U.S. Fish and Wildlife Service
SYSTEM OPERATIONAL REQUEST: #2007-FWS-2___

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FROM: Rich Torquemada, Supervisor, Upper Columbia Fish and Wildlife Office, U.S. Fish and Wildlife Service, on behalf of the Kootenai Valley Resource Initiative.

DATE: 11/20/07

SUBJECT: Winter Temperature Operation of Libby Dam for Kootenai River burbot

SPECIFICATIONS:

U.S. Fish and Wildlife Service staff, in cooperation with the Kootenai Valley Resource Initiative (KVRI) and as recommended by the KVRI burbot sub-committee, request that the U.S. Army Corps of Engineers use the selective withdrawal gate system at Libby Dam to release the coolest water possible in November and December, 2007, before temperature stratification limits the temperature control capability. The purpose of this operation is to provide cooler river temperatures downstream of Bonners Ferry, and also to determine how radio-tagged burbot in the Kootenai River respond to these temperatures. This will likely result in November and December temperatures slightly cooler than the existing selective withdrawal temperature rule curve (Figure 1). This deviation from the temperature rule curve has been coordinated with Montana Fish, Wildlife & Parks (MFWP). The Corps at Libby Dam will remove selective withdrawal gates incrementally to assure that daily temperature change remains within 2 degrees F per day; gates should be removed systematically during October to slowly lower river temperature to the minimum by November 1 (on average, a span of about 5 degrees C, or 9 degrees F; Figure 1).

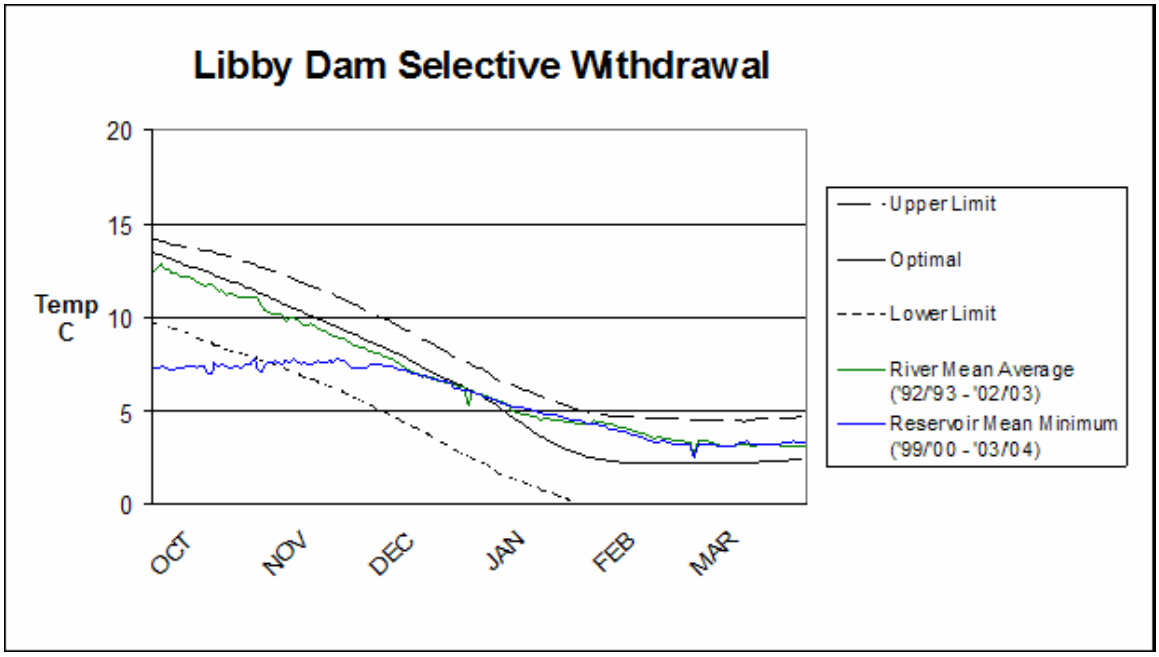

Figure 1. Selective withdrawal temperature guidelines for the Kootenai River below Libby Dam. The mean average release temperature was within the guidelines for the period displayed, with means slightly less than optimal early in the winter, and slightly higher than optimal later in the winter. There is water much cooler than optimal available for release during the early winter period until the reservoir becomes isothermic about mid-December (Figure 2).

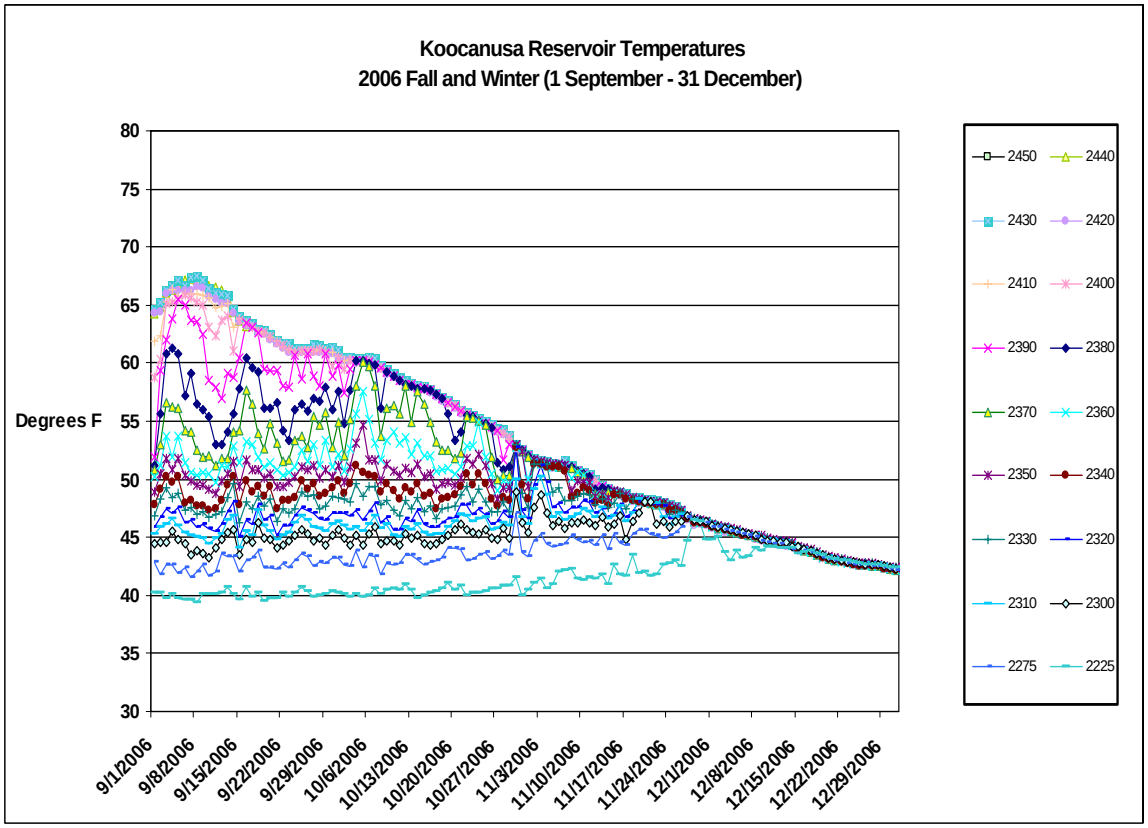

Figure 2 – 2006 Libby Dam forebay temperature profile. The reservoir becomes isothermic by mid-December during most years.

JUSTIFICATION:

The request is designed to cool the river (Bonners Ferry vicinity) during the burbot migration period (November to mid-December) and to the extent possible during spawning season (Dec 15 – end of Feb), when temperatures of 1 to 4° C are preferable. Burbot spawning migrations may be affected by water temperature conditions much earlier in the winter/late autumn (Paragamian 2005, pers. comm.), particularly when combined with higher flows.

Lengthy migrations have been documented in the late fall/early winter and again in late winter/early spring that coincide with spawning (Robins and Deubler 1955, McCrimmon 1959, Percy 1975, Morrow 1980, Johnson 1981, Breeser et al. 1988, Evenson 2000, Paragamian 2000, Schram 2000). These migrations were often temporally correlated with changes in water temperatures, although movement appeared to be minimal immediately prior to spawning (Evenson 2000).

The following excerpts of actions to be implemented are from the widely agreed upon Kootenai River burbot conservation strategy (KVRI Burbot Committee, 2005):

9.4 Hydro Operations

> 9.4.1 Develop an experimental Kootenai River flow/water temperature operation to evaluate the effectiveness of restoring natural spawning and recruitment by reducing winter temperatures and velocities. Implement experimental operations when conditions allow to evaluate burbot spawning requirements while preserving flexibility in needed hydropower production and flood control operations. Annual operations will be coordinated through the Regional Forum Technical Management Team (TMT). The KVRI Burbot Committee will coordinate with the U.S. Fish and Wildlife Service to develop System Operations Requests (SOR) to the TMT to request flow conditions or temperature requirements in any given year.
>
> 9.4.4 Evaluate use of selective withdrawal during migratory pre-spawning periods to affect thermograph at Bonners and downstream to benefit burbot, and monitor water temperature at Porthill.

The principal migration monitoring method involves implanting radio transmitters in larger animals, and the then tracking their behavior with an array of fixed, continuously recording receivers along the Kootenai (y) River and at some tributary mouths. Seven burbot were implanted with *Vemco* coded transmitter tags between October 2005 and March 2006. Three were tagged near Nick's Island (rkm 144.5), two were tagged near the mouth of the Goat River (rkm 152.7) and two were tagged at Ambush Rock (rkm 244.5). *Vemco Vr2* single channel monitoring receivers were placed in Deep Creek, Smith Creek and Boundary Creek in Idaho, and in the Goat River and Summit Creek in Canada to determine burbot use of the tributary streams. *Vemco* receivers in the Kootenai River were also monitored for burbot movement. Some of these transmitters carried into the winter of 2006-2007, but all batteries expired eventually. Because only two burbot were captured during winter of 2006-2007, no more fish were tagged with transmitters and it is unlikely any more will be tagged until there are adequate numbers of burbot to ensure rehabilitation goals are being met.

The burbot operation during winter 2006–2007 was marginally successful in minimizing Kootenai River water temperature in the Bonners Ferry reach. For most of November and December of 2006 water temperature at Bonners Ferry was held below 6°C. The coldest period was during the Thanksgiving Holiday, when temperature fell to about 3.4°C. Water temperature remained below 5°C during late December and through February. River water less than 6°C is important to stimulate pre-spawn migration and water temperatures <4°C are preferred for spawning (Paragamian and Wakkinen, In Press).

The results of the 2006 fall and winter temperature operation corroborate the availability of cooler water in the forebay of the reservoir, and the ability to provide cooler release temperatures at Libby Dam (Figure 3). Reduced river volume during this time period, in conjunction with minimized release temperatures, may allow the river to cool even further as it flows downstream to the Bonners Ferry reach.

Prior to Libby Dam, winter water temperature both below the current Libby Dam site and near Bonners Ferry was substantially cooler than post-dam temperatures. The Kootenai River gradually warmed slightly as it flowed downstream, whereas current conditions allow atmospheric cooling of the river, though still not to pre-dam levels (Figure 4). The committee would like to continue to investigate the possibility of influencing ambient river temperatures during the late fall and early winter migration period, as there is water available for release during this time that is substantially cooler than previous, post-dam release temperatures, and also cooler than the minimum temperature specified by the selective withdrawal temperature curve (Figure 1).

The committee will continue to review future forecasts and may issue additional SOR's related to flow should this season's conditions warrant. The committee is also pursuing methods for reintroducing burbot into the Kootenai River, and anticipates that in future years flow requests may be made to enhance spawning conditions for these fish, should they survive and persist. The committee hopes that results of seasonal temperature experiments carried out in the interim would enable the Action Agencies to implement discharge-related SOR's in future years, with less regard to seasonal conditions, should population numbers increase to a point where temperature and flow optimization would benefit the resultant migratory spawning population.

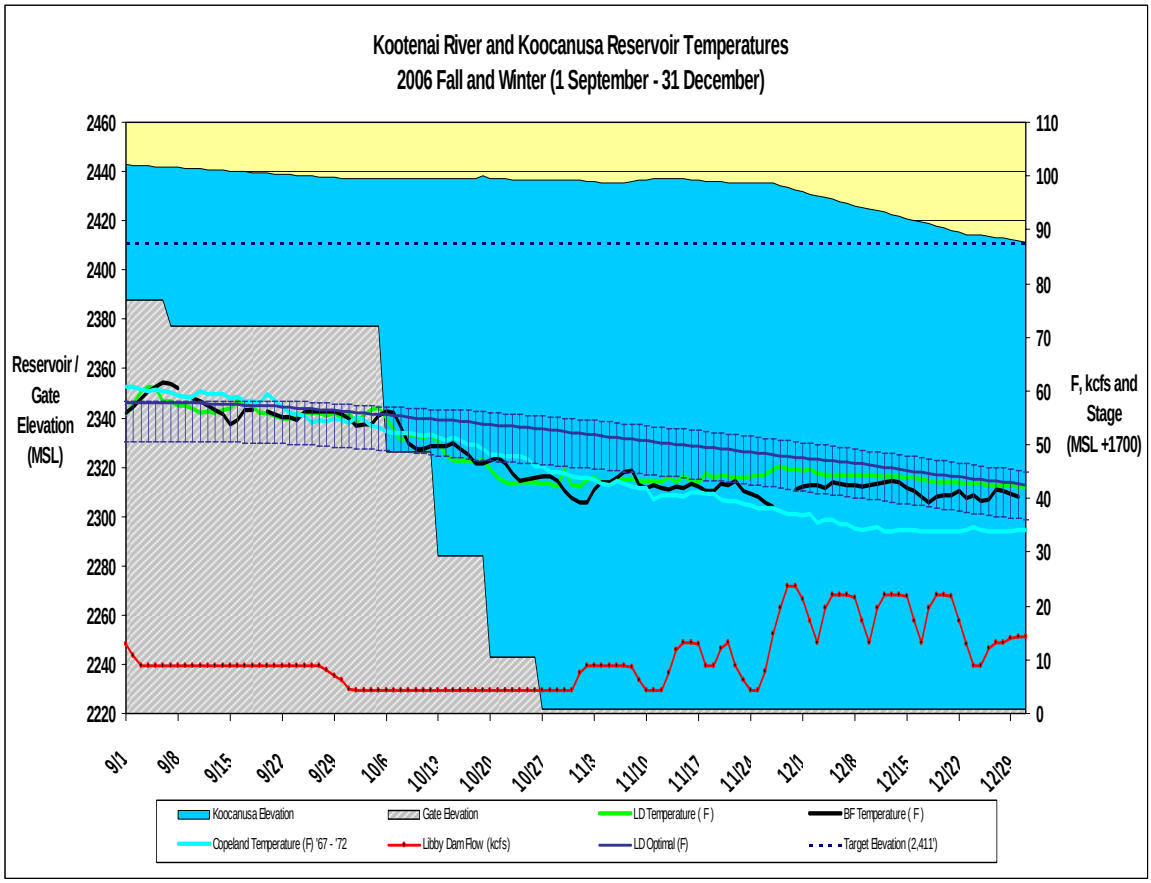

Figure 3. 2006 Libby Dam selective withdrawal gate removal, reservoir elevation, and Kootenai River flow and temperature data. The Copeland gage is downstream of Bonners Ferry, Idaho.

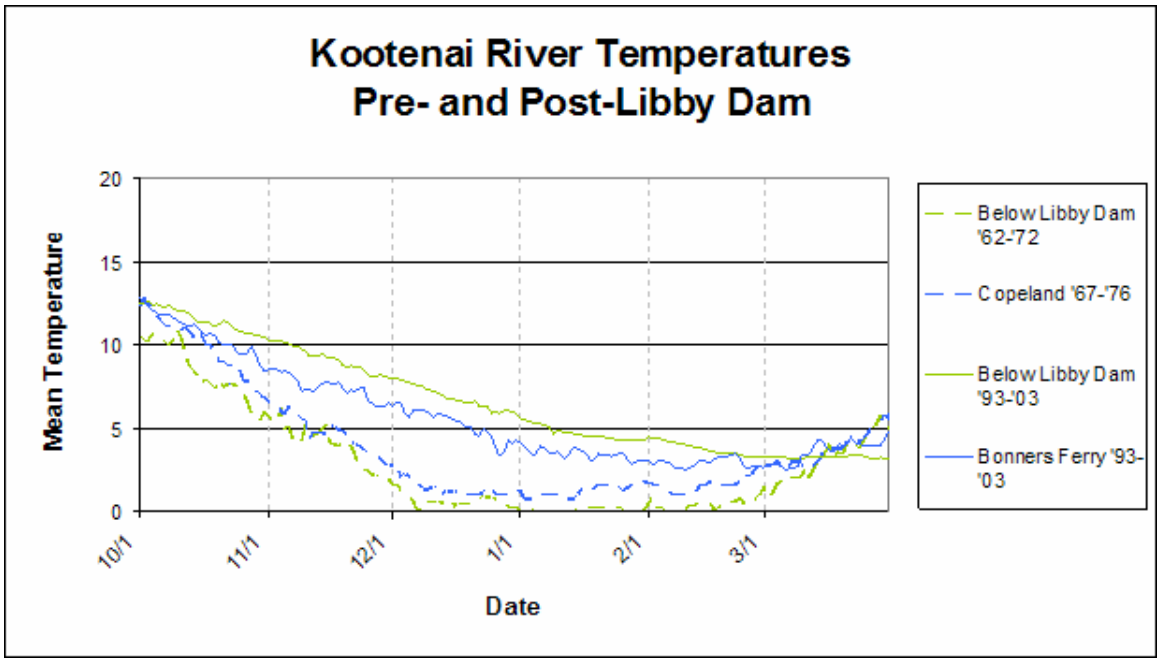

Figure 4. The thermograph in the Kootenai River before and after installation of Libby Dam is reversed to the point of the now-warmer river cooling with ambient air conditions as it reaches the Bonners Ferry vicinity, rather than warming.

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