

December 3, 2012

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Subject: Lower Boise River nuisance algae target

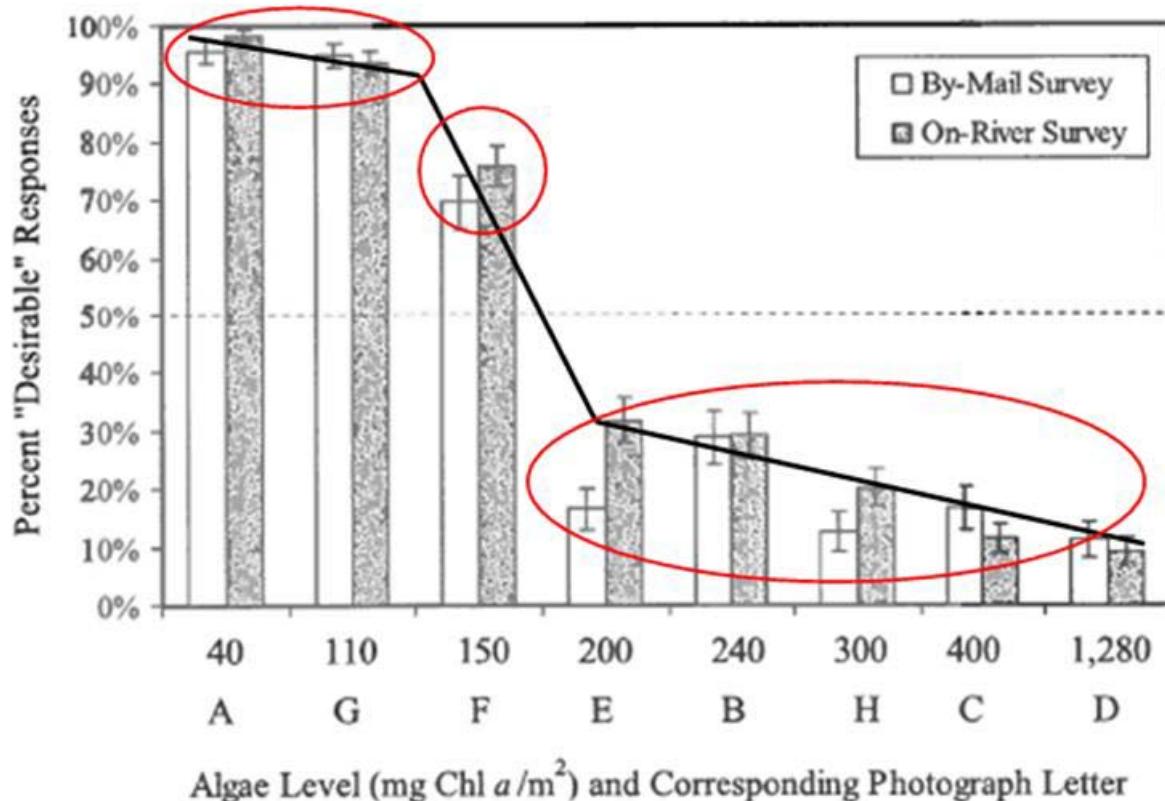
Troy:

First, I would like to acknowledge your effort on amassing data from similar works on quantifying nuisance aquatic growths. Short of conducting user surveys or bioassays on the Lower Boise River, these works provide useful information. Specifically, Suplee et al. (2009)<sup>1</sup> provided information very useful for a discussion of a nuisance aquatic growth target for the Lower Boise River. Second, IPC supports a periphyton algae chlorophyll a metric for a target on the Lower Boise River. While there are likely areas of rooted emergent macrophytes, periphyton is likely the most pervasive aquatic growth in the Lower Boise River.

Suplee et al. (2009) reported mean levels  $\leq$ 150 milligrams chlorophyll a per meter square (mg Chl a/m<sup>2</sup>) were found to be desirable for recreation in Montana streams. This finding was based on user surveys that evaluated 8 photographs of streams with benthic chlorophyll a levels across the range typically found in Montana (i.e., reference to impacted). Their conclusion is based on an a priori assumption of percent desirable responses of 50%. That is, one half of the respondents found a particular level of benthic chlorophyll a desirable. Similar to the societal question of what is “too green”; we should consider what percent of society is consensus. I would suggest that 50%, or a “coin toss” as the authors stated it, may not represent an appropriate level of desirable responses to reflect consensus.

There are other ways to less subjectively interpret Suplee et al. findings. One is to evaluate statistical differences between percent desirable responses among the survey’s photographs. The authors illustrated survey response error bars in Figure 2 included below. While there are many and variable statistical groupings among the surveys, there appears to be consistent similarities. The red circles overlaying Figure 2 are consistent similar groupings; some statistically significant ( $\alpha=0.05$ ). Similarly, spline modeling, as illustrated by the solid dark line, would likely indicate 2

<sup>1</sup> Suplee, M.W., V. Watson, M. Teply, and H McKee. 2009. How green is too green? Public opinion of what constitutes undesirable algae levels in streams. Journal of the American Water Resources Assn. Vol. 45, No. 1: 123-140.



**FIGURE 2.** Percent Desirable Responses From the By-Mail and On-River Surveys. Letters designating the survey photographs are sequenced from lowest to highest algae level. Error bars are the 95% confidence level of each proportion, expressed as percent error.

knots: 1 knot between the 110 and 150 mg Chl a/m<sup>2</sup> categories and another between the 150 and 200 mg Chl a/m<sup>2</sup> categories. The percent desirable response at the 150 mg Chl a/m<sup>2</sup> category appears to provide less useful information as it lies along a percent desirable response gradient from highly desirable and highly undesirable. Collectively, these data indicate a strong preference for desirable recreational opportunities at benthic chlorophyll a concentrations  $\leq 10$  mg/m<sup>2</sup>. That is, the desirable responses for 150 mg Chl a/m<sup>2</sup> were statistically different than those for <110 mg Chl a/m<sup>2</sup>.

This interpretation is consistent with Lower Boise River data. The Lower Boise River is listed as impaired by nutrients from Middleton to its confluence with the Snake River. Glenwood Bridge is located upstream of the listed reach. The U.S. Geological Survey reported benthic chlorophyll

a levels at Glenwood Bridge and Middleton. The median concentrations were 108 and 271 mg Chl a/m<sup>2</sup>, respectively.

IPC concurs periphyton algae chlorophyll a is an appropriate metric for nuisance algae in the Lower Boise River. The preponderance of information you provided, specifically Suplee et al. (2009), suggested a target of <150 mg Chl a/m<sup>2</sup>. The authors selected this target because at least half of the survey respondents found this level of benthic algae desirable. They also reported confidence intervals for the survey responses, which provides for evaluation of statistical differences. These data support a statistically significant preference for desirable recreational opportunities at benthic chlorophyll a concentrations  $\leq 10$  mg/m<sup>2</sup>.

Sincerely,



Brian Hoelscher  
Senior Biologist