Draft Operating Criteria for Bighorn Lake
Montana Fish Wildlife and Parks comments

The U.S. Bureau of Reclamation's Draft Operating Criteria for Bighorn Lake has made some major progress toward establishing a more-transparent plan for managing water in the Bighorn system. Thank-you for seriously evaluating a rule curve approach to managing Yellowtail Reservoir. The bureau's review of its efforts does a good job of pointing out some of the potential benefits of operating under the proposed criteria. But it ignores potential negative consequences, including those which water users already have experienced during the past two years of trying to manage the reservoir in a window that is narrower than historic levels.

MFWP believes that a comprehensive review should include an evaluation of both the positive and negative consequences of using the proposed criteria, and should provide an evaluation of how often problems are expected to occur under the new operating criteria compared to historic operations. For instance:

- Recreation at the upper end of Bighorn Lake is the only entity to benefit from the draft operating criteria. Recreation on the majority of the lake has suffered as high lake levels flooded beaches and campgrounds and floated debris that made boating dangerous – if not impossible – through a good part of the recreation seasons.
- The bureau's need to spill excess water past the dam power plant each spring – because of insufficient flood storage under the new criteria – has resulted in reduced power generation during peak demand periods (late summer and winter), resulting in economic losses to Western Area Power Administration.
- Continually rising flows in the Bighorn River below Yellowtail Dam – made necessary as the lake level approached the exclusive flood pool – interrupted rainbow trout spawning, pushing spawning redds further and further up the bank. As a result, the rainbow trout spawn was delayed by a month, which meant smaller fish going into winter and likely affected overwinter survival.
- High flows made for difficult – and often dangerous – fishing in the river for a significant part of the spring and summer. Outfitters reported that numerous clients cancelled trips because of the high flows.
- High flows continue to exacerbate the problem of side channel loss in the Bighorn River, which could ultimately lead to requirements for higher minimum flows to maintain the fishery.
- High water levels caused property damage and resulted in physical damage as well as direct economic losses to businesses, concessioners, outfitters and landowners at the north end of the lake and downstream from the dam.

Concerns and Recommended Changes

<u>Need for a system-wide plan</u>

The draft criteria present a water management plan only for Bighorn Lake and the river downstream. Approximately 70 percent of the water that enters Bighorn Lake is released from Boysen and Buffalo Bill reservoirs. The equations presented in the draft operating criteria use releases from these upstream reservoirs in their calculations, yet there are no plans or rules for how these reservoirs will be managed under different conditions. The criteria appear incomplete without a discussion of established, transparent rules for how water will be managed in the entire Bighorn system, based on available snowpack and water availability conditions.

Preferred river fisheries flows

As discussed at the recent meeting on the draft criteria, the Desired River Fisheries Flows on page 10 are mislabeled. A Bighorn River flow of 2,500 cfs is not an optimum fishery flow; it is the preferred minimum fishery flow that Montana Fish, Wildlife and Parks would like to see under normal water conditions. This represents the inflection point below which side channel habitat is lost at an accelerating rate. FWP believes 2,000 cfs is the minimum river flow under drought conditions and 1,500 cfs is the absolute minimum river flows under extreme drought conditions. If conditions require dropping river flows to 1,500 cfs, there should be an equal balance between losses in the river and in reservoir levels.

The flow of 3,500 cfs presented on page 26 as a recent FWP requested target flow has never been presented as a formal flow request to the BOR. This flow was first presented at one of the early long-term working group meetings when the BOR asked for optimum fisheries flows for the Bighorn River. FWP stated that optimum flows were probably 3,500 cfs or greater. Montana FWP always has said that flow levels are the single greatest factor controlling fish numbers in the Bighorn River. The higher the flows, the more fish biomass the river will support. Under ideal conditions it would be nice to see river flows maintained at 3,500 cfs or higher, but we realize this is not a reasonable request under normal conditions.

Flood control

According the Bureau of Reclamation review, the draft operating criteria would improve levels of flood control (page 3). Montana FWP questions that conclusion. Data collected by the Corps of Engineers during its recent study to evaluate the potential of reducing the size of the flood pool at Yellowtail Dam showed that a reduction in the size of the flood pool is not a likely possibility because of the increased risk of flooding downstream.

Based on recent experiences, there is an increased chance the reservoir will have to be operated in the exclusive flood pool under the proposed criteria. Based on the Corps study, this will mean a reduced level of flood control. Also, plans to go into the fall period with the lake at full pool seem to ignore the fact that several of the extreme precipitation events that have hit this system have occurred in the fall. The draft operating plan should address whether the exclusive flood pool alone could handle this type of event.

Recreational losses on a majority of Bighorn Lake

Operating the reservoir at a higher level has resulted in a net loss of recreational boating use on Bighorn Lake. Flooding has occurred at both boat-in campgrounds and most of the usable beach areas in the lower two-thirds of the reservoir during a majority of the recreation season. High water in the lake has greatly increased the volume of floating debris, making it dangerous to run a boat.

The bureau's review indicates that the narrow, steep canyon conditions in Bighorn Lake makes the Horseshoe Bend area important to recreational boaters (P 12). These same steep canyon conditions also make the boat-in campgrounds and other limited beach areas in the rest of the reservoir very important to boaters launching at Ok-a-Beh and Barry's Landing. It appears these recreational users are being ignored in the evaluation of the draft criteria.

These draft criteria are built around providing launching capabilities at the silted-in boat ramp at Horseshoe Bend on Memorial Day weekend, when it is usually cold and few people are out boating. Yet, these same criteria have resulted in a major loss of recreational opportunities on a majority of Bighorn Lake over the Fourth of July weekend, which is a much more important boating weekend. If recreational use on Bighorn Lake is a driving force behind these new draft criteria then they should include plans to

ensure lake levels are at 3,640 ft or lower prior to the Fourth of July weekend to allow the Park Service time to get facilities ready for boaters that want to use the lake during this important holiday.

After reviewing the numbers, Montana FWP has several suggested changes to the draft operating criteria that we feel could solve several problems without hurting recreational opportunities on the upper end of the reservoir.

The spring target level for Bighorn Lake should be shifted from 3,618 ft at the end of March, with plans to continue drafting the reservoir for spring storage, to a target of 3,614 ft by the end of April with plans to begin refilling the reservoir unless water conditions indicate additional storage is necessary. This plan would have several benefits. An elevation of 3,614 ft is still at the top of the former spring target window (3,605-3,614 ft) that the BOR has used to successfully manage most water conditions in the Bighorn drainage in the past. It would be better to have a bottom target level to shoot for in the spring with plans to start increasing water levels rather than an end of March target with plans to draft from that target.

An end-of-April target would give dam operators a much better picture of spring water conditions on which to base remaining spring operation plans. That should improve chances of filling the reservoir during dry years and still provide time to evacuate additional storage in wet years. A lower elevation with better forecast data at the end of April should reduce chances of having to increase spring river releases above 8,000 cfs to evacuate unexpected inflows. Under most water conditions, the reservoir elevation at the end of March should still be around 3,618 ft or higher, but with a better plan to control spring river releases.

Along with this minimum target, the operations plan should establish a maximum July 1 target level of 3,635 ft for Bighorn Lake. As indicated in the draft criteria (P 12) it takes an elevation of about 3,530 ft for the upper end of the reservoir to spread out, forming a good flat-water recreation lake. It was mentioned again at the recent meeting in Wyoming that an elevation of 3,535 ft provided full recreation on Bighorn Lake and no one disagreed. Both the National Park Service and Wyoming Game and Fish have requested a lake elevation above 3,630 ft for the summer recreation season (P 12). During the recent conference call the NPS said that, once lake elevations exceed 3,640 ft, recreational opportunities for boaters are being lost on a majority of the reservoir. An elevation of 3,535 ft on July 1 would meet all the requests listed above, but still provide five feet of storage to work with in an effort to keep reservoir levels out of the exclusive flood pool and maintain recreational opportunities throughout the lake. The July 31 target elevation of 3,640 ft could be maintained, but this target could be achieved by increasing lake elevations up to this point rather than pushing lake elevations well into the exclusive flood pool and then dropping back down to this target.

<u>Waterfowl hunting and waterfowl impacts</u>

Managing reservoir levels for waterfowl hunters was brought up for the first time at the water management meeting last fall. If waterfowl hunting is added as another management criterion for the Bighorn system, these criteria must look at waterfowl hunting on both the lake and the river.

Waterfowl hunting is a very important activity on the Bighorn River downstream of Yellowtail Dam. Warmer water coming from the bottom withdrawal at Yellowtail Dam helps maintain ice-free conditions on the Bighorn River downstream from the dam, and these conditions extend almost to the Yellowstone River during most winters. This open water results in large numbers of ducks and geese concentrating on the Afterbay Reservoir and the river downstream throughout the waterfowl season.

These conditions make the Bighorn River and entire Bighorn valley a very popular waterfowl hunting area. Several outfitters who work on the Bighorn River during the summer extend their business by guiding waterfowl hunters during the fall and early winter, and many local hunters depend

on the Bighorn River to extend their waterfowl season. Waterfowl hunting provides a major economic benefit to the Bighorn valley downstream of Yellowtail Dam.

The new draft operating criteria shows that flows in the Bighorn River will be lower than historic levels during the October-through-January time frame when waterfowl hunters are on the river (Figure 10). This would be detrimental from a riverine waterfowl hunting perspective. Much of the waterfowl hunting on the Bighorn River occurs on the side channels of the river, so it is important that side channel flows be maintained through the fall for waterfowl hunters. Based on past fisheries work, it is well established that once river flows start to drop below 2,500 cfs side channel habitat is lost at an accelerated rate. If waterfowl hunting is to be added as another management consideration in these draft management criteria, the modified criteria should be designed to maintain river flows of at least 2,500 cfs through the end of goose season in mid-January.

Because of the ice-free conditions, waterfowl hunters are launching jet boats on the lower Bighorn River into January. Several complained this year that, after the moss disappeared and the stage dropped, it was difficult to launch a jet boat at any of the boat ramps downstream of Hardin with a release of 2,370 cfs from the dam.

Spring water operations under the draft criteria have the potential to negatively impact waterfowl production in the Bighorn valley. A large amount of waterfowl nesting occurs along the Bighorn River below Yellowtail Dam, and much of this nesting, especially for Canada geese, takes place on the islands along the river. Most geese start nesting in early April with peak hatch times occurring in mid-May. Under the new draft criteria, plans are to maintain high reservoir levels through the winter and then after the March water forecasts are available start dumping water to make room for spring inflows if necessary. Under normal to above-normal snowpack conditions the Bighorn River will be subject to significant increases in flow during this spring nesting period which has the potential of flooding out many of the waterfowl nests along the river downstream of the dam.

Reservoir fisheries concerns

As indicated in the draft criteria (P 13), fisheries management efforts on Bighorn Lake are shifting away from walleye spawn management as part of an effort to establish a native sauger fishery in the lake. Montana FWP and Wyoming Game and Fish are currently working on a joint effort to collect wild sauger eggs in the Big Horn River upstream of Bighorn Lake, raise them in Montana's Miles City Fish Hatchery, and restock them into Bighorn Lake to enhance the current sauger fishery. In the short term, higher reservoir levels in the spring will likely benefit this effort by providing good rearing conditions for the young sauger stocked into the lake. Long-term plans however, are to establish a self-sustaining sauger population in the lake so annual egg takes are not necessary. It is likely the water management scheme for Bighorn Lake proposed in the draft criteria will be detrimental to this long-term fisheries effort.

The good sauger fishery that currently exists in Bighorn Lake is based on a very strong year class produced in 2004 when the reservoir level was at around 3,583 ft in the spring when the sauger were migrating out of the reservoir and spawning. Wyoming's fisheries studies have identified a section of the sauger population in the Big Horn River upstream of the reservoir that spends a majority of its life in Bighorn Lake. They found these sauger move a short distance up the river to spawn in the spring, and then return immediately to the lake. During low reservoir conditions, such as in the spring of 2004, river conditions extend down to the Horseshoe Bend area or below, providing considerably more river habitat for sauger spawning close to the reservoir. These same low reservoir conditions provide a single main river channel through the large sediment delta built up around Horseshoe Bend and may actually provide better passage conditions for sauger migrating upstream out of the reservoir. It is likely the additional sauger spawning habitat available in 2004 due to the low water conditions played a major

role in the production of the strong 2004 year class that is currently carrying the reservoir sauger fishery. These low water conditions in 2004 were immediately followed by a good water year in 2005 that filled the reservoir and flooded much of the shoreline vegetation that had grown along the reservoir while water levels were low, and provided excellent rearing conditions for the sauger produced in 2004.

By operating the Bighorn system under the proposed draft criteria, the potential no longer exists to occasionally draw the reservoir down in the spring if necessary to provide good sauger spawning conditions at the upper end of the reservoir. Without this potential it may not be possible to develop and maintain a viable sauger fishery in Bighorn Lake without an ongoing intense sauger spawning program.

In order to allow fisheries managers the opportunity to develop a reliable self-sustaining sauger fishery in Bighorn Lake, the draft criteria should evaluate conditions that would allow lake levels to be drawn down and held low during the spring on a periodic basis to enhance natural sauger spawning. Additional fisheries studies will be needed to determine if a single year of low water is enough to provide good spawning conditions. The successful sauger spawn in 2004 occurred after several years of low water where most of the sediment was pushed downstream past Horseshoe Bend cleaning up the river channel through the upper end of the reservoir. These conditions were immediately followed by a good water year that filled the reservoir providing good rearing conditions for young sauger.

Lack of rules for high and low water conditions

A major concern with these criteria is that they exclude the extremely high and low water years. These are the years when we would like to see established rules that govern how the interests of both the lake and the river users will be balanced so that both share the impacts of these extreme conditions. The discussion on page 24 that addresses years with forecasted inflows of less than 28 percent, talks about the need to balance between the needs for a minimum level for river fishery flows and sufficient storage to provide minimum service levels for lake recreation. With two of the three boat ramps on the lake usable down to an elevation of 3,580 ft, this should be considered the "minimum service level for lake recreation." Yet the discussion in this same paragraph defaults back to a minimum lake level of 3,618 ft for determining when river flows will be dropped below 2,000 cfs. River users realize that, under some drought conditions, it will be necessary to reduce river flows down to the absolute minimum of 1,500 cfs. FWP believes that low river flows should be recommended, however, only if there is some trade-off with lower reservoir levels under these extreme conditions.

Between 1981 and 2001, prior to the recent extended drought, river flows dropped down to the 1,500 cfs level only six times, and most of those were for fairly short time periods. The longest period of 1,500 cfs flows was in 1994 when flows remained at 1,500 cfs for 141 continuous days. We would like to see calculations run to determine how often river flows would have dropped to 1,500 cfs between 1981 and 2001 if the system was being managed under these draft criteria with an established minimum reservoir level of 3,618 ft.

High spring releases in the Bighorn River, and loss of power generation

Historically Bighorn River releases have been managed to maintain maximum river releases below the maximum turbine capacity of 8,000 cfs. With less reservoir storage available in the spring as proposed in the draft criteria, it appears spring river releases above 8,000 cfs would become a more regular occurrence. Figure 14, designed to show a 2 percent increase in annual power generation using the new criteria, is based on the 1988 to 2008 time period. This includes the extended drought period in the mid-1990s when power generation was depressed due to low water conditions. It also excludes the last two years when large volumes of water were spilled down river causing a loss in power generation. These criteria should include calculations and charts that show how often spring flows will exceed 8,000 cfs operating under the new criteria, compared to historic operations using the entire time period the

generation capacity of Yellowtail Dam has been at its current level. Power generation lost due to increased spillage of water under the draft criteria should then be used when calculating changes in total power generation while operating under the new criteria (p 27).

Downstream property damage due to river fluctuation

As indicated at the recent meeting in Billings, a number of downstream landowners along the Bighorn River experienced considerable property damage during and following the high spring river flows the past two years. As one example, at Grant Marsh Fishing Access Site downstream from Hardin, Montana FWP lost more than 30 feet of public land along a straight section of what should have been a fairly stable bank, during the past two spring high water releases. These losses included a newly constructed road and three camp sites along the river, and forced Montana FWP to move a latrine that was installed in 2006. The cost of moving the latrine and rebuilding the road approached $7,000, not counting the loss of valuable public land and the fact that the entire site was closed to all recreational use during the month of July 2010 during the peak of the summer recreation season. Additionally, landowners living on the Yellowstone River have expressed concern with dam operations that may result in the exacerbation of flooding during high water years such as those that occurred in 1996/1997.

Much of the bank loss along the lower Bighorn River occurred when river releases were rapidly decreased following extended periods of high flows. These high flows saturated the sandy banks along the river. When flows were rapidly reduced, large chunks of these saturated banks sloughed off with falling water levels. To reduce this problem the Bureau of Reclamation should improve coordination with upstream water managers in Wyoming so they can better anticipate decreases in inflows at the end of spring runoff. This would allow the bureau to start gradually reducing river releases earlier in the summer and extend these reductions over a longer period of time. With better coordination and planning, the bureau should be able to conserve the same amount of water in the upstream reservoirs, while reducing downstream erosion.