

## **PART I - ADMINISTRATIVE**

### **Section 1. General administrative information**

|   |                           |
|---|---------------------------|
| <b>Title of project</b><br>Chief Joseph Kokanee Enhancement Project   |                           |
| <b>BPA project number</b>   | <b>9501100</b>            |
| <b>Contract renewal date (mm/yyyy)</b>  | <b>October 1, 1999</b>    |
| <b>Multiple actions? (indicate Yes or No)</b>   | <b>yes</b>                |
| <b>Business name of agency, institution or organization requesting funding</b><br><b>Confederated Tribes of the Colville Resrvation</b>   |                           |
| <b>Business acronym (if appropriate)</b>  | <b>CCT</b>                |
| <b>Proposal contact person or principal investigator:</b>   |                           |
| <b>Name</b>   | <b>Richard LeCaire</b>    |
| <b>Mailing address</b>  | <b>P.O.B. 150</b>         |
| <b>City, ST Zip</b>   | <b>Nespelem WA, 99155</b> |
| <b>Phone</b>  | <b>509-634-2124</b>       |
| <b>Fax</b>  | <b>509-634-2126</b>       |
| <b>Email address</b>  |                           |
| <b>NPPC Program Measure Number(s) which this project addresses</b><br><b>1994, NPPC Project No.10 8B 7</b>  |                           |
| <b>FWS/NMFS Biological Opinion Number(s) which this project addresses</b><br><b>NA</b>  |                           |
| <b>Other planning document references</b><br><b>NA</b>  |                           |
| <b>Short description</b><br><b>This is a stock assessment project, specifically to determine the stock status, strength, genetics, and local fishery contribution by natural production kokanee. High entrainment rates are suspected through Grand Coulee Dam. An hydroacoustic assessment of entrainment through Grand Coulee Dam for all lake resident species is necessary.</b> |                           |
| <b>Target species</b><br><b>Natural Production Kokanee, all other incidental species as encountered.</b>  |                           |

### **Section 2. Sorting and evaluation**

|   |
|---|
| <b>Subbasin</b><br>Upper Columbia River Sub-Basin, Chief Joseph Dam to International boundry and British Columbia waters, specifically Lakes Roosevelt and Rufus Woods. |
|---|

**Evaluation Process Sort**

| CBFWA caucus         |                 | CBFWA eval. process   |   | ISRP project type        |                                     |
|----------------------|-----------------|---|---|--------------------------|-------------------------------------|
| X one or more caucus |                 | If your project fits either of these processes, X one or both |   | X one or more categories |                                     |
|                      | Anadromous fish | X   | Multi-year (milestone-based evaluation) |                          | Watershed councils/model watersheds |
| X                    | Resident Fish   |   | Watershed project eval.                 | X                        | Information dissemination           |
|                      | Wildlife        |   |   |                          | Operation & maintenance             |
|                      |                 |   |   |                          | New construction                    |
|                      |                 |   |   | X                        | Research & monitoring               |
|                      |                 |   |   |                          | Implementation & mgmt               |
|                      |                 |   |   |                          | Wildlife habitat acquisitions       |

**Section 3. Relationships to other Bonneville projects**

***Umbrella / sub-proposal relationships.*** List umbrella project first.

| Project # | Project title/description |
|-----------|---------------------------|
|           |                           |
|           |                           |
|           |                           |
|           |                           |

***Other dependent or critically-related projects***

| Project # | Project title/description  | Nature of relationship  |
|-----------|--|---|
| 9432148   | Lake Roosevelt Monitoring  | Coordination of Sampling and data sharing   |
| 9001800   | Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project | Coordinate manpower and equipment needs, share data and aide in development of reports. |
| 8503800   | Colville Tribal Trout Hatchery Program                           | Equipment sharing.  |
|           |  |   |

**Section 4. Objectives, tasks and schedules**

***Past accomplishments***

| Year | Accomplishment                           | Met biological objectives? |
|------|--|----------------------------|
| 1995 | Collected field data, compiled report to | Yes                        |

|      |   |  |
|------|---|--|
|      | BPA   |  |
| 1996 | Conducted field assessment of juvenile productio, adult spawner returns, gill net survey and hydroacoustic monitoring of entrainment through Grand Coulee Dam | Yes, annual report submitted to BPA.                               |
| 1997 | Same as above   | Yes ,1997 Annual report nesrly complete, expected delivery 1/15/99 |
| 1998 | Same as Above   | Yes, 1998 Annual report is not complete                            |

### **Objectives and tasks**

| <b>Obj 1,2,3</b> | <b>Objective</b>  | <b>Task a,b,c</b> | <b>Task</b>  |
|------------------|---|-------------------|--|
| 1                | Stock Status determination of natural production kokanee withing study area.  | A                 | Determine spawning escapement by trap and release methods for adult kokanee at all known spawnig sites using picket fence weirs, helicopter, foot and scuba survey techniques. |
|                  |   | B                 | Locate and assess all other possible sites.  |
| 2                | Determine contribution of natural production kokanee to fishery   | A                 | Conduct egg to fry survival study using redd cpping devices and rotary screw trap at appropriate loctions.   |
| 3                | Determine genetic status and strength of natural production kokanee in study area and assess possible impacts by hatchery production        | A                 | Collect spawned out kokanee carcasses from all Lake Roosevelt and Rufus Woods tributaries.   |
|                  |   | B                 | Collect kokanee samples from British Columbia water.   |
|                  |   | C                 | Contract for electrophoretic protein analysis to determine baseline blueprint of natural production kokanee  |
|                  |   | D                 | Compare genetic blueprint of samples stocks to natural production from all areas and determine impacts by ahtchery production in lakes.  |
| 4                | Determine rate of entrainment through Grand Coulee Dam for all species, and determine probable species composition of entrained population. | A                 | Conduct hydroacoustic survey at turbine intakes at Grand Coulle Dam using services of experienced hydroacoustic contracting firm.  |
|                  |   | B                 | Determine specific hydropower  |

| Obj<br>1,2,3 | Objective | Task<br>a,b,c | Task   |
|--------------|-----------|---------------|--|
|              |           |               | operation responsible for entrainment (Power peaking, flood control or firm power commitments).  |
|              |           | C             | Conduct weekly gill net survey in forebay of dam using vertical and horizontal net arrays to determine species composition of entrained species. |

### Objective schedules and costs

| Obj # | Start date<br>Mm/yyyy | End date<br>mm/yyyy | Measureable biological objective(s)   | Milestone   | FY2000<br>Cost % |
|-------|-----------------------|---------------------|---|---|------------------|
| 1     | 10/00                 | 9/01                | Determination of natural production spawning escapement   | Annual escapement figures   | 132,000.<br>00   |
| 2     | 10/00                 | 9/01                | Determine natural production component contribution to fishery by egg to survival studies.                                      | Annual contribution to fishery by natural production stocks.  | 60,000.0<br>0    |
| 3     | 10/00                 | 9/01                | Determine genetic make-up of natural production kokanee for possible inclusion into current hatchery operations                 | Continued genetic profile for all spawning kokanee within blocked area.   | 37,480.0<br>0    |
| 4     | 10/00                 | 9/01                | Determine entrainment rate of all fish through Grand Coulee dam and pinpoint operation responsible for possible later remedies. | Annual report citing entrainment totals by powerhouse, turbine, diel and monthly periods. Identification of hydropower operation responsible for highest entrainment. | \$370,520<br>.00 |
|       |                       |                     |   | <b>Total</b>  | 600,000.<br>00   |

### Schedule constraints

High water years cause trapping problems, flood events, and destroy sites and equipment.

Large water regimes cause spill episodes that are essential; un-monitored. Currently, the project is a single drum gate (eight total) where spill takes place in high water years.

**Completion date**

2003 \* Further funding may be sought dependant upon conclusions drawn regarding entrainment and techniques requirements for remedies.

**Section 5. Budget**

|   |              |
|---|--------------|
| <b>FY99 project budget (BPA obligated):</b> | \$600,000.00 |
|---|--------------|

***FY2000 budget by line item***

| <b>Item</b>   | <b>Note</b>  | <b>% of total</b> | <b>FY2000 (\$)</b>  |
|---|--|-------------------|---------------------|
| Personnel   |  | 16%               | \$98,400.00         |
| Fringe benefits   |  | 28%               | \$27,552.00         |
| Supplies, materials, non-expendable property                              |  | .03%              | \$19,456.00         |
| Operations & maintenance  |  |                   |                     |
| Capital acquisitions or improvements (e.g. land, buildings, major equip.) |  |                   |                     |
| NEPA costs  |  |                   |                     |
| Construction-related support  |  |                   |                     |
| PIT tags  | # of tags:   |                   |                     |
| Travel  | Travel/Perdiem/mileage reimbursement/training/boat expense | .02%              | \$29,052.00         |
| Indirect costs  |  | .06%              | \$38,573.00         |
| Subcontractor   | BioSonics Inc. Seattle Wa.<br>Hydroacoustic survey         | 62%               | \$370,520.00        |
|   | Gyar's Flight Service, Cheney, WA<br>Aerial Survey         | .01%              | \$5,400             |
|   | University of Montana, Missoula Mt.<br>Genetic analysis    | .01%              | \$7,800             |
| Other   |  |                   |                     |
| <b>TOTAL BPA REQUESTED BUDGET</b>   |  |                   | <b>\$596,753.00</b> |

***Cost sharing***

| <b>Organization</b> | <b>Item or service provided</b> | <b>% total project</b> | <b>Amount (\$)</b> |
|---------------------|---------------------------------|------------------------|--------------------|
|---------------------|---------------------------------|------------------------|--------------------|

|   |  |                         |  |
|---|--|-------------------------|--|
|   |  | <b>cost (incl. BPA)</b> |  |
|   |  |                         |  |
|   |  |                         |  |
|   |  |                         |  |
|   |  |                         |  |
| <b>Total project cost (including BPA portion)</b> |  |                         |  |

**Outyear costs**

|                     |               |              |              |             |
|---------------------|---------------|--------------|--------------|-------------|
|                     | <b>FY2001</b> | <b>FY02</b>  | <b>FY03</b>  | <b>FY04</b> |
| <b>Total budget</b> | \$600,000.00  | \$600,000.00 | \$350,000.00 |             |

Funding requests for outyear project costs are dependant upon findings and recommendations regarding probable successful prevention of excessive entrainment.

**Section 6. References**

| <b>Watershed</b> | <b>Reference</b>   |
|------------------|--|
|                  | Allendorf, F. W. and M. Ferguson. 1990. Genetics, Methods for Fish Biology. American Fisheries Society, Bethesda, Maryland.  |
|                  | Beckman, L. G., et. al.. 1985. Assessment of the Fisheries and Limnology in Lake F. D. Roosevelt 1980-83. Final Report, 1985. U.S.F.W. Service, Seattle National Fishery Research Center, Willard Substation. Prep for U. S. Bureau of Reclamation. FWS-14-06-009-904  |
|                  | Brannon, E. et. al.. 1994. University of Idaho Genetic Analysis of Oncorhynchus nerka: Life History and Genetic Analysis of Redfish Lake (Oncorhynchus nerka). U. S Dept of Energy. BPA. Portland, Oregon.   |
|                  | Carlson, T. J. et. al. 1980. Hydroacoustic Assessment of Downstream Migrant Salmon and Steelhead at Priest Rapids Dam in 1980. Grant Co P.U.D. Contract No. 403-148.   |
|                  | Cash, Kelly. 1996. National Park Service, Coulee Dam National Recreation Area Supt. Retired. Personnel Communication   |
|                  | Dotson, Thurston. 1993. Letter to University of Montana. Montana Dept of Fish, Wildlife and Parks. Helena Mt.  |
|                  | Earnest, D.E., Spence, M.E. et.al. 1965. A survey of the fish populations, zooplankton, bottom fauna and some physical characteristics of Lake Roosevelt.. Internal Report. Washington Department of Game, Olympia Wa.   |
|                  | Fraley, J.J. et. al. 1986. Emergence Trap and Holding Bottle for Capture of Salmonid fry in Streams.. N.A. Journal of Fisheries Management 6:119-121.  |
|                  | Griffith, J.R., A.C. McDowell and A.T. Scholz. 1991. Lake Roosevelt Fisheries monitoring program. Annual Report 1990. Prepared for Bonneville Power Administration, Project No. 88-63 by Upper Columbia United Tribes Fishery Research Center, Department of Biology, Eastern Washington University, Cheney Wa. 99004. |
|                  | Hisata, John. 1995. Washington Department of Fish and Wildlife. Personal   |

|  |  |
|--|--|
|  | communication.   |
|  | Hunter, J. G.. 1948. A Weir for Adult and Salmon Fry Effective Under Conditions of Extremely Variable Run-Off. Pacific Biological Station, Fisheries Research Board of Canada, Nanaimo, B. C.  |
|  | LeBerg, P. L.. 1990. Influence of Genetic Variability on Population Growth: Implications for Conservation. <i>Journal of Fish Biology</i> 37 (SuppA) 193-195.  |
|  | Levy, D. A. 1991. Acoustic Analysis of Diel Vertical Migration Behavior of <i>Mysis relicta</i> and kokanee ( <i>Oncorhynchus nerka</i> ) within Lake Okanogan, British Columbia. <i>Canadian Journal of Fisheries and Aquatic Science</i> . 48: 17-72                           |
|  | Marino, D. A. 1986. Dual-Beam Hydroacoustic Assessment of Kokanee Salmon Spatial and Temporal Distribution and Abundance in Three Pacific Northwest Lakes. Abstract from Masters Thesis. University of Washington. Seattle Wa.   |
|  | McDowell, A.C. and J.R. Griffith. 1993. Retrospective Analysis on the Fishery of Lake Roosevelt Wa. Final Report 1993. Prepared for Environmental Protection Agency, Grand Coulee Wa. by Spokane Tribal Fish and Wildlife Center, Spokane Tribe of Indians, Wellpinit Wa. 99040. |
|  | Meekin, T. K. 1992. Spring Chinook Spawning Ground Surveys of the Methow River and Okanogan River Basin. Yakima Indian Nation Fisheries Resource Management. Yakima Wa.  |
|  | Mullan, J. W. 1986. Determinants of Sockeye Salmon Abundance in the Columbia River, 1880's-1982.: A review and Synthesis. U. S. Fish and Wildlife Service. Biol. Report 86(12).  |
|  | Nigro, A. A., et. al. 1982. Assessment of the Fisheries and Limnology in Lake F. D. Roosevelt. Annual Report. U. S. F. W. Service. Seattle National Fishery Research Center, Grand Coulee Substation. U. S. Bureau of Reclamation. FWS-14-06-0009-904.                           |
|  | Parkinson, E. A. et. al. 1994. Comparison of Acoustic and Trawl Methods for Estimating Density and Age Composition of Kokanee. <i>Transactions of the American Fisheries Society</i> . 123: 841-854.   |
|  | Peone, T. L. et. al. 1989. Lake Roosevelt Fisheries Monitoring Program. Annual Report. Upper Columbia United Tribes Fisheries Research Center. Department of Biology, Eastern Washington University, Cheney Wa. 99004  |
|  | Sage, G. T. 1995 . Letter to Thurston Dotson on Electrophoretic Genetic Analysis of Kokanee Salmon.  |
|  | Scholz, A.T. et. al. 1985. Fish Surveys on the Spokane Arm of Lake Roosevelt. Winter/Spring 1984. Upper Columbia United Tribes Fisheries Research Center. Technical Report No.5. Eastern Washington University, Cheney Wa. 99004.  |
|  | Steig, T. W. et. al. 1995. Hydroacoustic Evaluation of the Effectiveness of Spill for By-Passing Juvenile Salmon and Steelhead at Rocky Reach Dam in Spring of 1994. Prepared for Chelan Co. P.U.D. by Hydroacoustic Technology Inc of Seattle.                                  |
|  | Stober, Q. J., et. al. 1977. Preliminary Survey of Fisheries resources in the forebay of FDR Reservoir 1976-77. Annual Report. College of Fisheries, Fisheries Research Institute. University of Washington, Seattle, Wa. FRI-UW7701.  |
|  | Wydoski, R. L and R. A. Whitney. 1979. <i>Inland Fishes of Washington</i> . University of Washington Press. Seattle and London   |

|  |  |
|--|--|
|  | Marino, D. A. 1986. Dual-Beam Hydroacoustic Assessment of Kokanee Salmon Spatial and Temporal Distribution and Abundance in Three Pacific Northwest Lakes. Abstract from Masters Thesis. University of Washington. Seattle Wa.   |
|  | McDowell, A.C. and J.R. Griffith. 1993. Retrospective Analysis on the Fishery of Lake Roosevelt Wa. Final Report 1993. Prepared for Environmental Protection Agency, Grand Coulee Wa. by Spokane Tribal Fish and Wildlife Center, Spokane Tribe of Indians, Wellpinit Wa. 99040. |
|  | Meekin, T. K. 1992. Spring Chinook Spawning Ground Surveys of the Methow River and Okanogan River Basin. Yakima Indian Nation Fisheries Resource Management. Yakima Wa.  |
|  | Mullan, J. W. 1986. Determinants of Sockeye Salmon Abundance in the Columbia River, 1880's-1982.: A review and Synthesis. U. S. Fish and Wildlife Service. Biol. Report 86(12).  |
|  | Nigro, A. A., et. al. 1982. Assessment of the Fisheries and Limnology in Lake F. D. Roosevelt. Annual Report. U. S. F. W. Service. Seattle National Fishery Research Center, Grand Coulee Substation. U. S. Bureau of Reclamation. FWS-14-06-0009-904.                           |
|  | Parkinson, E. A. et. al. 1994. Comparison of Acoustic and Trawl Methods for Estimating Density and Age Composition of Kokanee. Transactions of the American Fisheries Society. 123: 841-854.   |
|  | Peone, T. L. et. al. 1989. Lake Roosevelt Fisheries Monitoring Program. Annual Report. Upper Columbia United Tribes Fisheries Research Center. Department of Biology, Eastern Washington University, Cheney Wa. 99004  |
|  | Sage, G. T. 1995 . Letter to Thurston Dotson on Electrophoretic Genetic Analysis of Kokanee Salmon.  |
|  | Scholz, A.T. et. al. 1985. Fish Surveys on the Spokane Arm of Lake Roosevelt. Winter/Spring 1984. Upper Columbia United Tribes Fisheries Research Center. Technical Report No.5. Eastern Washington University, Cheney Wa. 99004.  |
|  | Steig, T. W. et. al. 1995. Hydroacoustic Evaluation of the Effectiveness of Spill for By-Passing Juvenile Salmon and Steelhead at Rocky Reach Dam in Spring of 1994. Prepared for Chelan Co. P.U.D. by Hydroacoustic Technology Inc of Seattle.                                  |
|  | Stober, Q. J., et. al. 1977. Preliminary Survey of Fisheries resources in the forebay of FDR Reservoir 1976-77. Annual Report. College of Fisheries, Fisheries Research Institute. University of Washington, Seattle, Wa. FRI-UW7701.  |
|  | Wydoski, R. L and R. A. Whitney. 1979. Inland Fishes of Washington. University of Washington Press. Seattle and London   |
|  | Wydoski, R. L and R. A. Whitney. 1979. Inland Fishes of Washington. University of Washington Press. Seattle and London   |

---

## PART II - NARRATIVE

## Section 7. Abstract

### ABSTRACT:

The construction of Grand Coulee and Chief Joseph Dams in 1939 and 1956 completely and forever blocked anadromous fish passage above these federal hydropower projects "**(Blocked Areas)**". The confederated Tribes of the Colville Reservation are working cooperatively with the Spokane Indian Tribe and the Washington Department of Fish and Wildlife in fisheries enhancement programs for Lake Roosevelt utilizing resident fish substitution for anadromous losses (**Resident Fish Substitution**). The Chief Joseph Kokanee Enhancement project is one such mitigation project being implemented in the "blocked area". This project was amended into the council's Fish and Wildlife program during the 1995 amendment process and began its first full year of operation in 1996. The goal of the project is the protection and enhancement of the natural production kokanee within the blocked area. Potential impacts by hatchery production of a non-indigenous kokanee stock have not been assessed. The resident fishery of Lakes Roosevelt and Rufus Woods are very important to the membership of the Colville Confederated Tribes for subsistence and provide an economic impact to the region by non-subsistence sports fisheries. The project is a stock status determining project not related to hatchery production. The project intends to preserve a potentially unique stock of kokanee. The status of these naturally producing fish is not well documented, however spawning populations have been recorded in at least eight (8) different tributaries and in the Lake Roosevelt itself. Evidence exists that the natural production spawning runs are severely declining. The primary objective of this project will be to determine the current status of the natural production kokanee and examine potential limiting factors such as; hatchery plant stock interactions, entrainment brought about by excessive spill, power peaking, firm power commitments or flood control considerations, to the natural production components that have not been addressed by other enhancement projects in the blocked area and propose potential actions based on research findings. Potential limiting factors and research include: ( 1) Determine specific entrainment losses through Grand Coulee Dam and determine probable species composition of entrained fish; (2) Determine spawner escapement (status/strength) at all historical and unknown spawning sites; (3) Determine egg to fry survival rates of the natural production kokanee and subsequent contribution to the fishery; (4) Determine genetic status of the natural production kokanee above the blocked area to determine any impacts by hatchery production, sport fishing and understand the genetic blueprint and source of this potentially unique stock of kokanee. This project is ongoing, findings may indicate a stock in jeopardy and identify hydropower operation, powerhouse and turbine/turbines responsible for greatest entrainment. Final outcome may include recommendations regarding power generation, fish regulation changes, development of captive brood program, etc.

## Section 8. Project description

The construction of Grand Coulee and Chief Joseph Dams in 1939 and 1956 respectively, completely and forever blocked anadromous fish passage. The blocked area is totally dependant upon resident fish for local sport fishing and tribal subsistence fishing. Species of interest include but are not limited to Rainbow trout (*Oncorhynchus mykiss*), White sturgeon (*Acipenser transmontanus*), and kokanee salmon (*Oncorhynchus nerka*) One species of special interest is the land-locked Sockeye salmon or kokanee. A small natural production kokanee fishery exists in several streams tributary to Lake Rufus Woods and Lake F. D. Roosevelt (Hisata, 1996),

(Beckman, L. et. al., 1985), ( Nigro, A.A., et. al. 1983), (Cash, K. Personal Comm. 1996). Following the completion of Grand Coulee Dam in 1942, the U.S.F.& W. S planted Lake Whatcom kokanee into Lake Roosevelt (Earnst and Spence, 1965). The planting operation was reported as a failure (Stober, et. al., 1977). Currently, BPA funded hatcheries; Sherman Creek hatchery, operated by the Washington Department of Fish and Wildlife and the Chamokane Springs hatchery operated by the Spokane Tribe of Indians, plant approximately 1.5 million Lake Whatcom origin kokanee into Lake Roosevelt annually.

Early creel census data indicates an increasing kokanee fishery that could not have come from hatchery operations. The source of the non-hatchery component is unknown at this time as is the status, strength, and genetic make-up of the natural production kokanee. Also unknown is the interaction between the natural production stocks and hatchery production. This project was designed to assess natural kokanee production through adult escapement, egg to fry survival, genetic fitness and entrainment through Grand Coulee Dam. It is integrated into the overall Lake Roosevelt monitoring effort. Kokanee populations in Lake Roosevelt are affected by annual water regimes which influence food production and entrainment (Scholz, et. al. 1985), (Griffith and Scholz, 1990), (Peone et. al. 1989), and (McDowell and Griffith, 1993) Floy tag returns (McDowell and Griffith, 1993) from down-river entities indicate that entrainment may be significant. Entrainment timing, duration, and hydropower operation which influence entrainment are unknown. In an effort to effectively manage natural production kokanee populations in Lake Rufus Woods and F. D. Roosevelt, the following unknown critical factors must be evaluated: Objective 1, Enumeration of adult natural production kokanee (Spawning Escapement); Objective 2, Genetic evaluation of kokanee stocks; Objective 3, Determine egg to fry survival (natural production contribution to existing fishery); Objective 4; Determine of dam entrainment rate and probable species composition of entrained fish. This project is not part of any hatchery production plan and is designed around and integrated with other Lake Roosevelt monitoring projects. Ultimately this project will provide a much clearer understanding of the dynamic fishery in Lake Roosevelt and Rufus Woods.

#### **a. Technical and/or scientific background**

Kokanee were first introduced into Lake Roosevelt by the U. S. F&W. S in 1942, (Cash, K 1996). These introduction were considered failures. Kokanee were also documented in the 1890s in the Upper Arrow lakes in British Columbia (Bouchard and Kennedy, 1985)

Fishery creel data indicates kokanee present for many years from an unknown source. Shortly after the completion of the third powerhouse at Grand Coulee Dam in the early 1970's a substantial kokanee fishery became evident. Thousands of kokanee were harvested from below the third powerhouse tailrace. Many of these fish were stunned or harmed. The Washington Department of Wildlife allowed a salvage fishery in the tailrace below the third powerhouse where daily success was measured by the number of apple boxes per day (Cash, K, 1996).

Kokanee have been in Upper Columbia river systems for decades. British Columbia Ministry of the Environment, Fisheries personnel are of the opinion that several stocks exist within the Kootenai River/Lake system that are of natural production origin without any previous supplementation efforts. Kokanee (landlocked sockeye salmon) have been present in the Upper Arrow Lakes since before the 1890's (Bouchard and Kennedy, 1985).

Early Lake Roosevelt creel census data indicates that a substantial kokanee fishery was present in

the late 1970's and early 1980's (Cash, 1996, personnel communication). In the early 1980s, several thousand kokanee eggs from an unidentified source (Lake Whatcom or British Columbia) were introduced into the San Poil River, Kettle River and into Big Sheep Creek. In Big Sheep creek a substantial run of kokanee returned each year to spawn. A run of natural production kokanee also exists in the San Poil River. No work has been done regarding the Kettle River planting effort.

Genetic analysis to date indicates that the natural production populations found in the San Poil and Nespelem Rivers are identical potentially unique to the Upper Columbia Basin (Leary, 1997)..

Lake Roosevelt Monitoring projects, through floy tag returns from down river facilities, have determined that entrainment occurs at an unknown rate.(Griffith and Schols, 1990) (Tilson, M.B. 1997, Personal Comm.).

This project is coordinated with and fully integrated with all BPA funded Lake Roosevelt monitoring projects to allow optimal management of the the Lake Roosevelt fishery. Project findings may indicate the need for a different hatchery stock and/or recommendation for alternative power generation operations, lake level management or implementation of equipment operation designed to act as deterrents to entrainment such as block nets or strobe light displays.. This integrated project attempts to answer the following question that are the objectives of the project.

Question 1, Objective 1: Determination of stock status by spawning escapement enumeration.

Question 2, Objective 2: Conduct egg to fry study to assess contribution of natural production kokanee to Lake Roosevelt fishery.

Question 3, Objective 3: Determine genetic blueprint of natural production kokanee, compare to other known local stocks to determine any genetic interaction between hatchery component and natural production fish.

Question 4, Objective 4, Determine entrainment through Grand Coulee Dam and probable species composition of entrained fish.

#### **b. Rationale and significance to Regional Programs**

**This project is significant to all monitoring and hatchery projects on Lake Roosevelt because it will answer the many unknown values regarding resident fish and their management in Lake Roosevelt. It is integrated into the general monitoring scheme and substantiates entrainment rates and other unknown values. This project furthers the goal of the FWP by providing information to fishery managers to effectively manage resident fish stocks into the future. Objectives for the project are specific to measurable unknown critical assumptions associated with the resident fishery in Lake Roosevelt resulting from hatchery and natural production for all other species of interest.**

#### **c. Relationships to other projects**

**This project has the goal of protecting and enhancing the natural production kokanee fishery within Lakes Roosevelt and Rufus Woods. This fishery is important from both a tribal subsistence and recreational sport fishery perspective. This goal falls within the councils 1994 Fish and Wildlife System goal of a healthy Columbia River system that supports human settlement and long term sustainability of native fish in native habitats. This project partially mitigates for anadromous fish losses associated with the blocked area above Grand Coulee and Chief Joseph Dams. The project is consistent with with other projects designed to mitigate for losses associated with hydropower development. The project is relevant to all other Lake Roosevelt Fishery Monitoring projects funded by Bonneville Power administration in that it is integrated into the monitoring process concerning the question of entrainment, genetic dilution by hatchery planting, determination of fishery contribution and spawning escapement. The project will protect and enhance the natural production kokanee fishery in the aforementioned lakes and is consistent with the goals and objectives of the Colville Confederated Tribe to provide a successful subsistence and recreational fishery for both tribal and non-tribal members. Project personnel are closely involved with coordination activities with other monitoring projects to reduce duplication of effort, attain a more diverse sample basis, share manpower and equipment needs, and share knowledge and data to maintain an efficient fishery management program that is equitable for all concerned. Projects administered by the Colville Confederated Tribes work hand in hand with each other and other agencies and tribes. (for ongoing projects)**

**Project No. 9501100 is funded by the Bonneville Power Administration as partial mitigation for anadromous fish lost as a result of the Grand Coulee and Chief Joseph Dams. It is a stock status determination project not connected with hatchery production.**

**Monthly reports are submitted to Mr. Charlie Craig, the BPA COTR for the project. A field season summary was provided to Marcella LaFayette for the initial field season of 1995.**

**The 1996, Chief Joseph Kokanee Enhancement Project annual report has been submitted to BPA's Charlie Craig.**

**The 1997, Chief Joseph Kokanee Enhancement Project is completed and undergoing the final edits, delivery can be expected by January 15, 1999.**

**Preliminary work on the 1998 annual report is currently underway.**

**Reports were compiled and submitted that included Report No. 1, a Kokanee Stock Status report and Literature review; Report No. 2, A summary of weir literature; Report No. 3, A summary on spawning ground surveys; Report No. 4, Kokanee Genetic Evaluation Methodology and Summary; Report No. 5, Egg to Fry Survival and Scope of Work for determination of Spawning Success, Report No. 6, Summary of Hydroacoustic literature and Scope of Work for hydroacoustic sensing at Grand Coulee Dam.**

**No major biological opinions have been reached, however we have determined with hydroacoustic sensing, that a significant problem exists at the Grand Coulee Dam regarding entrainment. Our genetic research indicates that the San Poil and Nespelem River stocks are identical and possibly unique to the Upper Columbia basin. Adult spawner counts (Escapement) indicate a substantial decline in adults returned.**

**e. Proposal objectives**

## **Phase I/Objective 1; Determination of spawning escapement.**

It is assumed that the contribution of natural production kokanee is insufficient to support a viable kokanee fishery in Lake Roosevelt. An escapement study will determine any decline in returning adults. It will assess interaction opportunities between hatchery and wild fish and based on known fecundity rates offer insight into probable contribution to the fishery in Lake Roosevelt and Rufus Woods. Additional methodologies will employ foot, aerial and scuba survey techniques.

## **Phase 2/Objective 2; Egg to Fry Survival.**

The critical assumption is that fecundity rates from literature values are identical or similar to wild production kokanee. The knowledge of adult escapement and fecundity allow the calculation of the probable contribution number by wild fish.

Prior to initiation of any survival study, a literature survey and summary was completed and submitted to Bonneville Power Administration as periodic report No. 5. "Egg/Fry Survival Summary and Scope of Work Kokanee Spawning success.". The use of this type of equipment was discussed at great length among area fishery managers. These devices are prone to destruction in high water flow events. In addition to this methodology, we are employing the use of an E. G. Solutions five foot rotary screw trap. This type of trap monitors outmigrating fry of all species in a non-lethal, non-intrusive manner and will continue to be used for the duration of the project.

## **Phase 3/Objective 3, Genetic Blueprint Analysis.**

The basic assumption is that the remaining kokanee populations that utilize tributaries for spawning may be unique or pre-date the construction of Grand Coulee Dam or possess some unique quality that makes them less prone to entrainment. Genetic analysis will determine genetic fitness for possible inclusion into a hatchery augmentation program such as captive brood. Samples for genetic analysis are obtained from spawned out adult kokanee carcasses at all known sites. Samples are difficult to obtain in some systems due to predation by bear, otter, mink and eagles. Samples will be analyzed using protein dna signatures. Samples are immediately frozen and then shipped to a reputable laboratory for analysis. Prior to beginning analysis, a literature and telephone survey was conducted to ascertain the most efficient, accurate methodology. A summary of pertinent literature was drafted and provided to BPA. Collaborative efforts have been undertaken with area tribes, agencies and the provincial British Columbia Government in the procurement of samples for analysis. Current analysis support the concept that these population may pre-date Grand Coulee Dam and/or are genetically unique in the Upper Columbia Basin.

## **Phase 4/Objective 4, Entrainment Survey**

The extent of entrainment is unknown at Grand Coulee Dam, the species composition of the fish entrained is also unknown. Hydroacoustic assessment and gill net surveys will answer both questions.

The question of entrainment numbers is of paramount importance to all fishery managers in the Upper Columbia Basin. A literature survey and summary was provided to BPA prior to contracting for the work. The science of hydroacoustic sensing has evolved as the tool of choice for its cost and non-intrusive manner of data collection. Bids for hydroacoustic sensing were

examined and a contractor selected. Hydroacoustic data analysis has determined that a significant amount of entrainment occurs annually. In 1996, 816,236 fish targets were recorded. The majority of the entrainment seems to happen at the third powerhouse. More than 1/2 of the annual entrainment occurred during the month of July at the third powerhouse. The species of the fish entrained are unknown. In conjunction with the hydroacoustic sensing project personnel are conducting weekly horizontal and vertical gill net surveys in the forebay area of Grand Coulee Dam to determine probable species composition of the entrained fish. Hydroacoustic sensing is providing data which indicates the level of entrainment, the month, diel period, powerhouse, turbine and hydropower operation responsible for greatest entrainment. Currently we are monitoring 14/24 turbine intakes and a single drum gate location. Final data analysis may yield requests for recommendations for operational changes, barrier netting, strobe light deterrent, hatchery stock change, altered net pen release strategy or some other method to reduce the entrainment out of the lake.

#### **f. Methods**

### **PHASE 1: Adult Escapement Determination.**

The use of a picket fence type of weir and associated live/holding box is an established and accepted methodology for enumerating adult salmonid spawners. Prior to the installation of any weirs, a literature search, review and summary was completed and provided to Bonneville Power as Periodic Report No 2., "Weir Literature Summary". Critical assumptions in the use of this type of trap is that migrating fish will pass unimpeded and uninjured. Foot, canoe, helicopter, and scuba surveys were also conducted and are non-intrusive. The use of electroshocking techniques has been intentionally kept limited.

Weirs will be installed on all streams known to harbor returning adult spawner kokanee. Weirs will be installed in late July to insure all adults are counted. They will be maintained on a seven day per week basis or more often if conditions warrant. Weirs will remain in place until returns cease or water conditions force early removal.

### **PHASE 2: Egg to Fry Determination**

The determination of egg to fry survival has entailed the use of experimental redd cap devices used successfully by Idaho Fish and Game (Fraley, 1978). These devices are made of a one meter square of flat iron bolted together at the corners. A 1/8 in mesh net is attached to the framework. The net is tapered and leads to a zippered cod end with a plastic holding bottle attached. The cap structures are installed over marked redds using a 5 ft. section of 5/8 in. concrete re-bar driven into the substrate. The sample bottles are maintained on a twice per week basis until probable swim up and then every day until swim up is complete. In addition we will enumerate the out-migration of kokanee fry and other incidental species using an E. G. Solutions rotary screw trap fished near the mouth of the San Poil River. The trap will be monitored and fished on a 24 hr a day basis.

### **PHASE 3: Genetic Blueprint Analysis.**

Electrophoretic protein analysis will be performed by the University of Montana, Wild Salmon

and Trout Genetics Lab in Missoula, Mt. under the guidance of Dr. Robb Leary. Samples will be collected in accordance with established lab protocols, frozen and sent for analysis. The process uses a starch-gel plate and electrical currents that causes the genetic fingerprints to migrate and deposit themselves in a recognisable pattern. Nearly all regional kokanee stocks have been analyzed and their respective blueprints recorded (Winans, et al. 1996). It will be possible to determine any relationship between our San Poil or Nespelem River stocks (identical to each other) to other area stocks and assess any interaction between hatchery outplanted fish and the wild natural production stocks.

#### **PHASE 4: Dam Entrainment Study.**

Hydroacoustic sensing of fish entrainment is an established science (Steig T. W. et. al. 1985) Entrainment rates will be determined using hydroacoustic monitoring that uses the process of sonar. A total of 14 transducers that emit sound waves will be installed on selected turbine intakes at Grand Coulee Dam. Transducers will be placed on the trash rack spine just above the actual turbine intake at ele 1228, the transducers will be oriented in a downlooking manner and have a 6 degree cone or field of view. The survey will be coordinated remotely through telephone modem from Seattle by the firm of Biosonics Inc, a pioneer in this field. Data analysis will determine turbine, powerhouse, month, diel period and identify hydropower operationj responsible for greatest entrainment and may offer insight into correcting high entrainment. Monthly reports on entrainment are contractually obligated. Monthly reports indicating a peak in entrainment allow an increase in gill netting operation frequency.

#### **g. Facilities and equipment**

Currently project personnel conduct gill net surveys in forebay area of Grand Coulee Dam in order to determine the species composition of fish being entrained through Grand Coulee dam. A twenty one foot (21) outboard powered aluminum work boat is utilized and owned by the project for the deployment of the gill net arrays.

The net arrays consist of three (3) vertical nets deployed inside the logboom. The nets are of variable mesh design with net size ranging from 3/4 inch to 4 in square mesh. Three vertical nets make up an array. A vertical net is 20 ft. in width and 250 feet long. Each net has two 10 foot panels of a different mesh size. Sizes graduate in 1/2 in increments to the 4 in maximum size. Horizontal nets are also fished inside and outside the logboom at varying depths. Each horizontal net is 20 ft. deep and 200 feet long. Mesh size varies the same as in the vertical nets. A horizontal array consists of a pair of nets fished with the large/small mesh in opposition to one another. Project work boat has a davit lift arm with a remote control winch capstan installed. Nets are deployed for 24 hrs. after all safety clearance's have been obtained and strict lock-out procedures followed according to the BOR rules. Project personnel are in possession of a Washington Department of Fish and Wildlife, Scientific Collection Permit. All captured fish are examined for species using an Inland of Fishes of Washington Handbook (Wydoski and Whitney) as a key. Data pertinent to origin, length, weight sex etc is recorded. Bi-monthly catch summaries are provided to the Washington Dept. of Fish and Wildlife regional managers. An annual summary is

provided to the State Dept. Director. Edible species killed in the net process are disposed of by cleaning and providing to the Colville Tribes Food Distribution program/Senior Citizens program. Inedible species or spoiled fish are disposed of in the Tribal landfill located in Nespelem, Wa., according to the provisions of the permit.

Other specialized equipment include creel boards, electronic scales, flow meters and picket fence type weirs. The weirs and holding/live boxes are constructed using aluminum tubing as pickets and side bars. Weirs are custom built on site and anchored in place using 1/2-3/4 in iron re-bar. This project also owns/uses a E. G. Solutions made 5 ft. Rotary Screw trap. This trap is anchored at a selected site near the mouth of the San Poil River and monitors the out-migration movements of all fish species using the drainage for spawning. Summaries of all data collected is shared with all local funded BPA project's and are presented in the annual report submitted to the funding agency.

The project also owns Microscan Micron 486 computer with pentium. A keyboard, color monitor, and Hewlett - Packard laser jet printer are included in package as are various software programs.

Project personnel also use many hand tools which are kept in a locked tool compartment in the GSA leased vehicle. Some fabrication/repair work is done in the Colville Tribal Trout Hatchery Complex.

On site equipment storage is inadequate.

Project personnel utilize vehicles leased from the General Services Administration in addition to mileage accrual on personal vehicles.

## **h. Budget**

This budget was developed to be within a \$600,000.00 ceiling. The actual cost is \$599,996.00. Of this figure, \$98,400.00 is set aside to cover the costs of salaries for three full time employees and one 1/2 time secretary. Fringe and indirect costs total costs are \$66,125.00 bringing the salary and benefits line items up to \$164,525.00.

Travel costs associated with the project include the monthly lease of two GSA vehicles, the monthly mileage associated with them and re-imbursement for personal vehicle use. Other associated costs include boat operation expense for fuel, maintenance, trailer tires, oil, tune-ups and emergency repairs. Additional expenses within this line item include \$677.00 for conference/training fees.

Capitol expenditures are minimal with a \$2,922.00 set aside to purchase a lap top computer for data entry in the field.

The major cost to the project is associated with sub-contracts. Hydroacoustic technology is is complicated and uses technically advanced equipment; there for the high cost of the entrainment study at \$370,520.00. The costs are associated with monthly installments to cover a total of fifteen (15) transducers, fourteen are located on turbine intakes and the other is on a single drum gate. These costs are paid to BioSonics Inc. of Seattle Wa. A second sub-contractor is the University of Montanas Wild Salmon and Trout Genetis lab. for electrophoretic protein analysis of natural production kokanee stocks, to a maximun of \$7,800.00. The third sub-contractor was Gary's Air Service of Cheney Wa. These costs are payment for up to 5 flights at \$300.00 per hour lasting from 2-3 hours each. The filghts are necessary to locate other spawning kokanee

populations, their numbers and locations of redds..

The final line item is program supplies at a total of \$19,456.00. These costs are associated with office and field supplies. Office supplies include paper, printer cartridges, pen, pencils, file folders, and office water dispenser. Field supplies include costs for replacement of worn gear such as survival clothing, life vests, hip and chest waders, film and developing. A portion of this line item is to cover costs associated with annual repair of traps and equipment.

## **Section 9. Key personnel**

Project Biologist: Richard W. LeCaire.

Education:

Associate in Arts Degree, 1988, Spokane Fall's Community College, Colville Wa. campus, General studies.

Bachelor of Science Degree. Eastern Washington University, 1990. Zoology Major, emphasis on fisheries and water related studies.

Minor in Environmental Studies Completed 10 credit hours of post graduate directed studies regarding fisheries and wildlife habitat.

Job Experience: varied, Employed as underground lead miner, lead/zinc concentrate mill leadman, 19 years in sawmill as debarker operator and sawyer .Computer literate and proficient in many programs. Fisheries experience; volunteer fish hatchery laborer, two years as lab technical for U.C.U.T. fisheries research center at EWU doing scale analysis, stomach content analysis and electroshocking vessel experience.. Two summers experience with Colville National Forest, Republic and Colville Ranger District performing stream surveys and population estimated using backpack electrofishing gear. Trained in Hankins-Reeves visual estimation techniques. Two years as fisheries technician for Washington Dept. of Fish and Wildlife., Three years experience as Fisheries Biologist for Colville Tribes in their Timber Fish and Wildlife (TFW) program monitoring fisheries concerns related to timber harvest. Trained in TFW Ambient monitoring techniques at Northwest Indian Fisheries Commission. Co-Chair of DNR/TFW Field Implementation Committee in Olympia for 1 year. Co-Chair of Washington DNR N. E. region, Upper Columbia Basin Working group (UCB). Certified Watershed analysis professional in Fisheries and Riparian Function module's. Completed a DNR/TFW watershed analysis Fisheries module on the Huckleberry Watershed in 1994. Life time area resident with extensive local fishery knowledge especially in the Columbia river and Lake Roosevelt. Full time employee working in excess of 2080 hr per year.

Supervisory Fisheries Tech I.: Stephen Francis

High school graduate, Colville Tribal member Attended WSU for three years as a natural science major. Eight years experience with State of Hawaii Park service as natural resource technician in animal control and fire control. Experienced as cattle ranch foreman on island of Hawaii. Grew up on local farm, is an avid fisherman with extensive knowledge of local fishery in upper Columbia. Two years experience as Colville Tribal Fish and Wildlife Enforcement Officer. Current duties include supervision of field crew in safe efficient gill net operation, boat operator, supply procurement, schedules and clearances for netting, adult and juvenile trapping, equipment repair etc. Computer literate. Full time employee works 2080 hr per year.

Fisheries Aide I;

Michael McCartney, High School graduate, Colville Tribal member, Experienced in home construction and remodeling. Experienced fisherman, has excellent working knowledge of local fisheries, Current duties include assistance of biologist and tech. in all phases of project that include construction of adult weirs, deployment of screw trap, removal and routine maintenance of traps that include weekends and holidays when necessary. Computer literate, full time employee working 2080 hr per year.

(Replace this text with your response in paragraph form)

## **Section 10. Information/technology transfer**

Annual report's to Bonneville Power Administration will be published and shared through-out region with interested agencies and tribes. Four preliminary report's have been submitted that include (1) Stock Status report; (2) Weir Literature Summary; (3) Spawning Ground Survey Summary and (4) Review of Kokanee Genetic Literature Summary. 1995 Field Season Summary completed and submitted to Marcella LaFayette of Bonneville Power Administration. Draft copy of the 1996 annual report is being edited prior to submission. 1997 Annual Report is being developed while awaiting final report from hydroacoustic contractor, BioSonics Inc.

Project progress report's are written semi-annually and submitted to the local press that include the Colville Tribal Tribune, Spokesman Review, Star, Wenatchee World and Statesman Examiner.

As part of the agreement for the Scientific Collection Permit an annual summary is written and presented to Washington Dept. of Fish and Wildlife. The report contains a summary of all adult, and juvenile fish of all species caught using the methods described in permit.

Information is also shared with presentations of findings at Bonneville Power Administration sponsored "Annual International Kokanee Workshop" at various regional locations and at other regional gatherings that include the " Lake Roosevelt Forum" and Lake Roosevelt Hatchery Coordination Team meetings.. Final analysis and summary will include recommendations regarding hydropower operations that effect lake levels, drawdown etc.

(Replace this text with your response in paragraph form)

**Congratulations!**