Fisheries Stream Scientist's Response to Mammoth Fly Rodders Comments to Reports Submitted to the Water Board

The Stream Scientists submitted four reports to the Water Board on August 3, 2009. These reports were:

1. Rush and Lee Vining Creeks - Instream Flow Study.

2. Radio Telemetry-Movement Study of Brown Trout in Rush Creek

3. Pool and Habitat Studies on Rush and Lee Vining Creeks

4. The Effects of Flow, Reservoir Storage and Water Temperatures on Trout in lower Rush and Lee Vining Creeks.

We appreciate the effort that reviewers have put into commenting on the reports and we're eager to respond to their comments. Mr. Dahlgren submitted comments for the Mammoth Fly Rodders on September 15, 2009.

Dahlgren Comment: Why hasn't the trophy trout fishery that existed prior to 1941 as described in the court proceedings recovered?

Stream Scientist Response:

First of all, the sizes of brown trout as described by Mr. Dahlgren in the court records were not based on actual scientific data, mostly the recollections of the Fish and Game biologist, Elden Vestal, who unfortunately was unable to provide data sheets or written records during his deposition to confirm these sizes of fish as being "average" or "common". His recollections were supported by interviews conducted in the 1990's, with long-time Mono Basin residents recalling their youthful fishing experiences of 50 to nearly 70 years prior (Andrews/Hess, Banta, Carrington, and Dondero interviews). However, angler recall of their catch has been found to be biased in several studies and usually has been related to length of time between the angling event and the survey response (Thompson and Hubert 1990; Page et al. 2004).

No data were submitted during Water Board hearings to support the contention that a significant proportion of brown trout caught in Lower Rush Creek ever attained the larger sizes alluded to in the historic interviews. This apparent lack of quantifiable data was mentioned repeatedly in Decision 1631 and in the Mono Basin EIR, including the introduction of Chapter 3-D Fishery Resources:

"Published and unpublished scientific information is scarce, and definitive information is unavailable to quantitatively describe historic pre-diversion fish habitats or populations."

Secondly, the physical conditions of Rush Creek below the Narrows pre-1941 suggest that the channel was heavily manipulated by irrigation, grazing, and other diversions that unintentionally created conditions that may have been suitable for larger brown trout. These

conditions included the increased spring flow below the Narrows that was caused by irrigation of the Cain Ranch meadows and the Walt Dombrowski duck hunting ponds near the Mono Lake delta. Because the goal of the Mono Basin restoration program is to have functional stream and riparian ecosystems, not just a trophy trout fishery, the Stream Scientists do not advocate re-creating some of the pre-1941 conditions that allegedly supported a trophy trout fishery.

Dahlgren Comment: Though the reports were heavily footnoted with 144 documents and scientific references from dozens of fisheries scientists, we found the findings to be scientifically incomplete and shockingly lean……..Much of the material is from Sweden, Norway, Scotland, and the Iberian Peninsula……..a few (USA) domestic fisheries are referenced, but none with the characteristics of Rush Creek.

Stream Scientist Response:

We contend that our 12+ years of monitoring the trout populations in Rush and Lee Vining creeks, in combination with our collective knowledge of the peer-reviewed literature has created a data set that is scientifically complete and amply supportive. There are few stream systems, anywhere in the world, that have such a continuous long-term brown trout monitoring program. The 10 annual fisheries monitoring reports and the reports submitted this year provide ample findings from the studies conducted.

As to the locations and characteristics of the watersheds where some of the brown trout studies were conducted; yes; many were in Sweden, Norway, Scotland, and the Iberian Peninsula. Geographically, these locations are where brown trout are a native species. In our professional opinion, some of the best brown trout research has been conducted within their natural distribution by scientists such as Jan Heggenes. Also, the Movement Study report referenced 21 papers, of which, 13 (or 62%) were studies conducted in North American watersheds (Taylor et al. 2009). As to the diversity of watersheds, brown trout appear to prefer similar types of holding habitats and seasonally exhibit similar movement patterns across a wide range of watersheds.

Dahlgren Comment: No reference to fishery in Rush Creek between Grant Reservoir and Silver Lake.

Stream Scientist Response:

We did not mention this section of Rush Creek, nor have we studied this section due to several factors. Primarily, this section of Rush Creek is managed by the California Department of Fish and Game (CDFG) as a put-and-take fishery for catchable hatchery trout and is heavily planted; thus it would be extremely difficult to evaluate the ability of this Rush Creek section to support a self-sustaining fishery. We suspected that seasonally (in the fall) large brown trout migrate out of Grant Reservoir and/or Silver Lake to spawn in this section of Rush Creek; however these fish most likely attain their large size within Grant Reservoir and Silver Lake.

Dahlgren Comment: The first two miles of the Rush Creek below Grant Lake Reservoir were reconstructed by Trihey and Associates to provide the deep-water habitat so critical for winter survival.

Stream Scientist Response:

Below Grant Lake Reservoir, Rush Creek flows through the Mono Gate One Return Ditch (MGORD) for approximately 1.5 miles. The MGORD was constructed in the late 1930's by LADWP for the sole purpose of diverting Mono Basin water into the Mono Craters Tunnel for export to the City of Los Angeles. The construction of the MGORD is first referenced in a 1936 article titled *The Mono Basin Project* in *Civil Engineering* magazine (Volume 1, No. 5).

The entire MGORD section was not reconstructed by Trihey and Associates and it was not reconstructed to provide deep-water habitat. In 1991 Trihey and Associates installed the boulder grade-control weirs along the lower 1,400ft of the MGORD and introduced spawning-sized substrate to ten specific locations and the weirs were intended to retain the introduced substrate. At this time several pools were also constructed in Rush Creek downstream of the Sheepherder's Cabin. The original plan to mechanically alter the Rush Creek channel was vetoed by the original Stream Scientists (Chris Hunter, Bill Trush and Richard Ridenhour). The restoration program was then focused on recommending Stream Restoration Flows (SRFs) to mimic the snowmelt hydrograph and allow flood flows on wetter years to scour pools and recover the channel.

Ironically the MGORD (basically a trapezoidal diversion canal) located immediately below Grant Reservoir does support an ample population of brown trout, including many individuals exceeding 14 inches in length and some up to and greater than two pounds in weight. We suspect the following conditions have lead to the fishery that exists within the MGORD:

1. Cover – extensive beds of elodea provide overhead cover and velocity refuge for fish.

2. Food – the elodea supports amphipods and caddis flies. Non-native crayfish are also abundant and use the interstices within the rip-rap as habitat.

3. Temperature – the HOBO recorder data indicates that the MGORD has a steadier thermal regime than other downstream sections of Rush Creek.

As described in our Movement Study Report, large brown trout that reside within the MGORD seasonally migrate downstream during the October-December spawning period (Taylor et al. 2009).

Regardless of the productive nature of the MGORD, the Stream Scientists do not support the mechanical trenching of the Rush Creek channel to create more ditch-like habitat. We feel that the stream channel is moving towards a recovered state as the riparian vegetation continues to mature and periodic high-flow events scour deep pool and run habitats. The Pool and Habitat Studies report documented the improvement of naturally-formed pool/deep run habitats below the Narrows, as well as the degradation of the mechanically dug "Trihey" pools located upstream of Highway 395 (Knudson et al. 2009).

Dahlgren Comment: Myth #1 – Grant Lake Reservoir has been drawn-down to minimum storage pool almost every year since it was constructed in 1915. Grant Lake Reservoir is located in a deep canyon and shaded most of the day with a rapid cooling rate.

Stream Scientist Response:

Grant Lake Reservoir's was enlarged in the late 1930's for DWP's operations to its current storage capacity of approximately 47,000 acre-feet. According to Figure 3.1 in Cullen and Railsback (1993), Grant Lake Reservoir was only drawn-down close to minimum storage pool in three of ten years between 1982 and 1992 (Figure 1). Since the implementation of WR98-05 and WR98-07, Grant Lake Reservoir has been drawn-down close to minimum storage (less than 15,000 acre-ft) in three of 18 years (Figure 2). The Grant Lake Reservoir report also discusses how this body of water poorly stratifies, if ever, due to its relatively shallow depths and that frequent windy conditions disrupt whatever weak stratification that occurs (Cullen and Railsback 1993).

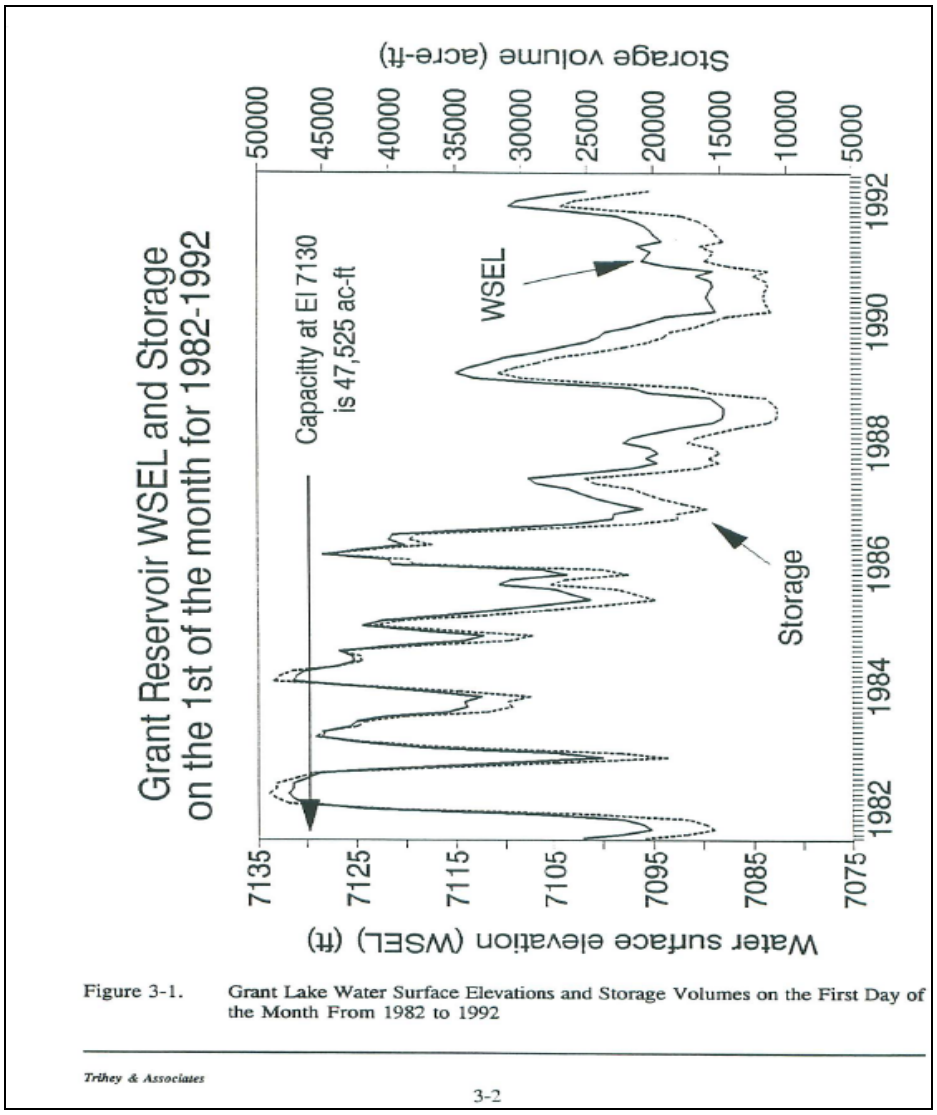

Figure 3-1. Grant Lake Water Surface Elevations and Storage Volumes on the First Day of the Month From 1982 to 1992

Trihey & Associates

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Figure 1. Figure 3.1 from Cullen and Railsback (1993) depicting Grant storage levels.

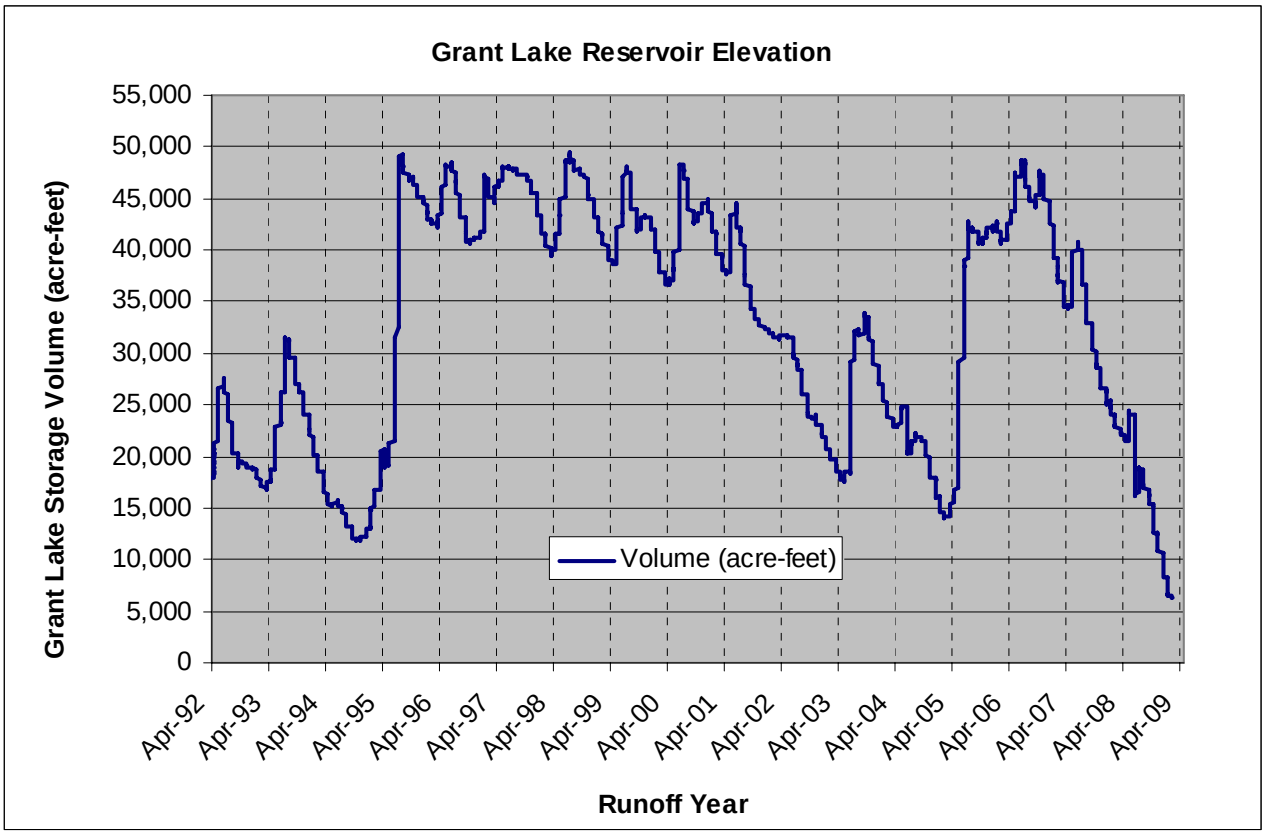

Figure 2. Grant Lake Reservoir storage volumes for 1992-2009.

As to the comment made regarding the shading of Grant Reservoir during most of the day, please refer to Figure 3 that shows the actual exposed, minimally-shaded condition of Grant Lake Reservoir.

Figure 3. Grant Lake Reservoir panoramic photograph taken on September 21, 2009 from the jeep trail into Parker Lake.

Dahlgren Comment: Myth #2 – Rush Creek does not warm-up to lethal levels above 70^{o}F because the Shepard et al. (2009) report shows graph after graph of temperatures within a range optimum range for a thriving brown trout fishery. Also, Mr. Dahlgren has measured cooler temperatures with a handheld thermometer in July of 2006 and 2009.

Stream Scientist Response:

First point – the graphs referred to in the Shepard et al. (2009) report are daily average temperatures and on many days to get a daily average temperature in the mid-60's there are extended periods, including the daily maximum, where temperatures exceed 70°F.

Second point – as we will present in more detail within the upcoming Synthesis Report, ideal thermal conditions for brown trout growth occur between 52°F and 67°F as based on work by Raleigh et al. (1986)(Figure 4). Elliot and Hurley (1999) also found that growth (positive weight gain) only occurred in brown trout between 37 °F and 67°F, with highest growth rate occurring at 57°F. At water temperatures above 67°F and below 37°F, no growth occurred even when test fish were provided full food rations. Using this information we then went through nearly 2,800 Rush Creek temperature measurements made between June 1st and September 30th and determined that daily average temperatures between 55.5 and 60.5°F best represent days where brown trout may experience ideal growth. Below 55.5°F the rate of potential growth tapers down gradually; in contrast potential growth rates drop quickly towards zero as daily average temperatures increase above 60.5°F.

As to cooler water temperatures measured by Mr. Dahlgren in July of 2006, yes they were cool that year because of the extremely large snowpack that was still actively melting-off. In fact, Grant Reservoir spilled for many days during 2006 and the flow upstream of the Narrows was more than 200 cfs for 71 days between May 23rd and August 1st, including when Mr. Dahlgren took his temperature measurements. Daily maximum water temperatures for 2006 and 2008 are provided to show the contrast in daily maximum temperatures between a wet year runoff and a dry year runoff (Figure 5). Note the numerous days in 2008 when daily maximum temperatures were well above 70°F.

As to the cooler water temperatures measured by Mr. Dahlgren in July of 2009, personnel from McBain and Trush have not yet downloaded the HOBO temp recorders to generate the entire summer's data set. A preliminary review of a partial set data showed temperatures nearing 70°F on July 27th in Rush Creek downstream of the Narrows (69.3°F within the Bottomlands sampling reach and 69.0°F at the County Road culvert).

Dahlgren Comment: Further proof from the report clearly identifies the fact there is little or no deepwater habitat crucial to a thriving large trout fishery.

Stream Scientist Response:

We disagree with this comment; the Pool and Habitat Studies report clearly documents the recovery of pool habitat in Rush Creek downstream of the Narrows (Knudson et al. 2009). In this report we compared the results of our 2002-03 and 2008 Rush Creek surveys to pool data collected during 1991 (Trihey and Associates 1994) using the locations, lengths and residual depths of all the pools they reported. This allowed us to compare, by stream reach, the number of pools that had residual depths ranging from 2.0 – 2.9 ft, and those with residual depths >3.0 ft (potential Class-5 pools) during 1991, 2002 and 2008. This comparison shows the progression of pool development over a 17-year period. The final figure of our response is

Figure 4 from the Pool and Habitat Studies report that shows this 17-year development of high-quality pools in the four sections (#4 - #7) below the Narrows (Figure 6).

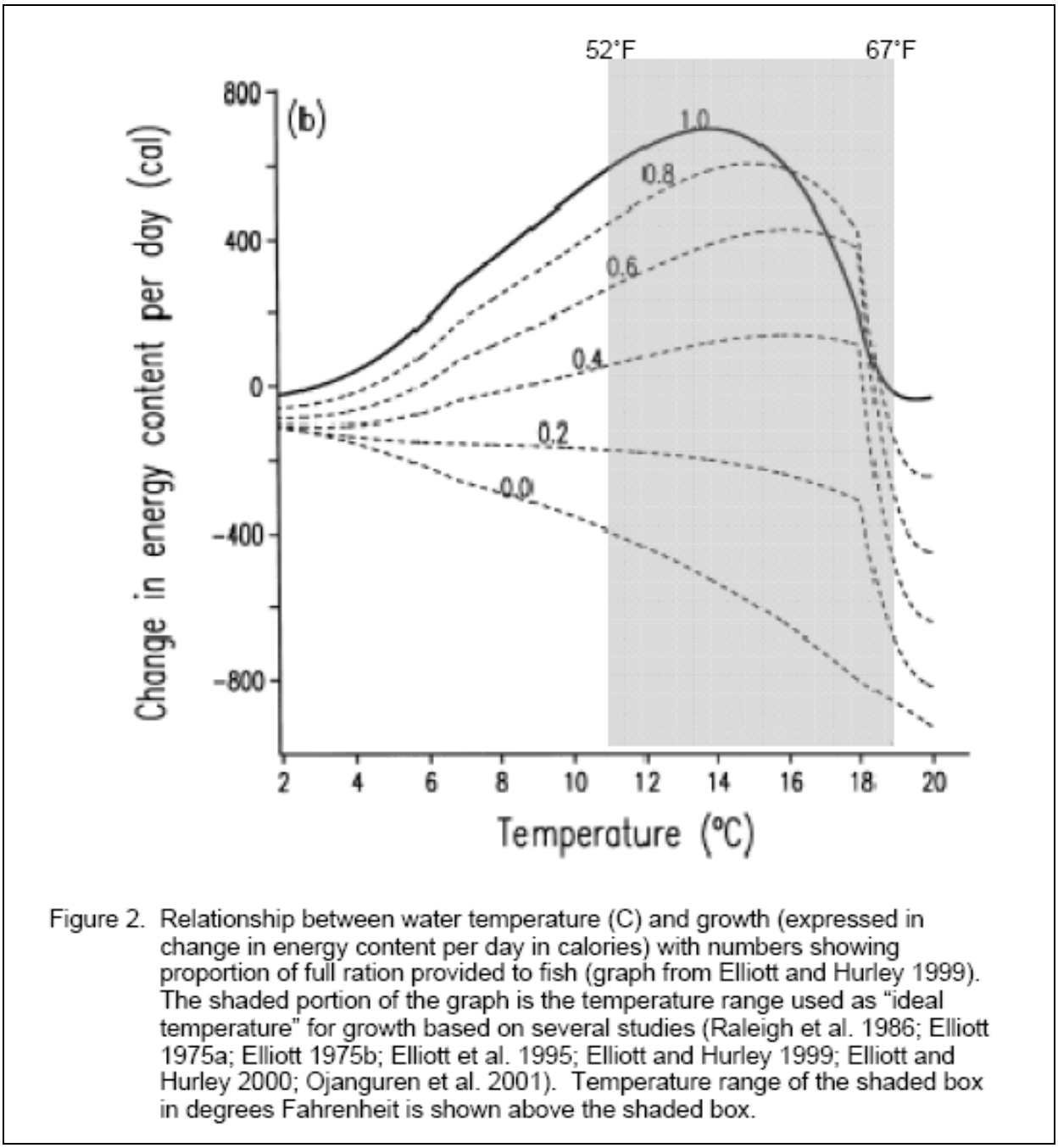

Figure 2. Relationship between water temperature (C) and growth (expressed in change in energy content per day in calories) with numbers showing proportion of full ration provided to fish (graph from Elliott and Hurley 1999). The shaded portion of the graph is the temperature range used as "ideal temperature" for growth based on several studies (Raleigh et al. 1986; Elliott 1975a; Elliott 1975b; Elliott et al. 1995; Elliott and Hurley 1999; Elliott and Hurley 2000; Ojanguren et al. 2001). Temperature range of the shaded box in degrees Fahrenheit is shown above the shaded box.

Figure 4. Figure 2 from Shepard et al. (2009) that depicts relationship between water temperature and growth as originally presented in Elliot and Hurley (1999).

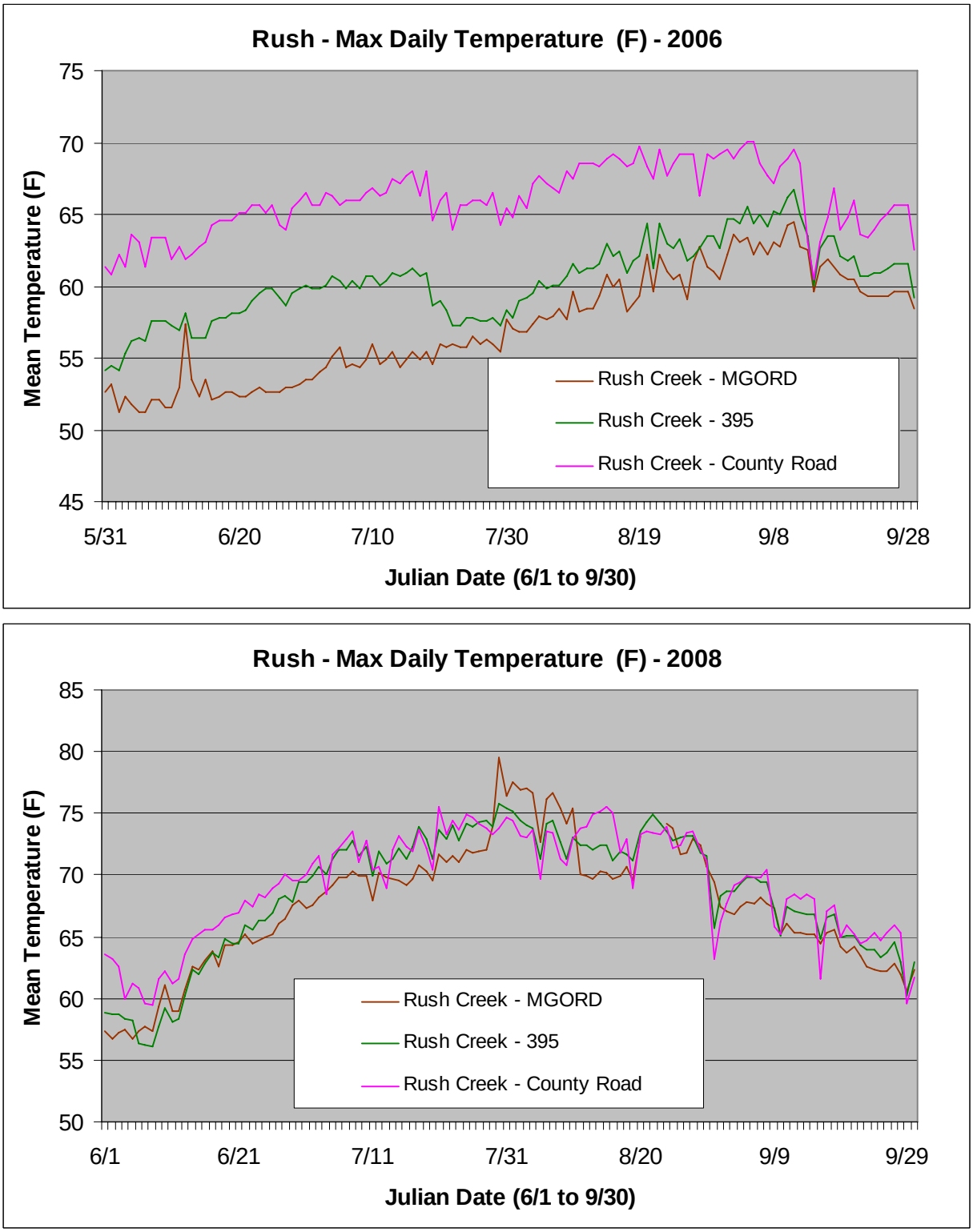

Figure 5. Daily maximum water temperatures in Rush Creek at three locations for the summers of 2006 and 2008.

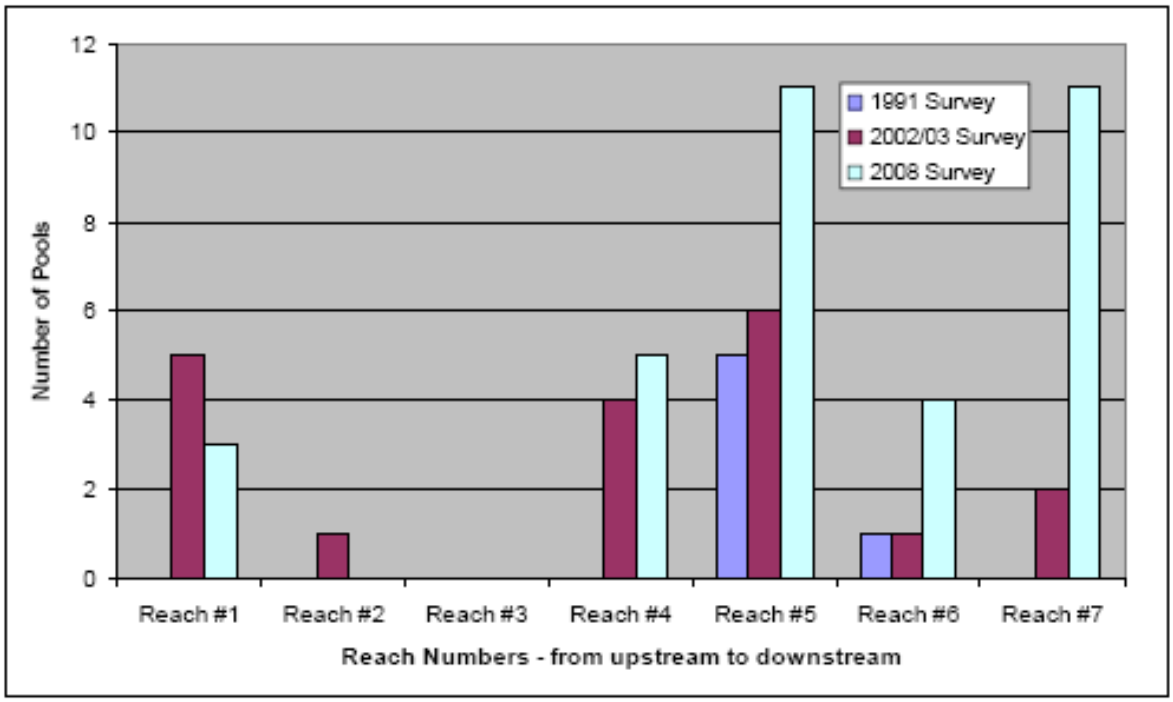

Figure 4. Total Numbers of Pools with Residual Depths Greater than 3.0 ft within seven stream reaches on Rush Creek during the 1991 Trihey survey, the initial 2002/03 pool survey and the follow up 2008 pool survey.

Figure 6. Figure 4 from Pool and Habitat Studies report (Knudson et al. 2009). Reaches #4-#7 were located downstream of the Narrows.

Literature Cited

Cullen, R.T. and S.F. Railsback. 1993. Thermal characteristics of Grant Lake, Mono County, California. Final report for the Rush Creek Restoration Planning Team. Trihey and Associates.

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