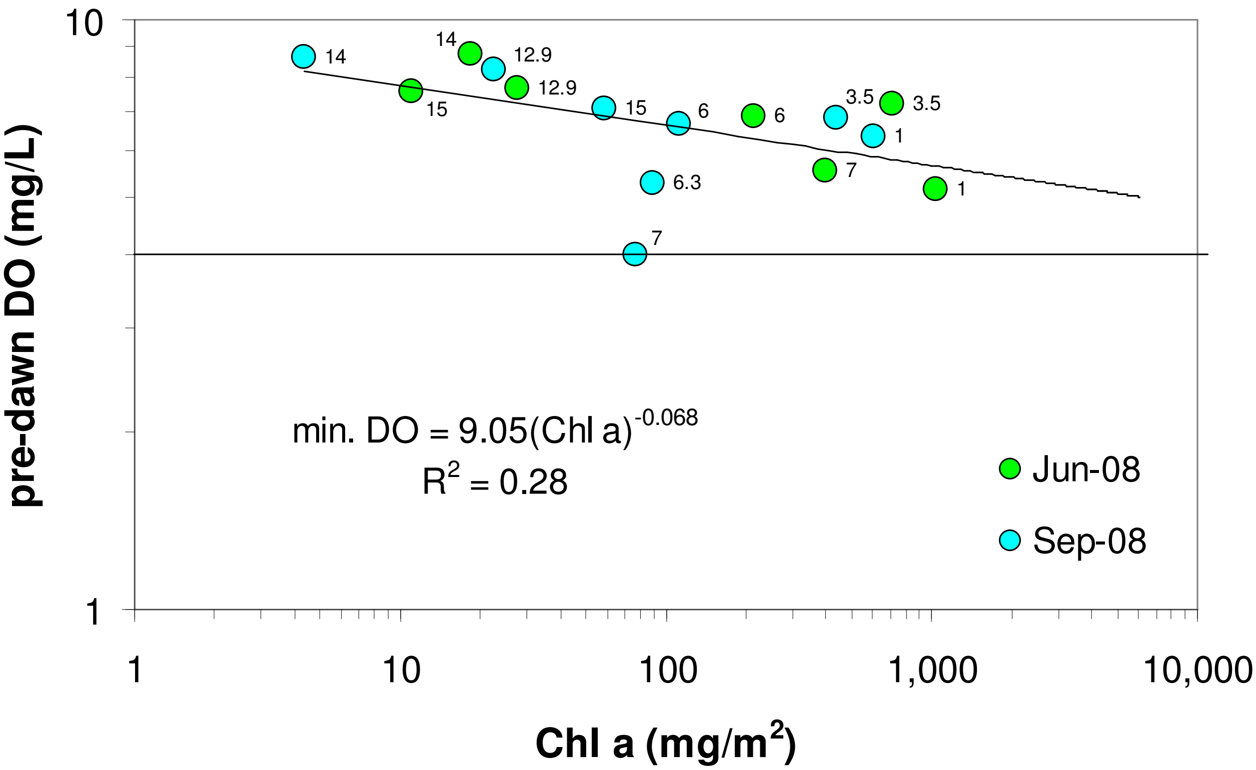
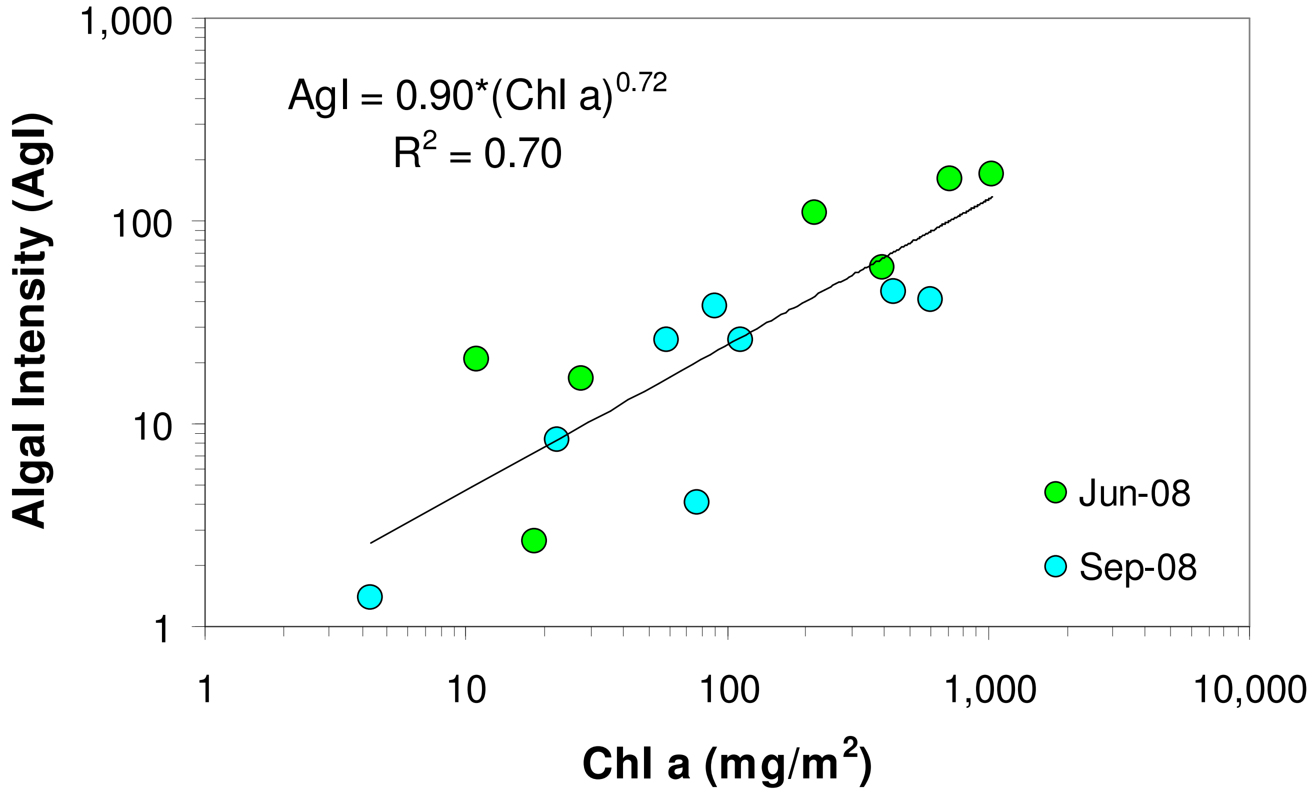


Scott, here you go. Off hand, I'd say it'd be a hard sell. The regression line shows you'd need a Chl a density of 163,000 mg/sq-meter to achieve a minimum DO of 4 mg/L. That sounds a little high even to me; I don't think the Regional Board would go along. I don't know why I'm having so hard a time convincing people that flow, *the quantity of water*, matters. If you have a fixed amount of algae the change in DO over a 24 hour period will vary depending on the amount of flow: more water and algal modifications of dissolved oxygen will have less impact, less water produces a greater impact. Other things matter (as I've discussed elsewhere), but when flow is relatively high and algae in the midst of a significant bloom – like what happened this spring – not so much.

[I'll repeat my main justification. Other processes depress oxygen (e.g. aerobic decay) or increase oxygen (e.g. physical re-aeration). My measure of Algal Intensity ignores all other factors, attributing changes in DO to algae alone, a reasonable assumption only as long as the magnitude of algal productivity dwarfs other processes. As the amount of algae increases, and as flow increases (reducing the relative amount of oxygen gain or loss per unit flow via physical processes), this becomes increasingly true. As algal biomass and/or flow decrease, other factors become increasingly important and the utility of AgI as a measure decreases.]

So let's take this a step or two further. Let's use Chl a to predict, not minimum DO, but "Algal Intensity" (AgI, the product of the diel DO variation and flow).



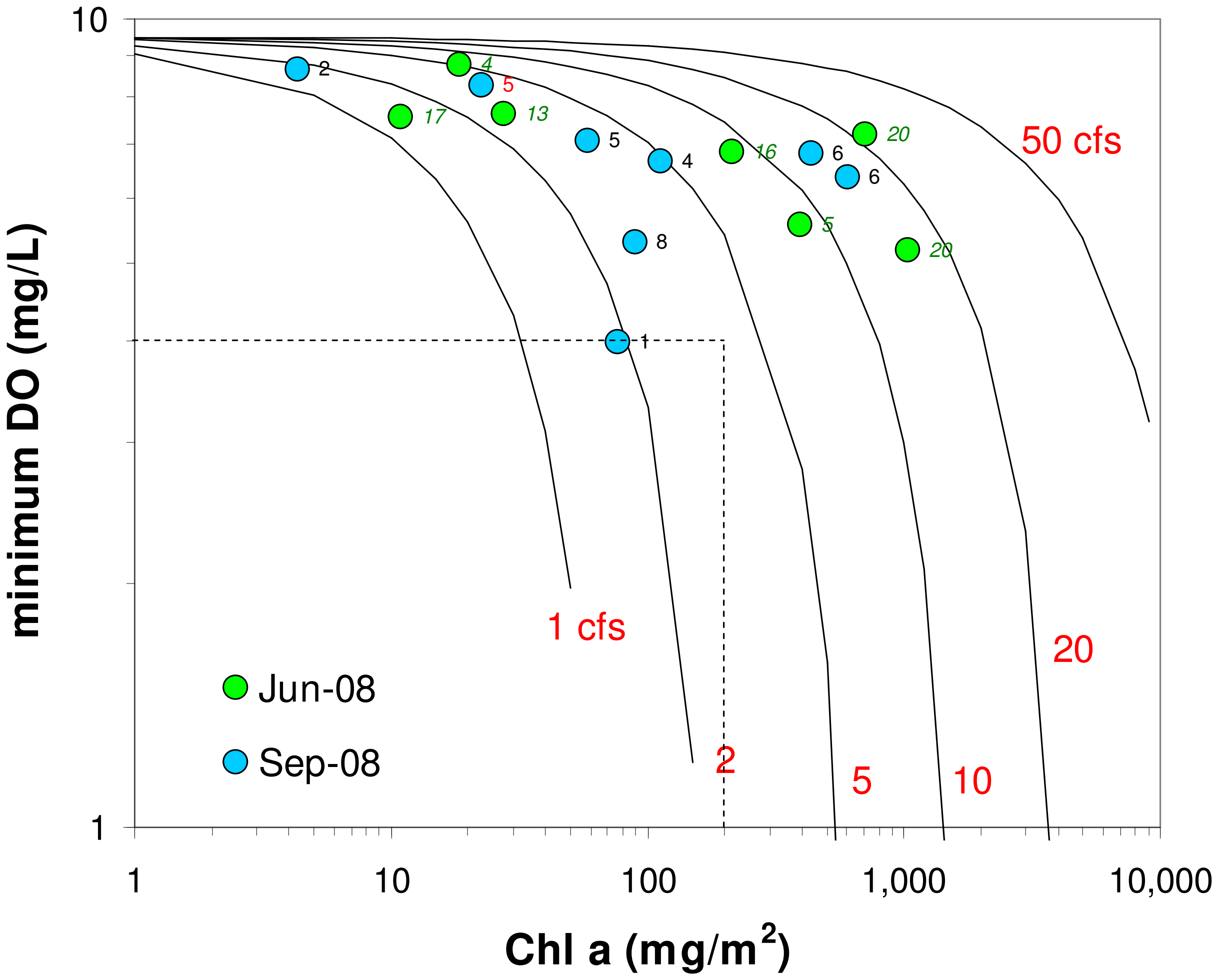
OK. Here's a plot of Algal Intensity against Chl a. I think it's a kinda nice relationship, but I'm probably biased. All we need to do now is deconstruct AgI into its two components: the diel variation and flow, i.e. AgI = delta-DO * flow or expressed another way (maximum DO – minimum DO) * flow. And since we are not interested in maximum DO we can re-write it as: AgI = 2 * (mean DO – minimum DO) * flow. In other words we can assume that the diel variation occurs around some mean value. From the diel measurements made this past dry-season the mean (halfway) concentration was 9.49 ± 0.14 mg/L (± SE of the mean); or if we look at the overall Ventura mean DO concentration (DO is measured around 9:30 to noon, which generally puts us about halfway) we get 9.68 ± 0.08 mg/L. I'm going to simply use 9.5 mg/L. So the relationship between AgI and minimum DO can be written as:

$$\text{minimum DO} = 9.5 - \text{AgI}/(2 * \text{flow})$$

Or substituting the Chl a equation from above for AgI:

$$\text{minimum DO} = 9.5 - (0.45/\text{flow}) * (\text{Chl a})^{0.72}$$

From here I can construct a whole family of curves with which, *given Chl a and flow*, we can estimate minimum dissolved oxygen concentrations. In other words, the ecological impact of algal growth is not solely dependent on algal density (Chl a), *but is dependent on both density and flow*. The beauty of this, of course, is that when AgI is low (i.e. when factors other than algal growth play increasing roles in determining DO depression) the accurate calculation of AgI becomes unimportant – *because DO levels will not be at hazzard*.



Here is the the revised graph. This is exactly the same relationship as shown in the first graph, except that I've added a family of flow curves based on the AgI vs. Chl a relationship from the graph on page 2. I could be used by (1) entering a Chl a density value, (2) moving vertically to intersect the appropriate flow value, and (3) horizontally to determine the estimated minimum DO that will result from an algal density at that flow. The labels for each of the data points now show flow at the time of measurement and not, as before, SBCK site numbers.

In my opinion the fit isn't bad at all, given all the assumptions that had to be made. The one real problem point (flow of 17 cfs) is from the Matilija above the dam. I've shown two dashed lines on the graph, the first indicating 200 mg/sq-meter Chl a (an often-quoted figure for an algal boundary) and the second its intersection with your 4 mg/L DO limit. The interpertation would be that a 200 mg/sq-meter Chl a density would only depress DO below the minimum allowable if flow was under 5 cfs (or perhaps something a little greater if some sort of factor-of-safety was added.