

## **Study No. 5**

### **West Rosebud Creek Bypass Reach Habitat and Fish Population Evaluation**

### **Mystic Lake Hydroelectric Project FERC No. 2301**

Mystic Lake, Montana

#### **PPL Montana**

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# Memo

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Date: 9/26/2005  
Re: Mystic Project Study No. 5

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## Introduction

The 2005 *Mystic Lake Final Study Plan (FSP)* was delivered to the FERC on March 1, 2005. The FSP contained the final report for Study No. 5 *Mystic Project Effects on West Rosebud Creek Bypass Reach Habitat and Fish Populations*. Study No. 5 was developed in consultation with the Mystic Lake Interagency Fisheries, Aquatic Habitat, and Water Quality resource group. Field work for Study No. 5 was conducted during 2004 in collaborative manner together with PPL Montana, Montana Fish, Wildlife, and Parks (MFWP), and the U.S. Forest Service. At the Mystic Project stakeholders meeting in Billings, Montana on January 20, 2005 MFWP and USFS concurred with the decision to not undertake any further studies of instream flows or biological indicators in the West Rosebud Creek bypass reach. Below is a brief description of methods and the general findings of the 2004 bypass reach studies. For further details please see the Study No. 5 final report titled *West Rosebud Creek Bypass Reach Habitat and Fish Population Evaluation* in the FSP.

## General Methodology

The West Rosebud Creek bypass channel was broken into three general sections, one at the lower elevation near the PPL Montana powerhouse, one in the middle of the bypass channel, and one in the upper elevations closer to the Mystic Dam. Both cross sectional and longitudinal surveys were made during varying flows. Two pools were surveyed in each section with two separate cross sectional transects surveyed within each pool during the various flows. Flow was measured at the upper weir just upstream of the powerhouse and at each site with a pygmy current meter. A photographic tour of each site at differing flows was also compiled during the study. The photographs were taken at the same location looking in the same direction at differing flows, therefore giving visual perspective of how the aquatic habitat changes with varying discharge.

Fish sampling by means of backpack electrofishing also occurred in the same three sections that were surveyed for habitat on August 3 and 4, 2004. All fish sampled were released back into the stream with their adipose fins being removed. A recapture run for the middle section occurred on September 1, 2004. The recapture effort allowed the MFWP to estimate the population size of the sampled reach and make an estimate of abundance. This estimate was used to extrapolate population estimates for the upper and lower reaches, since high flows would not allow for a recapture run in those two sections.

Furthermore, a modified USFS R1/R4 habitat survey was conducted in the bypass reach on November 3 and 3, 2004. Custer National Forest fisheries biologist Darin Watschke lead a group of fisheries scientists in this field effort. Three larger study sections were sampled, one beginning at the upper weir just upstream of the powerhouse to the downstream end of the bedrock gradient barrier, the second from the hiking trail bridge upstream to the upper end of the previously surveyed middle habitat section, and from the upstream end of the previously surveyed upper habitat section

upstream of Maxie Creek, near the base of the Mystic Dam. A total of 5,574 linear ft of the bypass reach was surveyed, which is approximately 53% of the entire bypass reach.

The R1/R4 survey consisted of breaking the stream into habitat units such as pools and riffles and measuring the length of units and the average and maximum depths within each unit. Measuring these parameters allowed for pool to riffle ratios to be quantified as well as metrics such as the frequency of pools and riffles per stream length.

## General Results

The lowest flows that the longitudinal surveys were conducted were 2.0, 2.1 and 3.6 cfs for the upstream, middle, and downstream sections respectively. The maximum depths identified during the corresponding low flows were 2.55, 2.56, and 2.60 ft for the upstream, middle, and downstream sections respectively. The minimum depths within the three sections were 0.3 ft for both the upstream and middle sections and 0.52 ft for the downstream site.

The cross sectional data indicated that the upstream section had a maximum depth of 2.12 ft during the lowest flow of 2.0 cfs. The depth of the deepest pools decreased on average by 0.53 ft from a stream flow of 10.4 cfs to 2.0 cfs.

For the middle section, all pools contained depths in excess of 1.0 ft during the lowest flow of 2.1 cfs. The depths of the deepest pools within the middle section decreased on average by 0.46 ft from a high flow of 11.7 cfs to the low of 2.1 cfs.

The downstream section had a range in maximum depths in the pools between 1.57 ft to 0.7 ft at the lowest flow of 3.6 cfs. On average the depth of pools in the downstream section decreased by 0.44 ft from a high flow of 14.1 cfs to a low of 3.6 cfs.

The modified R1/R4 survey indicated that the average pool depth for all three sections combined was 2.3 ft at a flow of 4.5 cfs measured at the upper weir. Overall average riffle depth was 0.89 ft and the average stream channel width was found to be 19.11 ft. The upper section had the highest pool to riffle ratio at 3.47:1, while the middle and lower sections were calculated at 0.95:1 and 1.58:1 respectively. A total of 640.5 ft<sup>2</sup> of spawning habitat was identified during the survey.

Extrapolated estimates of abundance for rainbow trout in the bypass reach ranged from 242 to 435 fish per 100 m of stream. An estimate of 4,883 fish per mile was calculated for the middle section, which is the highest estimate of density for trout that MFWP has estimated for all the streams they monitor in Region 5 (Jim Olsen, MFWP Region 5 fish biologist, Personal Communication September 28, 2004).

## Discussion

The cross sectional, longitudinal, and the modified R1/R4 habitat surveys indicated that during low flow periods sufficient depth occurs within pools to over winter rainbow trout. In addition, the average depths of the riffles are most likely adequate for the movement of rainbow trout between habitat units. The fish sampling data is a good indicator of the overall quality of the instream habitat for trout. Rainbow trout are found in high abundance within all sections of the bypass reach. Although these fish are not large, that is to be expected since the bypass reach is a steep gradient stream at a high elevation. Due to the combined results of the habitat and fish surveys conducted in the bypass reach during 2004, the Mystic Project fisheries resource group decided that no further studies were needed to assess the impacts of the Mystic Dam on the instream habitat or fisheries of the bypass reach. For further detail please see the Mystic FSP.