

EPA is recommending 13°C 7DADM in its most recent draft of regional temperature guidance, based primarily on the evidence presented below. For migratory populations, the guidance intends that the criteria recommended for salmon juvenile rearing (16°C 7DADM) will be protective. The recommendation to protect summer spawners in site specific areas (generally headwaters with cold groundwater influence) is 10°C 7DADM.

EPA used the lines of evidence presented below to support 13°C 7DADM as protective criteria for bull trout rearing. **Please provide a critique of EPA's basis for the recommendation.** For comparison to various studies, a 13°C 7DADM converts to a 13.5-14°C summer maximum, a 10-12°C maximum weekly mean, and a 8.5-11°C summer mean (rounded to nearest .5 degree) (assuming a diurnal range of 0-2 or 2-4°C)(based on Dunham 2000).

1. Field Study on presence/absence (Rieman/Chandler 1999):
 - a. juvenile bull trout were most frequently observed where the summer maximum temperature was 14°C (there was also a high frequency 12°C, 13°C, and 15°C); bull trout were also observed where the summer maximum was 17/18°C, but the number of observations dropped off steeply at 18/19/20°C.
 - b. the probability of occurrence was greatest where the summer maximum was 12°C and 13°C, but probability of occurrence was greater than 50% at 14°C, 15°C, and 17°C (16°C was slightly below 50%); probability of occurrence dropped off steeply at 18/19°C; in Dunham et. al 2001 the probability of occurrence was highest at a summer maximum of 11-12°C (>75%), but was above 50% at 14-16°C.
 - c. bull trout rearing was also most frequently observed where the summer mean temperature was 10°C.
 - d. **13°C 7DADM (converted to a 13.5-14°C summer maximum or a 8.5-11°C summer mean) reflects where bull trout are most frequently observed and where the probability of occurrence is high (but not the highest) - thus these studies suggests that 13°C 7DADM to be near the warmer end of their optimal range and fully protective.**
2. Growth studies (Selong & McMahon studies):
 - a. Optimal growth in the laboratory under satiated feeding was at a constant 13.2°C (10.9°C - 15.4°C 95% CI); optimal growth under limited rations (11%) was at a constant 12.6°C; optimal growth in a fluctuating environment was 9-15°C;

- b. For comparisons to growth studies, the 13°C 7DADM should be converted to the maximum weekly mean (10-12°C) or a seasonal mean (8.5-11°C). 8.5°C - 12°C is colder than the optimal growth laboratory studies at constant temperatures (13.2°C satiation, 12.6°C at 11% ration). However, other salmonid studies have shown a greater difference between full and limited food rations. Plus, conversations with the study authors indicate that a super high caloric food was used, which means the limited ration study (11%) was likely more akin to full rations under more typical feeding situations. Bull trout in the field are more likely to be under limited rations.
- c. The optimal growth study in a fluctuating environment (9-15°C) shows that in a lab environment, bull trout can do well with short term daily exposure to 15°C;
- d. **From these studies, we can conclude that 13C 7DADM (converted to a summer mean of 8.5 - 11C) will result in near optimal growth temperatures for the summer months after taking into account limited rations that bull trout are likely have in the field.**

3. Heat Shock Protein Study (Weber):

- a.. No detect at 12°C, 1 fish in 26 detected at 14°C, and 40% detect at 18°C (8 hours constant temperature);
- b. **A 13°C 7DADM in bull trout streams (converted to a summer maximum of 13.5-14°C), where maximum daily stream temperatures generally occur for less than 8 hours of the day, appears to prevent bull trout from forming heat shock proteins.**

1. Field Measurement in Bull Trout Strongholds:

- a. Chiwawa river, WA: measured maximum temperatures in our case study (August 5th, 2000) near 14°C for most of the river and near 16°C within 10 miles of the mouth;
- b. Little Lost River - Smithie Fork, ID: maximum 7DADM was 14.6°C and summer mean was about 10°C;
- c. **These two cases, suggest that 13°C 7DADM is fully protective of bull trout.**

2. Application of 13°C 7DADM at the lowest downstream extent of use:
 - a. The 13°C 7DADM would apply at the lowest downstream extent of use. Use being defined as where bull trout rearing may currently occur. Applying the criteria in this manner, will necessarily provide colder temperatures upstream, because it is unreasonable to expect that temperatures will be constant as rivers drop in elevation.

