

2003 Bull Trout Spawning Survey of Mad River
(WDFW Index Reach from Young Cr. to Jimmy Cr.)
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Introduction: Bull trout (*Salvelinus confluentus*) inhabiting the Entiat/Mad River Subbasin are included in the Upper Columbia River Evolutionary Significant Unit (ESU), which was listed as Threatened under the Endangered Species act (ESA) on June 12, 1998. Bull trout are also a USFS Regional Forester's Sensitive Species and an indicator species on the Wenatchee National Forest. Bull Trout migrate into, spawn and rear in the mainstem Mad River and have been observed in lower Cougar Creek (Brown 1993, WNF 1990-1998), in lower Tillicum Creek (Brown 1992, WNF 2001) and lower Young Creek (Fisher 1998). Natural barriers exclude fish from the remaining Mad River tributaries (Windy Creek, Miners Creek, Berg Creek, Billy Creek, Alma Creek, Wilma Creek and numerous unnamed tributaries). Bull trout are also known to spawn and rear in the Entiat River up to Entiat Falls (RM 34). However, the Mad River is considered to be "significant" because it holds the largest known spawning population in the Entiat System (MacDonald et al. 1996).

In 1989, due to decreasing populations of bull trout within streams and rivers on the WNF, the FS contracted with the Washington Department of Wildlife (WDW) to determine bull trout distribution and abundance and to provide recommendations for future management of this species. *The Management Guide for the Bull Trout on the Wenatchee National Forest* final version was distributed in 1993 (Brown 1993) at which time the WNF began implementing its recommendations. Monitoring recommendations included the need to quantify spawning adult bull trout populations. Redd count surveys were determined to be an excellent indicator of the number of spawning adults in a tributary. Long-term records of redd surveys also provide valuable data on population status and trends (Brown 1993).

Bull trout spawning surveys (redd counts) have been conducted by WDW and OOWNF fisheries specialists in the Mad River, from Young Creek to Jimmy Creek, in the fall of each year since 1989. Incidental sightings of bull trout redds within the Entiat River have been documented (1 redd at RM 27 USFWS-FRO 1999, at RM 18 and 19 USFWS-FRO 1996 and just below Entiat Falls at RM 33 USFS 1993 to 2001), however a full survey has not been done on the Entiat River. In 2002, a short survey from the USGS gaging station below Entiat Falls to Entiat Falls (0.25 miles) was conducted by FS personnel. This section was surveyed again in 2003. A total of 57 redds (52 in the Mad River and 5 in the Entiat River) were counted in 2003, which is the highest number of redds since surveying began in 1989. The increase in redd counts is primarily attributed to the bull trout angling closure instituted in 1992 and the total angling closure of the Mad River from the mouth to Jimmy Creek instituted in 1995 by Washington Department of Fish and Wildlife.

Methods: The survey procedures used in 2003 (and all previous years) are outlined in the *The Management Guide for the Bull Trout on the Wenatchee National Forest* (Brown 1993).

The index reach used in 2003 (Mad River from Young Creek to Jimmy Creek) was established by the WDW (Brown 1993) and is consistent with surveys done in previous years. The index reach of the Mad River covers 7.5 miles and for logistical purposes it is broken into the following three survey segments:

1. Young Creek to Alma Creek (2.3 miles),
2. Alma Creek to Berg Camp (2.9 miles), and
3. Berg Camp to Jimmy Creek (2.3 miles).

A combination of decreasing photoperiod and water temperature dropping below 52°F triggers bull trout spawning activity (Brown 1993). Mad River water temperature was monitored weekly beginning mid-August 2003 in order to determine when to begin preliminary surveys. Water temperatures dropped below 52°F in mid-September and preliminary surveys began on 9/25/03 (see attachments). During the preliminary survey period, Mad River water temperatures averaged 48.9°F and

ranged from 41.6°F to 55.6°F. The preliminary surveys were completed on 10/09/03, and a final survey of the lower segment (Young Creek to bridge below Alma Creek) was conducted on 10/23/03. Prior to the final survey, a high elevation (>5000 ft) rain-on-snow event (10/20/03-10/21/2003) caused Mad River streamflow to increase from approximately 50 cfs to 250 cfs within a 24-hour period (WDOE gaging station at Camp Nine). Increased flows transported large amounts of bedload and fines downstream which filled in redds that had previously been documented as “definite” and prevented identification of any possible new redds. Due to the absence of adult bull trout and/or spawning upstream from Alma Creek on the preliminary survey and with consideration that no spawning has occurred in segments 2 and 3 upstream of the log jam at Alma Creek since 1999, a final survey in segments 2 and 3 was deemed unnecessary this year.

Data collected included date, time, weather conditions, water temperature, fish observed, redd identification by type (definite, probable, possible), and other relevant observations. 2003 surveys were conducted by Fishery Biologist Phil Archibald, his twelfth consecutive year of surveying the Mad River index reach, Fishery Biologist Emily Johnson and Biological Technician Kyle Legare.

Results: A total of 52 bull trout redds (consisting of 46 definite redds and 6 probable redds) and 4 adult bull trout were identified in segment 1 of the Mad River (Figure 1). The attached data table (see appendix A) describes the sizes and locations of juveniles, adults and redds observed in 2003. All of the adult fish were observed on or near redd sites below the Alma Creek log jam. No redds, possible redds or bull trout were observed upstream from the Alma Creek log jam. However, in previous years (1999-2002), small bull trout (approximately 6-8 inches length) have been observed in the second segment of the index reach during spawning surveys.

Bull Trout Redds and Adults Mad River Index Reach 1989-2003

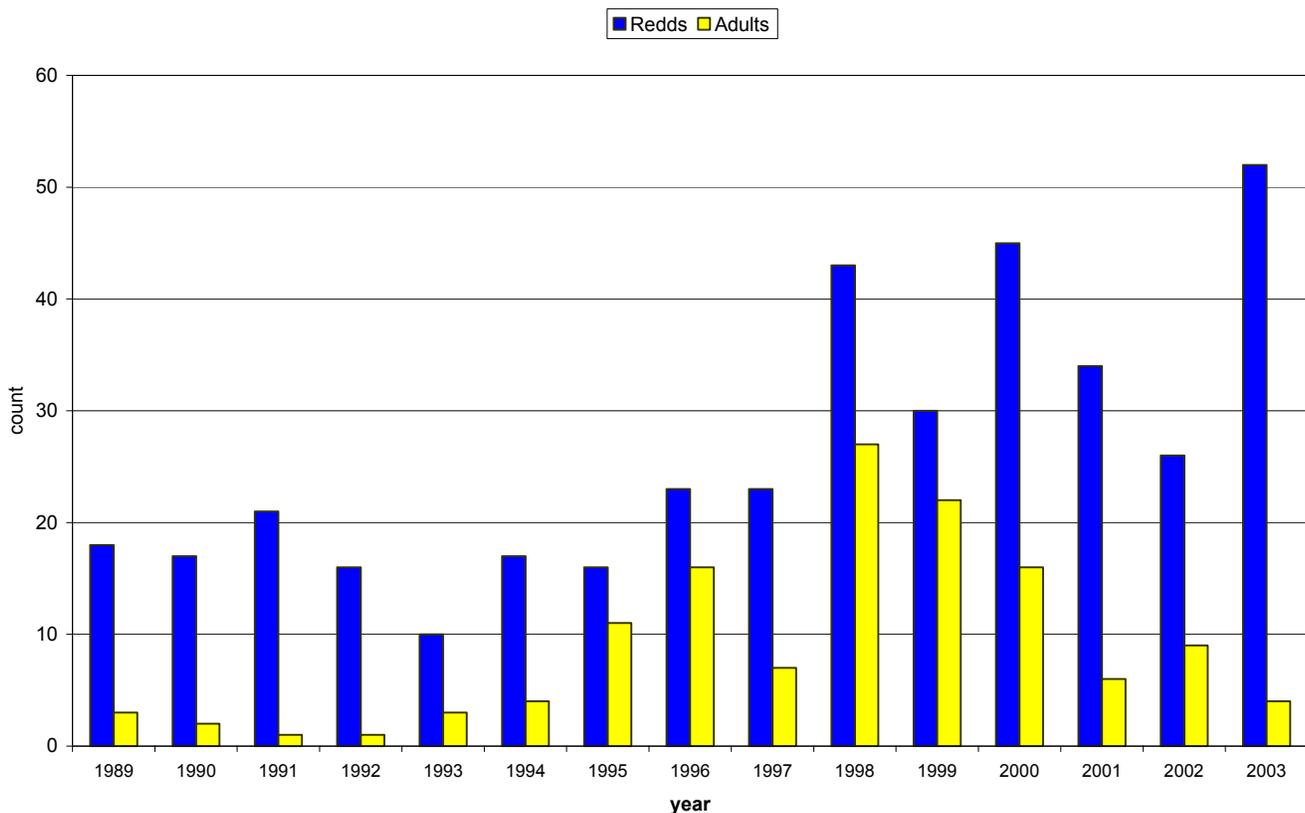


Figure 1. Bull trout redds and adults identified in the Mad River Index Reach 1989-2003.

In 2003, 5 bull trout redds and 5 adult bull trout were observed between Entiat Falls and the Gaging Station 0.25 miles downstream during a bull trout survey conducted by FS fisheries personnel. Spawning activity was first observed at the gaging station site on September 19th and a preliminary survey from the gaging station to Entiat Falls was conducted September 23, 2003. A final survey of this reach was conducted September 30, 2003. This reach was surveyed in 2002 and 7 bull trout redds were documented.

Discussion: During the 2003 spawning survey, the natural log jam barrier to bull trout migration at RM 14.2, near the upstream end of the "Dolly Holes" below Alma Creek, remained in place (see Figure 2). For the fifth consecutive year in the 15-year history of the survey, no bull trout redds or adults were observed above this point. Prior to 1999, the segment of the Mad River that is bounded by Alma Creek and Berg Creek was the preferred spawning area within the Mad River and averaged 15.6 redds per year (see Table 1). Furthermore, in 2003 all observed redds (52) and adults (4) were located downstream from this log jam in a segment (Young Creek to the "Dolly Holes") that produced an average of only 2.4 redds per year from 1992-1998 (see Table 1).

Table 1. Distribution of bull trout redds by survey segment, 1992 to 2003.

Survey Segment	Segment Length	1992	1993	1994	1995	1996	1997	1998	Ave. 92-98	1999	2000	2001	2002	2003
Young to Alma Cr.	2.3 mi	1	0	0	7	2	3	4	2.4	30	45	34	26	52
Alma to Berg Camp	2.9 mi	13	7	13	7	19	15	35	15.6	0	0	0	0	0
Berg to Jimmy Cr.	2.3 mi	2	3	4	2	2	5	4	3.1	0	0	0	0	0
Totals	7.5 mi	16	10	17	16	23	23	43		30	45	34	26	52

This particular log jam is one of several that have accumulated at a narrow bedrock nick point where the channel descends through a series of steep bedrock cascades and falls, the uppermost having a vertical drop of ten feet. This log jam has existed to varying degrees for at least 30 years. Holtby (1972) described the situation as follows: "*Several log jams occur on the Mad River that appear to be capable of completely blocking upstream migration of fish. However, these log jams shift some each year and what may be a barrier one year may not be the following year. The falls below Cougar Creek appears to be an impassable barrier for upstream migration of fish.*"

In 1999, the log jam near Alma Creek had accumulated sufficient small-sized material (bedload and organic) to create a vertical drop of 15 feet (estimated). This situation is naturally occurring and is continually monitored during annual bull trout spawning surveys. The natural fish barrier created by the Alma Creek log jam in 1999 provides a unique opportunity to examine the population types (migratory and/or resident) of bull trout utilizing the Mad River drainage. Brown (1993) and a WDFW (1998) publication both report that resident and migratory bull trout populations are presumed to exist in the Mad River drainage. The 1999 to 2003 spawning surveys combined with stream survey data from Cougar Creek (2000) however, seem to indicate that only a migratory population may exist here. Key evidence for the lack of a resident population is the absence of spawning observed above the log jam both in the mainstem Mad River and in Cougar Creek despite the presence of bull trout seen in previous spawning surveys. According to length/age data presented in Rieman and McIntyre (1993), an 8" bull trout could be either a migratory (about age 3) or a mature resident (age 5 or 6) fish. If the bull trout seen in previous years were resident, then spawning activity should have been observed.



Figure 2. Log Jam below Alma Creek, barrier to bull trout since 1999

After preliminary surveys of the Mad River index reach were completed, a high elevation (>5000 ft) rain-on-snow event (10/20/2003-10/21/2003) caused Mad River streamflow to increase from approximately 50 cfs to 250 cfs within a 24-hour period (WDOE gaging station at Camp Nine). Flows had decreased by October 23rd, and a final survey was conducted from Young Creek to the bridge below Alma Creek. High flows had transported large amounts of bedload and fine sediment downstream, filling in most redds. Bull trout redds that had been identified as “definite” redds during preliminary surveys were infilled with fines (rather than scoured) and obscured as seen in the before and after pictures below (Figures 3 and 4).



Figure 3. Bull trout redd (#E10) at Wilma Creek Log Jam on 9/25/03



Figure 4. Bull trout redd (#E10) at Wilma Creek Log Jam on 10/23/2003

Conclusions: This year's spawning survey results indicate that recovery of the bull trout population in the Mad River is occurring under the current environmental conditions and fishing regulations. Video counts of bull trout migrating through the adult fish ladders at Rocky Reach Dam and Rock Island Dam also provide evidence of recovery in bull trout populations in the mainstem Columbia River nearby. Additional future annual data are needed to further monitor the species and confirm the apparent upward trend of this population in the Mad River. The results from the 2003 survey (52 redds) showed a 46 percent increase over the fifteen-year average number of redds (24.2 redds per year).

The increase in numbers of bull trout redds can be attributed to the bull trout angling closure instituted in 1992 and the 1995-2003 total angling closure of the Mad River from mouth to Jimmy Creek. In the 1997 and 1998 reports it was noted that: "*Brown (1994) stated that the majority of first time adfluvial female bull trout spawners on the Wenatchee National Forest are five to seven years old. Accordingly, 1997 was*

the first year that recruits from the 1992 cohort, the first to be protected by the angling closure, would begin to spawn. We believe that an increase in spawners as evidenced through increased redd counts over the next several years (1997-2001) would be a valid indicator of the success of angling closures to protect bull trout." In addition, recruits from the 1995 cohort (the first to benefit from the more stringent total angling closure instituted that year) would begin to spawn in the year 2000. The post-1993 trend depicted in Figure 1 appears to reaffirm these conclusions.

From 1992-1998, WDFW-provided signs explaining the closure of the bull trout fishery were posted at each camp, trail intersection, and bridge along the Mad River from Pine Flat Campground to Maverick Saddle. These signs were replaced with WDFW-provided "Closed Waters" signs at Tillicum Creek junction, Pine Flat Campground, and Maverick Saddle in 1999. This action was taken after public input indicated some confusion about the older bull trout closure signs. The interpretation by some was that the River was closed to bull trout fishing but open to other trout fishing, despite the unequivocal published fishing regulations. Inevitably, some anglers are still unaware of or ignoring the fishing regulations.

Recommendations: It is recommended that WDFW maintain the total angling closure at least until an upward spawning trend is firmly established; continue to monitor Mad River water temperature weekly beginning in August to determine best survey initiation date; encourage the continued participation of USFWS in this survey; and continue to fund this monitoring project at a level similar to 2003. It is also recommended that the Entiat River continue to be surveyed from the USGS gaging station below Entiat Falls to Entiat Falls (0.25 miles).

In light of the June 12, 1998 listing of bull trout as a Threatened Species under the ESA, the angling closure may have been the most effective conservation measure available. Additionally, the angling closure will likely benefit other ESA-listed species (steelhead, spring chinook) in the lower Mad River. It is recommended that Bull Trout Biological Assessments include the angling closure as an ongoing and previously instituted conservation measure for the species on the Wenatchee National Forest.

The 2003 survey costs totaled \$5,000. This total includes: 4 days GS-11 surveying and reporting (\$278/day = \$1112); 10 days GS-9 surveying, data entry, and reporting (\$208/day = \$2080); 3 days GS-4 surveying = \$410; 6 days GS-9 temperature monitoring (\$1248); and 380 miles of travel (\$150).

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Appendix A

Bull trout passage through Rock Island and Rocky Reach Dams, 1998-2003. Unpublished data from 24-hour video counts of adult fish ladders at Rocky Reach and Rock Island Dams, Chelan County PUD.

Rocky Reach Dam	1998	1999	2000	2001	2002	2003
April-June	70	84	170	160	157	151
July-October	14	9	43	34	32	65
Total	84	93	213	194	189	216

Rock Island Dam	1998	1999	2000	2001	2002	2003
April-June	32	37	56	62	63	71
July-October	35	24	31	20	21	31
Total	67	61	87	82	84	102

Chelan County PUD in cooperation with Douglas and Grant County PUDs contracted BioAnalysts Inc. from Boise, Idaho to radio-tag adult bull trout in order to determine the movements and migration patterns of adult bull trout and to determine the effects of hydroelectric dams in the mid-Columbia River on movements and migration patterns of adult bull trout. Bull trout were tagged at Rock Island, Rocky Reach and Wells dams in 2001 (39 adults) and 2002 (40 adults) from mid-May to late-June (BioAnalysts, Inc. 2003, *draft*). Of the 21 tagged fish that entered the Entiat subbasin, 15 left the system by 12/17/02. Of those that remained in the system, one died, two others may have died, and the other three remained in the Mad River. Locations of tagged adult bull trout in the Mad River ranged from just below the Hornet Creek confluence to the just below the Alma Creek confluence (RM 14.5). In the Entiat River, tagged fish were located from Silver Creek down to the mouth during the spawning and migration periods. Radio tagged adults were located repeatedly in the mainstem Entiat River near Lake Creek, near Box Canyon and just below Entiat Falls on successive aerial surveys in the fall of 2001 and 2002 and those areas are likely to be spawning areas. More complete results from the bull trout telemetry study will be available with the publication of the final report in 2004.