

**Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal Form**

Section 1. General administrative information

**Listed Stock Chinook Salmon Gamete
Preservation**

Bonneville project number, if an ongoing project 9703800

Business name of agency, institution or organization requesting funding
Nez Perce Tribe Department of Fisheries Resources Management

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

Name	<u>Paul Kucera</u>
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Subcontractors. List one subcontractor per row; to add more rows, press Alt-Insert from within this table

Organization	Mailing Address	City, ST Zip	Contact Name
Washington State University	Department of Zoology, Science Hall 312	Pullman, WA 99164-4236	Dr. Gary Thorgaard
University of Idaho	Department of Life Sciences	Moscow, ID 83843	Dr. Joe Cloud

NPPC Program Measure Number(s) which this project addresses.
7.4E, 7.4D, 7.2D

NMFS Biological Opinion Number(s) which this project addresses.
ESA Section 10 permit

Other planning document references.

If the project type is "Watershed" (see Section 2), reference any demonstrable

support from affected agencies, tribes, local watershed groups, and public and/or private landowners, and cite available documentation.

Snake River Salmon Recovery Plan ; IV.A The recovery goal.....is to restore these distinct populations (and their genetic and demographic subunits)

IV.A.5 Objectives Supporting the Recovery Goal - Judiciously use hatchery production..... but exercise caution to avoid introductions which can degrade the genomes of natural stocks. a. Supplement the weakened natural stock with hatchery propagated fish, but only of the same genetic lineage.

IV.C.6 The following principles have influenced Team evaluations and decisions....and should also serve as guidelines.... a.) Biological Diversity-The biological diversity of the listed species must be maintained, and particular attention must be paid to the array of genomes 2) some 38 separate breeding subpopulations.....

Strategy for Salmon Calls for research improvements in cryopreservation technology, and development applications to preserve salmon eggs for future use.

Subbasin.

Middle Fork Salmon River, Upper Salmon River, Lemhi River, Pahsimeroi River, South Fork Salmon River, mainstem Salmon River tributaries, Grande Ronde River, Imnaha River, and Snake River tributaries

Short description.

A genetic resource management approach using cryogenic technology is implemented to preserve and maintain genetic material (male gametes) from chinook salmon conservation units that are at low levels of abundance and high risk of extirpation. These efforts are needed to preserve and maintain salmon population genetic diversity as an insurance policy against population collapse and extirpation, for ongoing artificial propagation programs and to preserve genetic material for future management options.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction		Watershed
	Resident fish		O & M	X	Biodiversity/genetics
	Wildlife	X	Production		Population dynamics
	Oceans/estuaries	+	Research	+	Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other	+	Resource mgmt		Fish disease
			Planning/admin.	+	Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

Genetics, cryopreservation, gene bank, gene conservation, chinook salmon, germ plasm, ESA

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
9604300	Johnson Creek artificial propagation enhancement project	Preserved genetic material may be used in spawning protocols to promote genetic diversity.
LSRCP Reim. Prog.	Lower Snake River Comp. Plan Hatchery Production	Preserved genetic material may be used in spawning protocols to promote genetic diversity.
960440	Grande Ronde spring chinook captive brood stock program project	Preserved genetic material may be used in spawning protocols to promote genetic diversity.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Coordinate the listed stock chinook salmon gamete preservation with management agencies and Tribes in the Snake River basin.		Tasks not measurable.
2	Define cryopreservation project goals for gene banking of gametes from chinook salmon populations at high risk of extirpation in the Snake River basin.	a	Identify chinook salmon conservation units (populations) that are at high risk of extirpation in the Snake River basin.
		b	Determine chinook salmon populations for germ plasm sampling.
		c	Determine sample sizes required per population to preserve a representative sample of the genetic diversity within a population.
		d	Determine the period of time (years) for cryopreservation to occur, per

			population, to ensure that sufficient directly non-related individual genetic material is preserved.
3	Apply cryopreservation techniques to chinook salmon conservation units at low levels of abundance and high risk of extirpation.	a	Apply for needed ESA Section 10 research permits for cryopreservation purposes.
		b	Develop and utilize detailed adult sampling protocols and cryopreservation techniques for the collection, preservation, storage and inventory of male salmon germ plasm.
		c	Cryopreserve adult male chinook salmon gametes from conservation units identified as being at low levels of abundance and high risk of extirpation.
		d	Establish gene bank locations in at least two independent locations
		e	Preserve gamete samples on-site or at the identified independent locations.
4	Transfer of Technology	a	Prepare and provide annual reports summarizing all activities associated with cryopreservation sample collection, preservation and storage.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	07/1997	06/2004	10
2	07/1997	12/2004	5
3	07/1997	03/2005	55
4	08/1997	04/2005	30

Schedule constraints.

Annual abundance in each chinook salmon population will determine if sufficient samples can be gene banked within the prescribed duration of the project. Sample timing must be closely coordinated with surveyors to ensure only spawned -out males are available. See Underlying Assumptions or Critical Constraints section.

Completion date.

>In 2002 the project will be evaluated in terms of meeting required cryopreservation goals and how much preserved material has been used annually. Storage and management of germ plasm will require long term funding for maintenance and inventory at reduced levels.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel		60,500
Fringe benefits		13,804
Supplies, materials, non-expendable property		15,800
Operations & maintenance		
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		0
PIT tags	# of tags:	0
Travel		22,500
Indirect costs		33,219
Subcontracts		15,000
Other		
TOTAL		160,823

Out year costs

Out year costs	FY2000	FY01	FY02	FY03
Total budget	178,000	180,000	182,000	184,000
O&M as % of total	100	100	100	100

Section 6. Abstract

Snake River spring/summer chinook salmon populations have experienced significant decline in population numbers over the past five decades and are now a listed species under the ESA. Genetic conservation through population protection and management has not been successful. With the constant threat of losing genetic diversity in specific native fish stocks, the establishment of a program for conservation of salmon germ plasm would serve as backup insurance for ongoing conservation programs. A genetic resource management approach using cryogenic techniques is recommended. The goal of the Listed Stock Gamete Preservation project seeks to apply cyrogenic technology to preserve the genetic diversity of Snake River chinook salmon populations (spawning aggregate) that are at low levels of abundance and high risk of extirpation. This approach would

target chinook salmon populations with ongoing conventional hatchery or captive brood stock artificial propagation programs, to preserve and use cryopreserved material to enhance genetic diversity. Secondly, this project will establish long term germ plasm repositories at the University of Idaho and Washington State University as an insurance policy in case extirpation of chinook salmon populations does occur. When used with hatchery propagation, collected sperm could enhance genetic diversity of the propagated population. When gene banked at repositories, samples preserved would allow for future management and research options.

Section 7. Project description

a. Technical and/or scientific background.

With the constant threat of losing genetic diversity in specific native fish stocks, the establishment of a program for the long-term storage of listed chinook salmon germ plasm would serve as an insurance for ongoing conservation programs. One way to ensure availability of a representative genetic sample of the original population is to establish a germ plasm repository, now, before the population is extinct. At present, the cryopreservation (long-term storage of material at extremely low temperatures) of semen is the only functional means of storing fish germ plasm for extended periods of time. Salmonid semen will remain viable for an extended time and is easily shipped. The technology for preservation of female gametes is currently not available to fisheries science. Maternal DNA is not used. Successful research and development in this area would allow the ability to preserve germ plasm components from male and female chinook salmon to preserve future management options.

There are two important factors to be considered when establishing a germ plasm repository. First, this is a genetic repository, and will not solve population problems of a stock that is decreasing. Secondly, fertility of the frozen/thawed sperm will not be greater than the fertility of the starting material. The quality of the thawed sperm is usually a direct reflection of the quality of the sperm that was cryopreserved, and 50-80% motility of sperm is considered good.

We would desire that fertilization rates using cryopreserved semen would average 80% or higher when used in conventional hatchery programs. Several limited trials have documented average fertilization rates of 65% using cryopreserved semen (Glen Mendel Pers. comm). Fertilization rates using cryopreserved semen have ranged up to approximately 85%. There is a risk of lower fertilization rates and potential loss of eggs using cryopreserved semen. Lesser fertilization rates may be acceptable where genetic concerns warrant them, such as in captive brood stock programs. Section 10 permits allow for collection of spawned-out males from the spawning grounds. This assumes that sufficient quantity and quality of semen can be obtained from spawned-out males for gene banking purposes.

The Listed Stock Chinook Salmon Gamete Preservation project was initiated in cooperation with the Lower Snake River Compensation Plan hatchery evaluations program in 1992 and has continued through 1996. Funding was minimal and sampling was limited. The project was fully funded by BPA in 1997 and the program expanded. In 1997, 198 viable cryopreservation samples were taken from nine locations. A total of 309 cryopreserved samples taken from the Snake River basin since 1992 are in storage at Washington State University and/or the University of Idaho.

Several Northwest Power Planning Council (NPPC 1994) program measures in the Columbia River Basin Fish and Wildlife Program (FWP) direct the implementation of the listed stock gamete preservation project.

FWP measure 7.4E - Cryopreservation states “cryopreservation (preservation of fish gametes by freezing) has the potential of allowing”banking” of genetic stocks for future use, especially when the population is severely depleted and its habitat has been damaged or destroyed.”

FWP measure 7.4E.2 directs Federal and State agencies to “Fund needed research and demonstrations of cryopreservation identified in the coordinated habitat and production process.”

FWP measure 7.4D addresses captive brood stocks. “Captive brood stock programs have the potential to rapidly increase adult fish numbers, while retaining genetic diversity of severely depleted wild or naturally spawning stocks of salmon.”

FWP measure 7.4D.2 directs National Marine Fisheries Service and Bonneville to “Fund captive brood stock demonstration projects funded under the coordinated habitat and production process.

FWP. measure 7.2D.2 “Also fund tests of new techniques at Columbia River basin artificial propagation facilities.”

The National Marine Fisheries Service’s Salmon Recovery Plan states that “Captive brood stock and supplementation programs should be initiated and/or continued for populations identified as being at imminent risk of extinction, facing severe inbreeding depression, or facing demographic risks.” The plan further states that “the conservation of local populations or stocks of Pacific salmon and the preservation of their genetic resources is an important goal.”

The chinook salmon captive brood stock plan (ODFW 1996) for Grande Ronde salmon populations recognizes the importance of and contains guidelines for the use of cryopreserved semen to maintain genetic diversity of the propagated populations.

b. Proposal objectives.

Objective 1 - Coordinate the listed stock chinook salmon gamete preservation with management agencies and Tribes in the Snake River basin. This objective is not measurable.

The Nez Perce Tribe does not recognize that the Endangered Species act takes precedence

over or preclude Tribal; sovereignty or rights in any manner. However, the Tribe does recognize that salmon are a listed species, and strongly believes in coordination efforts to monitor, conserve, protect and recover populations at low levels of abundance and high risk of extirpation. In that regard the Columbia River Inter-Tribal Fish Commission maintains a Section 10 permit by and through the Bureau of Indian Affairs, coordinating Tribal activities relative to listed salmon populations. An annual report is submitted to NMFS which summarizes project activities relating to chinook salmon populations listed under the Endangered Species Act.

Objective 2 - Define cryopreservation project goals for gene banking of gametes from chinook salmon populations at high risk of extirpation in the Snake River basin. Almost all of the listed Snake River chinook populations are below threshold numbers of spawning adults in each population/stream and are below 10% of their historical production potential. The upper Big Creek population has experienced three years of cohort collapse. Tribal and agency input for the selection of populations to be preserved (i.e. sample sizes per population, per year, and period of time to cryopreserve) has been requested.

Objective 3 - Apply cryopreservation techniques to chinook salmon conservation units at low levels of abundance and high risk of extirpation. Chinook salmon spawning times have been determined by on the ground information collected by the Nez Perce Tribe, ODFW and IDFG since 1986. Spawning timing is further coordinated on an annual basis with redd count surveyors from each stream. Sperm samples are collected and shipped to storage facilities for processing within 24 hours.

Objective 4 - Transfer of technology

An annual report publication summarizing all activities associated with the Listed Stock Chinook Salmon Gamete Preservation project will be prepared and publicized through the BPA. A peer review paper detailing the preservation of salmon gametes in the Snake River basin will be presented at the Idaho Chapter of the American Fisheries Society 's annual meeting.

c. Rationale and significance to Regional Programs.

The Lower Snake River Compensation Plan hatchery evaluations program, funded through the U.S. Fish and Wildlife Service, has provided crucial though limited amount of support for this effort since 1992. The Listed Stock Gamete Preservation project has previously received a relatively high project ranking through the Columbia Basin Fish and Wildlife Authority. The project was funded by BPA for the first time in FY 1997.

Several Northwest Power Planning Council (NPPC) program measures in the Columbia River Basin Fish and Wildlife Program (FWP.) direct the implementation of the Listed Chinook Salmon Stock Gamete Preservation Project.

FWP. measure 7.4E - Cryopreservation states “cryopreservation (preservation of fish gametes by freezing) has the potential of allowing”banking” of genetic stocks for future use, especially when the population is severely depleted and its habitat has been damaged or destroyed.”

FWP. measure 7.4E.2 directs Federal and State agencies to “Fund needed research and demonstrations of cryopreservation identified in the coordinated habitat and production process.”

FWP. measure 7.4D addresses captive brood stocks. “Captive brood stock programs have the potential to rapidly increase adult fish numbers, while retaining genetic diversity of severely depleted wild or naturally spawning stocks of salmon.”

FWP. measure 7.4D.2 directs National Marine Fisheries service and Bonneville to “Fund captive brood stock demonstration projects funded under the coordinated habitat and production process.

FWP. measure 7.2D.2 “Also fund tests of new techniques at Columbia River basin artificial propagation facilities.”

d. Project history

The Listed Stock Chinook Salmon Gamete Preservation project was initiated in cooperation with the Lower Snake River Compensation Plan hatchery evaluations in 1992 and continued through 1996. Funding was minimal and sampling was limited. The project was funded for \$110,500 by BPA in 1997 and the program expanded. In 1997, 198 viable cryopreservation samples were taken from nine locations. A total of 309 cryopreserved samples taken from the Snake River basin since 1992 are in storage at Washington State University and/or University of Idaho. A project report summarizing 1997 study results will be available by mid 1998.

e. Methods.

Fish handling protocol training was provided to all personnel prior to collection and handling of adult male salmon to minimize handling stress. Each team member was assigned a specific duty to improve the efficiency of sample collection. All adult male salmon sampled were collected by hand or dip net. Pre-measured MS-222 was used to anaesthetize all adult salmon, along with a sodium bicarbonate buffering compound to buffer the acidic effect of the MS-222, with the exception of unmarked fish at the South Fork salmon River weir. Semen samples taken from natural or wild unmarked male chinook salmon adults at the South Fork Salmon River fish weir were collected during McCall Hatchery spawning operations conducted by Idaho Department of Fish and Game. Fish handling and spawning protocols of IDFG were used and adults were not anesthetized before semen samples were taken. Extra care was taken with milt collection

to ensure the quality of preserved samples. The abdomen of the anesthetized male chinook salmon was thoroughly dried and stripped gently to reduce or eliminate contamination of the semen samples.

Fish biological information (length, general condition, external marks) was recorded following semen collection. Caudal fin tissue was collected for genetic (DNA) analysis. Scales were taken for scale pattern analysis to determine wild or hatchery origin and age classes. Following sampling and data collection the anesthetized salmon were immediately returned to a slow water area and assisted until recovered. Concurrently, the semen samples were placed in two separately labeled Whirl Pak® bags, oxygenated, and placed in a covered insulated cooler on wet ice on top of newspaper. Cryopreservation and storage occurred independently at the University of Idaho and Washington State University within a 24 hour period. One Whirl Pak® sample was shipped to, and stored at each university as a safeguard to protect against a catastrophic event that could destroy all germ plasm samples if they were stored at one facility.

Sperm evaluation is an important component of the cryopreservation program in order to cull poor quality sperm samples prior to freezing, and to estimate the fertility of the stored sperm post-thaw. Fertility is evaluated by:

- *fertilization rate - proportion of eggs fertilized by a given number of spermatozoa;

- *sperm motility - percentage of motile sperm following the addition of a sperm activating solution (Mounib 1978).

The Cryopreservation Process

There are four stages in the cooling sequence of cryopreservation of cells:

- 1) cooling cells to the point of ice formation - This does not appear to be a critical factor in the cryopreservation of salmonid sperm;

- 2) the formation of ice - The goal at this stage is to have ice form near the freezing point of the extracellular solution;

- 3) cooling through the critical period - During this phase, there is a net movement of water out of the cells as the temperature is constantly being reduced. The cooling rate during this phase needs to be slow enough to allow water to move out of the cells, but it must be fast enough to protect the intercellular environment from the effect of the high salt concentrations. The success of cryopreservation is dependent upon required cryoprotectants (such as DMSO) in the freezing solution. These small compounds enter the cells and protect the cells during dehydration. The rate at which the sperm is cooled is a critical factor in the success of the cryopreservation process; For salmonid sperm, cooling rates of -20 to -30 degrees C/minute appear to be optimal (Stoss 1980), down to approximately -79 degrees C.

- 4) reduction to liquid nitrogen temperature - The frozen milt is then plunged into liquid nitrogen at -196 degrees C.

The amount of sperm cryopreserved varies greatly by individual fish. Many of the fish sampled have been actively spawning for several days and sometimes very little or no

sperm is available. A semen sample of 5 ml is sufficient to fill 20 “0.5 ml straws” (see display). Depending on the motility of the post-thawed sperm, a “straw” can fertilize up to 450 eggs (Joe Cloud, U. of I. Pers comm).

f. Facilities and equipment.

The cryopreservation project is conducted out of the Tribe’s field office in McCall, Idaho. This office currently houses NPT personnel from three other BPA funded projects. The office facilities are adequate for all administrative and personnel needs. The project leader has a new Pentium computer and utilizes GSA fleet vehicles.

No special field equipment is required for the collection of semen samples. All specialized laboratory equipment (liquid nitrogen tank) required for the actual cryopreservation process is located at Washington State University and the University of Idaho.

g. References.

Rondorf, D.W., and K.F. Tiffan. 1997. Identification of the spawning, rearing and migratory requirements of fall chinook salmon in the Columbia River Basin. Annual Report 1995. DOE/BP-21078-5, Bonneville Power Administration, Portland, Oregon.

Cloud, J.G. and Craig Osborne. 1997. Cryopreservation of salmonid sperm. Department of Biological Sciences, University of Idaho. Moscow, ID.

Columbia River Basin Fish and Wildlife Program. 1994. Northwest Power Planning Council. Portland, OR.

Mounib, M.S. 1978. Cryogenic preservation of fish and mammalian spermatazoa. Journal of Reproductivity Fertilization 53:13-18.

Snake River Recovery Plan. 1994. National Marine Fisheries Service. Seattle, WA.

Strategy for Salmon. 1992. Northwest Power Planning Council. Portland, OR.

Wy-Kan-Ush-Mi Wa-Kish-Wit (Spirit of the Salmon). 1995. Columbia River Inter-tribal Fish Commission. Portland, OR.

Section 8. Relationships to other projects

Type here (The National Marine Fisheries Service’s Salmon Recovery Plan states that

“Captive brood stock and supplementation programs should be initiated and/or continued for populations identified as being at imminent risk of extinction, facing severe inbreeding depression, or facing demographic risks.” The plan further states that “the conservation of local populations or stocks of Pacific salmon and the preservation of their genetic resources is an important goal.”

The chinook salmon captive brood stock plan (ODFW 1996) for Grande Ronde salmon populations recognizes the importance of and contains guidelines for the use of cryopreserved semen to maintain genetic diversity of the propagated populations. provide answers in paragraph form)

Section 9. Key personnel

Research Director: Paul Kucera, Director of Biological Services, 160 hrs
Nez Perce Tribe Department of Fisheries Resources Management
Technical Advisor: Jay A. Hesse, Research Coordinator, no ISS funding associated
Nez Perce Tribe Department of Fisheries Resources Management

Education: M.S. in Fisheries, Michigan State University, 1994
B.S. in Fisheries and Wildlife, Michigan State University, 1992

Duties: Technical direction and supervision of fisheries research projects, research coordination, Nez Perce Tribe LSRCP project implementation, report writing, monitoring and evaluation plan and proposal development, tribal fisheries research representation at federal and state meetings, budget preparation, personnel supervision.

Experience: Project Leader, Idaho Salmon Supplementation Study. Nez Perce Tribe. July 1994 - October 1997.

Skills:

Publications: Hesse, J. 1997. A-run steelhead status in tributaries of the lower Clearwater River, Idaho. In Interactions of hatchery and wild steelhead in the Clearwater River of Idaho. 1995 Progress Report, Fisheries Stewardship Project, USFWS Report. November 1997.

Hesse, J.A., P.J. Cleary, and B.D. Arnsberg. 1995. Salmon Supplementation Studies in Idaho Rivers. Annual Report - 1994. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.

Hesse, J.A. and B.D. Arnsberg 1994. Salmon Supplementation

Studies in Idaho Rivers. Annual Report - 1993. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.

Hesse, J.A. 1994. Contribution of hatchery and natural chinook salmon to the eastern Lake Michigan fishery, 1992-1993. Masters Thesis, Michigan State University.

RESUME
Paul A. Kucera

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Lapwai, Idaho 83540
(208) 843-2253, extension #2435

CURRENT POSITION: Director of Biological Services

EDUCATION: Bachelor of Science. 1975.
Utah State University.
Major: Fisheries Management.

Completed MS studies at the University of Idaho 1990
Major: Fisheries Management.

PROFESSIONAL EXPERIENCE:

1991-present Director of Biological Services with the Nez Perce Tribe Department of Fisheries Resources Management. Responsible for technical program direction and administration of the Fisheries Research Division.

1988-1991 Senior Fisheries Biologist with the Nez Perce Tribe Fisheries Department.

1987-1988 Acting Fisheries Program Manager with the Nez Perce Tribe Fisheries Department. Responsible for fisheries program management and direction.

1984-1986 Senior Fisheries Biologist with the Nez Perce Tribe Fisheries Department. Conducted research on juvenile steelhead trout life history characteristics and abundance in relation to physical habitat parameters on five streams.

1982-1983 Project fisheries biologist with the Nez Perce Tribe Fisheries Department. Responsible for conduct of a physical and biological inventory of streams on the reservation proper with emphasis on anadromous salmonids.

1978-1980 Fisheries biologist with the Colville Confederated Tribes Fish

and Wildlife Department. Developed fishery management programs for the Colville Tribe on their 1.3 million acre reservation and the 1.7 million acre ceded area.

1975-1978 Fisheries research biologist with W.F. Sigler and Associates, Environmental Consulting Firm. Ecological and fish life history research on 110,000 acre Pyramid Lake, Nevada.

Unique Abilities:

Certified Fisheries Scientist - AFS
Experienced with Endangered Species Act and management of listed fish species.
Experience in program development and procuring project funding.
Research and management experience with resident and anadromous species.
Familiar with Tribal government and management approaches.
Trained in CPR and First Aid.
Certified SCUBA diver - NAUI

Publications

Kucera, P.A. and J.L. Kennedy. 1977. Evaluation of a sphere volume method for estimating fish fecundity. The Progressive Fish Culturist. 39(3):115-117.

Kucera, P.A. 1978. Reproductive biology of the tui chub, Gila bicolor, in Pyramid Lake, Nevada. Great Basin Naturalist. 38(2): 203-207.

Kennedy, J.L. and P.A. Kucera. 1978. The reproductive ecology of the Tahoe sucker, Catostomus tahoensis, in Pyramid Lake, Nevada. Great Basin Naturalist 38(2): 181-186.

Vigg, S., P. A. Kucera. 1981. Contributions to the life history of Sacramento perch, Archoplites interruptus, in Pyramid Lake, Nevada. Great Basin Naturalist 41(3): 278-289.

Sigler, W.F., W.T. Helm, P. A. Kucera, S. Vigg and G. W. Workman. 1983. Life history of the Lahontan cutthroat trout, Salmo clarki henshawi, in Pyramid Lake, Nevada. Great Basin Naturalist 43(1): 1-29.

Kucera, P.A., D.L. Koch and G.F. Marco. 1985. Introductions of Lahontan cutthroat trout into Omak Lake, Washington. North Amer. Jrnl. Of Fish. Mngt. 5(2): 296-301.

Johnson, J.H. and P.A. Kucera. 1985. Summer-autumn habitat utilization

of subyearling steelhead trout in tributaries of the Clearwater River, Idaho. Can. J. Zool. Vol, 63:2283-2290.

Kucera, P.A. 1989. Nez Perce Tribal review of the Imnaha River Lower Snake River Compensation Plan. AFF1/LSR-89-08, Tech. Rep. 89-7. Annual project report to the U.S. Fish and Wildlife Service. Nez Perce Tribe Fisheries Dept., Lapwai, ID. 49 pp.

Kucera, P.A. and M.L. Blenden. 1996. Summary report of 1996 project activities relating to endangered chinook salmon populations listed under the Endangered Species Act. Nez Perce Tribe Department of Fisheries Resources Management, Lapwai, Idaho. 60 pp.

A Project Leader position, 1 FTE, is being advertised. The position is expected to be filled in April/May 1998. The minimum qualification is a B.S degree in a fisheries related field and 2 years experience.

Section 10. Information/technology transfer

Type here (Annual project reports will be published by the BPA. Project presentations will be presented as requested by the BPA and presentations will be given at state chapter AFS meetings as time allows. provide answers in paragraph form)

An annual report following scientific publication guidelines is distributed through the BPA publications system. A presentation to the Idaho Chapter of the American Fisheries Society is planned for the 1999 or 2000 annual meeting.