Department of Energy
Bonneville Power Administration
PO. Box 3621
Portland, Oregon 97208-3621

January 14, 1992

In reply refer to. PJS

Interested Parties

Subject: Review of the Sturgeon, Resident Fish and Wildlife Projects for 1990/1991:

The Bonneville Power Administration (BPA) held a public meeting on November 19-21, 1991, for the purpose of review, coordination, and consultation of the BPA-funded projects for sturgeon, resident fish, and wildlife in the Columbia River Basin (Basin). The comments received after the meeting were favorable and the participants agreed that the meeting was stimulating and productive. The information exchanged should lead to better coordination with other projects throughout the Basin.

The following pages list the projects by title, the project leaders and BPA's project officers, and an abstract of each leader's presentation. Remember: these summaries are in some cases preliminary: they are subject to change and should not be quoted without consulting the project leader.

As promised, this information was assembled and is being disseminated to interested parties to further the goals of the meeting. If you have any questions, please feel free to contact the respective project leader or the BPA project officer at (503) 230-5215.

Sincerely,

Robert W. Walker
Biological Planning Branch

Sincerely,

Fred W. Holm
Biological Planning Branch

Enclosures

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LIFE HISTORY AND POPULATION DYNAMICS OF SUBADULT AND ADULT WHITE STURGEON BETWEEN BONNEVILLE AND MCNARY DAMS. **R.C. Beamesderfer - Oregon Department of Fish and Wildlife, Clackamas, OR. (BPA Project Officer: Fred Holm)**

The key to understanding how to preserve and rebuild a valuable white sturgeon resource in the lower Columbia River may be found in an understanding of how dam construction and operation has affected this fish. Oregon Department of Fish and Wildlife is nearing completion of 5 years of research to determine if and how construction and operation of dams has contributed to the decline of white sturgeon. This project is part of a cooperative and comprehensive program examining sturgeon stocks, reproduction, and habitat. Details of sturgeon biology are being synthesized into a model of sturgeon populations which will used estimate the net effect of differences between impounded and unimpounded populations in the surplus production available for harvest.

Differences in numbers, recruitment, growth, and maturation have been observed between impounded and unimpounded populations and among impounded populations. The net effect of these differences appears to be reduced productivity of the impounded populations. Reservoirs appear to provide limited habitat diversity and dams limit movements among scattered areas historically used to take advantage of seasonally available resources. Consequently, sturgeon populations in each reservoir no longer have access to conditions favorable throughout their life cycle.

Our final report will include an analysis of alternatives for protecting, mitigating, or enhancing impounded white sturgeon populations. Some possibilities we will address include altered flows, supplementation, and management tailored to each unique population.

Life History and Population Dynamics of Subadult and Adult White Sturgeon Downstream From Bonneville Dam. B.W. James - Washington Department of Fisheries, Battleground, WA. (BPA Project Officer: Fred Holm)

The Washington Department of Fisheries (WDF) is nearing the end of a five year, multi agency. research program designed to determine the effects of dam construction and operation on white sturgeon populations in the Columbia River downstream from McNary Dam. The effects of inpoundment should be measurable as the surplus production available for harvest in the impounded populations vs the free flowing lower river population. WDF has the responsibility of modeling the population dynamics of white sturgeon in the unimpounded lower Columbia River downstream from Bonneville Dam to determine its productivity.

We are measuring the productivity of the lower river population by estimating abundance. mortality, growth, reproduction and recruitment, and combining these parameters in a population dynamics model. We are using a mark recapture program to estimate abundance and exploition. We are utilizing research gillnet fisheries to capture sturgeon for marking and we are sampling recreational and commercial fisheries for recaptures. Sampling these fisheries also provides the data we need to estimate growth, survival and reproduction. We are finding that growth is related to the availability of food, such as smelt and anchovie. We see that the seasonal distribution of the population tends to follow the availability of the different food sources. And when we examine the strength of year classes we see that reproduction and recruitment is consistantly good compared to the impounded populations.

In conclusion. we are finding that the population below Bonneville Dam appears to have all of the elements necessary to make it more productive than the impounded populations.

Reproduction, Early Life History, and Habitat Requirements of White Sturgeon Downstream from Bonneville Dam. George T. McCabe, Jr., National Marine Fisheries Service, Seattle, Washington.

The National Marine Fisheries Service, in conjunction with the Washington Department of Fisheries, is studying the reproduction, early life history, and habitat requirements of white sturgeon *Acipenser transmontanus* downstream from Bonneville Dam, the lowermost dam on the Columbia River. This section of the river is being considered a "control" area, allowing comparisons between data collected downstream from Bonneville Dam and data collected in the impoundments between Bonneville and McNary dams. Downstream from Bonneville Dam, white sturgeon typically spawn from late April through late June or early July at water temperatures ranging from 10 to 19°C. Spawning occurs from the dam to points at least several miles downstream from the dam; spawning occurs in high water velocity areas with a cobble or boulder bottom. Stage 2 (freshly fertilized) white sturgeon eggs were collected in areas with mean water column velocities that ranged from 1.2 to 2.8 m/s. During the study, larval or small post-larval sturgeon were collected as far downstream as River Mile 28, which is more than 110 miles downstream from Bonneville Dam.

Catches of white sturgeon juveniles in the Columbia River downstream from Bonneville Dam were patchy. Catch data indicated that juvenile white sturgeon tended to be more abundant in water 9.1 m and greater in depth, at least during daylight. Because of the protracted spawning period and different environmental conditions, there can be large variations in lengths of white sturgeon from a specific year class. These large variations precluded separation of white sturgeon, except for the very young, into year classes using length-frequency histograms. Young-of-the-year (Y-O-Y) catches were relatively low from 1987 to 1989, ranging from 11 in 1988 (less than 1% of total sturgeon catch) to 111 in 1989 (4% of total sturgeon catch). In 1990, a total of 273 Y-O-Y (19% of total sturgeon catch) was captured. Data from 1989 indicated Y-O-Y growth was relatively good, with the mean fork length increasing from 85 mm in July to 234 mm in October. Growth of Y-O-Y in 1990 was somewhat slower, with the mean fork length increasing from 69 mm in July to 197 mm in October.

Since the white sturgeon is a demersal species, benthic surveys were conducted in conjunction with juvenile sampling to determine the relationship between white sturgeon densities and the benthos. The relationship between benthic invertebrate densities and white sturgeon densities was poor. The feeding habits of juvenile white sturgeon from two locations in the Columbia River downstream from Bonneville Dam were examined in 1988. Results from the stomach analyses indicated that juvenile white sturgeon fed on benthic organisms, but not necessarily in proportion to the importance of these invertebrates in the benthos. *Corophium salmonis*, a tube-dwelling amphipod, was overall the most important food item. Other important prey included the clam *Corbicula fluminea* and eulachon *Thaleichthys pacificus* eggs in May. Results from the stomach analyses suggested that food may be limited for juveniles, at least in certain areas of the river, in September-October.

REPODUCTION AND EARLY LIFE HISTORY OF WHITE STURGEON BETWEEN BONNEVILLE AND MCNARY DAMS. Paul Anders/ Allen Miller - U.S. Fish and Wildlife Service, Cook, Wa. (BPA Project Officer: Fred Holm)

The U.S. Fish and Wildlife Service sampled white sturgeon (Aciuenser transmontanus) eggs, larvae, young-of-the-year, and juveniles in the three Columbia River pools between Bonneville Dam (RM 146.5) and McNary Dam (RM 292.0) during April through October, 1991. White sturgeon spawned in the tailrace areas in each pool at water temperatures of 12.0 to 19.1°C. White sturgeon spawning occurred from 25 May to 23 July in Bonneville Pool, from 2 June to 15 July in The Dalles Pool, and from 8 June to 15 July in John Day Pool. Newly deposited eggs (less than *three* hours old) were collected at water velocities of 0.9 to 2.1 m per second. We collected 412 white sturgeon eggs in Bonneville Pool, 334 in the Dalles Pool, and 29 in John Day Pool. Twenty-one percent of the eggs collected in Bonneville Pool were non-viable compared with 23% in The Dalles Pool, and 36% in John Day Pool (29).

As in past years more larval white sturgeon were collected in Bonneville Pool (183) than in The Dalles Pool (53), or John Day Pool. Young-of-the-year white sturgeon collected in Bonneville Pool accounted for 92% of the total catch from all pools in 1991. Young-of-the-year white sturgeon were collected in all *three* pools at depths of 13.4 to 57.3 m, over sand, mud, gravel, and cobble substrates.

Eighty-three percent of all juvenile white sturgeon collected in 1991 were caught in Bonneville Pool. Juvenile white sturgeon were collected from water depths ranging from 8.2 to 49.6 m over substrates ranging from silt to cobble. Water velocities ranged from 0.1 to 1.2 m per second.

KOOTENAI RIVER YHITE STURGEON INVESTIGATIONS AND EXPERIHENTAL CULTURE

Kirberly A. Apperson and John T. Siple
Idaho Departaent of Fish and Game
Coeur d 'Alene

Gary Ai tken
Kootenai Tribe of Idaho
Bonners Ferry

Many human activities have impacted the Kootenai River. Over the past 70 years the lower river has been extensively diked for flood control, effectively eliminating backwater and slough areas that ray have provided fish rearing habitat. Contaainants have entered the river systea via mining operations and agricultural practices. Libby Dar began operation in 1972, reversing the natural flow regime of the river, and releasing frequent power peaking flows.

The population of white sturgeon in the Kootenai River has continued to decline since 1982, in spite of harvest closures. Setline and angling techniques were used to sample 374 sturgeon from the river between Kootenai Falls and Kootenay Lake from 1989 through 1991. Sturgeon were found primarily downstream from Bonners Ferry. There is a complete lack of recruitment of juveniles into the population that is now comparised almost entirely of adult fish. The youngest fish sampled was of the 1977 year class. The population was estimated at 880 individuals with 95% confidence intervals of 638 to 1,211. Current research is focused on identifying the cause of this decline in the sturgeon population.

Egg samples contained copper (1.2 to 3.2 µg/g), zinc (15.3 to 32.8 µg/g), lead (<0.01 to 1.6 µg/g), aluminum (1.2 to 24.0 µg/g) and strontium (<0.16 to 0.32 µg/g). Coabined levels of DDT, DDD, and DDE were 49 to 980 µg/kg. Levels of PCB as Arochlor-1260 were <110 to 733 µg/kg. Egg saaples from the lower Columbia River contained 8 to 12 tires more of the chlorinated compunds than did Kootenai River sturgeon eggs.

Use of sonic telemetry has revealed definite long distance noveaents. Sturgeon regularly • ove across the British Coluabia-Idaho border and seek out deep holes or migrate to Kootenay Lake during late fall.

Spring discharge to the lower river was extraordinarily high in 1990 and 1991. In April through June 1990 and May through July 1991, we observed concentrations of mature sturgeon within 16 km downstream from Bonners Ferry where water velocities were elevated (0.3 to 1.0 m/s). On July 3, 1991, twelve fertilized sturgeon eggs were sampled from the river near Bonners Ferry on a mat of artificial substrate.

Construction of an experimental hatchery was begun and completed in the spring of 1991. Culture efforts will yield approxiaately 1,500 yearling sturgeon for experimental stocking into the Kootenai River in 1992.

HABITAT ENHANCEMENT - IMPLICATIONS

Harvey E. Nyberg
Wildlife Mitigation Coordinator

November 20,1991
Sandpoint, Idaho

ABSTRACT

Hydroelectric development in the Columbia Basin essentially eliminated 294,921 acres of important wildlife habitats. That loss included hundreds of miles of riparian habitats which are exceedingly rare in the basin. These riparian areas supported some of the regions most diverse and abundant wildlife communities. Many of these were key seasonal habitats such as big game winter range. Other flooded habitats such as shrub-steppe prairie supported unique endemic fauna. Because of agricultural and other developments either related to or made possible by hydroelectric development, these kinds of habitats have been largely eliminated. The few relict sites remaining often support the only known populations of certain rare, potentially threatened species.

The NW Power Act required the Northwest Power Planning Council to develop a fish and wildlife mitigation program; but, it left considerable discretion to the Council and the regions State and Federal wildlife agencies and Indian tribes to determine what constitutes adequate mitigation. Most agencies and tribes developed mitigation programs that rely heavily on land acquisition to replace lost habitats. Montana is unique in the extent to which it relies on habitat enhancement for mitigation. Some of the regions agencies and tribes have questioned whether habitat enhancement is an appropriate mitigation strategy. This paper describes the advantages of using habitat enhancement as well as identifies special considerations.

NORTHWEST MONTANAWILDLIFE HABITAT PROTECTION: COLUMBIAN S-TAILED GROUSE MITIGATION

Marilyn A. Wood Montana Department of Fish, Wildlife and Parks, 490 North Meridian, Kalispell MT 59901, (406) 752-5501.

Columbian sharp-tailed grouse historically occupied intermountain valleys in western Montana. During the 1960's populations of sharptails were found in only three areas (Tobacco Plains, Little Bitterroot Valley, and Helmville-Ovando). Today, very limited numbers of Columbian sharptails are found on the Tobacco Plains and the Helmville-Ovando area. Observations of grouse in the Helmville-Ovando area are infrequent and there is some question regarding the taxonomy of this population. Historically, sharptails were common residents of the Tobacco Plains near Eureka Montana, however, by 1987 only 4 male grouse were observed on the last active dancing ground. The Montana Nature Conservancy, Montana Natural Heritage Program, and the Kootenai National Forest initiated augmentation of the population with grouse transplanted from British Columbia.

Under the Northwest Power Planning Act, Bonneville Power Administration was directed to mitigate wildlife losses due to construction of Libby Dam. Studies documented the loss of approximately 3,900 acres of grass and shrublands occupied by Columbian sharptails and recommended habitat protection of 2,462 acres on the Tobacco Plains as the preferred mitigation strategy.

Prior to acquiring conservation easements, fee title, or management agreements to protect habitat, a short term research project conducted in 1989 documented the success of previous transplant efforts and identified several additive factors contributingtothe decline of the Tobacco Plains grouse population. Field work from a two year graduate student project to identify nesting and brood rearing habitat has recently been completed. Preliminary results from 9 radio-equipped female grouse and 11 radio-equipped male grouse documented the importance of the native grassland communities in good to excellent condition. Approximately 80% of the relocations during May through July occurred in grassland habitat within 1 mile of the dancing ground. Four nests were located and all occurred in grassland habitat. Broods were observed during summer in both 1990 and 1991. During spring 1991, a second dancing ground was found and a total of 29 birds were observed.

A Columbian sharp-tailed grouse mitigation implementation plan was developed which identified management goals and strategies to protect and enhance grouse habitat in western Montana. First priority will be to preserve the grouse population on the Tobacco Plains. A cooperative project with Montana Nature Conservancy and mitigation funds to protect 680 acres of critical nesting and brood rearing habitat is being pursued.

WILDLIFE HABITAT ENHANCEMENT - LIBBY DAM PROJECT/US. FOREST SERVICE

Ron Komac, U.S. Forest Service, Kootenai National Forest, 1299 Highway 93 N. Eureka, MT 59917.

Abstract

The completion of Libby Dam in 1973 inundated some 29,000 acres of wildlife habitat in northwestern Montana. Approximately 4300 acres of bighorn sheep habitat and some 13,400 acres of mule deer habitat was lost. Mitigation projects for bighorns began in 1984 and mule deer mitigation began in 1987. Mitigation measures were completed through contracts between BPA and USFS. Some 1200 acres of key winter range were treated under these contracts. A long term plan to manage the mitigation projects was developed by a team of specialists representing USFS and MDFWP. An EA to cover the first decade of the implementation plan was completed and signed in November 1989 with no appeals resulting. The process for treating units begins with an ID team review of the area. ID team members represent the USFS, MDFWP and the Confederated Salish and Kootenai Tribes (CSKT). Treatments include slashing/logging, prescribed burning and fertilization. Implementation is carried out by the USFS. Response by the targeted wildlife species has been positive as well as overall public feeling of the project.

NORTHWEST MONTANA WILDLIFE HABITAT ENHANCEMENT: HUNGRY HORSE ELK MITIGATION PROJECI'

Daniel Casey and **Patrick R Malta,** Montana Department of Fish, Wildlife and Parks, 490 North Meridian, Kalispell, MT 59901.

Abstract

During September 1987, Bonneville Power Administration (BPA) funded an elk / mule deer winter range enhancement project adjacent to Hungry Horse Reservoir. The goal of this project is to mitigate the loss of 8,750 acres of big game winter range flooded when the dam was built. Initial program goals are to enhance 6,650 acres of winter range to support and increased carrying capacity of approximately 133 elk.

Two elk / mule deer winter ranges adjacent to (east of) the reservoir were selected for enhancement. Firefighter Mountain has been the primary enhancement area, because of limited quantity and quality of winter forage. Baseline data indicate the Firefighter winter range is inhabited by 150+40 elk, most of which are resident animals. Two primary herd units have been identified within the project area.

A total of 71 habitat enhancement sites (67 at Firefighter, 4 in the Spotted Bear winter range) have been selected. These include 13 sites in natural shrubfields, 6 sites where understory shrubs will be slashed, and 52 sites where some level of canopy removal will be used to create foraging areas. Enhancement activities are being funded through BPA, the U.S. Forest Service timber program, cooperative funding sources, and the Wildlife Mitigation Trust Agreement (between BPA and MDFWP). Enhancement work began during 1991; six shrubfield areas at Firefighter and 3 at Dry Parks were burned in the spring. Three individual timber sale units were sold during summer, and harvest activity began on one. A larger sale which included 28 enhancement sites was sold 21 October. Timber harvest will begin on these units during 1992, and will be completed by 1995. Shrubs and conifer saplings were slashed during late summer on 6 shrubfield units (101 acres) at Firefighter in preparation for spring, 1992 burning. Understory shrubs at three other sites totalling approximately 30 acres were treated through slashing of decadent shrubs during spring 1991.

A detailed monitoring and evaluation plan was submitted to BPA during December 1990. That plan identified specific sample sizes of marked animals and aerial surveys needed to accurately monitor population response to treatments during the period 1991-1995. We will maintain a marked sample of approximately 50 elk during this period. Evaluation of enhancement efforts also includes pellet-group and browse utilization transects, and ECODATA methods developed by the Forest Service to collect standardized vegetation measurements. These techniques were all implemented on selected enhancement sites during the 1991 growing season. The monitoring effort is designed such that the principle of adaptive management can be used to guide subsequent elk habitat enhancement efforts adjacent to the reservoir.

PEND OREILLE RIVER WETLANDS MITIGATION PROJECT

By: Christopher Merker, Upper Columbia United Tribes Fish and Wildlife Center, Department of Biology, Eastern Washington University, Cheney, WA 99004. (BPA Contract Officer: Joe deHerrera).

In October 1989 Northwest Power Planning Council (NPPC) passed its Wildlife Rule to begin mitigation for lost wildlife habitat due to the federal hydropower system in the Columbia River Basin. The Kalispel Tribe submitted a proposal to mitigate 5% of the losses due to Albeni Falls Dam on the Pend Oreille River. Lake Pend Oreille was once the center of subsistence use for the tribe. After local public hearings, and passage of the proposal through Columbia Basin Fish and Wildlife Authority, NPPC Wildlife Advisory Committee, NPPC hearings, and BPA Policy Review Group, it was ranked high by the BPA Scoping Group. After further PRG review, the Power Council voted 7-1 in January 1991 to direct BPA to fund acquisition of the parcel.

The objective of the proposal is to:
1. purchase a 440 acre floodplain ranch;
2. implement a restoration plan for a) wetlands and b) floodplain forest to replace about 1260 Habitat Units for wildlife;
3. dedicate to wildlife mitigation, maintain benefits, and monitor the results of the project by the tribe in perpetuity.

To date, an property assessment appraisel has been completed by BPA Realty. Costs are comparable to that negotiated by the tribe with the landowner. An interdisciplinary team composed of BIA, BPA, NPPC, electric utilities and UCUT conducted a field Habitat Evaluation Procedure (HEP). Purpose is to estimate baseline value of the habitat to wildlife in the property's present condition. This will be the value against which we will measure the success of our management efforts. A draft management plan has been completed, detailing tasks to be used to meet objectives above.

As one of the first wildlife projects to be approved through the system, there are not surprisingly several problems. The Implementation Planning Process system itself is very process-oriented. The multiple layers in the flow chart, and a variety of loops, make it seem that there is no clear path. At the project level, requirements are either still unclear, or need to be better communicated to sponsors. Tasks can and should be completed simultaneously rather than linearly. In order to speed up the process at the project level, sponsors can be given more responsibility. Some examples that need investigation include: tribes willingness to negotiate with landowners on terms of habitat protection, conduct of NEPA through the Bureau of Indian Affairs, hazardous material surveys by Eastern Washington University, are all possibilities that may be much quicker and cheaper than standard government contracting.

MEASUREMENT OF THYROXINE CONCENTRATION AS AN INDICATOR OF THE CRITICAL PERIOD FOR IMPRINTING IN KOKANEE SALMON (*Oncorhynchus nerka*): IMPLICATIONS FOR OPERATING LAKE ROOSEVELT KOKANEE HATCHERIES.

By: A.T. SCHOLZ, R.J. WHITE, V.A. KOEHLER and S.A. HORTON. UPPER COLUMBIA UNITED TRIBES FISHERIES CENTER, DEPARTMENT OF BIOLOGY, EASTERN WASHINGTON UNIVERSITY, CHENEY, WA 99004. (BPA PROJECT OFFICER: FRED HOLM)

Previous investigations have determined that thyroid hormone surges activate olfactory imprinting in coho salmon and steelhead trout smolts. The mechanism of action appears to require binding of thyroid hormones to receptors in brain cell nuclei, which stimulates neuron differentiation and wires a pattern of neuron circuitry that allows for the permanent storage of the imprinted olfactory memory. In this study, thyroxine concentrations [T4] were measured in 487 Lake Whatcom stock and 70 Lake Roosevelt stock Kokanee salmon to indicate the critical period for imprinting. Eggs, alevins and fry, reared at the Spokane Indian Kokanee Hatchery, were collected from January through August 1991. Sampled fish were flash frozen on dry ice and stored at -80°C until T4 was extracted and concentrations determined by radioimmunoassay. T4 levels were monitored in Lake Whatcom stock fish at approximately weekly intervals from 10 days before hatch to 185 days post hatch. Mean concentration ± SEM of 10-20 individual fish (assayed in duplicate) were determined for each lot. T4 concentration peaked on the day of hatch at 23.2 ± 7.3 ng/g and again at swim-up at 9.2 ± 4.1 ng/g, then steadily decreased to 0.1 ± 0.1 ng/g in fry older than 120 days post hatch. T4 content of eggs typically ranged from 7.0 to 14.0 ng/g. T4 levels were monitored in Lake Roosevelt stock fish at approximately monthly intervals from the egg stage in January through the time they were released in July. T4 concentrations were highest in eggs at 9.4 ± 1.8 ng/g, then steadily decreased to 0.1 ± 0.1 ng/g in older fry. Fry were released in Lake Roosevelt tributaries in July and August 1991, at about 170-180 days post hatching, in order to imprint them to those sites. The results of this study indicate that the time of release was not appropriate for imprinting. If T4 levels are an accurate guide for imprinting in kokanee, our results suggest that the critical period for imprinting in kokanee is at hatching or swim-up stages.

LAKE ROOSEVELT

RAINBOW TROUT HABITAT/PASSAGE IMPROVEMENT PROJECT

ABSTRACT

PREPARED BY

RICHARD LECAIRE

SCIENTIFIC TECHNICIAN

WASHINGTON DEPARTMENT OF WILDLIFE

ON BEHALF OF

JOE PEONE

PROJECT DIRECTOR

FISHERY BIOLOGIST

COLVILLE CONFEDERATED TRIBES

LAKE ROOSEVELT RAINBOW TROUT HABITAT/PASSAGE IMPROVEMENT PROJECT

Abstract:

Lake Roosevelt is the reservoir formed by the damming of the Columbia River by Grand Coulee Dam. Previous studies on the reservoir indicate that natural reproduction within the lake and tributaries are not sufficient to support a Rainbow Trout fishery (Scholz et. al. 1988). The scope of the project will encompass four phases:

1. Collection of baseline data and analysis to determine the existing habitat
2. Design a plan that will improve and preserve the existing habitat
3. Implement the proposed plan
4. Monitor and evaluate the effectiveness of implementation.

The collection of baseline data has included the classification and enumeration of stream parameters such as flow, area, valley type, substrate type and condition, riparian zpne condition, Rainbow Trout population density estimates, and type and location of obstructions or barriers to upstream migration. Data collection was done using methods and equipment described in the Timber, Fish and Wildlife Field Manual (Ralph 1990) and Hankin and Reeves (1987) visual estimation techniques.

The habitat/passage improvement plan will be developed using the data collected by field teams from the three cooperating agencies: Colville Confederated Tribes (CCT), Spokane Tribe of Indians (STI), and Washington Department of Wildlife (WDW). Further projects will be implemented that will eliminate passage barriers, reduce

sediment loading, improve or protect the existing vegetation and habitat, provide habitat diversity while protecting the genetic integrity of Rainbow Trout in the system. Finally, the project will monitor and evaluate the physical and biological parameters for changes and impacts effected by the implementation of the plan.

ASSESSMENT OF BULL TROUT AND CUTTHROAT TROUT HABITAT AND POTENTIAL FOR RESTORATION OF TRIBUTARIES ON THE COEUR D'ALENE INDIAN RESERVATION.

D. Chad Johnson, Kelly Lillengreen, Suzy Graves and Allan Scholz - Upper Columbia United Tribes Fisheries Research Center, Cheney WA.
(BPA Project Officer: Bob Austin)

The **purpose of the Coeur** d'Alene Indian Reservation tributary **study was to obtain baseline data on existing trout populations and their habitat to assess the** creeks that would be most suitable for habitat rehabilitation and stocking of cutthroat and bull trout.

An aerial survey was conducted in December 1990 on 19 creeks on and around the Coeur d'Alene Indian Reservation. The purpose of this survey was to identify road access, determine the length of suitable fish habitat, locate potential barriers to fish migration and determine potential for enhancement. From this survey 10 tributaries were selected for field investigations. Ground surveys were conducted from March through June to numerically rank the best four in which to conduct detailed habitat studies.

Ranking was accomplished through a modification of the Missouri method of evaluating stream habitat. Fourteen components including seven habitat quality parameters and seven habitat alteration functions were used for stream ranking. Habitat quality parameters were used collectively to measure the variation from an ideal pristine state. These parameters include barriers to fish passage, urban development of the watershed, condition of riparian vegetation, condition of the floodplain, land use of watershed, flow alteration and substrate suitability. Habitat alteration functions were intrinsic factors which directly and proportionately affect habitat quality, and often limit the continued existence of all or part of a fish community. Each function had the power to reduce the habitat quality rating. These functions include channel modification, impoundments, water quality parameters, streambed condition, base flow, water temperatures and habitat suitability for all life stages. These fourteen components were combined to calculate a habitat quality index (HI) for each stream. HI values can range from (0) highly degraded to **(10)** pristine. Streams that have HI values between four and seven are ideal for enhancement studies,

whereas streams with high HI values (i.e. near pristine conditions) should not be disturbed and streams with low HI values would be to expensive to rehabilitate.

Index values were: Belgrove **(0.85), Squaw** (1.25), Fighting (2.14), Hell's Gulch (3.38), Plummer (3.84), Little Plummer (3.91), Lake (5.1) Benewah (5.16), Evans (5.21) and Alder (6.03).

The four creeks selected for detailed habitat analysis based on HI analysis were Alder, Benewah, Evans and Lake Creeks. Detailed habitat analysis is being conducted according to procedures set forth by the Timber/Fish/Wildlife Ambient Stream Monitoring Field Program.

Relative abundance of fish was determined, by electrofishing, in spring (June), summer (August) and autumn (October). Population estimates of trout species were conducted in (October). A total of 2,161 fish were caught in June from Alder, Benewah, Evans, Fighting, Hell's Gulch, Lake, and Plummer/Little Plummer creeks. August totals were 1,824 fish caught from Alder, Benewah, Evans and Lake Creeks. October totals were 2,153 fish caught from Alder, Benewah, Evans and Lake Creeks. Relative abundance of trout species caught from all creeks in June, August and October were 7%, 12% and 16%. Mean densities of cutthroat trout obtained from October population estimates were 2, 3, 19, and 8 fish/l00 m* respectively in Alder, Benewah, Evans, and Lake Creeks. Eastern brook trout were collected only from Alder Creek, at **a** density of 31 fish/l 00 m^2. Bull trout were not encountered.

Recommendations include: 1) obtain better information about population of adfluval cutthroat trout in spring through the installation of migration traps; 2) conduct longitudinal profiles of temperature and flows. Longitudinal flow and temperature data will aid in determining the potential impact that rejuvenated riparian zones will have on the streams; 3) collect additional information on temperatures and water flows in 1992 due to the drought experienced in late 1991; 4) evaluate lower order feeder streams for potential spawning areas.

Rehabilitation of riparian zones through fencing should be implemented to protect streams from high sediment loads and erosion of banks. In several areas willow riprap will need to be placed. These restored riparian zones will also aid in reducing summer water temperatures and increase flows which now seriously impact the fishery.

CRITERIA USED TO STRATIFY PHYSICAL HABITAT ON THE KOOTENAI RIVER FOR INSTREAM FLOW INCREMENTAL METHODOLOGY (IFIM) STUDIES

by
Don Skaar
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475 Fish Hatchery Road
Libby, MT 59923

Instream Flow Incremental Methodology (IFIM) is being applied on the Kootenai River in order to simulate the effects of Libby Dam operation on physical habitat availability. White sturgeon, burbot, bull trout, rainbow trout and mountain whitefish are the target fish species. The study area encompasses the entire 143-mile stretch of river from Libby Dam downstream to Kootenay Lake. The river was divided into three study segments, based on channel gradient, sinuosity and a natural barrier (Segment 1 is from Libby Dam to Kootenai Falls; Segment 2 from the Falls to Bonners Ferry; Segment 3 from Bonners Ferry to Kootenay Lake). Segments 2 and 3 were divided into subsegments; Segment 2 divided into three area--a bedrock-controlled area, a braided area, and an area that could not be placed in either category; Segment 3 divided into two areas--a shallow, low sinuosity area and a deep, meandering area. Within each segment or sub-segment, the river was stratified into macrohabitat types--pool, glide, run, riffle, rapid and side channel/island. One or more "representative" microhabitat study sites were chosen for each habitat type, based on the percentage of total segment distance attributed to each habitat type. At each microhabitat study site, a minimum of three transects are taken, including that of the hydraulic control, in order to provide the flexibility of using either the IFG4 or WSP hydraulic models, or both. It is estimated that 80-100 transects will be needed to accurately portray conditions in the river; to date (November 18, 1991), measurements have been taken on 47 transects at medium flows (12,000-18,000 cfs).

The two- or three-tiered stratification approach described above is felt to be necessary in order to quantify the highly diverse habitat of this river without biasing (weighting) the database toward one habitat type or another. This approach will also provide the flexibility to simulate conditions in any segment or sub-segment of the river. This is particularly important in the Kootenai River, where distribution of target fish species is not uniform throughout the study area. White sturgeon are only found in segments 2 and 3, rainbow and bull trout are found throughout the river but predominantly in segment 1, while burbot are also found throughout the river, but mainly in segments 1 and 2. A further advantage of the segmentation process is that it will provide us with microhabitat availability data in each segment that we can then use with habitat utilization data (which we are developing) to generate suitability indices.

CABINET GORGE KOKANEE ASSESSMENT ,LAKE PEND OREILLE,IDAHO

Vaughn L. Paragamian
Senior Fisheries Research Biologist
Idaho Department of Fish and Game

ABSTRACT

Rehabilitation of kokanee Oncorhvnchua nerka *in* Lake Pend Oreille has met with some success , but unexpected results have raised new questions. Estimated kokanee abundance during late August of 1990 was about 6.9 million fish and 5.4 million in 1991. This was a decline of 19% from 1989 to 1990 , a continued decrease since 1988. The decreased population was attributed to low stocking of hatchery fry (7.3 million in 1990 and 5.0 million in 1991), lower wild fry survival in 1990 (1.5%), and exceptionally poor survival of fish ages 3 and 4, average survival of the older fish was only 35% in 1990 compared to 72% in prior years but it was 68% in 1991. Compensatory survival was noted for kokanee ages 1 and with an average of 81% in 1990 compared to 44% in 1989.

Hatchery fry comprised 47% of the total kokanee fry recruitment in 1990 (80% of fry biomass) ,data from 1991 is still in the analysis phase. This contribution ranked third behind 1988 and 1989 since hatchery supplementation began in the 1970's. Survival of hatchery fry was 20% in 1990, the second highest since this investigation began. Three release strategies were tested in 1990 of which the best survival was

recorded for the south shoreline at 28%, followed by the Sullivan Springs release at 23% and 15% for the early Clark Fork River release. Only two strategies were used in 1991. Survival of hatchery reared kokanee fry is still below the goal of 30%. Good survival of fry from the south shoreline and Sullivan Springs releases was attributed to large size of kokanee fry (52 mm), warm water temperatures of July, and higher Cladoceran densities compared to June. Lower survival of the early Clark Fork release is attributed to the exceptionally high river flows (850 cm^3/S and low density of zooplankton.

Findings of 1990 indicate a more comprehensive approach to managing kokanee must take into account predator stockings and predator/prey interaction. An unexpected low adult escapement was responsible for an egg take of only 5.6 million eggs in 1990, 58% of the previous year, this limited experimental stocking in 1991 but two strong age groups (age 3 and 4) in 1991 should double the egg take from the previous year. Modification of the fish ladder at the Cabinet Gorge Fish Hatchery to improve adult escapement is strongly recommended to increase egg take from the Clark Fork River.

Dworshak Reservoir Investigations-Trout, Bass and Forage Species

David P. Statler
Nez Perce Tribe Department of Fisheries Management
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ABSTRACT

Dworshak Dam, near Orofino, Idaho, impounded water 86 km up the North Fork Clearwater Basin. At normal full pool, Dworshak Reservoir encompasses 6,644 ha with 282 km of shoreline. Operational drawdowns are typically in excess of 30 m.

Since impoundment in 1972, gill net data reflect a characteristic early surge of productivity, followed by a decline to a lower equilibrium phase. Gill net catch rates peaked in 1974 at 4.99 fish per net hour. More recent sampling in 1988 and 1989 produced catch rates of .67 and .70, respectively. The once abundant redside shiner (Richardsonius balteatus), an important forage species, has virtually disappeared. The smallmouth bass (Micropterus dolomieui) has emerged as the most abundant self-perpetuating game fish species inhabiting littoral areas.

The record smallmouth bass for the State of Idaho (3.3 kg, 527 mm) was taken from Dworshak Reservoir in 1982. Smallmouth bass growth rates have declined dramatically since 1980. It currently takes about 5 years to produce a 305 mm bass. Estimated annual mortality (A) is low at .390. Estimated fishing mortality (F) is also mild at .261. Lower relative weight (W_r) values for bass in the 100-300 mm range suggest problems in food supply.

Low mortality and inherent food limitations associated with extreme pool fluctuations prompted a re-evaluation of the existing 305 mm minimum size limit. Application of an equilibrium yield model projected that an alternative 254 mm minimum size limit would increase the number and weight of bass harvested by 77% and 24%, respectively.

Techniques for revegetation of drawdown zones in fluctuating reservoirs are being developed and refined by the U.S. Army Corps of Engineers Waterways Experimental Station, Vicksburg, Mississippi. Revegetation of shoreline areas at suitable locations would partially offset habitat deterioration caused by reservoir pool fluctuations. Benefits would include improved cover, increased littoral food production and lower turbidity.

Rainbow trout (Oncorhynchus mykiss) hybridization with native westslope cutthroat trout (Oncorhynchus clarki lewisi) should be factored into future trout stocking activities. Alternatives that would minimize further genetic introgression include elimination of rainbow trout stocking, stocking sterilized rainbow trout and stocking westslope cutthroat trout endemic to the North Fork Clearwater Basin.

BPA PROJECT UPDATE - SANDPOINT, IDAHO

ABSTRACT

Reservoir Modeling Libby/Hungry Horse

Brian Marotz
Montana Department of Fish, Wildlife and Parks

Empirically calibrated computer models were developed using site-specific physical and biological data. Rapid comparisons of alternative dam operation scenarios are possible for a wide range of water conditions, drought to flood. Historic data or hypothetical conditions specified by the user during an annual simulation produce an output of physical and trophic conditions including water balance, thermal structure, primary production, zooplankton production, benthic insect production, terrestrial insect deposition, downstream loss and fish growth. Targeted fish species are kokanee and westslope cutthroat trout for the Libby and Hungry Horse models, respectively.

During 1991, modeling work concentrated on a simulated temperature control structure at Hungry Horse Dam. The selective withdrawal component enabled us to evaluate the relative costs and benefits of thermal control in dam discharges. A conservative model formula predicted a two to fivefold increase in trout growth potential in the main stem Flathead River below Hungry Horse Dam when thermal control was applied. Sudden spikes in river temperatures were moderated to minimal levels and a near natural thermal regime was achieved.

Some negative effects were detected in the reservoir. Removal of warm water through variable level withdrawals increased entrainment of phytoplankton and zooplankton. Reduced temperature units in the basin contributed to a net reduction in benthic insect production. However, the predicted impacts to reservoir production were minimal in comparison to benefits incurred in the Flathead River. Pilot programs were initiated to assess the feasibility of reducing or eliminating the negative effects of reservoir fluctuation and temperature control.

On November 12, 1991, the Northwest Power Planning Council approved most non-operational mitigation strategies, submitted by the Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes, for mitigating the effects of Hungry Horse Dam construction and operation. The implementing agencies were directed to immediately pursue funding for the selective withdrawal structure and fishery enhancement programs which were developed in part using the quantitative reservoir models.

SYSTEM OPERATION REVIEW

Dan Daley - Bonneville Power Administration

The Resident Fish Workgroup of the System Operation Review is comprised of representatives from interested federal and state fisheries management agencies, Columbia Basin Indian tribes, private utilities, and the'dam operating agencies (the Corps of Engineers, BPA, and the Bureau of Reclamation). This group has agreed on the basic form of a model which will assess the potential impacts of alternative system operational plans on populations of resident fish. The Resident Fish model combines elements of a generic form of a model developed by the Montana Department of Fish, Wildlife, and Parks for use on Hungry Horse and Libby Reservoirs, with key relationships representative of circumstances prevalent in other reservoirs throughout the basin. The model in its present form concentrates on up-river storage reservoirs. However, the Resident Fish Workgroup plans on adding abilities to evaluate impacts in run-of-river reservoirs and critical stream reaches. Current efforts include data collection on Grand Coulee and Dworshak Reservoirs in an effort to fill data gaps and allow consistent comparison of effects between reservoirs.

In its final form, this model should allow analyses of potential impacts from operational changes on resident fish throughout the Columbia Basin. It will be possible to evaluate impacts based on changes in fish numbers as well as fish growth. The use of consistent techniques across the major storage reservoirs should also allow comparison of relative impacts on individual reservoirs.

(1557W)

BONNEVILLE POWER ADMINISTRATION
FISH AND WILDLIFE PROGRAM
REVIEW, COORDINATION, AND CONSULTATION

Resident Fish and Wildlife Projects

November 19 - 21, 1991
Edgewater Lodge
Sandpoint, Idaho

MEETING AGENDA

November 19. Tuesday

1:00 p.m.	Introduction.
p.m.	Overview of White Sturgeon Research - Tony Nigro - ODFW.
1:30 p.m.	Life History and Population Dynamics of Subadult and Adult White Sturgeon between Bonneville and McNary Dams - Ray Beamesderfer - ODFW.
2:00 p.m.	Reproduction, Early Life History, Population Dynamics and Life History of Subadult and Adult White Sturgeon downstream from Bonneville Dam - Brad James - WDF.
2:30 p.m.	Break.
2:45 p.m.	Reproduction and Early Life History of White Sturgeon downstream from Bonneville Dam - George McCabe - NHFS.
3:15 p.m.	Reproduction and Early Life History of White Sturgeon between Bonneville and McNary Dams - Paul Anders/Allen Miller - USFMS.
3:45 p.m.	Kootenai River White Sturgeon Investigations and Experimental Culture - Kim Apperson/Jack Siple - IDFG. Gary Aitken - Kootenai Tribe of Idaho.
4:30 p.m.	Adjourn.

November 20, Wednesday

8:00 a.m.	Habitat Enhancement and its Implications - Harvey Nyberg - MDFWP.
8:30 a.m.	Columbia Sharptail Grouse Enhancement - Marilyn Wood - MDFWP.
9:00 a.m.	Habitat Enhancement/Libby Project - Ron Komac - USFS.
9:30 a.m.	Break.
9:45 a.m.	Hungry Horse Elk Project - Dan Casey - MDFMP.
10:15 a.m.	Grand Coulee Mitigation Pre Planning - Mike Kuttel/Paul Ashley - WDW.
11:00 a.m.	Kalispel Wetlands Project - Chris Merker - UCUT.
11:30 a.m.	Lunch.
1:00 p.m.	Overview of Lake Roosevelt Fishery Projects - Al Scholz - Eastern Washington University.
1:30 p.m.	Monitoring and Evaluation of Fishery Improvement Projects - Lake Roosevelt - Al Scholz - U.C.U.T.
	Habitat/Passage Improvements - Lake Roosevelt - Richard LeCaire - WDW.
2:15 p.m.	Assess Fishery Improvement Opportunities - Pend Oreille River - Becky Ashe - U.C.U.T.
2:45 p.m.	Break.
3:00 p.m.	Fisheries Habitat Evaluation in Tributaries on the Coeur d'Alene Indian Reservation - D. Chad Johnson - U.C.U.T.
3:30 p.m.	Libby Reservoir/Kootenai River Study - Don Skaar - MDFWP.
4:30 p.m.	Adjourn.

November 21. Thursday

8:00 a.m.	Kokanee Stock Status and Contribution of the Cabinet Gorge Hatchery, Lake Pend Oreille - Vaughn Paragamian - IDFG.
8:30 a.m.	Dworshak Dam Impacts Assessment/Limnology and Kokanee Investigation – Melo Maiolie – IDFG.
9:00 a.m.	Dworshak Dam Impacts – Small Mouth Bass/Rainbow - Dave Statler - Nez Perce Tribe.
9:30 a.m.	Break.
10:00 a.m.	Reservolr Modeling Libby/Hungry Horse - Brian Marotz - MDFWP.
10:30 a.m.	Relationship of Hungry Horse Model/Status of SOR - Dan Daley - Bonneville Power Administration.
11:00 a.m.	Discussions/Announcements, etc.
	Adjourn.

(0613W)

LIST OF ATTENDEES

November 19 - 21,199l

NAME	AGENCY	PHONE
Brent Mabbott	Montana Power Company	(406) 723-5421 ext.3408
Becky Ashe	UCUT	(509)359-7498
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WORD:ATTLIST