

Board Members

- Scott Harris, M.S., Chairman of the Board, Sitka Conservation Society
- Jim Seeland, Board Vice Chairman, UAS-Ketchikan, Assistant Professor of Fisheries
- Victoria O'Connell, Secretary, Coastal Marine Research
- Heather Woody, Treasurer, Sitka Tribe of Alaska, Research Biologist
- Marlin Keith Cox, Ph.D, NOAA Fisheries, Research Biologist
- Dave Arp, Sitka School District, Business Manager
- Jan Straley, M.S. University Alaska Southeast (UAS-Sitka), Marine Mammal Biologist
- Kitty LaBounty, M.S. UAS-Sitka, Adjunct Professor
- Bill Smoker, Ph.D. UA-Fairbanks, Professor Emeritus
- Tommy Sheridan, Northern Southeastern Regional Aquaculture Association
- Allen F. Turner, Wells Fargo Bank Sitka, Business Relations Manager

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834 LINCOLN ST. SAGE BUILDING #20
P.O. BOX 1373
SITKA, ALASKA 99835-1373 907-747-8878

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We appreciate your careful review of our application. Please let us know if there are other questions.

All the best,

Lisa Busch
Director

Board Members

- Scott Harris, M.S., Chairman of the Board, Sitka Conservation Society
- Jim Seeland, Board Vice Chairman, UAS-Ketchikan, Assistant Professor of Fisheries
- Victoria O'Connell, Secretary, Coastal Marine Research
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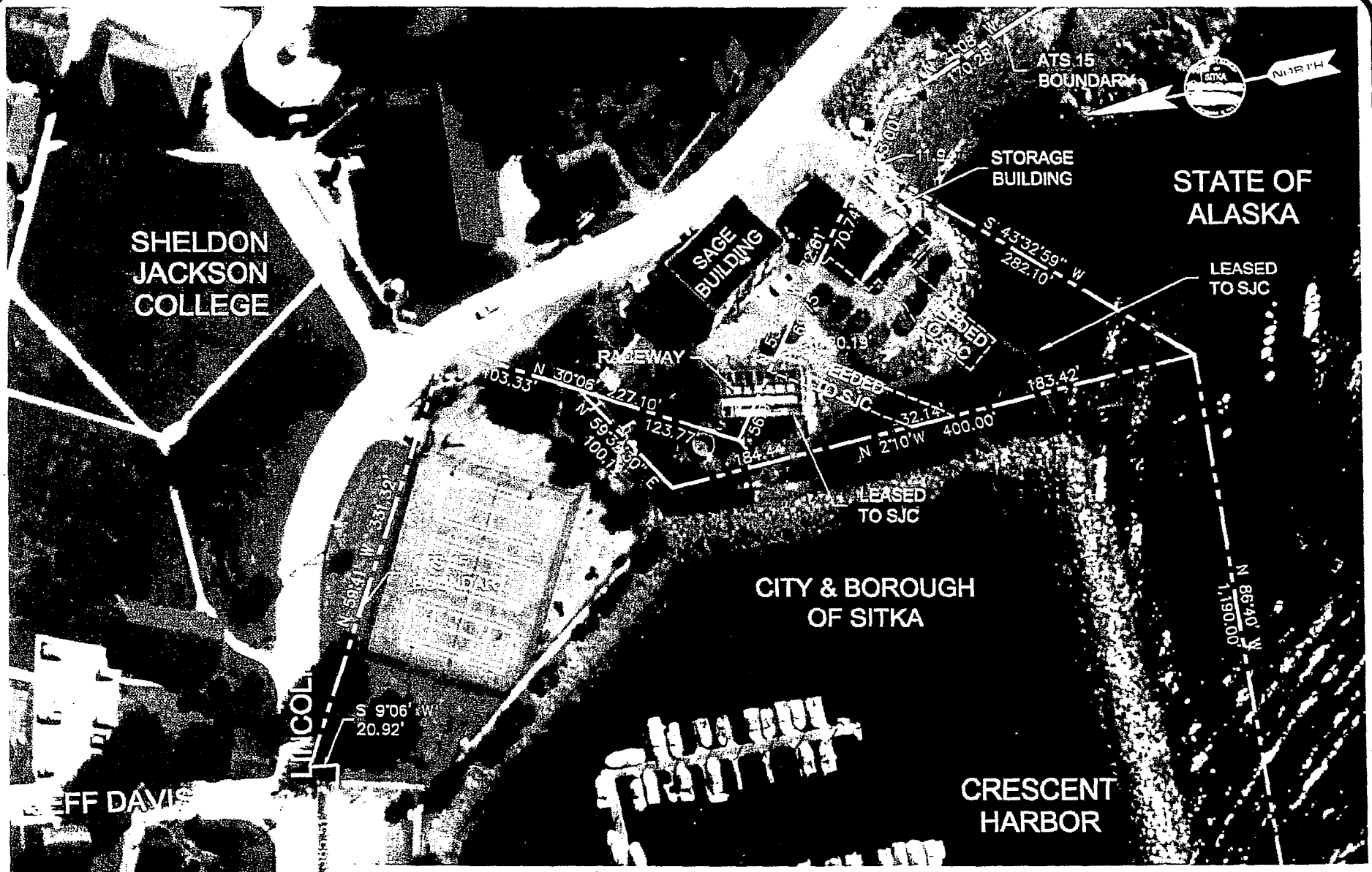
- Tommy Sheridan, Northern Southeastern Regional Aquaculture Association
- Allen F. Turner, Wells Fargo Bank Sitka, Business Relations Manager

ATTACHMENT 1

Topography



City and Borough of Sitka
PLANNING DEPARTMENT
100 LINCOLN STREET • SITKA, ALASKA 99835
TEL (907) 747-1814 FAX (907) 747-6138

SHELDON JACKSON COLLEGE & ATS 15

DRAWN: PAR	SCALE: 1" = 100'±
CHECKED: SWW	DATE: 2.23.01
DRAWING NAME	SJ–ATS15
SHEET NO.	1 / 1

assigned to State

T I D E L A N D S L E A S E

THIS LEASE, made and entered into this 11th day of September, 1985, by and between

CITY AND BOROUGH OF SITKA
hereinafter referred to as the Lessor, and

SHELDON JACKSON COLLEGE
of P. O. Box 479, Sitka, Alaska 99835
hereinafter referred to as the Lessee,

W I T N E S S E T H:

WHEREAS, the Lessor is owner of certain tidelands situated at Sitka, Alaska described as follows:

Beginning at a brass capped monument marked "Meander Corner, City of Sitka" delineating a meander corner of the Tidelands boundary of the Sitka Tidelands Survey of 1961, (A.T.S.15), from which bears the W.C.M.C. of Corner No. 1 of U.S.S. 1474, Tract A, N35°32'33"W, 666.63 feet, said brass cap being situated approximately 57.5 feet southeasterly from the northeast corner of an existing metal clad storage building, thence along the meander line of said A.T.S.15, N53°08'W, 43.00 feet to the true point of beginning of this description, thence S43°32'59"E, 282.10 feet to a point which is coincident with the southeast corner of Crescent Harbor, thence along the boundary line of Crescent Harbor, N02°10'W, 400.00 feet to a point, thence continuing along the boundary of Crescent Harbor N59°32'30"W, 100.12 feet to the intersection of a meander line of A.T.S.15, thence along the meander line S30°06'W, 123.77 feet to a point, thence S53°08'E, 229.59 feet to the true point beginning, EXCEPTING therefrom those portions of the above described tidelands already owned by Sheldon Jackson College, henceforth known as Tract A and Tract B of this description, to wit:

TRACT A

Beginning at the true point of beginning of this legal description, thence along the meander line of A.T.S.15, N53°08'W, 82.68 feet to the true point of beginning of Tract A, thence along the following courses:

S54°51'W, 3.38 feet to a point, thence;
S35°09'E, 7.02 feet to a point, thence;
S54°51'W, 38.23 feet to a point, thence;
S35°09'E, 11.10 feet to a point, thence;
S56°58'W, 28.81 feet to a point, thence;
S72°38'W, 20.15 feet to a point, thence;
S50°57'W, 47.98 feet to a point, thence;
S39°03'E, 29.38 feet to a point, thence;
N52°34'E, 82.87 feet to a point, thence;
S35°09'E, 27.01 feet to a point, thence;
N54°51'E, 74.54 feet to a point, thence;
N53°08'W, 70.74 feet to the true point of beginning of Tract A, containing 6,156 square feet, as near as may be;

TRACT B

Beginning at the true point of beginning of this legal description, thence along the meander line of A.T.S.15, N53°08'W, 172.62 feet to the true point of beginning of Tract B, thence along the following courses:

S33°49'12"W, 112.90 feet to a point, thence;
S02°10'E, 32.14 feet to a point, thence;
N38°34'E, 12.62 feet to a point, thence;
N33°55'30"E, 125.26 feet to a point, thence;
N53°08'W, 20.19 feet to the true point of beginning of Tract B, containing 2,520 square feet, as near as may be.

The lease area of this legal description contains 31,216 square feet, as near as may be.

NOW, THEREFORE, for and in consideration of the agreements hereinafter contained, Lessor and Lessee agree as follows:

1. Lessor hereby devises and leases unto the Lessee, the above-described property for a term of fifty (50) years, beginning September 11, 1985, and ending September 10, 2035.

2. Lessee, in consideration of lease from Lessor, agrees as follows:

(a) To pay rent therefore to Lessor at its order the sum of $2,497.28 annually payable on the first day September of each year in advance. It is acknowledged that the first year's payment has been made. In addition to said rental there shall be paid to the City and Borough of Sitka sales tax on the amount of each rental not exempt from such sales tax.

(b) The parties hereby agree that said annual rent is subject to adjustment on the seventh anniversary of the lease and each seven years thereafter, with the annual lease payment being changed by the percentage change in the amount (expressed in dollars and cents) established by dividing the grand total land value on the official municipal real property assessment roll for the initial lease year, or prior adjustment year by the number of that year's real property tax accounts, compared with a similar calculation using the figures seven years later. The base figure for the tax year 1985 is $40,424.39.

(c) This lease may not be assigned or sublet by the Lessee without the consent of the Lessor.

(d) If the rent shall be in arrears, or Lessee, its representatives or assigns, do or shall neglect agreements hereinabove contained which are to be performed and in the event Lessee fails to remedy default within thirty (30) days after receipt of written notice of any such rental arrears or neglect, then Lessor may immediately, or at any time thereafter, while such neglect or default continues, enter into and on the premises, or any part thereof, and repossess the same as of their former estate, and expel Lessee and those claiming under it and remove its effects (forcefully if necessary) without being guilty of any trespass and without prejudice to any remedies which might otherwise be used for arrears or rent, or proceedings on breach of agreement.

(e) That the Lessee herein agrees to pay any Local Improvement District assessments that may be levied against the property leased herein to the same extent and in the same amount as if the Lessee were the owner of the property leased herein which would be included in the Local Improvement District to be formed or contemplated. The Lessee shall share the Lessor's right as owner in all proceedings under the Local Improvement District (except for payment of assessments) in proportion that the remaining years of the lease bear to twenty (20). (For example: If the lease has five (5) years to run, the Lessee shall have the right to exercise 5/20ths of the Lessor's vote and the Lessor, 15/20ths.)

IT IS MUTUALLY AGREED AS FOLLOWS:

1. The terms and conditions herein contained shall apply to and bind the heirs, successors and assigns of the respective parties.

2. Waiver by Lessor of any agreement or condition herein shall not be considered a waiver of any subsequent breach of said agreement or condition.

3. If Lessee occupies the premises after the expiration date of this lease without the consent of the Lessor, such possession shall be construed as an annual tennancy and Lessee shall pay Lessor the annual rent paid during the last year of said lease.

4. At any termination of said tenancy, all improvements placed on said property and attached to the land so as to become part of the real property by common law definition shall become the property of the Lessor.

5. Lessee agrees to save the Lessor harmless from any liability or property damage or personal injury to any person or persons on or about the premises; to carry liability insurance in such amounts as may be agreed to between the parties to cover such liability, with the Lessor as an additional named insured.

Richard Anderson, Administrator
CITY & BOROUGH OF SITKA

Michael Kaelke President
for SHELDON JACKSON COLLEGE
(name) Michael Kaelke
(title) President

ATTACHMENT 2

Wood Stave Easement

THIS DECLARATION OF EASEMENTS AND ACCESS RIGHTS ("Declaration") for the Sheldon Jackson Campus Subdivision is made this 24th day of April, 2009, by Grantor **SHELDON JACKSON COLLEGE**, by and through its authorized representatives, with an address of 801 Lincoln Street, Sitka, Alaska, 99835 ("Grantor").

I. RECITALS

A. Grantor is the Owner of certain real property in Sitka, Alaska consisting of approximately 34.5 acres of land bordered by Davis Street on the west, Sawmill Creek Road on the north, Metlakatla Street and the Sitka National Monument on the east, and Lincoln Street on the south.

B. Grantor has submitted a plat to subdivide these properties into various parcels for marketing and sale, entitled the Sheldon Jackson Campus Subdivision ("Subdivision"). Collectively the properties within the Subdivision shall be known as the "Subject Properties."

C. Grantor recognizes that for the most favorable development of the Subject Properties, it is desirable that Grantor identify and convey certain easements and access rights as they are substantially depicted on the plat for the Subdivision dated April 8, 2009 ("SJC Plat"), along with the rights, obligations and duties relating to same, as more particularly described below.

II. SPECIFIC GRANTS

NOW, THEREFORE, for and in consideration of the Recitals herein, which are deemed a material and substantive part of this Declaration, and TEN DOLLARS ($10) and other good and valuable consideration, Grantor hereby declares, grants, covenants and agrees as follows:

A. Sage Building/Hatchery.

1. Wood Stave Easement. Grantor hereby grants and conveys to the Owner of Lot 7 of the Subdivision (where the Sage Building/Hatchery is located) an excusive use easement ("Wood Stave Easement") that crosses several of the Subject Properties. The Wood Stave Easement is approximately 30 feet in width and runs in a southerly direction from the

Creek as depicted on the SJC Plat for a distance of approximately 600 feet until it crosses under Lincoln Street to Lot 7.

The easement, rights, and privileges conveyed with the Wood Stave Easement are exclusive to the Owner of Lot 7 and his successors in interest who shall not be authorized to convey any other easement or conflicting rights within the area covered by the Wood Stave Easement except as conditioned or described by this Declaration.

The Owner of Lot 7 shall have the duty to repair and maintain the Wood Stave Easement and keep it free and open for the benefit of Lot 7 including, without limitation, removing vegetation and cutting or trimming trees or vegetation that may encroach on the Easement or obstruct the flow of water through it.

2. Hatchery Water Line Easement. Grantor hereby grants and conveys a 20 foot Water Line Easement which starts at the edge of Sawmill Creek Road where it is encompassed, and included within, the course of the Water Canal Easement described below and as depicted on the SJC Plat. It continues southerly within the course of the Water Canal Easement for a distance of approximately 650 feet until it branches off at or near the location where the Water Canal Easement bends to the east. The Water Line Easement then continues south within its own course for approximately 700 feet where it crosses underneath Lincoln Street to serve Lot 7, as more particularly depicted on the SJC Plat. The Water Line Easement contains a 12 inch water line throughout its course that provides a source of water for the exclusive use and benefit of Lot 7.

The easement, rights and privileges conveyed with the Hatchery Water Line Easement are exclusive to the Owner of Lot 7 and his successors in interest who shall not be authorized to convey any other easement or conflicting rights within the area covered by the Hatchery Water Line Easement except as conditioned or described by this Declaration.

The Owner of Lot 7 shall have the duty to repair and maintain the water line within the Easement, including repair of leaks, mitigation and prevention of damage from flooding caused by disrepair, and shall at all times keep the Easement free and open for the benefit of Lot 7.

3. Water Canal Easement. The Creek has developed into an anadromous fish stream below the penstock intake. Grantor hereby grants

CERTIFICATE OF OWNERSHIP AND DEDICATION

WE HEREBY CERTIFY THAT WE ARE THE OWNERS OF THE PROPERTY SHOWN AND DESCRIBED HEREON AND THAT WE HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH OUR FREE CONSENT AND DEDICATE ALL STREETS, ALLEYS, WALKS, PARKS AND OTHER OPEN SPACES TO PUBLIC OR PRIVATE USE AS NOTED.

24 April 2009 — DATE — David Lobler, president — OWNER (SIGNATORY) — Sheldon Jackson College

DATE — OWNER (SIGNATORY)

NOTARY'S ACKNOWLEDGMENT

US OF AMERICA
STATE OF ALASKA
CITY & BOROUGH OF SITKA

THIS IS TO CERTIFY THAT ON THIS 24th DAY OF April 2009, BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC IN AND FOR THE STATE OF ALASKA, DULY COMMISSIONED AND SWORN, PERSONALLY APPEARED David Lobler President of Sheldon Jackson College

TO ME KNOWN TO BE THE IDENTICAL INDIVIDUAL(S) MENTIONED AND WHO EXECUTED THE WITHIN PLAT AND he ACKNOWLEDGED TO ME THAT he SIGNED THE SAME FREELY AND VOLUNTARILY FOR THE USES AND PURPOSES THEREIN SPECIFIED.

WITNESS MY HAND AND NOTARY SEAL THE DAY AND YEAR FIRST HEREIN-WRITTEN.

NOTARY PUBLIC IN AND FOR THE STATE OF ALASKA

MY COMMISSION EXPIRES 7/1/11

GAIL ANN ROBERICK — NOTARY PUBLIC — STATE OF ALASKA

CERTIFICATE OF PAYMENT OF TAXES (STATE OF ALASKA) (FIRST JUDICIAL DISTRICT)

I, THE UNDERSIGNED, BEING DULY APPOINTED AND QUALIFIED, AND ASSESSOR FOR THE CITY & BOROUGH OF SITKA, DO HEREBY CERTIFY THAT ACCORDING TO THE RECORDS OF THE CITY AND BOROUGH OF SITKA, THE FOLLOWING DESCRIBED PROPERTY IS CARRIED ON THE TAX RECORDS IN THE NAME OF Sheldon Jackson College

AND THAT, ACCORDING TO THE RECORDS IN MY POSSESSION, ALL TAXES ASSESSED AGAINST SAID LANDS AND IN FAVOR OF THE CITY & BOROUGH OF SITKA ARE PAID IN FULL THAT CURRENT TAXES FOR THE YEAR 2009 WILL BE DUE ON OR BEFORE August 31, 2009

DATED THIS ~~April~~ 2009 17TH DAY OF April, AT SITKA, ALASKA

ASSESSOR, CITY AND BOROUGH OF SITKA

CERTIFICATE OF APPROVAL BY THE BOARD

I HEREBY CERTIFY THAT THE SUBDIVISION PLAT SHOWN HEREON HAS BEEN FOUND TO COMPLY WITH THE SUBDIVISION REGULATIONS OF THE CITY & BOROUGH OF SITKA PLATTING BOARD, AND THAT SAID PLAT HAS BEEN APPROVED BY THE BOARD BY PLAT RESOLUTION NO. PZ08-11 DATED 20__, AND THAT THE PLAT SHOWN HEREON HAS BEEN APPROVED FOR RECORDING IN THE OFFICE OF THE DISTRICT MAGISTRATE, EX-OFFICIO RECORDER, SITKA, ALASKA

4/17/2009 — DATE — CHAIRMAN, PLATTING BOARD

SECRETARY

CERTIFICATE OF APPROVAL BY THE ASSEMBLY

I HEREBY CERTIFY THAT THE SUBDIVISION PLAT SHOWN HEREON HAS BEEN FOUND TO COMPLY WITH THE SUBDIVISION REGULATIONS OF THE CITY & BOROUGH OF SITKA ASSEMBLY AS RECORDED IN MINUTE BOOK ___, PAGE ___, DATED ___ 20__ AND THAT THE PLAT SHOWN HEREON HAS BEEN APPROVED FOR RECORDING IN THE OFFICE OF THE DISTRICT COURT, EX OFFICIO RECORDER, SITKA, ALASKA

4-15-2009 — DATE

Sara Peterson, Acting Municipal Clerk — CITY AND BOROUGH CLERK

CITY AND BOROUGH OF SITKA — SEAL

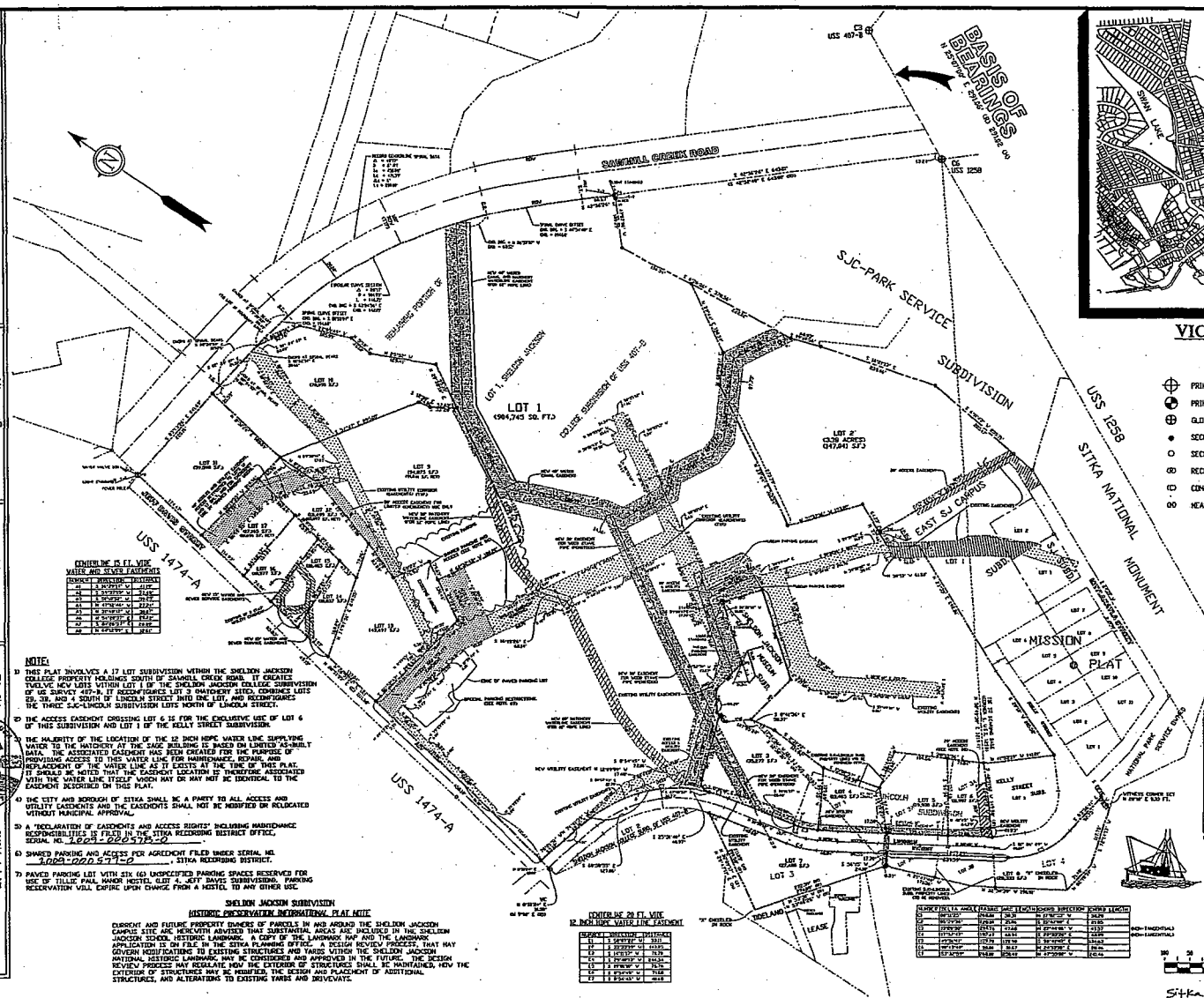
CERTIFICATE OF PAYMENT OF LOCAL IMPROVEMENT DISTRICT

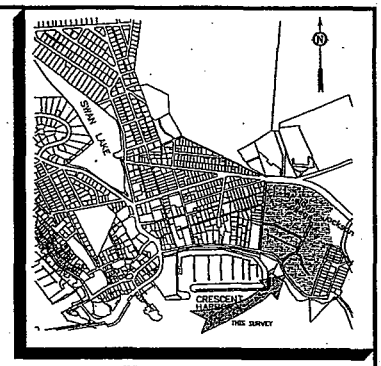
I, THE UNDERSIGNED, BEING DULY APPOINTED AND QUALIFIED, AND FINANCE DIRECTOR FOR THE CITY & BOROUGH OF SITKA, DO HEREBY CERTIFY THAT, ACCORDING TO THE RECORDS OF THE CITY & BOROUGH OF SITKA, THE FOLLOWING DESCRIBED PROPERTY IS CARRIED ON THE RECORDS IN THE NAME OF Sheldon Jackson College

ALL OWNERS OF RECORD, AND THAT, ACCORDING TO THE RECORDS IN MY POSSESSION, ALL L.I.D.'S ASSESSED AGAINST SAID LANDS AND IN FAVOR OF THE CITY & BOROUGH OF SITKA ARE PAID IN FULL.

DATED THIS 15th DAY OF April 2009, AT SITKA, ALASKA

FINANCE DIRECTOR
CITY & BOROUGH OF SITKA





VICINITY MAP

SCALE 1"=1,000'

LEGEND

- PRIMARY CONTROL MONUMENT (RECOVERED)
- PRIMARY CONTROL MONUMENT (SET)
- G.L.O./B.L.M. PRIMARY BRASS CAP (RECOVERED)
- SECONDARY MONUMENT (SET)
- SECONDARY MONUMENT (RECOVERED)
- (R) RECORDED DATA
- (C) COMPUTED DATA
- (M) MEASURED DATA

NOTE:

1) THIS PLAT INVOLVES A 17 LOT SUBDIVISION WITHIN THE SHELDON JACKSON COLLEGE PROPERTY HOLDINGS SOUTH OF SAWMILL CREEK ROAD. IT CREATES TWELVE NEW LOTS WITHIN LOT 1 OF THE SHELDON JACKSON COLLEGE SUBDIVISION OF US SURVEY 407-B. IT RECONFIGURES LOT 3 (MATCHERY SITE), COMBINES LOTS 2B, 3B, AND 4 SOUTH OF LINCOLN STREET INTO ONE LOT, AND RECONFIGURES THE THREE SJC-LINCOLN SUBDIVISION LOTS NORTH OF LINCOLN STREET.

2) THE ACCESS EASEMENT CROSSING LOT 6 IS FOR THE EXCLUSIVE USE OF LOT 6 OF THIS SUBDIVISION AND LOT 1 OF THE KELLY STREET SUBDIVISION.

3) THE MAJORITY OF THE LOCATION OF THE 12 INCH HDPE WATER LINE SUPPLYING WATER TO THE HATCHERY AT THE SAGE BUILDING IS BASED ON LIMITED "AS-BUILT" DATA. THE ASSOCIATED EASEMENT HAS BEEN CREATED FOR THE PURPOSE OF PROVIDING ACCESS TO THIS WATER LINE FOR MAINTENANCE, REPAIR, AND REPLACEMENT OF THE WATER LINE AS IT EXISTS AT THE TIME OF THIS PLAT. IT SHOULD BE NOTED THAT THE EASEMENT LOCATION IS THEREFORE ASSOCIATED WITH THE WATER LINE ITSELF WHICH MAY OR MAY NOT BE IDENTICAL TO THE EASEMENT DESCRIBED ON THIS PLAT.

4) THE CITY AND BOROUGH OF SITKA SHALL BE A PARTY TO ALL ACCESS AND UTILITY EASEMENTS AND THE EASEMENTS SHALL NOT BE MODIFIED OR RELOCATED WITHOUT MUNICIPAL APPROVAL.

5) A "DECLARATION OF EASEMENTS AND ACCESS RIGHTS" INCLUDING MAINTENANCE RESPONSIBILITIES IS FILED IN THE SITKA RECORDING DISTRICT OFFICE, SERIAL NO. 2009-000578-0, SITKA RECORDING DISTRICT.

6) SHARED PARKING AND ACCESS PER AGREEMENT FILED UNDER SERIAL NO. 2009-000577-0, SITKA RECORDING DISTRICT.

7) PAVED PARKING LOT WITH SIX (6) UNSPECIFIED PARKING SPACES RESERVED FOR USE OF TILLIE PAUL MANOR HOSTEL, ELOT 4, JEFF DAVES SUBDIVISION. PARKING RESERVATION WILL EXPIRE UPON CHANGE FROM A HOSTEL TO ANY OTHER USE.

SHELDON JACKSON SUBDIVISION
HISTORIC PRESERVATION INFORMATIONAL PLAT NOTE

CURRENT AND FUTURE PROPERTY OWNERS OF PARCELS IN AND AROUND THE SHELDON JACKSON CAMPUS SITE ARE HEREWITH ADVISED THAT SUBSTANTIAL AREAS ARE INCLUDED IN THE SHELDON JACKSON SCHOOL HISTORIC LANDMARK. A COPY OF THE LANDMARK MAP AND THE LANDMARK APPLICATION IS ON FILE IN THE SITKA PLANNING OFFICE. A DESIGN REVIEW PROCESS, THAT MAY GOVERN MODIFICATIONS TO EXISTING STRUCTURES AND YARDS WITHIN THE SHELDON JACKSON NATIONAL HISTORIC LANDMARK, MAY BE CONSIDERED AND APPROVED IN THE FUTURE. THE DESIGN REVIEW PROCESS MAY REGULATE HOW THE EXTERIOR OF STRUCTURES SHALL BE MAINTAINED, HOW THE EXTERIOR OF STRUCTURES MAY BE MODIFIED, THE DESIGN AND PLACEMENT OF ADDITIONAL STRUCTURES, AND ALTERATIONS TO EXISTING YARDS AND DRIVEWAYS.

CONTROL LINE 15 FT. WIDE WATER AND SEWER EASEMENTS

C1	S 30°25'00" W	21.00'
C2	S 30°25'00" W	21.48'
C3	S 30°25'00" W	20.00'
C4	S 30°25'00" W	20.00'
C5	S 30°25'00" W	20.00'
C6	S 30°25'00" W	20.00'
C7	S 30°25'00" W	20.00'
C8	S 30°25'00" W	20.00'

CENTER LINE 20 FT. WIDE 12 INCH HDPE WATER LINE EASEMENT

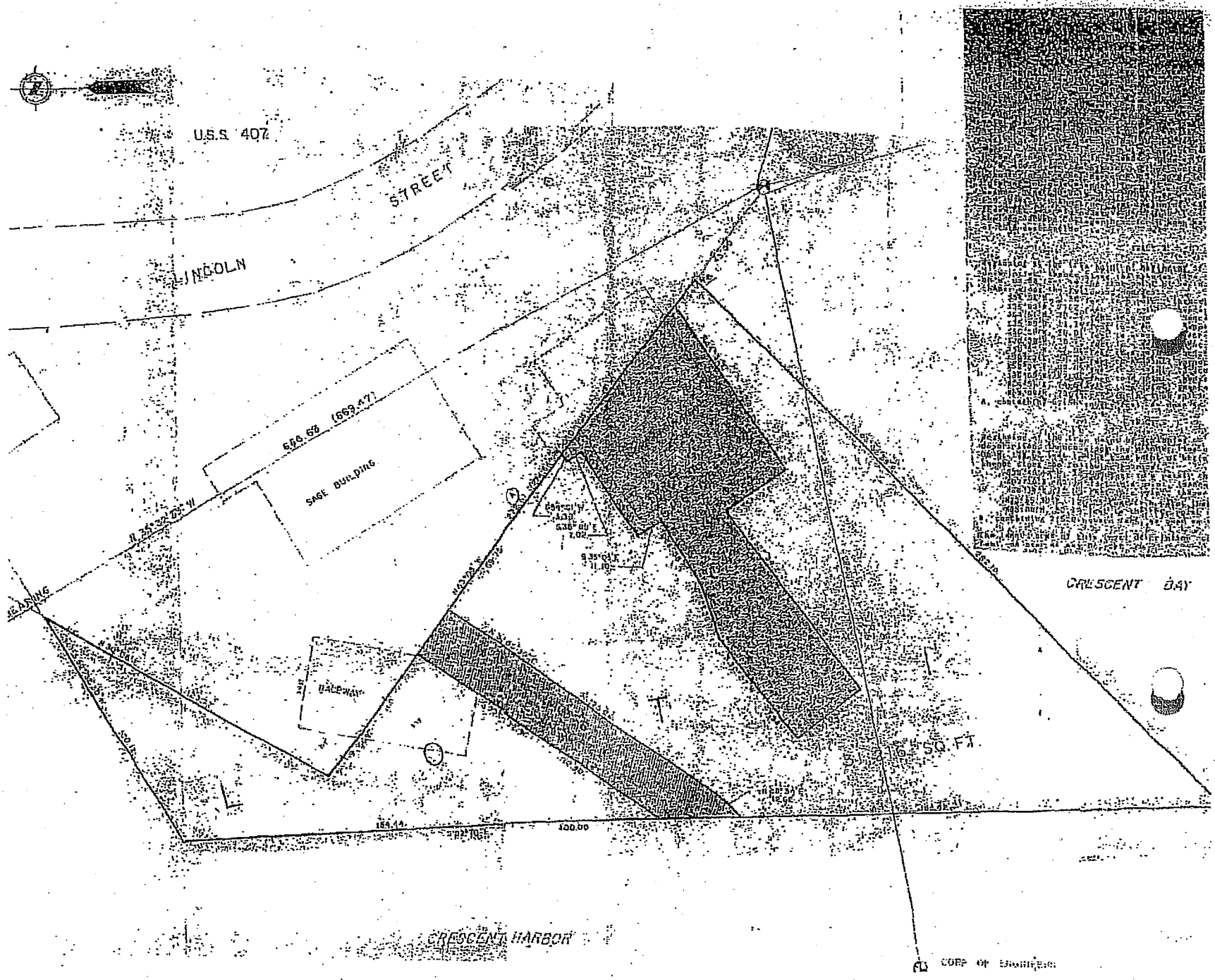
L1	S 30°25'00" W	3.00'
L2	S 30°25'00" W	103.25'
L3	S 30°25'00" W	78.25'
L4	S 59°34'00" W	134.24'
L5	S 59°34'00" W	75.50'
L6	S 59°34'00" W	71.00'
L7	S 59°34'00" W	40.00'

REFERENCE DATA FOR SET PRIMARY MONUMENTS

MON.	LINE	BEARING	DISTANCE	REFERENCE DESCRIPTION
P1	L1	S 59°34'00" W	84.5'	WOODEN BUILDING CORNER
	L2	S 59°34'00" W	84.5'	WOODEN BUILDING CORNER
	L3	S 59°34'00" W	42.5'	WOODEN BUILDING CORNER
P2	L1	S 59°34'00" W	42.5'	5/8" STANDARD
	L2	S 59°34'00" W	74.5'	5/8" STANDARD
	L3	S 59°34'00" W	39.0'	5/8" STANDARD
P3	L1	N 30°25'00" E	38.4'	WOODEN POLE
	L2	N 30°25'00" E	40.4'	5/8" STANDARD
	L3	N 30°25'00" E	84.0'	PAINTED "X" ON BOX
P4	L1	N 30°25'00" E	42.0'	5/8" STANDARD
	L2	N 30°25'00" E	4.0'	3/4" BRASS ALUMINUM
	L3	N 30°25'00" E	50.0'	5/8" "REBAR" CAP
P5	L1	N 30°25'00" E	52.0'	BUILDING CORNER
	L2	N 30°25'00" E	50.0'	BUILDING CORNER

SHELDON JACKSON MINOR SUBDIVISION (AND ASSOC. EASEMENTS) RECORD DATA

MONUMENT	DIRECTION	DISTANCE	MONUMENT	DIRECTION	DISTANCE
PM1	S 30°25'00" W	3.00'	PM2	S 30°25'00" W	103.25'
PM2	S 30°25'00" W	103.25'	PM3	S 30°25'00" W	78.25'
PM3	S 30°25'00" W	78.25'			
PM4	S 30°25'00" W	134.24'			
PM5	S 30°25'00" W	75.50'			
PM6	S 30°25'00" W	71.00'			
PM7	S 30°25'00" W	40.00'			
PM8	S 30°25'00" W	20.00'			
PM9	S 30°25'00" W	20.00'			
PM10	S 30°25'00" W	20.00'			


U.S.S. 407
STREET
LINCOLN
SAGE BUILDING
CRESCENT BAY
CRESCENT HARBOR
SQ. FT.
CORP OF ENGINEERS

SIZED

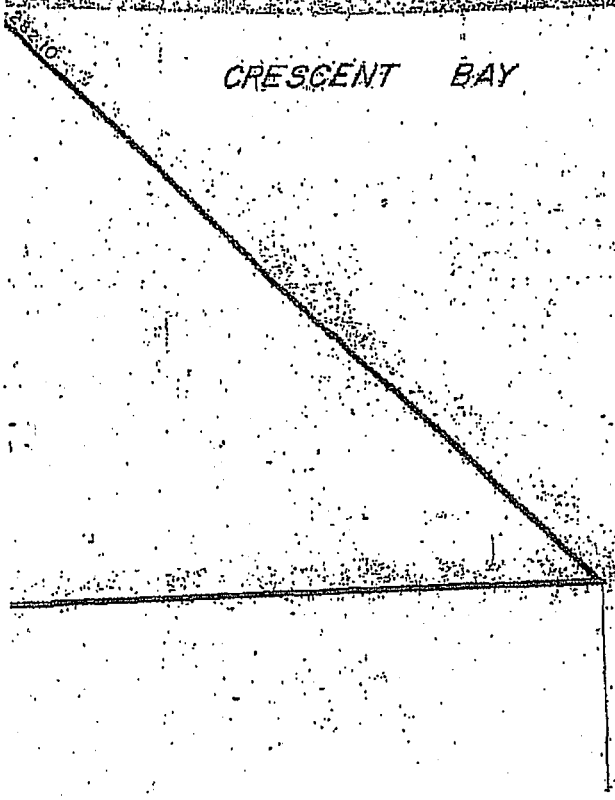
Tom, I updated the lease plat. Val is in Billing 7-1833 may have something in the file she can fax to you (like a better map)

Gail

TRACT B

Beginning at the true point of beginning of this legal description, thence along the northerly line of A.S. 16, N00°[illegible] 172.62 feet (true) to a point of beginning of tract B; thence along the [illegible] four feet; N33°46'[illegible] 112.90 feet to a point, thence; S02°16'E, 30.11 feet to a point, thence; N38°[illegible] 12.62 feet to a point, thence; N33°55'30"E, 124.28 feet to a point, thence; N53°08'W, 20.19 feet to the true point of beginning of Tract B, containing 2,530 square feet, as near as may be.

The leased area of this legal description contains 2,916 square feet, as near as may be.



LEGEND

TIDELANDS OWNED BY SHELDON JACKSON COLLEGE

TIDELANDS LEASED BY SHELDON JACKSON COLLEGE

MONUMENTS FOUND THIS SURVEY

OF ENGINEERS
NUMENT

ackson College
479
aska 99835
Program

TIDELAND LEASE PLAT

SHEET 1 OF 1

FINANCIALS

Budget from 2010

General Fund and Hatchery Budget 2010 (special project budgets not included)

Revenue and reserve 2010		Budget
4000	Donation Income	11280
4010	Friends of the Hatchery	34717
4020	Grant Income	142300
4030	Cost Recovery	45000
4090	Rental Income - sales tax	7650
4091	vessel charter income	1250
4099	Overhead transfer	24735
	total income: 266932	
	Total:	

Grant income for GF and Hatchery	amount
NSRAA	100000
White E	1500
Fish Box	32800
sitka womens club	500
CACC - pinnacles cle	2000
City of Sitka	6000

Line Item	Acct	Descriptio	Detail	Budget
100	100	**Total:**	**$ 155,775.35**	
	110	payroll tax		$ 11,090.35
	120		Executive Director	47,200.00
			hatchery personnel	61,785.00
			aquarium personnel	19,000.00
			Operations Manager	12,300.00
	130	worker's comp		4,400.00
200	200	Total:	**4,443.54**	
	210	boat fuel other		1,000.00
	211	boat fuel hatchery		500.00
	220	mileage		750.00
	230	training	600.00	593.54
	240	travel		1,600.00
300	300	Total:	**48,912.00**	
	320	bld maintenance		2,852.00
	330	heating fuel		8,000.00
	340	janitorial		2,700.00
	350	postage, box rent, shipping		860.00
		shipping pumps from fairbanks		
	360	sage building rent		21,000.00
	370	telephone internet		2,500.00
	380	water, electric, sewage		11,000.00
400	400	Total:	**9,500.00**	
	410	office supplies		1,700.00
	411	hatchery supplies		4,000.00
	440	aquarium supplies		800.00
	412	program supplies		3,000.00
500		Total:	**12,325.00**	
	510	boat insurance		1,225.00
	520	boat repair and maintenance		1,500.00
	530	hatchery equipment		4,500.00
		uv lights, saltwater pump		
	551	hatchery maintenance		2,220.00
		sawmill floor repair		
	550	maintenance		1,000.00
	560	moorage and storage		1,300.00
	580	equipment purchase and rental		580.00
600		Total:	**35,470.00**	
	610	advertising		1,900.00
	635	d&o		1,695.00
	639	liability		4,065.00
	630	other insurance		222.00
	640	fund raising expense		1,142.00
	645	meeting expense		200.00
	660	guest faculty contract		-
	665	dues, subscriptions, membershi		135.00
	675	cost recovery expense		3,500.00
	681	other professional services		2,000.00
	681	IT		
	681	per diem for Anna cummins (lyn		100.00
	681	condition survey/architechtural		3,721.00
	685	accounting		3,900.00
	689	legal		1,000.00
	688	Americorp (Shank, Paul)		10,640.00
	695	taxes, licenses, permits		1,250.00
		Hatchery State Permit		
		Water Quality permit		
700				
		interest income		150.00
	700	bank charges		100.00
		Totals:		$ 266,675.89