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June 19, 1998

CALFED Bay-Delta Program
1416 Ninth Street, Suite 1155
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Dear Mr. Snow:

This letter is about Lake Shasta water use, ecology, and a question about laws regarding the proposal to raise the height of Shasta Dam.

I am a junior at Cardinal Newman High School in Santa Rosa where I just got the highest honors in Geometry. With the help of my Grandfather (who has a Doctorate of Mathematics from University of Maryland and taught at Stanford and the Naval Academy) and my father (who has a Bachelor of Science in Community Environmentalism from the University of California at Davis) we had a family discussion where I was able to think through whether it is a good idea to build the dam at Lake Shasta any higher.

I am writing about this big concern, and, I am very interested in any of the possible solutions to these problems mentioned. If there are not solutions already proposed for any of the problems I am bringing up, I would be willing to be on any kind of a citizens advisory committee to work on proposals to make sure there are no negative impacts on the total environment. In the meantime I would like you to seriously consider this essay below:

- A Conceptualization of Water Storage in Lake Shasta -
Prior to Mathematical Calculations

My understanding is that the reason to increase the height of the Shasta Dam and to increase the size of Lake Shasta is to allow for more water to be released during the year to aid in water quality in the Bay-Delta region and other uses for agriculture and city needs. (I am emphasizing the Bay-Delta use as it is the most critical in my opinion.) It is also my understanding that Lake Shasta has two years of precipitation run-off stored in it presently. The proposal to increase the dam height would potentially increase the size of Lake Shasta to four years of run-off storage. If these assumptions are approximately correct, I would like to advance this conceptual thinking of Lake Shasta water management.

The basic thoughts in this conceptualization are as follows – It is only sustainable water releases that are valuable to the Bay-Delta and the other uses. The most water that can be let out of Lake Shasta on a sustainable basis is one year of precipitation run-off. If there are multiple years of storage then it is the average year runoff that can be let out. However, it is in reality the next year's precipitation amount that determines the run-off and the rolling average. It is only once the rain and snow-melt is in the reservoir/lake that it can be averaged. This averaged precipitation has a variance from year to year. I want to develop a term regarding this variance amount. The term quantifies the difference or variance amount between one or more years of precipitation and I have given it the name of the "Known Variance Amount" (K.V.A.).

I take it as a given that water releases are only useful if they are sustainable. And given that the greatest sustainable amount of water to be released from the lake is one year of precipitation run-off, it can only be modified by the K.V.A. We need to look at what are the forces acting on the amount of water released.

Here's how I see the two forces that are acting on the absolute amount of water to be released. The two forces are: 1) betting on what the next year's precipitation is going to be, and 2) how much confidence we have on the bet to let out more than the sustainable amount of water (one year's worth of precipitation) to keep saltwater from intruding in the Bay-Delta. Another way to think of this is to say, "Are we willing to bet the unknown on downstream demands?"

Making the dam taller and the lake bigger does nothing that increases the sustainable amount of water that can be released. All it does is makes the betting more comfortable. However, the increased water that is sitting behind the dam is doing nothing to help the problems downstream for any of the uses. So it is only knowing the amount of variance, or the K.V.A. that can possibly increase the amount to be released. Thinking of the Bay-Delta, saltwater intrusion is essentially a constant that is determined by sea level and tidal action. Any variance in the amount of water-release, no matter how spread out the variance is, will not be useful to hold back the tide of saltwater intrusion.

When we consider variance, we can see how sustainability is more important than any other issue. An increased number of stored years of water does not actually decrease real variance, and therefore, it will not actually increase real sustainability. The perceived comfort of the bet "How much precipitation run-off will there be next year?" is not the same as making the outcome of the bet safer. There is no real net gain of water release by making the bet safer or more comfortable.

In fact, the bet and the factors get worse when you start to figure in the evaporation rate of a larger lake surface. Conceptually, the increased evaporation may cancel out any increased amount of potential water

releases due to realizing the K.V.A. If I think of this sequentially, suppose there is an increase to four years of storage: the first year of run-off is subjected to roughly three years of evaporation before release.

If there were any kind of cyclic nature to the annual precipitation, then making the reservoir big enough to accommodate one cycle might make mathematical sense. But even I am old enough to know that there is no such cycle. So I come to the conclusion that there is no safe bet.

- Marginal Benefits Downstream and Environmental Disturbance in the Lake Shasta Area -

If my assumptions are approximately correct, then we can conceptualize that a larger lake lacks true ability to help things downstream because the annual release must approximately equal the annual precipitation run-off if it is to be sustainable (the current two years of storage is adequate for the "bet"). And what we are trying to do downstream will *only* be valuable if it is sustainable.

When we compare the very small increase in water releases by having a larger lake and "safer bet" on the K.V.A., it does not favorably compare to the environmental problems that would be caused in the Shasta area. I have researched the following list and am interested in knowing from you how could we possibly keep the following things from getting much worse?

1. Flooding of scenic rivers in the area.
2. Disturbing habitat of endangered species
3. Endangering habitat of threatened and rare species.
4. Negatively changing the ecology of the wild fishery for the Rainbow Trout.
5. Obliterating archeological sites that are yet to be researched.
6. Disturbing Wintu sacred ground.
7. Disrupting marina operations.
8. Flooding of campgrounds that can't be relocated to steeper ground.
9. Leaching of toxins from mines that would be flooded.
10. Enlarging and thickening the ugly look of the transition zone (bathtub ring) that is at the lake "shore."

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Each one of these environmental considerations is a major issue. The issues being listed in one brief sentence does not give the whole picture of the complexities and impacts that each point represents.

It just seems to me raising the level of Shasta Dam any would not be the right thing to do given the conceptually small amount of increased water releases. I summarize that very little water can be released just because there is a more stable K.V.A., particularly when figuring in the off-set caused by the evaporation and percolation rate. And it is the case that a more stable K.V.A. doesn't always mean more water, the average is the average.

I wouldn't want to create upstream problems because of downstream problems.

When it comes to calculating how much money it would take to keep things as good as they are on the 10 points, it seems that it would be very expensive. The dollars might not add up when considering the upstream problems in view of the very small (if any) increased water releases for downstream.

Although I have not researched the legal issues, I wonder if any of the current laws and conservation and land use management plans would be violated. Could you please let me know what your thinking is on this issue.

So I give you this water management conceptualization for your consideration. I would be more than happy if you could add any points that figure-in to this conceptualization. As a student I am always interested in increasing my observational and thinking skills. I look forward to your answers and input.

Sincerely,

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