Mad River Summer Steelhead Report
2014

Jacob Pounds (BLR, MRA)
Pat Righter (GDRC)
Steve Gough (USFWS)
Michelle Gilroy (CDFW)
Seth Naman (NOAA)
Dave Feral (MRA)

April 2015

Summary

On August 4th and 5th, 2014, personnel from the Mad River Alliance (MRA), National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), U.S. Forest Service (USFS), Youth Conservation Corps (YCC), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), Green Diamond Resource Company (GDRC), Blue Lake Rancheria (BLR), Wiyot Tribe, and several volunteers performed a dive survey of summer-run steelhead in the Mad River. This continues the effort initiated in 2013 to perform a comprehensive and consistent survey for Mad River summer-run steelhead. The survey was initiated in large part due to the efforts of the non-profit group Mad River Alliance, which brought state and federal agencies together to restart the monitoring effort. Teams of snorkelers covered approximately 61 river miles within the 74.4-mile section of river from R. W. Matthews Dam downstream to Kadle Hole, near Highway 101. Divers counted a total of 322 adult (≥ 16 inches fork length) and 92 half-pounder (< 16 inches fork length) summer-run steelhead, with the majority being found in 1 reach. Presence of other aquatic species, including Pacific Lamprey, freshwater mussels, and western pond turtles were also noted.

Introduction

Steelhead in the Mad River are part of the Northern California (NC) Steelhead Distinct Population Segment (DPS) and are listed as Threatened under the U.S. Endangered Species Act (ESA) (reference the listing with the Federal Register information). Summer-run steelhead in the Mad River are one of ten functionally independent summer-run steelhead populations in the NC Steelhead DPS (Spence et al. 2008). As a major life-history type, they are an important component of the overall DPS viability according to criteria established by Spence et al. (2008). Although numeric population viability thresholds were not established for summer-run steelhead in the NC Steelhead DPS, at the time the limited available data provided no evidence that the summer-run steelhead population in the Mad River was viable (Spence et al 2008). An estimated 36% of potential Steelhead habitat lay above R. W. Matthews Dam, though a natural, flow-dependent partial barrier approximately 30 miles downstream of this dam limits use of the upper watershed by summer steelhead in some years (Spence et al. 2008).

Spence et al. (2008) reviewed the Mad River summer-run steelhead dive survey data from 1980 to 2005. The data did not meet the minimum requirements to formally assess viability using their criteria, mainly because the data series was shorter than 4 generations. However, the data provided some indication of population status. From 1994 to 2002 (Table 1), when several reaches of the Mad River downstream of Deer Creek were consistently surveyed, the geometric mean abundance was about 250 fish and the run sizes declined throughout the period (Spence et al. 2008). They concluded that the population was at least at moderate risk of extinction. Because of these findings, it is crucial that the following be considered:

1) The summer-run steelhead population is a critical component of the viability of Mad River steelhead and the NC Steelhead DPS as a whole,
2) Available data indicated the summer-run steelhead population is at least at a moderate risk of extinction, and
3) Limited data is available to formally assess the status of the population or track the trend of the population over time; therefore it is imperative that a consistent, long-term summer-run steelhead monitoring effort continues on the Mad River.

In the fall of 2012 Dave Feral from MRA convened a series of meetings with local resource agency leads to discuss three critical topics:
1) The danger of extinction of Mad River summer-run steelhead.
2) The need to collect enough data to sufficiently evaluate population trends of Mad River summer-run steelhead.
3) The need to organize and re-initiate efforts to survey Mad River summer-run steelhead on an annual basis.

Those meetings with local agencies, industries, tribes, and volunteers lead to a re-organization of summer steelhead survey methods and procedures to provide a consistent survey protocol, so the data would meet the minimum requirements for NMFS to formally assess viability of Mad River summer-run steelhead in the future.

Table 1. Dive survey results for the Mad River from 1980 to 2013.

		Adults			Half pounders		
Year	Miles Surveyed	Live	Dead	Total	Live	Dead	Total
1980[p]	17.9	0	0	0	0	0	0
1981[p]	17.5	2	0	2	0	0	0
1982[p]	32.4	167	0	167	0	0	0
1983[p]	22.8	31	0	31	0	0	0
1984[p]	14.1	111	0	111	0	0	0
1985[p]	14.8	52	0	52	0	0	0
1986[p]	7.8	10	0	10	0	0	0
1987[p]	20.2	18	0	18	0	0	0
1988[p]	10.6	60	0	60	0	0	0
1989[p]	10.6	20	0	20	0	0	0
1990[p]	10.6	33	0	33	0	0	0
1991[p]	14.7	59	0	59	0	0	0
1992[p]	10.6	34	0	34	0	0	0
1993[p]	10.6	48	0	48	0	0	0
1994[p]	51.6	305	0	305	166	0	166
1995[p]	66.6	541	1	542	10	0	10
1996[p]	60.7	427	1	428	19	0	19
1997[p]	66.6	292	5	297	12	0	12
1998[p]	57.0	191	0	191	20	0	20
1999[p]	46.4	82	0	82	15	0	15
2000[p]	53.5	170	0	170	62	0	62
2001[p]	12.5	194	0	194	583	0	583
2002[p]	19.7	185	0	185	80	0	80
2003[p]	18.7	483	0	483	5	0	5
2004[p]	5.8	209	0	209	9	0	9
2005[p]	5.6	211	0	211	10	0	10
2006			No survey				
2007			No survey				
2008[p]	5.1	110	0	110	20	0	20
2009			No survey				
2010			No survey				
2011			No survey				
2012			No survey				
2013	50.0	280	2	282	28	0	28
2014	61.0	322	0	322	92	0	92

[p] = Provisional data

2014 Dive Survey

Goals of the 2014 Mad River survey were:
1) Obtain a count of summer-run steelhead from R. W. Matthews Dam to the Kadle Hole (.5 miles above the Highway 101 Bridge).
2) Gain private property access to reaches of the river that had not been surveyed in several years.
3) Perform a Dive Training Day to provide community volunteers a meaningful way to participate in data collection and learn surveying techniques. This training could lead to future volunteer recruitment for more difficult and remote survey reaches.

In several meetings preceding the dive, personnel renamed the reaches alphabetically with Reach A starting directly downstream of R. W. Matthews Dam (Table 2). Logistics and safety concerns were also discussed.

On August 4th and 5th, divers surveyed reaches G-Q and performed spot checks of pools in reaches A, B, and C. 10.4 river miles (Reaches D-F) were not surveyed due to the proliferation of marijuana farms in the area, and because of this, the total distance surveyed was not contiguous. Approximately 61 river miles were surveyed, 13.3 miles above Reaches D-F, and 47.7 continuous miles downstream. Divers counted a total of 322 adult (≥ 16 inches) summer-run steelhead and 92 "half-pounders" (< 16 inches) (Table 1.). The majority of summer-run steelhead (265) were counted in Reach H.

All adult summer-run Steelhead in Reach H were observed downstream of the Humbug Creek barrier. From the upstream end of Reach H (Deer Creek) to the Humbug Creek barrier (about 3.2 river miles), zero adult summer-run steelhead were counted, indicating that it is possible that summer-run steelhead likely did not migrate upstream of the Humbug Creek barrier prior to the 2014 summer survey. Drought conditions in 2014 could have limited upstream passage. We believe the survey covered the majority of habitat in the Mad River in 2014 where summer-run Steelhead were present.

A few surveyors from reaches K, M, N, O, P, and Q reported minor rashes and slight headaches potentially due to exposure to toxic cyanobacteria. All symptoms dissipated within 24 hours.

Table 2. Reach List for the 2014 Mad River Summer-Run Steelhead Surveys.

Reach	From	To	Length (miles)
A	R.W. Matthews Dam	Mad River campground (U.S.F.S.)	3.4
B	Mad River campground (U.S.F.S.)	Lamb Creek	4.5
C	Lamb Creek	Nelson Flat (Rattlesnake Bridge)	5.4
D	Nelson Flat (Rattlesnake Bridge)	Anderson Ford	4.2
E	Anderson Ford	Wildcat Creek	3.7
F	Wildcat Creek	Olsen Crossing	2.5
G	Olsen Crossing	Deer Creek	4.4
H	Deer Creek	Access downstream of Humbug Creek	4.0
I	Humbug Creek	Swinging Bridge	5.7
J	Swinging Bridge	G.D.R.C. Goodman Prairie	4.7
K	Goodman Prairie	Church Camp	3.5
L	Church Camp	Butler Valley Ranch	4.8
M	Butler Valley Ranch	G.D.R.C. 4510 Road Crossing	4.4
N	4510 Road Crossing	G.D.R.C.4090 Road Crossing	5.0
O	4090 Road Crossing	Mad River Hatchery	4.7
P	Mad River Hatchery	Annie and Mary Bridge	5.3
Q	Annie and Mary Bridge	Kadle Hole	4.2
		Total Miles	74.4

Snorkel Survey Data Considerations

A comprehensive census of all habitat units in a river is the most accurate way to inventory fish populations (Dollof et al. 1993), greatly reducing error in estimating fish abundance (Hankin 1984; Hankin and Reeves 1988). Performing a dive survey in a river where all of the habitat is surveyed (census), error in estimating fish abundance may arise from observer error (divers counting more or less fish than are actually present) and catchability [the proportion of the fish population actually observed and counted by the divers (Som 2013); also known as "second stage variance" (Hankin 1984)]. While Hankin and Reeves (1988) provide an approach for analyzing juvenile salmonid diver observation data that is calibrated using depletion electrofishing, a more accurate survey technique. This method is not used to calibrate adult steelhead dive counts. Since observer error and catchability are not quantified for this survey, the snorkel count is considered an index of "relative abundance" (Som 2013). Assuming that observer error and catchability are consistent among reaches and between years, we can make inferences on distribution and long-term trends.

When all of the reaches are not surveyed, there is error, called first stage variance, which could be quantified by employing an appropriate sampling scheme (Hankin and Reeves 1988; Dolloff et al. 1993). Also, if days or weeks lapse between reaches, fish could move between reaches of the river, introducing another source for error. Furthermore, error (or bias) is compounded for dive counts when surveys are spatially incomplete, not completed within minimal time duration, and experience of snorkelers varies. When any of these occur, the data cannot be reliably used

as a measure of relative abundance because results between years cannot be compared. Sampling consistency improves data integrity and usefulness.

Snorkel surveys of adult summer-run steelhead and spring-run Chinook salmon are one practical method that can be used to monitor these salmonid populations. The snorkel survey method is cost effective, and when done properly, can provide a valuable index of population size that can be used to monitor trends in these populations over time. If not done properly, the utility of the data is compromised. NMFS will only consider the information as "anecdotal" in ESA status reviews and updates because the data requirements to quantify population viability metrics are not met (Spence et al. 2008).

In addition, monitoring the Mad River summer-run steelhead population into the future and developing linkages between water temperature, snowpack, stream discharge, and climate change will be impossible without consistent spatial and temporal coverage and consistent annual effort.

Recommendations and Environmental Considerations

It is imperative for all future efforts to:
1) Survey reaches that have been standardized by location and length
2) Survey the entire river from R.W. Mathews Dam to the Kadle Hole until an upper limit to the surveys can be agreed upon by the fisheries management agencies
3) Survey all of the reaches within a few days
4) Rely only on trained and most-experienced divers for the more difficult reaches: H, I, and J
5) Produce annual reports detailing the survey
6) Maintain a database and/or spreadsheet of the results for at least 4 generations (12 years), in order to meet the minimum data requirements to formally assess population viability (Spence et al. 2008).
7) As flow allows, setting the dive date to occur earlier in the year could help avoid potential cyanobacteria illness symptoms.

The group discussed using data from the CDFW-operated ARIS sonar camera unit to target survey dates for 2015. The idea being that the survey will be conducted after the entire run has entered the river. This will require additional and continued collaboration and communication with CDFW Anadromous Fisheries Resource Assessment and Monitoring Program. This idea will be discussed at the 2015 planning meeting. Additionally, CDFW plans on continuing to operate the ARIS sonar camera year-round to enumerate spring/summer runs of adult steelhead on an annual basis. Snorkel survey counts can then be compared to sonar counts which will show whether the trends in snorkel counts over years parallels the actual run size(s). If so, snorkel counts can then be used as an index to adult summer run steelhead population abundance(s).

This effort would not be possible without the generous assistance and work from all volunteers and surveyors who have spent lots of time planning and implementing this survey and creating and editing this report to ensure success and safety for all involved. We would also like to thank the private landowners who helped facilitate crucial access points in remote stretches of the river. Thank you all very much for being a critical part of this effort!

References

Add CDFG, M Zuspan 2009 Memorandum to files (2008 survey), 2013 SSTH report – any other USFS or GDRC reports, CDFW field notes, etc…

Dolloff, C.A., D.G. Hankin, and G.H. Reeves. 1993. Basinwide estimation of habitat and fish populations in streams. U.S. Forest Service, General Technical Report SE-83.25pp.

Hankin, D.G. 1984. Multistage sampling designs in fisheries research: applications in small streams. Can. J. Fish. Aquat. Sci. 41:1575-1591.

Hankin, D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Can. J. Fish. Aquat. Sci. 45:834-844.

Spence, B.C., E.P. Bjorkstedt, J.C. Garza, J.J. Smith, D.G. Hankin, D. Fuller, W.E. Jones, R. Macedo, T.H. Williams, E. Mora. 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast Recovery Domain. NOAA Technical Memorandum NMFS-SWFSC-423. 173 p.

Som, N. 2013. Personal communication. Statistician (biology). U.S. Fish and Wildlife Service. Arcata, California.