

2006 Mad River Rainbow/Steelhead Trout Spawning Surveys

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Objective: Conduct redd counts to expand local knowledge of steelhead spawner numbers, timing, and locations and establish a steelhead spawning index reach on the Mad River.

Methods: Forest Service Fishery Biologists Phil Archibald and Emily Johnson conducted the 2006 spring spawning surveys on the lower Mad River (RM 0-7) and Roaring Creek (RM 0.5-2), see attached table for specific dates and locations. Data collected included date, flow conditions, water temperature, adult fish observed, redd identification by type (definite, probable, possible), redd development (incomplete, complete, fading, erased) and other relevant observations such as redd dimensions and water velocities. All redd and fish dimensions and surface water velocities over redds were estimated. Redds were enumerated sequentially for each stream in the order encountered.

Preliminary surveys were initiated in late-February. Preliminary surveys consist of weekly spot-checks of easily-accessible known spawning locations. More extensive surveys were initiated after first spawning activity was observed (March 29, 2006) and continued on April 4, 12, 20, 28, and May 5, 7 & 12. Spring spawning surveys were targeted for March through May, a time period which has previously been observed to encompass the peak of the steelhead spawning season in the Entiat/Mad Rivers. The mid-April to early-May spawning timeframe comports well with steelhead spawning observed in the Icicle River, Nason Creek, and Wenatchee River (Murdoch and Viola 2003).

Surveys were conducted by biologists walking along the top of streambanks or from adjacent roads/trails or by wading sections of streams that were not visible from other vantage points. Most of the lower Mad River is easily surveyed from the adjacent County Road and Mad River Trail. Surveyors wear polarized lenses to improve visibility of fish and redds. Binoculars are used to observe adult fish from a distance and detect the presence (or absence) of adipose fins if possible.

This year we were able to revisit most redds several times throughout the spawning season to document the development of each redd through the stages of new-and-bright to complete-and-fading to obscured (erased). The multiple visit procedure is recommended by WDFW biologist A. Viola and is also being utilized by the FRO on the Entiat River.

Biologists from the USFWS Mid-Columbia River Fisheries Resource Office (FRO) initiated more extensive spawning ground surveys of the Entiat River in 2003 and continued the extended surveys in 2004, 2005, and 2006. Their results are documented in the appendix at end of this report.

Results: During the survey period (3/29-5/12/2006), Mad River water temperature averaged 5.8°C as recorded by a datalogger at Mad RM 2.0. Streamflow at Entiat RM 18 was below average from February to late-April before ramping up in the more typical manner during the spawning period, from 289 cfs (4/24/06) to 4000 cfs (5/19/06). Mad River streamflow at RM 9 spiked to over 700 cfs on 5/19/06 (Figure 1) and more than 900 cfs at RM 0.4 on the same day. Survey flow conditions were low-to-moderate and clear until late-April with good visibility during the first four weekly surveys. The final four weekly surveys (late-April to mid-May) were hampered by

reduced visibility resulting from a combination of turbulence, turbidity and depth. The Mad River is unwadeable at flows greater than 200 cfs.

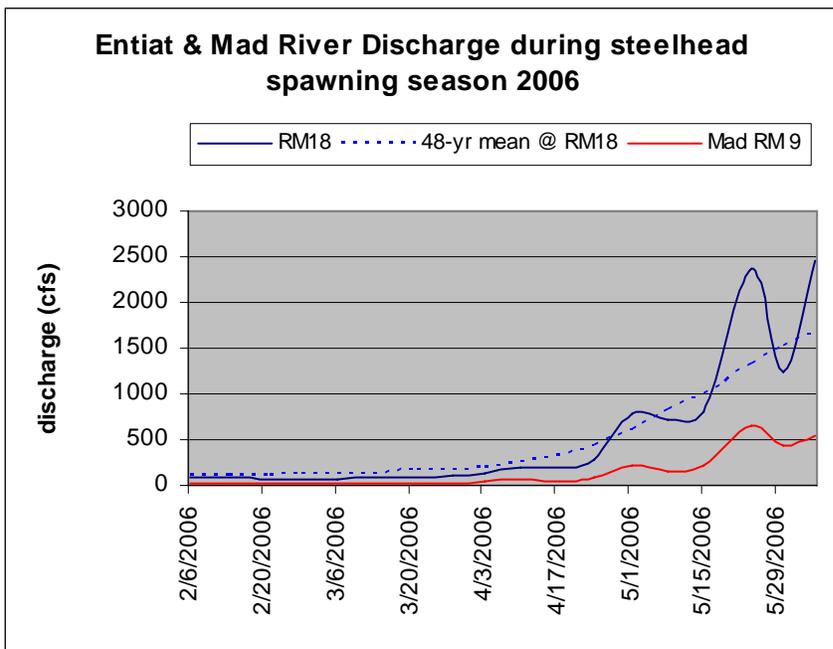


Figure 1. Flow conditions in the Entiat River (RM 18) and Mad River (RM 9) during steelhead spawning season 2006.

A total of 25 steelhead redds were identified in the Mad River between rivermiles 0 and 7, consisting of 23 definite redds (52 percent with spawners present) and 2 probable redds (see Table 1, attachment 1, and Figure 2 for specifics).

Table 1. Steelhead/Rainbow trout redd counts on the Mad River, 1997 through 2006.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Definite Redds	8		0	3	15	14	38	26	44	23
Probable Redds	Not distinguished		3	5	2	3	6	9	1	2
RM surveyed	1 to 3	No survey	1 to 4	1 to 10	1 to 10	1 to 7				

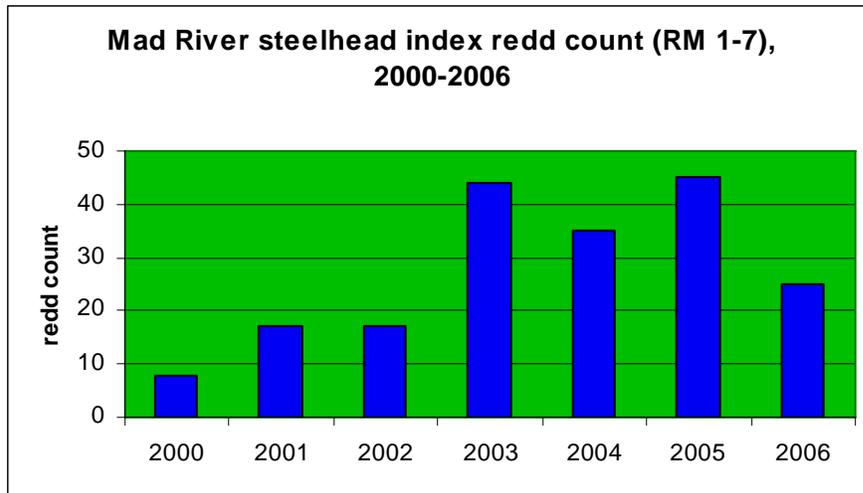


Figure 2. Mad River steelhead index redd count, 2000-2006.

Twenty-one adult steelhead were observed on or near redds in the Mad River. Nine of these fish (43%) were observed with intact adipose fins. The other 12 adult fish did not permit close enough observation to determine the presence of adipose fins. Mad River steelhead ranged from 16 to 26 inches estimated total length this year (Figure 3) with a modal length of 22 inches which is consistent with previous year's observations.

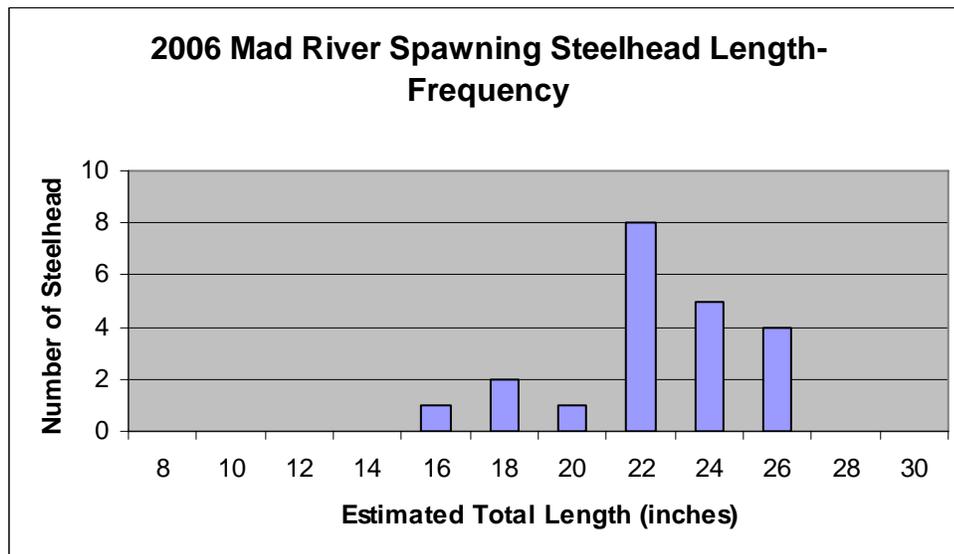


Figure 3. Mad River steelhead spawner length-frequency, 2006

The occurrence of multiple redds and superimposed redds last year (2005) was noteworthy. This year only a single multiple redd and no superimposed redds were observed. The multiple redd was at a high quality (in terms of depth, velocity, and gravel quantity/quality) spawning site where multiple redds have occurred in previous years.

Three steelhead redds were observed in Roaring Creek between RM 0.5 and 1.5 on May 5 & 9 (Q = 21 cfs, water temp = 7.0°C). One Roaring Creek redd was attended by (2) 20" steelhead.

Discussion and Conclusions: It is widely acknowledged among fishery biologists that spring spawning surveys can be unpredictable and difficult to replicate from year-to-year due to snow conditions, poor visibility due to turbidity, and rising stream flows. Steelhead spawning timing can also vary widely through the months of March through June depending on flow, temperature, and weather conditions. Regardless of these potential drawbacks, we continued spring spawning surveys in the Mad River and Roaring Creek this year with good success.

The results of our spawning ground surveys likely underestimated steelhead spawning in the Mad River in 2006. Increasing streamflow at the end of April and May hampered repeat surveys of the upper segment of the index reach between river miles 4.5 and 7.2. We detected a total of 11 redds in this segment with single new redd detections occurring on each of the last 3 surveys in May (Figure 4). Typically, steelhead spawning proceeds in a longitudinal manner from downstream to upstream as flows rise and water temperatures increase. Most of the definite redds observed between Mad River miles 1.1 and 5.6 were at locations where steelhead redds have been seen in previous years. The 2006 redd count (25 redds) is close to the seven-year average (27 redds/year) for the Mad River index reach. Steelhead spawning in the Mad River appeared to peak in late April 2006 (Figure 4), one week later than expected from prior years observations and the results of English et al. (2001).

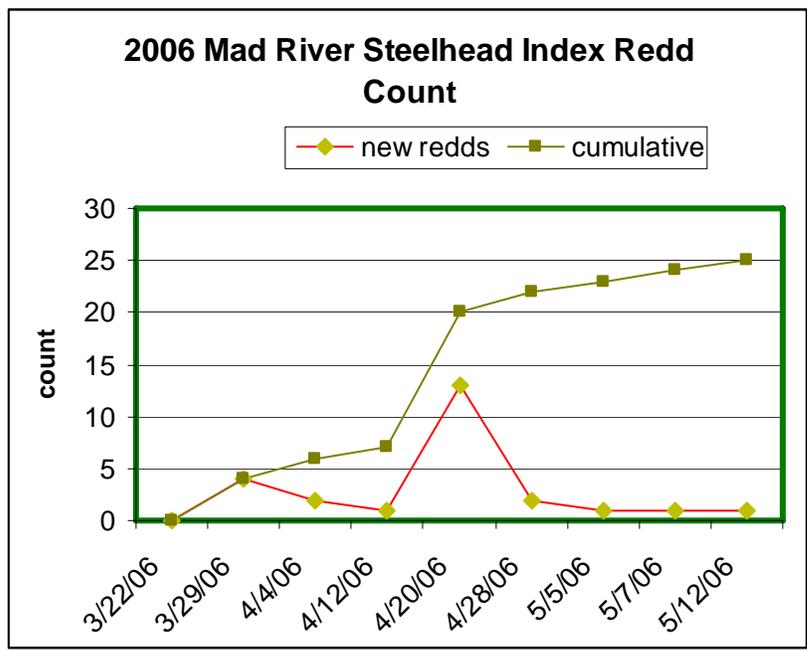


Figure 4. Mad River steelhead redd chronology, 2006.

Recommendations: With respect to the 8/11/97 ESA endangered listing of Upper Columbia River steelhead, more and better information on this species is needed for quality Biological Assessments. The draft Upper Columbia Salmon and Steelhead Recovery Plan relies heavily on steelhead redd counts as a measure of progress toward recovery of steelhead. It is recommended that spring spawning surveys be continued. Based on the results and knowledge gained during the past eight years of steelhead spawning surveys we recommend continuing the index reach on the Mad River between river miles 1 and 7. This Mad River index reach will be our primary focus in the future. We will continue to seek assistance from WDFW and USFWS MCRFRO to expand survey areas (Entiat River) and increase survey frequency and continue implementation of a standardized survey protocol.

The 2006 survey costs totaled \$5,850. This total includes: 10 days GS-11 surveying and reporting (\$3,060); 10 days GS-9 surveying, data management, and water temperature monitoring (\$2,410); 1.5 months of vehicle 2662 (\$255) and 400 miles of travel (\$125).

References:

English K.K., C. Sliwinski, B. Nass, and J.R. Stevenson. 2001. Assessment of Adult Steelhead Migration through the Mid-Columbia River using Radio-Telemetry Techniques, 1999-2000. Report prepared by LGL Limited for PUD No. 2 of Grant County, PUD No. 1 of Chelan County, and PUD No. 1 of Douglas County. 48 p + appendices.

Murdoch, A. and A. Viola. 2003. 2002 Wenatchee River Basin Steelhead Spawning Ground Surveys. WDFW Fish Program, Science Division, Mid-Columbia Field Office, Rock Island Evaluation, 610 N. Mission St., Suite B8, Wenatchee, WA 98801.

Appendix:

Table 2. Entiat River steelhead redd survey sites. Site locations, dates surveyed, and number of redds enumerated by USFWS MCR FRO, 2003, 2004, 2005, and 2006.

2003							
Survey site number	Site type	Site location river kilometer	Start date	End date	Number of surveys	Number of redds	Total
1	Index	41.8 - 43.1 and 43.7 - 44.2	April 9	May 22	5	21	
4	Index	30.0 - 34.1	March 21	May 16	7	25	
8	Index	1.1 - 2.5	March 21	May 7	6	13	
2	Extended	37.7 - 41.8	May 7	-	1	6	
3	Extended	34.1 - 37.7	May 7	-	1	8	
5	Extended	25.9 - 30.0	May 6	-	1	5	
6	Extended	10.6 - 25.9	No survey	-	-	-	
7 A	Extended	2.5 - 10.6	No survey	-	-	-	
7 B	Extended	2.5 - 7.5	May 6	May 7	1	2	80

2004							
Survey site number	Site type	Site location river kilometer	Start date	End date	Number of surveys	Number of redds	Total
1	Index	41.8 - 43.1 and 43.7 - 44.2	April 8	June 2	5	7	
4	Index	30.0 - 34.1	March 15	June 2	6	5	
8	Index	1.1 - 2.5	March 18	June 2	6	21	
2	Extended	37.7 - 41.8	April 28	-	1	1	
3	Extended	34.1 - 37.7	April 26	-	1	2	
5	Extended	25.9 - 30.0	April 26	-	1	8	
6	Extended	10.6 - 25.9	April 23	-	1	10	
7 A	Extended	7.5 - 10.6	April 22	-	1	8	
7 B	Extended	2.5 - 7.5	April 22	-	1	7	69

2005

Survey site number	Site type	Site location river kilometer	Start date	End date	Number of surveys	Number of redds	Total
1	Index	41.8- 43.1 and 43.7 - 44.2	March 10	June 9	12	4	
4	Index	30.0 - 34.1	March 28	June 6	9	2	
8	Index	1.1 - 2.5	March 30	June 10	10	36	
E	Extended	Not surveyed	-	-	-	-	
D	Extended	37.7 - 41.8	March 30	June 10	10	3	
C	Extended	25.9 - 37.7	March 17	June 6	10	24	
B	Extended	10.6 - 25.9	March 31	June 8	7	75	
A	Extended	2.5 - 10.6	March 10	June 9	10	79	223

2006

Survey site number	Site type	Site location river kilometer	Start date	End date	Number of surveys	Number of redds	Total
1	Index	41.8- 43.1 and 43.7 - 44.2	April 12	May 8	5	4	
4	Index	30.0 - 34.1	March 30	May 16	8	11	
8	Index	1.1 - 2.5	March 15	May 11	10	8	
E	Extended	Not surveyed	-	-	-	-	
D	Extended	37.7 - 41.8	March 28	May 8	7	8	
C	Extended	25.9 - 37.7	March 30	May 16	8	23	
B	Extended	10.6 - 25.9	March 29	May 15	9	26	
A	Extended	2.5 - 10.6	March 15	May 11	10	28	108