

# Moses Lake Fishery Restoration Project

Annual Report  
1999 - 2000



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# **Moses Lake Fishery Restoration Project**

**Project Number: 199502800**

**Contract No. 00006320**

## **FY 2000 Annual Report**

Prepared for Submission to the Bonneville Power

Administration

## **Acknowledgments**

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## **Introduction**

The Moses Lake Project (project # 199502800) was first funded during FY 99 and field studies commenced October 2000. Later review of the proposal by the ISRP revealed perceived shortcomings. Immediately following the ISRP review Washington Department of Fish and Wildlife (WDFW) personnel were in contact with the Northwest Power Planning Council (NWPPC) regarding further options. The NWPPC allowed WDFW to re-submit the first proposal revision that was followed in June 2001 by a second negative review by the ISRP. In August 2001, the NWPPC authorized a third and final submission of the proposal and limited funding extension. Therefore, proposal revisions and resubmissions limited progress in data collection and analysis.

This report covers work conducted within the submitted scope of work (FY 2000, September 27, 2000 – September 26, 2001) and incorporation of the suggested modifications to the proposal.

The bulk of the work covered by this report concentrated on data collection.

## Methods

### Objective 1: Implement Study Design Developed for Phase 2

#### Task 1.1 Diet study/ Fish Stomach Content

Monthly surveys for fish diet samples conducted on Moses Lake started in October 2000 and continued through the report period. Fish were collected during daylight and night hours using boat electrofishing, gill netting and angling. Using multiple gear types reduced sampling gear bias and enhanced collection of multiple species and size classes of fish. Fish were sampled from randomly selected areas within each of the four lake sections (Figure 1). Gill nets were checked hourly to minimize digestion while in the net.

Three individuals for each age group, young of year, juvenile and adult were collected from each of the four Moses Lake sections. For each species a total of 36 individuals were sampled monthly within Moses Lake for night and day samples. A goal of 72 fish were sampled each month for the target species: walleye *Stizostedion vitreum*, black crappie *Pomoxis nigromaculatus*, bluegill *Lepomis macrochirus*, yellow perch *Perca flavescens*, smallmouth bass *Micropterus dolomieu*, largemouth bass *M. salmoides* and rainbow trout *Oncorhynchus mykiss*. Diet samples of other species did not exceed 20 individual fish sampled per month.

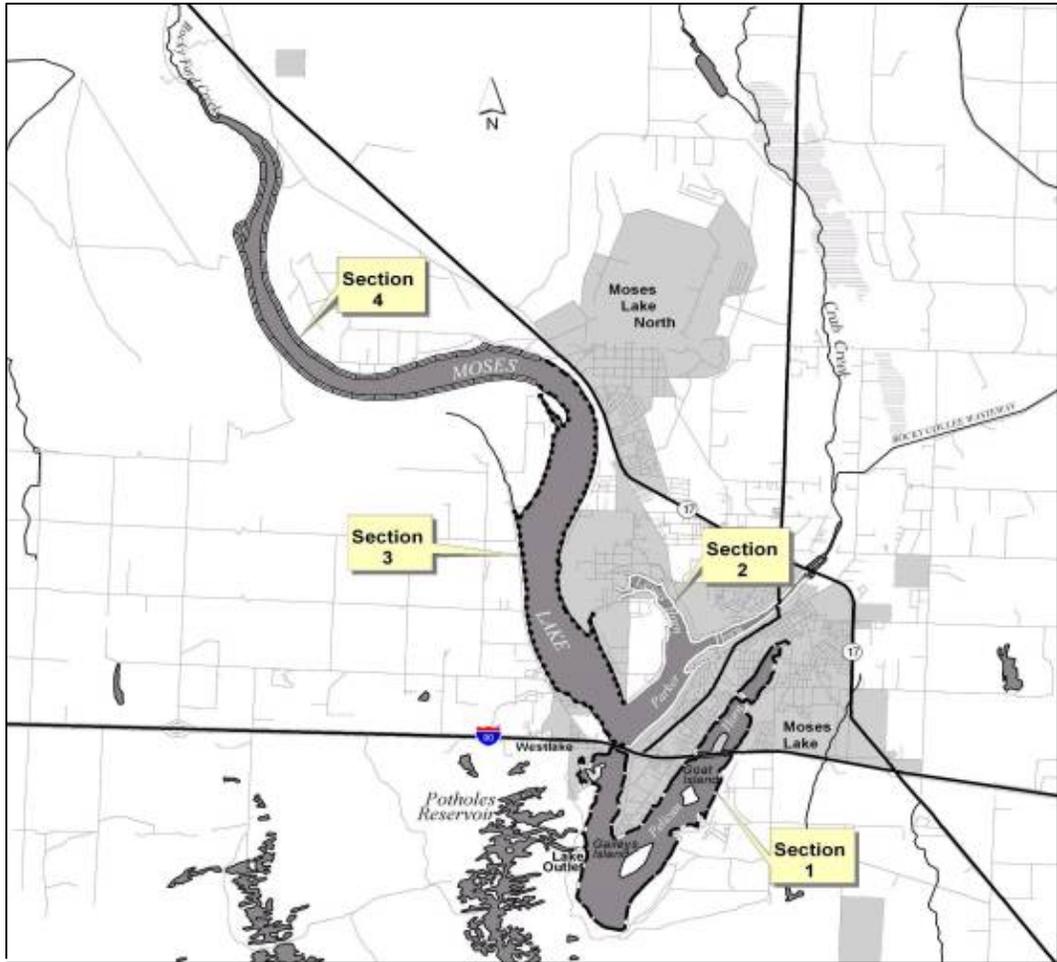
Stomach contents were collected via gastric lavage methods. Gastric evacuation (GR) has been used successfully on a variety of sizes and fishes (Singh-Renton and Bromley 1996; Ruggerone 1989; Brown 1995; Hartleb and Moring 1995). Upon capture, an elongated nozzle from a modified handheld garden sprayer was inserted into the stomach orally and contents were “washed” into a tray. Fish were then released and contents preserved for later identification.

Stomach contents of selected samples were identified to order for macroinvertebrates, order for zooplankton and to species for fish whenever possible. Zooplankton and macroinvertebrate sizes and wet weights were measured, for each individual, from each order detected in the sample. Contents were identified using a variety of sources (e.g. Pennack 1989-invertebrates; Wydoski and Whitney (1979) and a WDFW generated bone key.

No further analysis of contents was conducted during this reporting period. Further analysis of frequency of occurrence and percentage by weight will be conducted. These data will be incorporated into the bioenergetics model to estimate total consumption of prey items in Moses Lake.

### **Subtask 1.1**

Recent notes and literature suggests using scales to age fish can be inaccurate. Understanding the age structure of fishes within Moses Lake is an integral portion of the study. Therefore, scales, otoliths and spines were extracted to aid in the correct determination of length at age for the fishes of Moses Lake. Scales and otoliths were collected from fish captured during diet sampling. These structures were then sent to the WDFW ageing laboratory in Olympia for analysis.



**Figure 1. GIS created map of Moses Lake and surrounding area. Sections 1-4 placed on map.**

## **Task 1.2 Implement Zooplankton and Phytoplankton Data collection**

We monitored phytoplankton abundance to detect temporal and spatial changes in primary producers. Beginning in April 2001, personnel on the Moses Lake Project collected seasonal phytoplankton samples. Additional phytoplankton samples were collected in July, October and when the ice-receded in winter 2002. Samples were taken in triplicate for each of the four lake sections (Figure 1).

The depth of the euphotic zone was determined as the product of the Secchi depth and three. Once the euphotic zone was determined, an integrated core sampler was inserted to the bottom of the euphotic zone and a sample of the entire column taken. The sample was placed in a 20.0 l bottle and stirred to evenly distribute the phytoplankton. A 1.0 l subsample was taken from this container for identification and enumeration following USEPA (1998).

A total of 12 samples were taken during each sample period that will permit spatial and temporal analysis. A contracted limnologist is determining species composition, density, and bio-volume of phytoplankton within Moses Lake.

We monitored zooplankton abundance to identify spatial and temporal changes in primary consumers. Zooplankton collections were also initiated in April 2001 at 12 randomly selected sites. Monthly vertical tows were conducted using a Clarke-Bumpus sampler with a 15 cm throat at three mid-channel sites in each of the four sections on Moses Lake. To calculate the number of zooplankton for a given volume of water that passed through the sampling device, the

volume of water sampled ( $V$ ) and the total density of zooplankton ( $D_z$ ) will be calculated using the following equations:

$$V=D*A$$

Where:  $D$  is the distance traveled, and  $A$  is the area of the opening of the sampling device

$$D_z=n/V$$

Where:  $n$  is the number of zooplankton and  $V$  is the volume of water sampled.

Zooplankton samples were preserved in Lugol's solution and held in whirl packs to be processed at a later date. A limnologist will be contracted to determine species composition, density, and estimated biomass.

### **Task 1.3. Implement Year Long Creel Survey**

To better understand effects of harvest in Moses Lake fishery, a year creel survey was conducted. One concern is that harvest may be contributing to shaping the fish community. Prior to this study, four intensive creel surveys were conducted on Moses Lake during 1974-1975 (Duff 1976), 1983 (Jackson 1985), 1991 (Korth 1992), and 1996-97 (Donley et al. 1999). All surveys determined the number and species of fish caught, and quantified total time spent fishing. For the purposes of this project, much of the same protocol was used as in previous surveys to allow for comparative analysis between different sampling dates. The three main components that are consistent for the previous and future creel surveys are index counts, creel data, and effort (Korth 2000). Because of its size (6,800 acres) and multiple access points, it is neither economically or logistically feasible to strictly adhere to either a roving (Robson 1991) or

access point creel design (Hayne 1991). Consequently, we used the following methods on Moses Lake.

#### Angler Harvest and Effort Sampling

- Interviews were conducted on four weekdays and four weekend/holidays per month.
- Each day is divided into two sample periods. Each sample period is one half of the total daylight for the day.
- Ideally a minimum of 10 complete angler trips is required per day.

#### Expansion Methods

- Counts at Index Sites (see below) are conducted twice during each creel-surveying period: Once during the half of the shift and once during the second half of the shift. Index times are randomly selected.
- Total counts are conducted twice a month (one week day and one weekend) via an aircraft. Counts are not done simultaneously with interviews. Total count days will be randomly selected.
- Total counts are done in conjunction with additional index counts.
- All types of recreation watercraft and activities are counted and separated into either fishing or other types of activities.

The selection of angler interview days, 8 hour sampling periods within each day, time of index and day and time for total counts are randomized with the following qualifications:

- Sampling periods are divided evenly between morning and afternoon periods for both weekday and weekend strata within a given month.

- Sampling periods occur only once each weekend and once each week.
- Index counts during any single angler interview day are at least two hours apart.
- Scheduled survey periods, which are missed due to unavoidable circumstances, shift to the next available day or time within a given month.

The following are the Index Sites and types of counts used in Moses Lake:

1. Airman's Beach- Located off of highway 17. Boat, shore and vehicle counts.
2. Cascade Valley- Located on Valley Rd. within Lewis Horn. Boat, shore and vehicle counts.
3. Moses Lake Park (formerly state park)- Located off of I-90 exit 174. Shore and vehicle. Shore anglers on I-90 Bridge will be included within this site.
4. Peninsula Drive Boat ramp- Located on the west side of Pelican Horn. Shore (minimal), and vehicle.
5. Alder St. Bridge- Shore.

Data from each creel survey are collected using a modified version of the WDFW angler survey form and includes:

1. Party size.
2. Time checked or finished.
3. Determine age of party members.
4. Hours fished.
5. Satisfied or dissatisfied with trip.
6. Angler type: boat, shore, and float tube, ice.
7. Gear type: lure, bait, flies.

8. Species caught: Abbreviations will be consistent with state protocol.
9. Number and species of fish kept.
10. Number and species of fish released
11. Length (mm)
12. Counts: The number of boats and shore anglers fishing.

Compiling total count, and data from the assigned index sites permits the expansion of total anglers at any given time.

Other data collected included air and water temperatures, barometric pressure and current weather conditions (raining, clear, cloudy, windy). Scale samples, lengths, and weights were collected from harvested fish. Creel and expansion data permit calculation and distribution of each species caught per unit effort for boat and shore anglers.

#### **Task 1.4. Estimate Fish Population Size**

No work was conducted on this task during FY 2000.

#### **Task 1.5. Habitat Qualification and Quantification**

Habitat manipulation and degradation may be negatively impacting the production of game fishes within Moses Lake. The objective of this task is to quantify by habitat type available habitat in the littoral zone of Moses Lake during both high and low water periods. At high water Moses Lake has 60.5 miles of shoreline and considerably less at low water. Consequently, the potential for radical change in available habitat exists between the low and high water seasons. During the summer months of 2001, we quantified littoral habitat via boat. Habitat assessments

were completed during the summer months of 2001. The following data will be used to develop GIS coverage maps detailing habitat types, fish density and fish distribution to detect trends in habitat use during different times of the year, and thus enabling quantification of habitat types.

The following data were collected based on the following shoreline land use classifications:

**Shoreline Development (distance of shoreline (m) occupied with each one of these categories:**

1. agricultural
2. industrial/business
3. residential
4. undisturbed
5. Bulkhead
  - a. Presence or absence: If “present”, length of affected area in meters.

This will be compared to a similar survey done in 1991 by the Bureau of Reclamation to track changes and/or habitat lost since the last survey.

**Shoreline vegetation:** vegetation that is growing in the riparian area (m).

- 1.tree
- 2.shrub
- 3.reed/bulrush
- 4.grass/forbes
- 5.sparse vegetation
- 6.exposed soil or bedrock (none)

**Submerged Aquatic Macrophytes:** area (m<sup>2</sup>) of aquatic macrophytes visible along the shoreline and offshore. The assessment separates offshore macrophytes and nearshore macrophytes.

1. present/absent
2. dominant species
3. density: high, medium, low

**Substrate type:** distance (m) along the shoreline of visible from water's edge to end of visibility in the water.

1. silt
2. sand
3. gravel: less than 4 inches in diameter
4. cobble: 4 to 12 inches in diameter
5. boulder: greater than 12 inches in diameter
6. bedrock

**Fish presence:**

1. Detail any spawning activity noted during survey
2. Detail any fish observed, species and approximate number of individuals

A second portion of the habitat study on Moses Lake is the analysis of aerial photos. The USDA, Farm Service Agency (FSA), conducts flights every summer to monitor water usage throughout the Columbia Basin Reclamation Project. Summer aerial photos of the lake will be

used to quantify the inundated littoral zone. During the winter months, post draw-down, we will be contracting Columbia Basin Aviation to conduct similar flights. Photos will then be subject to analysis using SCION photo analysis software (beta version) to determine the variations in littoral habitat changes between the two season full and low pool scenarios

The entire shoreline of Moses Lake was examined and the habitat type recorded during full pool. During diet study sampling and future population estimate sampling data detailing fish capture rates, and distribution will be recorded relative to habitat type.

#### **Task 1.6. Process Stomach and Plankton Samples**

Using a hydrolab sonde 4, we monitored such parameters as dissolved oxygen, temperature, specific conductivity, pH and turbidity on a monthly basis during March 2001 to November 2001 at twelve sites. Secchi disk depths were also determined at each site. As indicated (Task 1.2), water samples were also collected using an integrated core sampler, preserved in Lugol's solution and sent to Eastern Washington University to be analyzed for phytoplankton identification.

#### **Task 1.7. Data Analysis and Literature Research Related to the Outlined Tasks**

An intensive literature search of both water quality and primary productivity in Moses Lake has been performed. As reported in our FY 1999 Moses Lake Report a considerable amount of water quality data has been collected since the 1960's. Although most of the analysis will occur in future years once tasks are completed, we have found that some oxygen depletion has occurred resulting in occasional fish kills. The role of this oxygen depletion in shaping the fish community will be later evaluated.

## **Objective 2: Database maintenance**

### **Task 2.1. Enter and Maintain Field Data**

Upon the collection of data, copies are made and then immediately entered into Microsoft Excel spread sheet format. This will minimize the potential of lost data.

## **Objective 3: Attend Agency Training and Meetings**

### **Task 3.1 Track BPA process and submit required documents to maintain project**

### **Task 3.2 Attend agency meeting for coordination of project implementation**

### **Task 3.3 Attend training pertinent to the implementation of the project**

Due to the funding issues experienced on this project, a considerable amount of time and effort was put into proposal revision. During December 2000, we were first informed our project was non-fundable. From that moment until the following fiscal year we spent considerable time to maintain active funding as well as keep on task. Meeting attendance was limited by the variable funding circumstances.

## **Objective 4: Reporting to Bonneville Power Administration**

### **Task 4.1 Quarterly reports to BPA**

Quarterly reports for FY 2000 are currently being completed.

## **Results**

### **Objective 1. Implement study design developed for Phase 2 of the Moses Lake Fishery Restoration Project.**

#### **Task 1.1 Implement fish diet study**

WDFW personnel collected a total of 2447 individuals representing seven species for diet examination. Analyses of dietary items were made on 278 individuals during the report period.

#### **Subtask 1.1 Collect hard structures (scales, otoliths and spines) for continual age structure analysis.**

Collected samples were sent to the WDFW ageing lab in Olympia for analysis. During this reporting period we did not receive the results.

#### **Task 1.2 Implementation of zooplankton/phytonplankton sampling.**

Zooplankton abundance, community structure and size are being analyzed at Eastern Washington University.

#### **Task 1.3 Implement creel survey for Moses Lake.**

Data entry has been conducted and preliminary analysis suggests that walleye and stocked rainbow trout are major contributors to the harvest. Angling hours and the sizes of fishes being creeled are being computed.

#### **Task 1.4 Estimate fish population size via mark and recapture methods.**

No work on this task was completed under FY 2000.

### **Task 1.5 Development of GIS coverage to document habitat.**

We identified littoral vegetation, macro invertebrate presence, substrate type, slope and dominant land use. Also, each artificial structure such as bulkheads and docks were located and marked via a global positioning system. Data has been entered and passed to the Washington Department of Ecology (WDOE) for their assessment of growth management and shoreline development. They are in the process of producing a GIS map.

The FSA has agreed to process aerial photos from Moses Lake through their acreometer to quantify the difference in acreage between summer and winter months. Due to the multi-agency involvement in this portion of the study, this task will span the next fiscal year.

### **Task 1.6 Process Stomach and Zooplankton Samples**

Collected samples have begun to be processed, which will continue into the next fiscal year.

### **Task 1.7 Data analysis and literature review**

This is an ongoing task and will continue through the project period. Relevant fishery and limnological literature is continuously being reviewed in the published literature such as the North American Journal of Fisheries Management, Transactions of the American Fisheries Society and the Canadian Journal of Fisheries and Aquatic Sciences. In addition, we are continuously ferreting new literature regarding techniques and related topic essential to the continuation of the Moses Lake Project.

**Objective 2: Keep databases up to date.**

**Task 2.1 Enter data from field sample activities**

Field data collected during FY 2000 has been entered and the preliminary analysis has begun. Additional copies have been made and are stored elsewhere.

**Objective 3: Training and meetings for the efficient operation of the Moses Lake Project**

**Task 3.1 Track BPA process and submit required documents to maintain project**

**Task 3.2 Attend agency meeting for coordination of project implementation**

**Task 3.3 Attend training pertinent to the implementation of the project**

During the implementation of the Moses Lake Project, project personnel have attended agency meetings and training seminars necessary to conduct the proposed tasks. Personnel have attended hydrolab training seminars, electrofishing training classes and state budgeting classes. Project members have also attended WDFW meetings presenting progress reports and informative presentations to obtain constructive criticism regarding project direction. Furthermore, members of the Moses Lake Project have been in close contact with the BPA contract officer, Ron Morinaka regarding budget and spending issues.

**Objective 4: Reporting to the Bonneville Power Administration**

**Task 4.1 Quarterly reports**

As additional deliverables, Quarterly reports are being finalized during the FY 2000 period.

#### **Task 4.2 Reports and Proposal Preparation**

Due to some inadequacies with our previous proposal, we have spent a considerable amount of time (Oct. 2001- May 2002) revising and consulting with others to improve the original draft proposal (see Proposed tasks: FY2001-FY2003). WDFW staff contributed more than 400 hours assisting and providing the necessary guidance to complete the FY 2001-2003 proposal. As a result, we are now 1 year behind the proposed sampling schedule. Despite shortcomings in our proposal we have submitted the FY 1999 annual report.

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