STATE WATER RESOURCES CONTROL BOARD

PUBLIC HEARING

CALIFORNIA DEPARTMENT OF FISH AND GAME'S
LOWER YUBA RIVER FISHERIES MANAGEMENT PLAN
AND A COMPLAINT BY
THE UNITED GROUP AGAINST YUBA COUNTY WATER AGENCY
AND OTHER DIVERTERS OF WATER FROM THE LOWER YUBA RIVER
IN YUBA COUNTY

TUESDAY, MAY 2, 2000
PAUL R. BONDERSON BUILDING
SACRAMENTO, CALIFORNIA
9:00 A.M.

REPORTED BY: ESTHER F. WIATRE
CSR NO. 1564

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SACRAMENTO, CALIFORNIA

TUESDAY, MAY 2, 2000, 9:00 A.M.

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HEARING OFFICER BROWN: The hearing will come back to order.

Mr. Minasian, you have 12 minutes.

MR. MINASIAN: Thank you.

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CONTINUED CROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME BY SOUTH YUBA WATER DISTRICT & CORDUA IRRIGATION DISTRICT

BY MR. MINASIAN

MR. MINASIAN: Dr. Rich, would you turn to Page 6 of your typed testimony and look at what you described as the optimal thermal ranges for each lifestage of chinook salmon.

Do you see that you have put down the range of 44 to 54 degrees Fahrenheit for the immigration, which means the incoming adults at spawning, and also the same range of 44 degrees to 54 degrees for the egg or alevin incubation period?

DR. RICH: Yes, I do.

MR. MINASIAN: Is there anywhere in California in regard to the fall-run or the spring-run where the temperature of the water of the salmon immigrating in to spawn is, in fact, the same as the egg alevin incubation

water temperature?

DR. RICH: I don't know.

MR. MINASIAN: Isn't it true that salmon tend to want to spawn during the warmer periods; that is, water is warmer than the period in which they actually lay the eggs and the eggs incubate?

DR. RICH: Not necessarily.

MR. MINASIAN: Isn't it a fact that that is one of the adjustments that salmon have made and adaptation that they have made in their lifestages in California?

DR. RICH: Could you rephrase the question?

MR. MINASIAN: Yes.

That is the alevin or egg stage, the incubation stage, in fact, does require for maximum survivability colder temperatures than the immigration or spawning stage, does it not?

DR. RICH: Not necessarily. We don't know a lot about the natural, actual thermal requirements for the adult. It is assumed by physiologists that it is probably about the same as the egg and alevin stages because the females are carrying the eggs in their bodies at that time.

So I don't think that one could differentiate the two from a physiological standpoint.

MR. MINASIAN: Would you agree that the salmon in California, be it spring or fall-run, have, in fact, adapted

to the temperature conditions in California?

DR. RICH: No, I wouldn't. We have seen a great loss in salmon and trout over the years, and I think, if anything, it shows that they have not adapted for the conditions.

MR. MINASIAN: I am referring to the adaptation to the temperature conditions that we have in California.

DR. RICH: I don't believe they have, no.

MR. MINASIAN: Could I ask when you started to do the work that resulted in this testimony being filed for the Department of Fish and Game?

MR. CUNNINGHAM: Mr. Brown, I am going to object to that. That has nothing to do with the testimony itself or rebuttal presented. I don't think it is relevant in this testimony.

H.O. BROWN: Explain how it does, Mr. Minasian.

MR. MINASIAN: It certainly goes to the relevancy if this testimony was available in the first part of the hearing, the question of why it was not presented. And in addition, it goes to the question of what work efforts were made by the witness to, in fact, present the testimony today. So it is a foundational question to ask what the witness was asked to do for Department of Fish and Game.

H.O. BROWN: Thank you, Mr. Minasian.

Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I am puzzled. Is Mr. Minasian trying to posit that we should have presented all of this in direct testimony? Clearly it is rebuttal and not direct testimony. It was focussed in rebutting certain statements made by witness, other witnesses, in this proceeding, whether or not we had arranged before or after.

MR. MINASIAN: I hate to consume my 12 minutes in this argument. Why don't I withdraw the question.

H.O. BROWN: It is not included in your 12 minutes.

MR. MINASIAN: Thank you, Mr. Brown.

H.O. BROWN: Withdraw the question.

MR. MINASIAN: Ms. Rich, were you asked to look at the actual conditions on the Yuba River?

DR. RICH: It is Dr. Rich.

MR. MINASIAN: I am sorry, Dr. Rich.

DR. RICH: I was asked to review the water temperature requirements for chinook salmon and steelhead, and I was asked to review the testimony that has been provided, the documents that have been provided that would apply to that. And the scope of my work was very, very narrow. The Department of Fish and Game wished me to focus on specifically what the water temperature requirements would be for chinook and steelhead.

MR. MINASIAN: Was that focus to focus solely from your scholastic background and your familiarity with

publications?

DR. RICH: You mean did I go out and do some research on the Yuba River, is that what your question is?

MR. MINASIAN: Right, on the Yuba River itself.

DR. RICH: In terms of fieldwork, no, I did not.

MR. MINASIAN: Do you have a scholastic background in which you have conducted studies in regard to temperature tolerance of various lifestages of chinook salmon in a river or stream?

DR. RICH: Yes, I have.

MR. MINASIAN: Could you point it out to me on the resume?

DR. RICH: The work that we did on the American River addressed a lot of those issues.

MR. MINASIAN: You actually went into the river and looked at the lifestages and temperature conditions in the water column?

DR. RICH: Yes, we did.

MR. MINASIAN: Is that a published report?

DR. RICH: It was part of the hearings back in the American River hearings, and I don't know if anybody -- it is part of the public record.

MR. MINASIAN: So it was testimony, basically?

DR. RICH: Yes.

MR. MINASIAN: Let me understand, when you look at the

lifestages of salmon, chinook salmon, be it spring-run or fall-run, you use the phrase "optimal temperature," do you not?

DR. RICH: That is a phrase I use.

MR. MINASIAN: Are you using it in your testimony here in a physiological sense, that if you could have a perfect temperature for the body of the fish, discarding food, discarding predation, discarding all other aspects, that's the temperature you would recommend?

DR. RICH: You cannot discard predation or food; that is the part of the fish's life.

MR. MINASIAN: I am asking what is the relevancy of your testimony here, if you haven't studied the physiology, the food source, the migration time, the risk of predation or loss in the Sacramento or Feather.

DR. RICH: No one has studied those parameters in relation to what the fish, their thermal requirements are for the Yuba River. And in the absence of data it is common to use information that is relevant. And the relevant information in terms of water temperature requirements are found in a number of publications and documents that have been done in California and other states.

MR. MINASIAN: You have seen the lines drawn by Mr. Nelson on Fish and Game 39, have you not?

DR. RICH: Yes, I have.

MR. MINASIAN: Those lines show an increase in population, whether they are correct or not, under either scenario, don't they?

DR. RICH: Yes, they do.

MR. MINASIAN: Over a period of time. And you know that in the early '50s there was large depredation through large harvest rates of salmon, don't you?

MR. CUNNINGHAM: Objection. Mr. Brown, again, we are way outside the scope of rebuttal. This witness did not testify as to the regression curves of Mr. Nelson. Now she's being asked to evaluate and review it.

MR. MINASIAN: If I can't ask a foundational question to figure what the significance of the physiological optimal testimony is, then I might as well stop, Mr. Chairman. The relevancy is that you have to have a continuum in your questioning in order to understand the significance of Dr. Rich's views.

H.O. BROWN: In treating you as a panel in this case here, so, Mr. Minasian, I am not sure that Dr. Rich is the best person to ask that question to. Since we are treating them as a panel, proceed.

MR. MINASIAN: Thank you.

Dr. Rich, you are aware and familiar with this drawing?

DR. RICH: I saw the drawing for the first time

yesterday.

MR. MINASIAN: Then you really don't have an opinion as to whether the population has been expanding?

DR. RICH: No, I don't.

MR. MINASIAN: Do you know generally what the conditions of the fall-run population are in the Feather River system?

DR. RICH: No.

MR. CUNNINGHAM: Mr. Brown.

MR. MINASIAN: Thank you. Nothing further of the witness.

H.O. BROWN: Thank you, Mr. Minasian.

Mr. Lilly, you are up. Mr. Lilly, how much time do you need?

MR. LILLY: A lot depends on how long the answers are. If it is short answers, obviously we will go quicker. A rough estimate, about one hour.

H.O. BROWN: Try to make them short answers.

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CROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY YUBA COUNTY WATER AGENCY

BY MR. LILLY

MR. LILLY: By way of introduction, Mr. Silva, since you are new here, I want to introduce myself. I am Alan Lilly. I am with the law farm of Bartkiewicz, Kronick &

Shanahan here in Sacramento, and I represent the Yuba County Water Agency. I think everyone else around the room knows that. This is sort of our tenth day here, but I did want to introduce myself. We are very happy to have you here this morning. We appreciate your interest.

Mr. Nelson, I am going to start by asking you some questions. Do you have an overhead of the Exhibit S-DFG-41?

MR. NELSON: Yes, I do.

MR. LILLY: Could you put that up on the projector, please?

And just so we are clear, it says S-YCWA-19 at the top, but this actually is S-DFG-41?

MR. NELSON: That is correct.

MR. LILLY: Let' first talk about the solid line. How did you create that solid diagonal line that goes from the lower left-hand corner to the upper right-hand corner?

MR. NELSON: That is a regression of the 1953 through 1971 population data for the Lower Yuba River taken from YCWA Exhibit 19, I believe.

MR. LILLY: So variables -- first of all, is it a linear regression analysis?

MR. NELSON: Yes.

MR. LILLY: The variables then are the annual adult salmon count in the Yuba River in time?

MR. NELSON: For fall-run, yes.

MR. LILLY: Do the salmon counts even distinguish between fall-run and spring-run, or are they just for chinook salmon?

MR. NELSON: They are primarily for fall-run chinook salmon. There was no estimate for spring-run. If there were carcasses that were encountered at the time the fall-run population survey was being conducted, it would have included those.

MR. LILLY: If there was spring-run carcasses counted, they would be treated as part of the survey?

MR. NELSON: Yes.

MR. LILLY: What is the significance of this linear regression?

MR. NELSON: Basically, I indicated that the pre-1999 -- excuse me, pre-New Bullards Bar population was expanding at a greater rate than has the population of fall-run since New Bullards Bar.

MR. LILLY: Did you calculate any R-squared value for this linear regression?

MR. NELSON: I believe there was, but I don't recall what that was.

MR. LILLY: Let's go forward to the dashed line. How did you create that?

MR. NELSON: That is on the population estimate from 1972 through 1999 out of YCWA Exhibit 19.

MR. LILLY: It is basically the same variables?

MR. NELSON: Yes. I would add that there is one typo on there where it says 1951 through 1970.

MR. LILLY: What should it be?

MR. NELSON: 1953 data.

MR. LILLY: '51 should be '53?

MR. NELSON: Yes, yes.

MR. LILLY: Please try to wait until I finish asking my question or the Court Reporter is going to yell at both of us. Usually yell at me more than you.

Did you calculate an R-squared value for the dashed line of the linear regression that is shown here?

MR. NELSON: Same as I indicated for the pre-New Bullards Bar population. That was, I believe, computed, but I did not report it here.

MR. LILLY: Please correct me if I am wrong. It looks like the slope of that dashed line indicates the trend where the annual adult salmon population in Yuba River are growing at a rate of 500 adult fish per year. Does that look about right to you?

MR. NELSON: I will take your word for it at this point.

MR. LILLY: Does that seem approximately correct?

MR. NELSON: I am sure you've looked at it. I'm sure it's approximately correct.

MR. LILLY: Basically, we can look at the slope of the line and figure out the growth, say, a growth of 5,000 and figure out how many years that took to get the growth per year?

MR. NELSON: That is about right.

MR. NELSON: Do you have any evidence that the construction and operation of New Bullards Bar Reservoir has adversely affected these salmon populations that are indicated in your exhibit?

MR. NELSON: Yes, I do.

MR. LILLY: What is that?

MR. NELSON: There are surveys, salmon surveys, post-New Bullards Bar that indicate turbidity from construction may have influenced populations in the near term after the construction of New Bullards Bar.

MR. LILLY: That would have been a construction-related impact?

MR. NELSON: Yes.

MR. LILLY: Anything else?

MR. NELSON: I don't recall. I believe there was some mention of temperature; temperatures had increased initially, but that may have been during the fill-in period, also.

MR. LILLY: Neither of those would be an effect that would carry over to the present?

MR. NELSON: That is correct. Would you ask your question one more time, please

MR. LILLY: Neither the construction-related turbidity impacts nor the initial temperature impacts have carried over to the present day, have they?

MR. NELSON: I meant your original statement, question. Would you ask that one more time?

MR. LILLY: The original question was: Do you have any evidence that the construction and operation of New Bullards Bar Reservoir had adversely affected the salmon population that are shown in your exhibit?

MR. NELSON: I believe they have affected, yes. I believe there is additional testimony that was here from the standpoint of some dewatering of redds and also some isolation and stranding of juvenile fish.

MR. LILLY: Is that it, the only impact?

MR. NELSON: Yes.

MR. LILLY: Isn't it true that the construction and operation of New Bullards Bar Reservoir has resulted in significantly higher and more stable flows in the Lower Yuba River during the fall and winter egg incubation periods?

MR. NELSON: That is probably generally true. I would have to go back and look at the hydrograph on a daily basis to determine if fluctuations were, but you are probably correct.

MR. LILLY: Going back to your exhibit here, the plot for 1953 through 1971 periods, were there any significant droughts during that period?

MR. NELSON: I don't know. I didn't testify to that.

MR. LILLY: You don't know of any?

MR. NELSON: I didn't testify, and I have no knowledge one way or another.

MR. LILLY: Do you have any knowledge as to whether there were any significant droughts during the 1972 to 1999 period?

MR. NELSON: I know there were drought periods, yes.

MR. LILLY: 1976 to '77 were affected, the two-year drought period?

MR. NELSON: That is always used as the worst, the driest period on record, yes.

MR. LILLY: 1987 through 1992 was also a significant drought period?

MR. NELSON: I believe so.

MR. LILLY: Did the droughts adversely affect the Salmon populations in the Yuba River?

MR. NELSON: They have, yes. That would be an opinion.

MR. LILLY: Is that your opinion?

MR. NELSON: Yes.

MR. LILLY: Dr. Rich, I'm going to shift over to you now. You testified yesterday about condition factors for

fish. Please correct me if I am wrong.

My understanding is your testimony was that the condition factors were previously discussed and were really of no practical use in the field; is that correct?

DR. RICH: Yes, that is generally true unless you have a lot more control over the system than we have in this particular hearing.

MR. LILLY: Are you aware that the 1991 Department of Fish and Game plan for the Lower Yuba River contains a detailed discussion of condition factors from fish sampled from the Yuba River?

DR. RICH: I have not reviewed that.

MR. LILLY: If, in fact, it does contain a discussion, was it a mistake for the Department of Fish and Game to include that discussion in its plan?

DR. RICH: I have no opinion about that. That is their discussion, not mine.

MR. LILLY: Let's go forward to Exhibit S-DFG-38. Do you have overheads of that? That was the outline presentation that you gave yesterday.

DR. RICH: Yes, I do.

MR. LILLY: Could you please ask Mr. Nelson to put up Page 2 of that S-DFG-38 since he is right next to the projector?

Thank you. That is it.

Now the first line of this overhead system is water temperature optimal for salmonids.

What do you mean by the term "optimal" in this exhibit?

DR. RICH: In this exhibit what I mean is that from a physiological standpoint the fish in the first case can convert energy from food into fish flesh most efficiently. The water temperature at which that occurs on the second item, over preferred temperature, where the fish prefers to reside given the choice of all possibilities.

MR. LILLY: I understand those are your conclusions about when temperatures are optimal. I am not asking you that. I am asking what is your definition of the term "optimal."

DR. RICH: Basically those are my definitions.

MR. LILLY: Do you measure -- is there some success rate or something -- I understand that these are your conclusions as to what temperatures will result in optimal conditions for the salmonids. But my question is: What do you mean by optimal?

DR. RICH: Well, I would have to look up Webster's definition of optimal. In terms of salmonids, it is a situation where the food that the animal is eating is converted to energy at a most efficient manner, and as the water temperature goes up, conversion of efficiency goes up

to a certain point, sort of plateaus off and goes back down. Physiologists look at it in terms of the area where the food is converted most efficiently at a particular temperature or temperatures as being the optimal temperature for the fish.

MR. LILLY: I am afraid that this is still a circular reasoning. We have to have a definition of a term before you state a conclusion.

Does optimal -- you told us yesterday that optimal does not mean maximum growth rate; is that correct?

DR. RICH: Only when maximum growth rate is also maximum food conversion or efficiency.

MR. LILLY: Is there some measure of condition of the fish that can determine whether or not the conditions are optimal?

DR. RICH: If you would like a definition, on Page 10 of S-DFG Exhibit 39, Elliot, 1981, Item Number 2 on this page provides actually several definitions for the preferred temperature. On Page 11 of number four there is several definitions for preferred temperature.

MR. LILLY: Again, those are all in terms of the conditions that these authors believe lead to optimal conditions. My point is the word "optimal" implies some variable is maximized, some condition of the fish itself.

DR. RICH: It is. In terms of the food conversion and efficiency is the good food conversion and efficiency is

measured as a percentage that is maximized as a given temperature.

MR. LILLY: Does that mean that that is the maximum -- the conditions that lead to maximum survival of the fish or is that something different?

DR. RICH: That may be something different; that may be the same. That is not what these studies represent.

MR. LILLY: I take it then the term "optimal" also does not necessarily mean the conditions that result in the maximum populations for these fish; is that correct?

DR. RICH: It basically represents not so much what is happening in terms of a lethal situation, but it basically tells a physiologist what is the optimal in terms of the food conversion efficiency. When you start getting at higher water temperatures, food conversion efficiency goes down. That results in stress on the fish that ultimately can lead to reduced survival.

MR. LILLY: But you do not have a direct connection then between your definition of optimal and whether or not that leads to maximization of the populations for these fish in the wild?

DR. RICH: There have been studies that have actually shown that, but I don't have any here right now.

MR. LILLY: That is not a part of your testimony, then?

DR. RICH: Could you rephrase the question?

MR. LILLY: Is your testimony addressing the issue of whether or not your definition of optimal water temperatures would lead to maximization of fish population in the Yuba River?

DR. RICH: Yes, it is. My professional opinion in terms of what we know or what I know about the fish physiology is if the fish have optimal temperatures in the Yuba River that will increase the survival. If they do not have optimal temperatures, then either short-term or long-term survival they will have lower survival.

MR. LILLY: Do you believe optimal is the statement as maximizing survival?

DR. RICH: Yes, I do.

MR. LILLY: Is that survival of these particular fish or survival of the fish through the entire population cycle?

DR. RICH: You mean -- rephrase the question.

MR. LILLY: When you have temperature optimal -- well, let's focus now on juveniles which I belive the next page of your overhead does. When you are talking about the temperatures being optimal conditions for juveniles, does that necessarily mean that those optimal conditions will lead to the highest level of survival for those fish through adulthood and back to spawning as adults in the river?

DR. RICH: No. It is a progression. The most -- the

lifestage which is most sensitive in terms of increased water temperatures is the alevin and then you proceed to fry which is a little more tolerant, but not much. And then you proceed to the smaller juveniles which are a little more tolerant, but not much. When you get to the smolt phase, they are not particularly tolerant simply because this is an extremely stressful time in these animals' lives; they are changing from a freshwater to a saltwater animal.

I think it is difficult for human beings to understand really what that is all about. It would be maybe analogous for us going through a lifestage where we had to suddenly breathe pure helium or pure nitrogen or something else. It is changing the physiology of the animal dramatically, which is a big stress. When you get to the adult stage where the fish is coming back, then you have to account for the fact that the eggs and the adult bodies are sensitive to water temperature and so the water temperature needs to be lower then, too.

MR. LILLY: Focusing on that smolt stage while you are talking about that, for the Yuba River fish, does the smoltification occur as they migrate through down the lower Sacramento River into the Delta and start encountering salinity there?

DR. RICH: The smolt stage for some of the fish begins in the Yuba and proceeds all the way down to the ocean.

MR. LILLY: They're in that stage during that part of the migration?

DR. RICH: Throughout the migration.

MR. LILLY: Just to close the loop on this. Does your testimony address any of the other factors that affect the survival of these juvenile chinook salmon in the Yuba River through their life cycle to adulthood?

DR. RICH: No, it does not.

MR. LILLY: There are, in fact, many other factors including predation and ocean conditions and so forth; is that correct?

DR. RICH: That's correct.

MR. LILLY: Since we have Page 3 of S-DFG-38 up there, I am going to ask you some questions about that. The line in the upper right-hand corner says, "max growth rate 100 percent ration, 64.6 degrees to 69.7 degrees Fahrenheit."

Do you see that line?

DR. RICH: Yes.

MR. LILLY: What reference supports that line, the information depicted on it?

DR. RICH: That was Dr. Brett, et al., 1982.

MR. LILLY: Okay.

I have some overheads here from Brett 1982 I am going to ask you about. For the record these are part of an exhibit, a new exhibit, which I will label as S-YCWA-101.

I have copies here for the parties.

I assume -- I have put on the overhead Figure 3 from Brett, 1982. I assume since you are relying on this document you are familiar with this figure?

DR. RICH: Yes, I am.

MR. LILLY: In fact, does this figure show the relation between growth rates and temperatures that were observed by Brett for one sample of his fish?

DR. RICH: For growth rate, yes.

MR. LILLY: It's the relationship between temperature and growth rate, correct?

DR. RICH: This is true.

MR. LILLY: He actually observed in this laboratory study that the peak growth rates occurred, it looks like, at a point between 20 and 21 degrees centigrade?

DR. RICH: This is true.

MR. LILLY: Can you convert 20 degrees centigrade into Fahrenheit?

DR. RICH: I don't have a calculator with me. No, I can't. I don't have a calculator.

MR. LILLY: Do you know the formula?

DR. RICH: Not off the top of my head.

MR. LILLY: If I told you the that 20 degrees equals 68 degrees Fahrenheit, does that sound right to you?

DR. RICH: Yes.

MR. LILLY: I am not trying to trick you. That is, in fact, the conversion. I am going to put up Figure 4 from Brett 1982.

As I understand it, in his study he had samples or populations or groups of fish from two different rivers.

Is this, in fact, the relationship between growth rate and temperature that he observed for his other sample of fish?

DR. RICH: Yes, it is.

MR. LILLY: It looks like this one he has an arrow showing the peak growth rate at approximately, somewhere between 18 and 19 degrees C?

DR. RICH: This is true.

MR. LILLY: Just so we are clear, the little circles represent the actual data points from his work; is that correct?

DR. RICH: That's correct.

MR. LILLY: If you can go back to Page 3 of Exhibit S-DFG-38, I am going to go down to the next maximum growth rate line which goes from 58.1 to 69.7 degrees Fahrenheit. What was the reference that supported that line?

DR. RICH: That was my work on the American River.

MR. LILLY: Which reference supported the -- dropping down for a minute to the line below the next one which says maximum growth rate and has a temperature range between 55

and 60 degrees.

DR. RICH: Seymour, 1956.

MR. LILLY: I also have some excerpts from your 1982 American River work. I am going to put those up there. I also have copies of those for everybody.

Just so we are clear, this graph, which is Figure 5 from Exhibit S-YCWA-102, shows lots of your observations of growth rates at different temperatures for American -- fish taken from the American River; is that correct?

DR. RICH: That's correct.

MR. LILLY: For yours, the little circles represent your actual data points?

DR. RICH: That's correct.

MR. LILLY: What does the circle at 76 degrees Fahrenheit with a zero growth rate represent?

DR. RICH: Basically, there was no growth.

MR. LILLY: Did they just not grow or did they actually die?

DR. RICH: First, they did not grow and eventually they died.

MR. LILLY: Except for that point at 76 degrees Fahrenheit, is there any substantial difference between the various growth rates that are plotted on this figure?

DR. RICH: Yes, there are.

MR. LILLY: Is it your position there is a trend where

the growth rate actually goes down slightly as temperatures increase in the range plotting?

DR. RICH: Yes. After about 62, somewhere between 61 and 62, according to the graph, the significance or the growth rates declined.

MR. LILLY: You actually don't have any points between 60 and 65 on that plot, do you?

DR. RICH: That's correct.

MR. LILLY: Now, if we can go back to Page 3 of Exhibit S-DFG-38. Did you plot any entry on this page for the maximum growth rate or temperatures at which maximum growth rates were observed by Cech and Myrick during their study?

DR. RICH: No, I did not, because I felt they had not provided any new data based on their results.

MR. LILLY: They did, in fact, observe that the highest growth, the higher growth rates, at 19 degrees centigrade than at the other temperatures they conducted their surveys; is that correct?

DR. RICH: Please rephrase the question.

MR. LILLY: Let me see if I have it. That is probably the easiest.

I have put on the overhead Table 9 which is Page 63 from Exhibit S-DFG-36. I am not making copies because that one has already been circulated to the parties.

Focusing for a minute on the growth rate column, if we look at where it says this study, and it is referring to the Cech and Myrick study; is that correct?

DR. RICH: I presume so; it was from their report.

MR. LILLY: They show growth rate at 3.6 at 15 degrees centigrade and growth rate of 4.38 at 19 degrees centigrade; is that correct?

DR. RICH: This is correct.

MR. LILLY: Again, do you have the conversion for what 19 degrees centigrade is in Fahrenheit?

DR. RICH: Not off the top of my head. Actually I do, 66.2.

MR. LILLY: Thank you.

So is it correct to say that both the Brett study and the Cech and Myrick study observed increasing growth rates as temperatures increased in the range between approximately 60 degrees Fahrenheit and approximately 66 degrees Fahrenheit?

DR. RICH: Yes. May I expand on the answer?

MR. LILLY: We are trying to move on. If Mr. Cunningham thinks expansion is necessary, he can ask it later on.

MR. CUNNINGHAM: Mr. Brown, if I might. To the extent it is relevant at this point in time, I do think it is useful for the Board to hear the testimony at this point in

time other than me try to recreate this at some point in time on redirect.

H.O. BROWN: This is Mr. Lilly's time. It is his opportunity to ask questions the way he wants to. If you feel you can't answer a question without an explanation, you may preface that before you do answer the question and make that a requirement.

MR. LILLY: Let's go on, I am trying to get through a lot of data. I know our time is limited.

From Page 3 of S-DFG-38, what reference supports the maximum food conversion efficiency line that is plotted here between 55 and 61.7 degrees Fahrenheit?

DR. RICH: That is the information on the American River, the study that I did.

MR. LILLY: That was, again, Rich, 1987?

DR. RICH: That's correct.

MR. LILLY: I am going to put up Figure 4 from S-YCWA-102.

Again, are those circles plots of the food conversion efficiency that you observed during your study at different temperatures?

DR. RICH: Yes, they are.

MR. LILLY: Again, I see there is a zero down on the 76 degrees. Does that mean that the fish were not converting any food and eventually were dying?

DR. RICH: At the time that I graphed this, the fish were in a no-growth state. They had not grown.

MR. LILLY: Now, Mr. Nelson, I am sorry to keep flipping back. If you can put up Page 3 again. That is kind of a key page here.

Thank you.

Did you plot any lines on this Page 3 of Exhibit S-DFG-38 for Brett's observation of food conversion of efficiency?

DR. RICH: No, I did not.

MR. LILLY: I have put up Figure 5 from Exhibit S-YCWA-101. This is, in fact, is a plot of food conversion efficiency that Brett observed during his study; is that correct?

DR. RICH: Yes, it is.

MR. LILLY: This figure shows that the food conversion efficiencies do not decline until the water temperatures exceed approximately 20 to 21 degrees centigrade; is that correct?

DR. RICH: No. Actually, it isn't. I had extensive conversations with both Dr. Brett and Dr. Clarke years ago when I was working on the American River. And they had a very difficult time putting together actual quadratic equations for the curves that they ultimately did put into their report. And when I spoke with them about the

difference between the laboratory situation which is what we are looking at here and the field situation --

MR. LILLY: Excuse me, I don't want to interrupt. All I asked you was whether the data plotted here regarding the lab situation shows a decline above 20 degrees centigrade. We will get to the field situation later; right now is just limited to the lab situation.

MR. CUNNINGHAM: Mr. Brown, this witness is responding to the question and trying to expand upon -- if he wants to ask a yes or no, she can give him a yes or no. He asked for a qualitative answer, and she is giving him a qualitative answer. If he doesn't like the answer, that is not a reason to cut her off.

H.O. BROWN: Mr. Lilly.

MR. LILLY: I think it was a yes or no question. I will rephrase it and make it clear; it is a yes or no question.

H.O. BROWN: If there is any doubt, you may want to say that up front.

MR. LILLY: Dr. Rich, yes or no, do these data that are plotted -- I am not talking about the curved lines, I am talking about the actual data points. Do these data that are plotted on Figure 5 show any decline in food conversion efficiencies from the laboratory study done by Brett and his group until the temperatures exceed 20 degrees centigrade?

DR. RICH: Actually, from the actual point it looks like it may be somewhere between 18 or 19 for the Nechako.

MR. LILLY: Basically, the data speaks for themselves as to that specific question?

DR. RICH: Yeah. What you see is what you get up here in terms of the actual data points.

MR. LILLY: Let's go back to Page 3 of Exhibit S-DFG-38.

Did you plot any line on Page 3 of Exhibit S-DFG-38 for Cech and Myrick's observations regarding food conversion efficiencies?

DR. RICH: No, I did not because they were not significantly different.

MR. LILLY: Let's look at Table 9 from Page 63 of the Cech and Myrick report.

MR. CUNNINGHAM: Mr. Brown, may I object? This goes outside the scope of rebuttal in that this witness did not testify about the food conversion efficiencies research done by Cech and Myrick. If they want to put this on or they should have put this on in the direct case, that is fine. They presented Cech and Myrick in the original case as a source and as a support to the statements made in the original testimony.

This witness has testified as to some defects in Cech and Myrick study, but this was not one of the identified

defects. This goes outside the scope of rebuttal.

MR. LILLY: He's wrong. Just flat-out wrong. This witness testified that the Yuba County Water Agency biologist incorrectly relied on the Cech and Myrick report, in particularly on its conclusions regarding temperatures. This witness also has testified that the most important variable, in her opinion, regarding optimal water temperatures is food conversion efficiencies.

So it is entirely within the scope of cross-examination and, of course, very relevant to this hearing that would be looking at the actual numbers instead of just her opinion, but to look at actual numbers from the lab studies to see whether or not they support her opinions. We've got the numbers up here and I want to ask her about those.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, this is not direct testimony. This is rebuttal testimony. I would agree if this witness testified in the original proceeding, we would be able to expand the scope of cross-examination to examine these documents. This witness, however, very carefully and precisely analyzed the Cech and Myrick, and made statements only as to certain elements of the Cech and Myrick study, nothing more. This goes outside the scope of rebuttal. If they want to rehabilitate Cech and Myrick, this is not the time or place.

H.O. BROWN: Overrule the objection.

Answer the question if you can.

DR. RICH: Rephrase the question.

H.O. BROWN: Let me state this again. This will help you and your attorney. If you feel this is not part of your direct and Mr. Nelson has a good answer for that in the way he handled that, just so state it. And then let that be the discussion between you and the attorney.

MR. LILLY: All right. Let's just ask the numbers, and then we don't have to get into a dispute on interpretations. First of all, the growth conversion efficiency, is that the same as your term of food efficiency?

DR. RICH: No, it is not, and both the growth rate and the growth -- I guess, gross conversion efficiency numbers are different than my actual numbers that I had in my study.

MR. LILLY: We'll let that report speak for itself, then. Can you put up Exhibit 3 in S-DFG-38?

What reference supports the preference line that is shown on this page between 53.1 and 55.4 degrees Fahrenheit?

DR. RICH: Hemmings, et al., 1971, I believe.

MR. LILLY: Let's go forward to the gray area and the thermal stress/lethal line that you plotted between 60 degrees and 71 degrees.

What reference supports the drawing of that line between those temperatures?

DR. RICH: DFG, Exhibit S-DFG-31, which is my testimony from the 1997 Delta Wetlands Hearings. In the back there are many pages in the A Appendix which go through a number of pages for chinook juveniles and for fry, and there are references cited there.

MR. LILLY: Can you tell me which specific ones in those references actually support your drawing of the thermal stress lethal line between 60 and 71 degrees?

DR. RICH: If you give me a moment I'll go through this.

We can begin with Page A40, Table 7, again, from this Exhibit 31 from Fish and Game; 50 percent mortality. This is Brett, 1952, at 45.3 degrees Fahrenheit. Actually everything on this page would support water temperatures within that range.

If you go to the next page --

MR. LILLY: That is A41?

DR. RICH: Yes.

You have percentage mortalities between 20 and a hundred percent from Hinze 1959. Temperatures ranging anywhere from about 55 to 62. These aren't stress. These are mortalities. Go to page A42. Eddy, 1971, have mortalities between 33 and 90 percent and 85 and a hundred

percent for temperatures 56.3 and 59.

Holt, et al., 1975. High percentages. Again, everything on this page would support as would all of the references on Page A43, A44, A45 and on Page A46, Coutant, 1973.

Page A47 we are now getting into the tables that have to do with thermal stress, not lethal. Obviously, many of these temperatures within this range are lethal. In addition, we have Donaldson, 1955. Disease incidents at 63, 65, 67 degrees Fahrenheit.

Do you want me to -- this is all, page after page. Do you want me to continue to read these?

MR. LILLY: I want you to just tell me which references specifically support your thermal stress. You don't need to summarize the references. You can tell me which ones, in your opinion, support your thermal stress line on this page.

DR. RICH: I believe I was just beginning to do that, to summarize basically all the references that are in the A Appendix, Pages A40 through A51.

MR. LILLY: And during your testimony that you submitted for this hearing, you have not submitted any of the actual data or protocols from those studies but you are simply stating your opinion based on those studies; is that correct?

DR. RICH: Well, I didn't. But Fish and Game submitted this exhibit as DFG-31, and in it there is a description of these studies. In addition, the testimony that Exhibit DFG-39 -- there is a discussion which -- incidentally, this Exhibit 39 is literally lifted out of Appendix A from DFG-31, which I believe was submitted a long time ago to these hearings; and it is verbatim. It is not new information.

And in this testimony on DFG-31, beginning on Page 4 there is a listing of the different kinds of studies that people have undertaken to figure out the stress, lethal, preference, optimal, different kinds of relationships between trout, salmon and water temperature.

MR. LILLY: Let's go back to the study of all these that I am sure you are the most familiar with. That is your own study which was published in Rich, 1987. I am going to put up Table 2 from your report on that study.

And, again, this is Table 2 from S-YCWA 102. This table summarizes the stress indicators that you observed during the laboratory portion of your study; is that correct?

DR. RICH: Yes, this is true.

MR. LILLY: Your lab study regarding the American River fish did not study fish at any temperature between 60 and 66 degrees; is that correct?

DR. RICH: Well, actually, we did. The 59.5, plus or minus 0.9, covered the 60 degrees.

MR. LILLY: Just barely, right?

Let me rephrase. You did not study any temperature between 61 and 65 degrees? I suppose you will say the 1.4 degree variability goes down there. Anyway, the data points that are listed on this table are, in fact, the temperatures that you studied; is that correct?

DR. RICH: That's correct.

MR. LILLY: Now for the fish that were held at a temperature of 66.2 degrees, your report indicates that you observed disease reduction and appetite growth rate and conversion efficiency; is that correct?

DR. RICH: That's correct.

MR. LILLY: The reductions in growth rate and conversion efficiency are based on the data shown in Figures 4 and 5 that we previously discussed today; is that correct?

DR. RICH: Which figures?

MR. LILLY: Figures 4 or 5 from this same report.

DR. RICH: Yeah.

MR. LILLY: Is that correct?

DR. RICH: That's correct.

MR. LILLY: The disease that you observed in this study was a bacterial infection of the fish's gills?

DR. RICH: That's correct.

MR. LILLY: Could have this disease affected the fish's appetite?

DR. RICH: It probably did.

MR. LILLY: Let's go forward to Page 4 of Exhibit S-DFG-38. I will ask Mr. Nelson if he can put that one up on the overhead.

What reference did you rely on for plotting your thermal optimum points of 58 degrees Fahrenheit?

DR. RICH: This was Seymour, 1956.

MR. LILLY: What reference did you rely on for the thermal optimum point of 53.6 degrees?

DR. RICH: I believe that was Hinze. I don't recall.

MR. LILLY: What reference did you rely upon for the maximum growth rate line that is shown on this figure?

DR. RICH: Banks, et al., 1970, I believe.

MR. LILLY: Finally, what reference did you rely on for the thermal stress lethal line that is shown on this?

DR. RICH: Again, I would refer you to DFG Exhibit 31, Pages A40 through A48.

H.O. BROWN: Mr. Morris, you rise.

MR. MORRIS: I have a procedural issue. I wanted to make sure that DFG-31 was actually an exhibit that we had in evidence. Dr. Rich didn't have the direct testimony. Just for my clarification, I wanted to ask that.

H.O. BROWN: Thank you, Mr. Morris.

Mr. Frink.

MR. FRINK: I don't know that it has been ruled on and admitted. I believe it was offered as an exhibit. It has been.

MR. MONA: It was admitted and accepted with objections.

MR. FRINK: Excuse me, yes.

MR. MORRIS: Thank you.

MR. LILLY: May I proceed?

H.O. BROWN: Proceed.

MR. LILLY: I Want to discuss for a minute the concept of thermal stress. In the laboratory studies do the fish experience the same levels of stress at all temperatures above 60 degrees?

DR. RICH: No, they do not.

MR. LILLY: In fact, in your 1987 report you recognize that there are different levels of temperature stress at different temperatures; is that correct?

DR. RICH: Before I answer yes or no, I need to expand on that with regard to this particular figure.

MR. LILLY: Let's first of all look at this figure. This is Figure 9 from your 1987 report; is that correct?

DR. RICH: Yes.

MR. LILLY: In this figure you show low, medium and high levels of stress and then a lethal point; is that

correct?

DR. RICH: I would like to expand on the answer.

MR. LILLY: I think -- again, I am just asking a yes or no question. This is something you can have your attorney ask you to expand on.

MR. CUNNINGHAM: Mr. Brown, as per your earlier direction, when the witness was confronted with a case where she cannot answer yes or no and she wished to explain why she could not answer yes or no without an expansion, if Mr. Lilly doesn't want her to answer the question, we can move on to another question.

H.O. BROWN: She had it backwards. Qualify it first and then answer. You answered and then asked for a qualification. Do it the other way.

MR. LILLY: I will try again.

Yes or no, does Figure 9 from your 1987 report, which is S -- or parts of which are S-YCWA-102 show low, medium and high levels of stress?

DR. RICH: I would like to explain this graph.

MR. LILLY: I think you will have to wait for Mr. Cunningham to ask you questions on that. I want to move on.

H.O. BROWN: That works.

MR. LILLY: Now I want to ask you some questions about the relationship of the lab studies to the fish that are in

the field. In the lab studies that we have discussed this morning, was each group of fish exposed to a constant temperature during the study period?

DR. RICH: No. Some of them had fluctuating temperatures.

MR. LILLY: Did the Brett 1982 study have fluctuating temperatures?

DR. RICH: No, I don't believe so.

MR. LILLY: Did your 1987 study have fluctuating temperatures?

DR. RICH: I will rephrase that; there was some fluctuation from day-to-day, a couple degrees on either side of the mean.

MR. LILLY: In which, Brett study or yours?

DR. RICH: Both, Brett and my study.

MR. LILLY: Let's split it up. First of all, in the Brett study what was the day fluctuation?

DR. RICH: A half a degree centigrade to a degree centigrade.

MR. LILLY: How about in your study that is reported in your 1987 report, what type of fluctuation did you have?

DR. RICH: It varied, anywhere from about a half degree Fahrenheit up to about 5 degrees Fahrenheit.

MR. LILLY: Can you be specific as to which groups of fish had which variations?

DR. RICH: The 50.2 degrees, 53. -- 50.2 Fahrenheit had a variation of .4, as did the 53.8, 55.4. 53.2 degrees Fahrenheit had a variation of 0.7. The 59.9 degrees Fahrenheit had a variation of 1.8. 62.4 degrees Fahrenheit had a variation of 3.2. And the 64.8 degrees Fahrenheit had a variation of 4.9.

MR. LILLY: And we had Table 2 up there. When they are plus or minus numbers, do they, in fact, show the variations for those particular studies?

DR. RICH: Yes.

MR. LILLY: Mr. Nelson, could you put up Page 8 from S-DFG-38.

And this graph, by showing a minimum and maximum and average temperatures on the Yuba River, shows the or gives you an idea of the range of the daily variations of water temperatures in the Yuba River; is that correct?

DR. RICH: Based on the data that I received from Fish and Game for that particular site. I assume if the data are correct, that that is true.

MR. LILLY: What is the approximate range of the temperature variations on the Yuba River during the summer periods that are depicted here at the Marysville gauge?

DR. RICH: Without having the actual raw data in front of me, I can't read the specifics. This exhibit was simply put up to show if you model mean temperatures, you do not

get variations. If you model daily minimum and maximum, you get the variation in terms of what is happening to the fish.

MR. LILLY: Is it fair to say that the variations that are indicated here during the summer periods of, looks like, 1998 and 1999 are the order of 15 degrees Fahrenheit?

DR. RICH: It varies.

MR. LILLY: Do any of the references that you have described for your lab studies describe studies where fish were exposed to diurnal variations in the order of 15 degrees Fahrenheit per day?

DR. RICH: Not for chinook salmon. For the steelhead there have been some.

MR. LILLY: This Page 8 from S-DFG-38 also shows significant seasonal variations in the water temperatures in the Yuba River; is that correct?

DR. RICH: That's correct.

MR. LILLY: In fact, isn't it fair to say that the average temperatures between summer and winter vary by approximately 20 degrees Fahrenheit?

DR. RICH: You obviously have spent more time figuring out the exact number ranges than I have. I will take your word for it.

MR. LILLY: I am not trying to be fancy here. But it looks like the average summer temperatures on the order of

60 and the winter temperatures on the order of 40. I am just simply taking 60 minus 40 to get 20.

Do you have any question as to whether or not that is a reasonable estimate?

DR. RICH. I do not, no.

MR. LILLY: Do you have -- do any of your references describe lab studies where the fish were exposed to seasonal variations in the order of 20 degrees Fahrenheit?

DR. RICH: I believe some of the steelhead do. I don't know about the chinook.

MR. LILLY: You have also discussed during your testimony the importance of ration in determining optimum temperature?

DR. RICH: Yes.

MR. LILLY: Is ration basically -- why don't you tell us what ration means so we are all clear of the concept.

DR. RICH: Ration is what the fish, in this particular case, what the fish is eating. And normally we start with a hundred percent ration sort of as a benchmark. A hundred percent is basically the fish just eating at libido as much as they can. Then you go down from there 80 percent ration; 80 percent of maximal ration. If it is 50 percent, it is 50 percent of what they would eat if they could eat a hundred percent.

MR. LILLY: Do you have any information regarding the

rations of the chinook salmon of the steelhead in the Yuba River?

DR. RICH: I don't believe anyone does. I do not.

MR. LILLY: Do you have any information regarding the relationship between water temperatures in the production of food for salmon and steelhead in the Yuba River?

DR. RICH: No, I do not.

MR. LILLY: Do you have any evidence indicated that salmon in the Yuba River have severed from any diseases?

MR. CUNNINGHAM: Mr. Brown, I am going to object. This is far outside the scope of rebuttal.

H.O. BROWN: Mr. Lilly.

MR. LILLY: Well, this witness has offered this testimony, I believe, to support the Department of Fish and Game's temperature recommendations which were offered for the Yuba River. And I think it is entirely appropriate for us to ask on cross-examination questions that demonstrate the scope of her testimony and whether or not it supports those recommendations.

If they want to stipulate that all she did was base her opinions based on lab studies and there is no connection between those and the field information of temperatures in the Yuba River, I will stop these questions. But if they are going to rely on this testimony to support their temperature recommendations, I am entitled to ask questions

about this.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, Dr. Rich's testimony was rebuttal testimony, not provided in support of the Department's direct position. Specifically, this Board's rules prohibit such an attempt to expand our direct testimony on rebuttal. It is rebuttal testimony; it is not part of our case in chief. It is not in direct support of the Department's conclusion. It is, however, direct rebuttal to statements made by Mr. Lilly's own witnesses. There was no rebuttal provided on the subject Mr. Lilly is wishing to ask.

H.O. BROWN: Mr. Frink.

MR. FRINK: I believe Dr. Rich has defined the scope of her testimony on rebuttal repeatedly. It was a relatively narrow scope. She answered a question from Mr. Minasian before that she didn't look at food supply factors on the Yuba River. I don't think there is anything indicating that she looked at disease of fish on the Yuba River.

I think the questions here are well beyond the scope of rebuttal.

H.O. BROWN: I concur, Mr. Lilly.

MR. LILLY: Fine. We will proceed. We will not ask further questions on this, but it is our understanding then the limitations that I have described on the use of Dr.

Rich's testimony to support DFG's recommendations will also apply.

H.O. BROWN: You made your position very clear.

MR. FRINK: Mr. Brown, I do have another concern and maybe now is the time to voice it. Maybe I should have voiced it much earlier.

H.O. BROWN: Go ahead.

MR. FRINK: The focus of this hearing is stated in the hearing notice, and as we discussed repeatedly in the earlier days of the hearing, was to be on relevant new information that became available since the close of the last hearing. We are now in the rebuttal portion of the supplement hearing, and we find ourselves in extended discussion of evidence on temperature preferences and requirements of fish that are based on many studies. Most of those studies were completed many years ago. I don't believe that a good bit of what we have been hearing is within the scope of the hearing notice in terms of being relevant, new information.

I have another concern. We noticed the exhibit numbers on Yuba County Water Agency's exhibits. Mr. Lilly identified this morning as beginning with 101 or something. They left off, I believe, with exhibits in the 30s. I don't know that the cross-examination is within the scope of the hearing notice, being relevant, new information. I am

concerned that we may be here for days if we get into discussions of dozens of studies that were completed over the last three decades.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: Board Member Brown, I believe various parties have filed objections, either in the written form -- I know South Yuba, Brophy and Cordua did, and I believe other parties did -- that the scope of the notice was impractical. If we are not to refer to anything that is known from the date before the final minute of the '92 hearings, nothing has context in this regard.

So, I understand Mr. Frink's desire to get done with this. But I think it points out a defect in the way this proceeding has been noticed and handled in its first instance. I won't repeat our objection.

H.O. BROWN: Thank you, Mr. Minasian.

Mr. Lilly, you have a parting comment.

MR. LILLY: First of all, Mr. Frink's concern about the exhibit numbers, I can set him to rest on that. I started with 101 because we haven't numbered our other exhibits. We haven't numbered all of them. I just didn't want there to be an overlap. We don't have exhibits all the way up to 99 or to 100. He can relax on that.

I figured it was better to have a record with a clear number rather than to have them all in order.

However, I think Mr. Frink raises a much more serious issue that I do want to address. And that is when Fish and Game brings in a new witness, who has not testified before, and starts stating her professional opinions about optimal temperatures, the only really effective way we have to cross-examine a witness like this is to go back and look at the data that was derived from the studies upon which her opinions are based. And yes, it is laborious. If they had come in and offered these opinions with, frankly, just a kind of general statement that it is wholly supported by the literature, we have to or we should properly be given the right to test whether or not that statement, in fact, is supported by the real data in the studies.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Cunningham.

MR. CUNNINGHAM: I am not sure I have any comments, Mr. Brown. I do think -- I would agree with Mr. Lilly to his probable surprise. To the extent this witness is offering an opinion, an expert opinion, which we would hold as clearly is in rebuttal to earlier testimony, he's entitled to explore the basis for her opinion to determine whether it should be given any credence or not.

I would apologize to Mr. Frink to the extent this does, by its nature, does expand the concept of the hearing. But experts' opinions cannot themselves be based on new

information since 1992. This expert's opinion is based on over 25 years of expertise in the field and studies that go back well into the '50s.

H.O. BROWN: This is a close call. Mr. Lilly's argument and Mr. Minasian's argument are both persuasive. Dr. Rich has quite a bit to contribute to this hearing, Mr. Nelson. And to that extent I am going to allow the cross-examination to proceed.

I am going to limit your time. Mr. Lilly, you asked for an hour. You're not quite at an hour. We will take an early morning break. How much more time do you need to complete?

MR. LILLY: Well, I'm sorry, I can't -- I know we have tried to get witnesses to give straight answers. I have to qualify this one. Exhibit S-DFG-39, which was the testimony of Alice Rich has -- Ms. Rich testified this morning that this is, in fact, verbatim from Exhibit S-DFG-31. It is our position that this exhibit is not proper rebuttal. This contains a general discussion of the theory of temperature requirements. It does not contain any specific references to any prior testimony or is it intended to rebut any prior testimony. But instead just a general description of optimal temperatures, methodology from lab studies and so forth.

Therefore, we are going to object to this exhibit being

admitted into evidence. And if, in fact, our objection is sustained, then I don't want to spend a lot of time asking questions about it. If our objection is going to be overruled, then I do have a line of questions regarding this exhibit that will take some additional time.

It might be good -- I was going to ask about my next step, anyway. If we can get a ruling on that, that will affect how much more questions I have.

H.O. BROWN: I will not rule on that. Let's make the assumption that it will be admitted. So give me a time on that basis.

MR. LILLY: Then I need about another 15 minutes.

H.O. BROWN: We will take our break. After the break you will have a full 15 minutes, not including interruptions by myself or others to conclude your examination. On that basis I am going to allow this type of questions to proceed. You are contributing to the hearing record and it is helping us. So from that standpoint, we will take our morning break now.

(Break taken.)

H.O. BROWN: Back in session.

Mr. Lilly, you have 15 minutes.

MR. LILLY: I would like to go back to Figure 9 of S-YCWA-102, and we will put that up on the overhead.

Now my question is, in your opinion -- I am going to

ask some questions about the temperature stress range which appears to go from 60 to 68 degrees Fahrenheit.

My first question is: Is one of the indicators of low stress in this temperature range the fact that you observed that growth rates of the fish were declining slightly in this temperature range? And for that question I am going to refer to Figure 5 from this exhibit.

DR. RICH: I would like to reiterate what I said before. I would like to describe this figure. I can't provide a yes or no answer.

MR. LILLY: Can you say yes or no, whether one of the factors indicating that the onset of temperature stress was your observation of lower growth rates?

DR. RICH: No, I cannot answer that yes or no.

MR. LILLY: Can you answer yes or no whether or not one of the factors that you observed showing low temperature stress in this zone was that food conversion efficiency was going down?

DR. RICH: No, I cannot answer that yes or no.

MR. LILLY: Can you answer that one of the factors that you observed in temperatures in this range that was a sign of stress was that disease was increasing?

DR. RICH: No, I cannot answer that yes or no.

MR. LILLY: Are you saying that you cannot give an objective list of the factors that you observed that were

indicators of temperature stress in this temperature range?

DR. RICH: I would need further explanation to provide that.

MR. LILLY: Can you without -- again, if Mr. Cunningham thinks it is necessary, he can ask you detailed questions. But I would just ask you to just give me a list, a specific list of the factors that you observed in the fish that indicated that they were suffering from low temperature stress in the range of 60 to 68 degrees.

DR. RICH: I cannot provide that without a full explanation of the graph.

MR. LILLY: Aside from the graph, let's just go forward, what are the indicators of temperature stress?

DR. RICH: There are many. People have reported many different indicators. Disease is one.

MR. LILLY: What is another one?

DR. RICH: Death, reduced growth rate, reduce food conversion efficiency. There are behavioral indications of thermal stress. Avoidance is one.

MR. LILLY: Any other factors that you can think of as indicators?

DR. RICH: Not off the top of my head right now.

MR. LILLY: Let's go forward to Exhibit S-DFG 39. And we don't have an overhead for this, so you can turn off the projector.

Can you turn to Page 6 of that exhibit. Do you have Page 6?

DR. RICH: Yes.

MR. LILLY: You have optimal thermal range listed on this page for chinook salmon immigration and spawning.

Do you see that?

DR. RICH: Yes.

MR. LILLY: What reference or references specifically support this range that is listed here on your testimony?

DR. RICH: The information that is listed in Table A of DFG-31.

MR. LILLY: Can you tell me which specific references or which specific pages?

DR. RICH: Pages A28 to A52.

MR. LILLY: For egg incubation, what are the references that specifically support those temperatures?

DR. RICH: The same.

MR. LILLY: How about for fry rearing?

DR. RICH: Actually, I would like to -- may I explain these tables?

MR. LILLY: My question is: What published references support your optimal thermal ranges that are listed for fry rearing?

DR. RICH: I would like to describe the tables so you understand where the references are.

MR. LILLY: Will you just tell us which references support this statement?

DR. RICH: We can go back to immigration and spawning, the references are listed on A28, A29, A30 for alevin and incubation. The references are the same as those plus A31, A32, A33, A34 through A39 for fry rearing. Pages A40 to Pages A50 for juvenile rearing to A45 for A50 for smoltification and immigration, to A50 to A52.

MR. LILLY: Which cite or reference specifically supports your references for thermal stress for migrating chinook?

DR. RICH: For each of the respective lifestages, the page numbers that I just gave you provide the references for that.

MR. LILLY: Let's go forward to Page 7 of S-DFG 39.

Please tell us what specific or what references specifically support your statement regarding optimal thermal ranges for immigration and spawning?

DR. RICH: On Pages 6 and 7, in parenthesis there is a listing of references beginning with Coutant, 1970, and on Page 7 ending with Zaugg and Wagner, 1973. And I obviously do not recall which corresponds to which on these. But these references correspond to all the lifestages in terms of the thermal stress, thermal tolerance and optimal.

MR. LILLY: You can't say which references apply to

which of the lifestages as we sit here today?

DR. RICH: Actually, I know Zaugg and et al., 1972, has to do with smoltification criteria. They found that the fish stop going through part smolt transformation at temperatures around 56, having to do with ATP, which is the enzyme that has to do with smoltification.

MR. LILLY: Beyond that you don't --

DR. RICH: I don't recall.

MR. LILLY: If I may have just a moment to confer with my team, please, take about a three-minute recess.

H.O. BROWN: Off the record for a moment.

(Break taken.)

MR. LILLY: If we can go back on the record, I don't have any further questions.

H.O. BROWN: Thank you, Mr. Lilly.

MR. LILLY: I do appreciate these witnesses' time and also Mr. Nelson's diligent work flipping the overhead exhibits on the projector.

MR. CUNNINGHAM: No bill yet.

H.O. BROWN: Mr. Bezerra.

MR. BEZERRA: We have no cross-examination.

H.O. BROWN: Mr. Morris.

MR. MORRIS: No cross-examination.

H.O. BROWN: Mr. Beuttler.

MR. BUETTLER: We have no cross-examination.

H.O. BROWN: Mr. Beuttler is filling in for the California Sportfishing Protection Alliance. Mr. Baiocchi is under the weather.

Would you please give him our regards. Let him know that he is being missed.

MR. BUETTLER: I will do that.

H.O. BROWN: Staff.

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CROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY STAFF

MR. FRINK: I do have just one question, Dr. Lilly.

Excuse me, I have one, Dr. Rich.

There is so much expertise going on that I get confused.

In response to a question from Mr. Minasian you responded that chinook salmon have not adopted to the temperature conditions is exist in California. Could you expand or clarify that?

DR. RICH: Certainly. I have seen various studies and I was born and raised in California, and I have observed over the years and looking at the literature and whatnot that you do know that temperature does have an affect on salmonids. That is pretty well established.

Since water temperature is probably the key factor that affects salmonids in particular because they are cold

blooded and, therefore, any temperature they are exposed to they react to immediately. So the fact that we've got a decline in populations, there is no question there is a decline in populations because of dams and because of fishing and all these other factors.

Temperature is definitely one of these factors, too. There is no way it could not be just simply because the fish exposed to the temperatures that are not good temperatures will be stressed and ultimately will die or they won't be able to get away from the predator or whatever.

MR. FRINK: In stating that they haven't adopted to the temperature conditions that exist in California, were you referring to the altered conditions or natural conditions?

DR. RICH: I was referring to the altered conditions.

MR. FRINK: I guess that is all staff's questions.

Thank you.

H.O. BROWN: Thank you, Mr. Frink.

Mr. Cunningham, do you have any redirect of the rebuttal?

MR. CUNNINGHAM: I think just one, please.

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REDIRECT EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY MR. CUNNINGHAM

MR. CUNNINGHAM: Dr. Rich, in a question and answer

discussion with Mr. Lilly about the, I believe, 1982 Brett study, you were addressing some concerns you had with the curves that were being shown on the overhead, curves that were contained within that study. You indicated that you had a conversation, I believe, with Dr. Brett in preparation of or in examination of that study.

Could you expand on what your statements were about your conversations with Dr. Brett?

DR. RICH: It was actually Dr. Clarke, not Dr. Brett. I tried to get ahold of Dr. Brett, but he wasn't around. Dr. Clarke told me over the phone -- this was many years ago. But he told me on this particular study, the 1982 study, that --

H.O. BROWN: Mr. Minasian, start with you.

MR. MINASIAN: How about Mr. Morris.

H.O. BROWN: Mr. Morris.

MR. MORRIS: I was just going to object to the answer. It clearly is hearsay evidence. We don't have a -- who the witness is before us. We have no way to cross-examine or determine the veracity. I would object to this answer based on hearsay.

H.O. BROWN: Thank you, Mr. Morris.

MR. MINASIAN: I join in that objection and add to it that there is absolutely no way to be sure that Dr. Rich's recollection of a conversation some time ago could in any

way properly characterize any qualifications to a written report that was peer reviewed and used by fish scientists for in excess of 30 years.

H.O. BROWN: Mr. Lilly.

MR. LILLY: I join in that objection, and also want to make it clear that I only asked questions regarding lab studies. To the extent the questions get into the issue of modeling of temperatures in the field, they are clearly beyond the scope of my questioning. And I am afraid that is where we are headed.

H.O. BROWN: Mr. Cunningham, are you sure you want to go in this direction?

MR. CUNNINGHAM: I only asked one question. Hearsay is clearly admissible in this proceeding. That objection is not well taken.

Dr. Rich did have a conversation with Dr. Clarke. It was in part relevant to the curve that was shown, not to anybody else's curve, not to any pieces of that report as prepared.

H.O. BROWN: Ask the question again. Let's hear it again.

MR. CUNNINGHAM: I will try it again.

Dr. Rich, my understanding you did have a conversation with Dr. Clarke and problems he had in preparing the curves that were shown to us as overhead exhibits by Mr. Lilly.

Could you expand upon the concerns Dr. Clarke expressed to you?

H.O. BROWN: Wait. Mr. Frink.

MR. SANDERS: Mr. Brown.

H.O. BROWN: Mr. Sanders.

MR. SANDERS: As you know, I have tended to keep my mouth shut in the past few days. I just have to jump --

H.O. BROWN: There are points for that, Mr. Sanders.

MR. SANDERS: I was assuming that was the case. I will be very brief now. I recall this conversation -- this question and answer goes something like Dr. Rich offered an explanation of these graphs and Mr. Lilly cutting her off and saying, "If your attorney wants to cross-examine you about these graphs, that is his right."

So, I think it is inappropriate for Mr. Lilly to object now that he has -- this is his chance to cross-examine her on what these graphs stand for, on her interpretation of them. So I believe she should be allowed.

H.O. BROWN: Thank you.

Mr. Lilly.

MR. LILLY: The whole point of moving this to Mr. Cunningham's questioning is so that I and other people will have an opportunity to object. And by saying it will be deferred later, I wasn't saying that I was waiving all rights of objections. So Mr. Sanders is incorrect.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Frink, how about some counsel here.

MR. FRINK: Well, hearsay is admissible under the Board's rules. Insofar as Dr. Rich believes that a conversation she had with another expert in the field or her recollection of the conversation would explain the graphs, I think the information would be helpful.

I share the concern of Mr. Minasian. I wouldn't want to interpret the information as being accurate recorded reflection of what this expert stated at the time. To the extent it explains the reason that Dr. Rich drew the graphs as she did, I think it is relevant and should be admitted.

H.O. BROWN: I agree with Mr. Frink. It will be noted as hearsay, and hearsay is admissible.

MR. LILLY: Mr. Brown, if we can get clarification. Is the questions are limited to clarification of these graphs and don't go beyond that. As I said before, these graphs concern lab studies, and that's what I was asking my questions about. And to get into whether or not models of effects of temperatures in the field is clearly beyond the scope of my questioning.

H.O. BROWN: Mr. Cunningham, is that what you intended?

MR. CUNNINGHAM: Mr. Brown, that is the only question I had, was the graphs that were shown.

H.O. BROWN: All right. Then I will allow the answer to the question and, of course, on the basis of hearsay since the gentleman is not here.

DR. RICH: Dr. Clarke told me that the actual lines that are drawn on this curves as well as the other ones in the report were very difficult to fit in terms of a mathematical equation, even though quadratic equations. He said that it was more just for illustration of a trend rather than a specific cause and effect type relationship.

H.O. BROWN: Is that it?

MR. CUNNINGHAM: That is all the questions I have.

H.O. BROWN: Thank you, Mr. Cunningham.

Redirect of the rebuttal -- recross of the redirect.

MR. LILLY: May I go?

H.O. BROWN: Anyone else wish to?

Mr. Lilly, you are first.

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RECROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME

BY YUBA COUNTY WATER AGENCY

BY MR. LILLY

MR. LILLY: One follow-up question just to clarify that clarification from Mr. Clarke concerned the curve and not the data points; is that correct?

DR. RICH: Dr. Clarke, yes, it was the data points.

MR. LILLY: Was it the curve or data points he was

clarifying?

DR. RICH: He was clarifying the relationship between the curve and the data points.

MR. LILLY: He was not saying that the data points were inaccurate, was he?

DR. RICH: No, he was not.

MR. LILLY: No further questions.

H.O. BROWN: Mr. Minasian.

RECROSS-EXAMINATION OF DEPARTMENT OF FISH AND GAME BY SOUTH YUBA WATER DISTRICT & CORDUA IRRIGATION DISTRICT

BY MR. MINASIAN

MR. MINASIAN: When did this conversation occur?

DR. RICH: I don't recall.

MR. MINASIAN: Could it have been before your 1987 studies on the American River?

DR. RICH: It was during that time.

MR. MINASIAN: So that would be approximately 17 years ago?

DR. RICH: Actually it happened then, but it happened fairly recently. I had another discussion with him about a year and a half ago on the same report, and asked if he had any updates in terms of this sort of information. So we basically have discussed it twice. The most recent was about a year, a year and a half ago.

MR. MINASIAN: As a result of those conversations you,

of course, applied the same mathematical formulas to see how the line might have been drawn in the same way, didn't you?

DR. RICH: No, I didn't. It was a completely different quadratic equation.

MR. MINASIAN: Are you offering an opinion that the method utilized by Dr. Clarke or Dr. Brett was wrong? Or what was the results of your conversation?

MR. CUNNINGHAM: Mr. Brown, if I might. This -- again. I asked one question of the witness that had a very simple answer. This goes far beyond the scope of what I asked him in cross again. All she enumerated was a very brief conversation on a very simple element. She has not testified about anything else.

MR. MINASIAN: Dr. Clarke --

H.O. BROWN: Wait a minute. You have a question, you respond to me.

MR. MINASIAN: Let's find out what Dr. Clarke said and the implications, the weight of it, the relevance to this proceeding. He's opened the subject. Let's find out what the relevance and the weight is.

H.O. BROWN: I disagree with that. I sustain the objection.

MR. MINASIAN: Nothing further.

H.O. BROWN: Anyone else?

I guess that completes your -- do you have any more

exhibits that we have not included?

MR. CUNNINGHAM: Mr. Brown, at this point in time I would like to ask for acceptance into the record of five exhibits identified by the Department as S-DFG-38, 39, 40, 41 and 42. I know there will be some debate about some of these exhibits. I would also at this time ask something else and then he will go back to the debate about the exhibits. I would like to ask for official notice, which I believe I can do at any time, and this Board can take it any time, of the 1992 through the year 2000 sport and commercial salmonid fish regulations, both state and federal. We can make copies of those available if the Board does not otherwise have those in the records.

H.O. BROWN: The fishing regulation?

MR. CUNNINGHAM: These are both, yes, commercial and sport salmonid fishing regulations.

H.O. BROWN: All right. We will give that a number.

MR. CUNNINGHAM: We can call it S-DFG-43. We do not have them available at the present. We are trying to collect those for the Board staff if that is appropriate.

H.O. BROWN: I have one in the car for what it is worth.

Mr. Lilly.

MR. LILLY: I don't anticipate any problem with 43, but I suggest we wait until we have copies. We can handle it at

that time.

H.O. BROWN: Okay.

MR. CUNNINGHAM: Okay.

H.O. BROWN: Let's go with 38 through 42, are there any objection to the admission of those into evidence?

Mr. Lilly.

MR. LILLY: Yes, Mr. Brown. I object to Exhibit S-DFG-38, Pages 3 and 4, on the grounds of lack of foundation, particularly in this rebuttal stage. It's not appropriate for us to just be handed these exhibits which, according to the witness, are based on numerous studies when we don't have any citation to the studies. And, frankly, this is information that clearly could have been offered as part of their direct case. Then we would have had a chance to check the references to determine whether they really support the conclusions.

At this point in the process, we have some limited opportunity to do that. And we have been researching very diligently on that. It's really not appropriate. And these exhibits don't even have the references listed on them. We have to get that information through cross-examination.

I object to those two pages on the grounds it goes beyond the scope of proper rebuttal and lack of foundation.

I previously stated my objections to Exhibit S-DFG-39. I won't repeat those unless you request I do so.

H.O. BROWN: Yes, will you please?

MR. LILLY: First of all, the witness testified that this was almost verbatim, I think were her words, from S-DFG-31. So I do not see how they can argue that this is rebuttal when it was a prior exhibit that was submitted, and, therefore, clearly they contemplated it was within the scope of their original case.

Furthermore, there is nothing in here that is rebuttal. This is general theory and opinion regarding water temperatures and fish. This is not directed to any specific testimony or evidence that was offered by any other party. And, of course, we do have the same problem that it is accompanied by 20 citations here which we have not had a chance to look at before.

H.O. BROWN: Is that it?

MR. LILLY: That is it.

H.O. BROWN: Are there any other objections?

MR. MINASIAN: South Yuba, Brophy, Cordua join in the objections as stated by Mr. Lilly.

H.O. BROWN: Thank you, Mr. Minasian.

Let's go with Exhibits 41, 42, 43. There being no objections with those exhibits, they are admitted into evidence.

Let's take 38, talk about it.

Mr. Cunningham, lack of foundation, Pages 3 and 4.

MR. CUNNINGHAM: Yes, Mr. Brown, a rather interesting objection. Especially since Mr. Lilly then spent, by my watch, almost 30 minutes laying out every exhibit or every paper, every report, every document, that Dr. Rich relied upon to make these determinations and to prepare this graph.

I would suggest that at no time has this Board ever required any expert to provide more foundation than that for the display of expertise contained herein. We are not required to provide every one of the background exhibits, essays, reports or documents that Dr. Rich relied upon. We were never required to do that in this proceeding.

To the extent they have had less than adequate time to review this, I'm sorry, that is the nature of rebuttal, that we came prepared with actual written documents as part of our rebuttal. I am sure Mr. Lilly and others will have similar documents or exhibits. It is unfortunate if they feel they did not get a chance to adequately review those. But that has been the problem at all these proceedings. We can use years of time.

I would argue that the foundation is clearly established. This is an exercise of expertise from Dr. Rich, and we have lengthy testimony as to the documents and reports she relied on to make these conclusions.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Lilly, do you have a response?

MR. LILLY: I have nothing further. I believe I have made my point. I disagree with Mr. Cunningham.

H.O. BROWN: Mr. Minasian, anything further?

MR. MINASIAN: No, thank you.

H.O. BROWN: All right.

Mr. Cunningham, your argument is the most persuasive on this. Ample time is provided to really explore those exhibits, and Dr. Rich and Mr. Nelson have provided ample time reviewing those.

I am going to admit Exhibit 38 into evidence.

Let's talk about 39. What is your comment on 39, it is more direct than rebuttal?

MR. CUNNINGHAM: Mr. Brown, I think it is the same comment I had in the initial discussion of Exhibit 39. Exhibit 39 was provided in part to expedite Dr. Rich's testimony, to the extent it contains explanatory descriptions of words and concepts that she then incorporated into her direct statements, oral statements. It was provided as a part of the entire package of testimony. We thought it appropriate that it be used in that fashion. It was material specifically prepared by her in explanation of these subject matter issues.

I offered it at the time, but nobody seemed willing to accept. We could have done the same thing by having Dr.

Rich read that document for 20 minutes. I think it is especially interesting now that this issue is being raised after Dr. Rich was cross-examined by several parties on this document, as well. It is explanatory. It is general. It is helpful in understanding her oral testimony.

It was provided, yes, in part earlier in Exhibit 31. But Exhibit 31, as you may recall, is a document that was relied upon by Ms. McKee in her testimony. And if I recall, Mr. Lilly objected to it at the time it was submitted that it itself was hearsay and could not be used for much of the substance of the material contained therein.

Dr. Rich is here now. This time we are not using the document as hearsay. This is explanatory for her direct testimony in this proceeding today.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Lilly.

MR. LILLY: I stand by my objections. I disagree with Mr. Cunningham's statement.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: Nothing, thank you.

H.O. BROWN: I, too, do believe it is helpful, and on that basis I am going to admit Exhibit 39 into evidence.

Panel, Dr. Rich, Mr. Nelson, thank you very much.

MR. CUNNINGHAM: Thank you, Mr. Brown.

For the record, we will attempt to get the copies of

the sport and commercial regulations that we asked you to take judicial notice of as quickly as possible for all parties to review before I submit it to the Board.

H.O. BROWN: You will not forget to admit that, to consider for admission into evidence at the appropriate time.

MR. CUNNINGHAM: Yes, sir.

H.O. BROWN: Moving on, Mr. Buettler, do you have anything in rebuttal?

MR. BUETTLER: No, I don't. Thank you.

H.O. BROWN: Mr. Sanders.

MR. SANDERS: We have no rebuttal.

H.O. BROWN: Mr. Lilly.

MR. LILLY: We have some rebuttal.

(Break taken.)

H.O. BROWN: Back on the record.

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DIRECT EXAMINATION OF YUBA COUNTY WATER AGENCY

BY MR. LILLY

MR. LILLY: Thank you, Mr. Brown.

While we had the break, we got our panel up here. We also distributed copies of some of the exhibits that we will be using today, in particular S-YCWA 31 through 41 and 19B.

This panel is going to basically provide rebuttal testimony, rebuttal to the Department of Fish and Game's

proposed water temperature requirements. And we will start with Mr. Grinnell.

Mr. Grinnell, can you pull that microphone up close to you.

Mr. Grinnell, you previously testified in this hearing?

MR. GRINNELL: Yes, I have.

MR. LILLY: You are still under the same oath that the Hearing Officer administered in this hearing.

Have you reviewed the Department of Fish and Game's proposed water temperature requirements for the Yuba River at Daguerre Point and Marysville gauge?

MR. GRINNELL: Yes, I have.

MR. LILLY: What are the proposed requirements, if you could summarize them?

MR. GRINNELL: The requirement is 56 degrees at Daguerre Point Dam at all times and 56 degrees at Marysville gauge all times except July, August and September when the requirement would be 60 degrees.

MR. LILLY: Have you analyzed whether it would be feasible for the Yuba County Water Agency to meet the temperature requirements?

MR. GRINNELL: Yes, I have.

MR. LILLY: Would it be feasible?

MR. GRINNELL: No, it would not.

MR. LILLY: If you could go forward with your analysis

or support for these conclusions, please examine with S-YCWA-31, and tell us what this is.

MR. GRINNELL: S-YCWA-31 is a graph showing recorded release temperatures at Narrows 2 Powerhouse, which is below Englebright Dam and release temperatures from the Colgate Powerhouse, which is below New Bullards Bar Dam. It also shows the temperature requirements both for Marysville, which is the kind of sawed-tooth line, and the requirement at Daguerre, which is the flat line across the 56 degrees.

You will note the hollow squares are the Narrows 2 Powerhouse releases, which is the final control for flows to the Lower Yuba River. You will notice at many times this is recorded temperatures. Many times from the period of 1990 to 1999 the release temperature is above the requirement, and, therefore, regardless of the flow, there would not be the chance to meet the temperature at that time.

MR. LILLY: Based on your analysis, during the summer months, no matter what the flow is, the temperature never goes down as the water flows down the Yuba River?

MR. GRINNELL: That's correct. It at almost all times the temperature -- at all times in the summertime the temperature goes up?

MR. LILLY: It goes up as water flows from the Narrows 2 to Marysville.

MR. GRINNELL: That's correct.

MR. LILLY: Did you analyze how often the Department of Fish and Game's proposed temperature requirement would be met if the agency, assuming it has sufficient water supplies, released 3,500 cubic feet per second from the Narrows 2 Powerhouse at all times?

MR. GRINNELL: Yes, I did.

MR. LILLY: What is the significance of the 3,500 cfs?

MR. GRINNELL: 3,500 is the maximum release capacity of the Narrows 2 Powerhouse under nonflood conditions.

MR. LILLY: Please put Exhibit S-YCWA-32 up on the overhead and tell us what this exhibit is.

MR. GRINNELL: This is a table of probabilities for which the daily mean temperature in the Lower Yuba River would exceed the temperature requirements for both Daguerre Point Dam and the Marysville gauge when releasing 3,500 cfs.

MR. LILLY: Just to clarify, these are daily mean temperatures; is that correct?

MR. GRINNELL: Yes, that is correct.

MR. LILLY: We will go on later and ask you about the significance if the Department of Fish and Game requirements were construed to be instantaneous maximum requirements. For the purpose of this analysis, you are assuming that the DFG requirements are mean daily requirements?

MR. GRINNELL: For our analysis we assumed daily mean.

MR. LILLY: What does this exhibit show regarding the

feasibility of using releases of 3,500 cubic feet per second to attempt to meet DFG's requirements?

MR. GRINNELL: Well, it shows several things. One is that in all months there is some probability that the temperature requirements at both Daguerre Point Dam and Marysville could not be met. It also shows there are months, specifically in the summer months, when it is probable that the temperature requirements would not be met.

MR. LILLY: Did you also examine how much water would be required if YCWA attempted to meet DFG's proposed temperature requirements but with a cap on releases at 3,500 cubic feet per second?

MR. GRINNELL: Yes, we did.

MR. LILLY: Please tell us what S-YCWA-33 is.

MR. GRINNELL: I will do it by talking about the columns. The first column is a listing of the flow standards in the Draft Decision under normal and wet years. The next two columns describe the additional flow that would be needed for the temperature requirements but limiting the maximum flow to 3,500 cfs. And it shows -- so both the Type 1 and Type 2 columns show the additional amount that would be required. And the final two columns are the summation of the flow standard plus the additional flow.

MR. LILLY: I know you went over Type 1 and Type 2 when

you had a similar graph regarding the Draft Decision temperature requirements. Could you briefly summarize what Type 1 and Type 2 mean in this graph?

MR. GRINNELL: If you will look, the DFG proposed temperature requirements stated that the flow in September should be maintained throughout the time period to March, and that is reflected in the Type 1 operation. If we do not comply with that operation, then you would have a Type 2 operation where the September flow is not maintained throughout the wintertime. You just have the flow standard.

MR. LILLY: Basically, the additional flow needed, in your estimate, under Type 1 would be slightly over 2,000,000 acre-feet?

MR. GRINNELL: Yes. Type 1, 2.52 million acre-feet and Type 2, just under 1.6 million acre-feet.

MR. LILLY: Those are the total amounts; the other columns show the additional amounts over that flow requirement?

MR. GRINNELL: Yes, those would be the total amounts.

MR. LILLY: Just to clarify, even with all this water, would the temperature standards always be met or would they sometimes still be violated?

MR. GRINNELL: You can see many times they are just bumping up against the 3,500 cfs limit.

MR. LILLY: The temperature standards would or would not --

MR. GRINNELL: Would not be met.

MR. LILLY: Did you also analyze how high the flows in the Lower Yuba River would have to be if there were no limitation on either water supply or outlet capacity to actually meet DFG's proposed temperature requirements?

MR. GRINNELL: Yes, we did.

MR. LILLY: Is that Exhibit S-YCWA-34?

MR. GRINNELL: Yes.

MR. LILLY: Please put that on the overhead and tell us what that is.

MR. GRINNELL: This is a table of additional flow that would be needed above the flow standard in the Draft Decision to meet the temperature requirements in Exhibit S-DFG-1, and this is graph at various exceedance probabilities of the monthly average of the air temperatures at Marysville which drives the temperature of the river. And the columns range from 10 percent mixing probability of monthly average of air temperature to 99 percent exceedance probability, chart out the flows that are required in each time period.

MR. LILLY: So, at the 99 percent exceedance probability, which would come flows, but still would not guarantee that the standards would be meet; additional flows

would be approximately 3,000,000 acre-feet?

MR. GRINNELL: That's correct.

MR. LILLY: Again, these are to meet mean daily temperatures at DFG's numbers; is that correct?

MR. GRINNELL: That's correct.

MR. LILLY: Now please examine S-YCWA-35 and tell us with this is.

MR. GRINNELL: This is a plot of the same analysis shown in the previous table, using various confidence levels of the prediction for temperature based on regression analysis that we previously testified to.

MR. LILLY: The 99 percent curve -- at the 99 percent exceedance probability for air temperature gets up to the 3,000,000 acre-foot number you previously described?

MR. GRINNELL: That's correct.

MR. LILLY: Now, just going back to the Draft Decision, does it contain any different minimum flow requirements for dry years?

MR. GRINNELL: Yes, it does. The Draft Decision includes a 900 cfs reduction in flow in the month of May from 2,000 cfs to 1,100 cfs.

MR. LILLY: Did you analyze the amounts of water that would be required to attempt to implement DFG's proposed temperature requirements during dry years as such term is defined into the Draft Decision?

MR. GRINNELL: Yes, we did.

MR. LILLY: I am not going to ask you to spend a lot of time, but basically your Exhibits S-YCWA-36, 37 and 38 contain similar analyses that you just described but for dry years?

MR. GRINNELL: Yes, they do.

MR. LILLY: Is there any particular conclusion you would like to state regarding those?

MR. GRINNELL: Yeah. Let me put up S-YCWA 36 to illustrate that. You will notice in the month of May the reduction to 1,100 cfs. And what happens is in order to attempt compliance with the temperature standards, the additional flow negates the 900 cfs reduction so that the same 3,500 cfs is required at the cap of the maximum released temperature at Narrows 2 Powerhouse.

So there is essentially when combining both flow and temperature requirement no reduction for dry year.

MR. LILLY: Just to summarize, how do the numbers that go up to 3,000,000 acre-feet compare to the actual storage capacity of New Bullards Bar Reservoir?

MR. GRINNELL: New Bullards Bar active storage is 732,000 acre-feet. So, the amount of water required in attempting to meet the temperature standards are several times the actual storage of New Bullards Bar.

MR. LILLY: We just talked about -- so far today you

have been treating the DFG proposed temperature requirements as daily averages; is that correct?

MR. GRINNELL: That's correct.

MR. LILLY: If the DFG's proposed temperature requirements were instantaneous maximum allowed temperatures and not daily averages, would that affect your analysis?

MR. GRINNELL: Yes, it would.

MR. LILLY: Using S-YCWA Exhibit 39, please explain the differences between average daily and maximum allowable temperature requirements.

MR. GRINNELL: This is a graph of daily river temperature at Marysville gauge in 1995 and '96. It shows the daily minimum, daily mean or average and daily maximum. You can see there is a significant spread between the mean and maximum. In order to operate to attempt to reduce the maximum to meet those temperature requirements, significantly greater amounts of water would have to be released and the probabilities of meeting the temperature requirements would be less as the agency does not have that water available to meet the requirement.

MR. LILLY: Would changing the DFG requirements from mean daily to instantaneous maximums have a significant affect on the feasibility of implementation?

MR. GRINNELL: Yes, it would. It would also mean that the agency would have to -- they would have to make releases

-- as they release continuously in an attempt to mitigate a temperature that only occurs for a couple hours a day. So there would be a significant amount of water required and a significant higher probability of not meeting temperatures.

MR. LILLY: That is on top of the high amounts of water and low probabilities of meeting the requirements when mean daily?

MR. GRINNELL: That's correct.

MR. LILLY: Let's go forward to another point. During DFG's testimony questions arose and discussion was given regarding the water temperatures that would be experienced in the Sacramento River by juvenile anadromous fish leaving the Yuba River. Have you assembled historic water temperature data for the Lower Sacramento River?

MR. GRINNELL: Yes, I have.

MR. LILLY: Please tell us what S-YCWA Exhibit 40 is.

MR. GRINNELL: This is a plot comparison of the daily flow temperatures of the Sacramento River at two locations in the Yuba River. The two locations are at Hood, which is essentially the upper portion of the Delta, Sacramento River at Atherton, which is considered the lower Delta Sacramento River, and the Yuba River location is at Marysville gauge.

MR. LILLY: If you can just summarize for the spring months, what do these temperatures show?

MR. GRINNELL: For the Sacramento River, for instance

for the month of May, the temperature has already climbed above 63 degrees at both locations. This is the mean daily temperature.

For June the temperature is then above 65 degrees. While the Yuba River temperature for this time period was for May around 55 degrees and then climbs to approximately 58 or so, reaches just under 60 degrees in the early June period and just over 60 degrees in the late June period.

MR. LILLY: What year or years are these data from?

MR. GRINNELL: This is 1999, which was a wet year in the Sacramento Valley.

MR. LILLY: Was it also a warm or cool summer as far as the Sacramento Valley?

MR. GRINNELL: Relatively cool.

MR. LILLY: I know you don't have data for other years, would the temperatures generally be the same or higher?

MR. GRINNELL: I would expect the temperatures to be higher.

MR. LILLY: Just to clarify, these are mean daily temperatures?

MR. GRINNELL: That's correct.

MR. LILLY: These do not show the fluctuations in temperatures, either in the Sacramento River or the Yuba?

MR. GRINNELL: No.

MR. LILLY: Excuse me, does not show the --

MR. GRINNELL: Does not show the diurnal.

MR. LILLY: Let's go back to the Yuba River for a minute. Regarding the Department of Fish and Game's proposed temperature requirements and historical temperatures, did you examine the historical water temperatures in the Lower Yuba River and compare those to DFG's proposed temperature requirement?

MR. GRINNELL: Yes, we did.

MR. LILLY: Please put overhead S-YCWA-41 and tell us what this is. I realize this exhibit has two pages; maybe you can describe each page.

MR. GRINNELL: The first page is a plot of the historic temperature, which is the monthly average of the daily mean, and this first page is for Daguerre Point Dam, historic being 1998 to 1999, and simulated temperatures of --

MR. LILLY: Excuse me, I think you misspoke.

What are the historic years?

MR. GRINNELL: 19- -- the history is 1989 to 1999.

MR. LILLY: Thank you.

MR. GRINNELL: Simulated temperatures for the time period of 1949 to 1992. And the simulation is a model simulation, a flow simulation based on the Yuba County Water Agency proposed flow requirement.

MR. LILLY: To clarify, do those bars show diurnal variations or something else?

MR. GRINNELL: No. This is variations of the monthly average of the daily mean.

MR. LILLY: Just to put it in perspective, what is DFG's temperature requirement at Daguerre Point Dam?

MR. GRINNELL: The temperature requirement is 56 degrees as all times.

MR. LILLY: Is it fair to say that in the spring, summer and fall months there are times historically when the temperatures even on a mean daily basis have or even on a mean monthly basis have significantly exceeded DFG's proposed requirements?

MR. GRINNELL: Yes. As you can see, the historic time period of '89 to '99, for instance, in July the variation is always above the 56 degrees.

MR. LILLY: Let's go forward to Page 2 of S-YCWA-41. Please tell us what this is.

MR. GRINNELL: This is the same set of or graph only for temperatures at the Marysville gauge, both historic '89 to '99 and simulated monthly averages for 1949 to 1992.

MR. LILLY: Please just put in perspective what Department of Fish and Game's proposed requirements are.

MR. GRINNELL: 56 degrees in all months except for July, August and September when it is 60 degrees.

MR. LILLY: For this graph as well as the other, the bars show monthly averages; is that correct?

MR. GRINNELL: That's correct. The squares or the diamonds are the average and then the bars are the variation of the monthly average.

MR. LILLY: So the variation of daily averages would be greater than these bars?

MR. GRINNELL: Yes, it would be outside the variation. Daily variation is greater than monthly.

MR. LILLY: Would the instantaneous variation within a day even be greater?

MR. GRINNELL: Yes, both higher and lower.

MR. LILLY: Now when you were preparing Exhibit S-YCWA-41, do you and your staff review the temperature exceedance figures that were in Exhibit S-YCWA-19A?

MR. GRINNELL: Yes, we did.

MR. LILLY: During that review, did you determine corrections to those figures were necessary?

MR. GRINNELL: Yes, we did.

MR. LILLY: Why is that?

MR. GRINNELL: We received data from NCDC that had some missing data records. And our calculation improperly handled those missing records, and so a correction of the calculation took care of that error.

MR. LILLY: And is Exhibit S-YCWA-19B, does that contain the corrected figures?

MR. GRINNELL: Yes, it does. But I would mention this

error only affected the predictions, those exceedance probability prediction plots.

MR. LILLY: Only the plots that are shown here, not anything else.

MR. GRINNELL: That's correct.

MR. LILLY: Again, these plots are the monthly averages; is that correct?

MR. GRINNELL: That's correct.

MR. LILLY: What was the purpose of using monthly averages in these two graphs?

MR. GRINNELL: We used monthly averages to just compare between the two scenarios, the YCWA proposal and the Draft Decision flow requirements to see what their effects would be on temperature.

MR. LILLY: I take it where only a square is shown, that that means a circle and square are basically right on top of each other?

MR. GRINNELL: Yes. Both lines are shown. They are plotted over each other many times in each graph.

MR. LILLY: That concludes Mr. Grinnell's testimony. If we can take a two-minute break, we need to get some more papers out for Mr. Mitchell. He only has three exhibits. I would like to get those out and distributed to the parties.

H.O. BROWN: Off the record.

(Break taken.)

H.O. BROWN: Back on the record.

MR. LILLY: Mr. Mitchell, I have some questions for you.

You previously testified in this hearing and took the oath; is that correct?

MR. MITCHELL: Yes.

MR. LILLY: Please understand you are under the same oath that was administered in the beginning of the hearing.

Mr. Mitchell, during cross-examination by the Department of Fish and Game did you testify that there was some minor errors in Figure 7 of S-YCWA-19?

MR. MITCHELL: Yes.

MR. LILLY: Is Exhibit S-YCWA-42 a corrected figure to replace Figure 7?

MR. MITCHELL: Yes, it is.

MR. LILLY: During the State Board staff's questioning of Department of Fish and Game's witnesses and questioning of you, questions were raised regarding the use of the Hallwood-Cordua fish screen data to determine the timing of the juvenile salmon outmigration and particularly regarding the fact that these data were collected during different time periods each year.

Even though they were different sample periods each year, the collection periods each year, is it nevertheless reasonable to use these data to estimate the timing of

outmigration of juvenile chinook salmon in the Lower Yuba River?

MR. MITCHELL: Yes. If I could have the next exhibit, please.

MR. LILLY: I will state for the record this one is entitled Figure 7 Expanded Daily Numbers of Juvenile Outmigration Chinook Salmon Trapped at the Hallwood-Cordua Fish Screen and Yuba River Discharge Near Smartville, April 1 to July 10, 1988. We will ask that this one be labeled S-YCWA-103. Somehow it got missed from our numbering before.

Go ahead, Mr. Mitchell.

MR. MITCHELL: There were a number of years when the Hallwood-Cordua fish screen operated continuously during the primary chinook salmon smolt outmigration period. In those years the daily fish salvage data indicates a pattern that is very typical of the outmigration pattern observed for juvenile chinook salmon in other rivers.

As shown in this graph of 1981, these are daily salvage numbers that have been adjusted to account for the effect of proportion of flow diverted to obtain a more reliable indicator of the numbers of fish passing the dam. Indicate clear pattern of lower numbers during the first part of the season, increasing to a seasonal peak and the decline at the end of migration season, which is typical of the

outmigration pattern observed for chinook salmon in other rivers.

MR. LILLY: Is it fair to say, based on this phenomenon of an increase to a peak and then a decrease, that in your opinion, your use of the Hallwood-Cordua fish trap data, just for the purpose of determining the type of outmigration of juveniles was, in fact, appropriate?

MR. MITCHELL: Yes. I believe it is a reasonable indicator for the timing migration.

MR. LILLY: Let's go forward to Exhibit S-YCWA-43, and I will ask you an introduction question.

During prior testimony, there was questions raised regarding the pre-New Bullards Bar and post-New Bullards Bar adult salmon spawning escapement numbers because Jones & Stokes methodology sampled an additional reach of the river that had not been covered in DFG's prior carcass survey.

Following up on those questions, did you recalculate the recent annual chinook salmon spawning escapement estimates to use the same method that DFG used from 1953 to 1990?

MR. MITCHELL: Yes.

MR. LILLY: Please tell us what S-YCWA-43 is and explain the differences between the two bars for each year from 1994 to 1999.

MR. MITCHELL: This figures shows the annual estimates

of chinook salmon, adult chinook salmon, spawning escapements in the Lower Yuba River since 1953. The figure is divided into two periods, the pre-New Bullards Bar Reservoir period and post-New Bullards Bar period. And then for each of those periods an average number of salmon for those periods is shown as a horizontal line. The dark bars for 1994, '96, '97, '98 and '99 represent the estimates of total numbers of salmon in the Lower Yuba River, including an actual estimate of the number of fish that spawned in the Rose Bar reach which is the uppermost spawning reach above the Highway 20 bridge.

In those same years we also estimated a total estimate using the assumption that, as has been used by the Department of Fish and Game in the past, which is that 15 percent of the run spawns in the Rose Bar reach. And using that assumption resulted in the light bars that are shown for those same years.

MR. LILLY: Just to clarify, Mr. Mitchell, DFG never sampled in the Rose Bar reach?

MR. MITCHELL: Evidently, from memos that we have been able to obtain there were several surveys of that area done in the '70s from which the average of 15 percent was obtained.

MR. LILLY: For DFG methodology, they assumed that 15 percent spawning escapement in the Rose Bar reach?

MR. MITCHELL: Yes.

MR. LILLY: Your gray bar is basically, were to use the same methodology that DFG used rather than your actual data for the Rose Bar?

MR. MITCHELL: That's correct.

MR. LILLY: What are the results of the recalculation as far as the effects of the averages?

MR. MITCHELL: Well, I recalculated the average spawning escapement for the post-New Bullards Bar Reservoir period using both the actual estimates that we had obtained, which is shown in the upper horizontal bar on the right-hand side of the graph, an average of 115,119 adult salmon. Using the estimates based on DFG assumption for the years '94, '96, '97, '98, '99, the average for the post-New Bullards Bar Reservoir period is 14,421.

MR. LILLY: Do those -- do these additional calculations affect any of your prior conclusions regarding adult chinook salmon in the Yuba River?

MR. MITCHELL: No.

MR. LILLY: Why is that?

MR. MITCHELL: Using either method supports the same conclusion, that the numbers of adult salmon spawning in the river since the completion of New Bullards Bar has been sustained and increased in recent years relative to the preproject level.

MR. LILLY: Have you reviewed the Department of Fish and Game's proposals for water temperature requirements for 56 degrees all year long at Daguerre Point Dam and 56 degrees and 60 degrees at Marysville?

MR. MITCHELL: Yes.

MR. LILLY: If such temperatures could be achieved in the Lower Yuba River, would they have any effect on the timing of the migration of adult fall-run chinook salmon in the Feather River up into the Yuba River?

MR. MITCHELL: Based on our observations of the timing and arrival of the fish, maintaining those water temperatures, particularly in the summer, in my opinion, would encourage earlier upstream migration of fall-run chinook salmon.

MR. LILLY: If adult fall-run were encouraged and did migrate into the Yuba River earlier than they do, now would that change increase the likelihood of interbreeding between fall-run and spring-run chinook salmon?

MR. MITCHELL: Yes.

MR. LILLY: Please explain why that is.

MR. MITCHELL: The early arrival of the fall-run chinook salmon also corresponds to the earlier spawning of fall-run. That potentially could result in spawning and interbreeding with spring-run which do spawn earlier, generally, than fall-run.

MR. LILLY: Basically, if you have a redd with one spring-run parent and one fall-run parent, can they interbreed?

MR. MITCHELL: Yes.

MR. LILLY: What would the affect of such increased interbreeding have on the long-term viability of spring-run chinook salmon population in the Lower Yuba River?

MR. MITCHELL: There is a potential for adverse effect due to hybridization between the two races.

MR. LILLY: During DFG's testimony, there was some discussion of their opinions regarding the distribution of steelhead spawning in the Yuba River.

Did you recently observe steelhead redds in the Yuba River this year?

MR. MITCHELL: Yes.

MR. LILLY: Where were those redds located?

MR. MITCHELL: Our surveys this spring, we found spawning and redds above Daguerre Point Dam with a majority of those redds above the Highway 20 bridge in Rose Bar reach.

MR. LILLY: Did you look for redds below the Daguerre Point Dam?

MR. MITCHELL: Yes. We looked for redds throughout the river, all the way down to the mouth.

MR. LILLY: Did you find any steelhead redds below Daguerre Point Dam?

MR. MITCHELL: No.

MR. LILLY: During DFG's testimony, there was also some discussion of the effects of catch and release fishing of adult steelhead.

During your recent fieldwork, did you observe fishermen fishing for steelhead in the Yuba River?

MR. MITCHELL: Yes.

MR. LILLY: Did that fishing affect the steelhead spawning?

MR. MITCHELL: The fishermen were fishing for steelhead that were in effect redds, and, therefore, there could have been some disruptions of spawning activity.

MR. LILLY: Were you present during the testimony of Alice Rich during this hearing?

MR. MITCHELL: Yes.

MR. LILLY: Did you hear Alice Rich state that water temperatures are optimal -- it is her opinion that water temperatures are optimal in lab studies when there is maximum food conversion efficient?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Mr. Brown.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, this is rebuttal to rebuttal. This is not an attempt to state as classic rebuttal should questions that were addressed in the earlier

testimony. They are now asking for him to rebut Dr. Rich's testimony. I believe that is specifically prohibited in this proceeding.

H.O. BROWN: Mr. Lilly.

MR. LILLY: I don't think it is prohibited. I think there is nothing that says we can't rebutt any testimony that is given before we give our rebuttal. And clearly it is very important that we get to the truth of this matter as to the effects of these water temperature requirements that DFG has recommended.

So, number one, we are following on prior testimony. I don't think there is a limitation as to when that prior testimony came in. And, number two, this does relate to the overall rebuttal of DFG's recommendations of its water temperatures of 56 and 60 degrees.

H.O. BROWN: Mr. Gee.

MR. GEE: That is inaccurate. This clearly prejudices the parties that gave their rebuttals before Mr. Lilly. For him to use it as now rebuttal, what is essentially the rebuttal case of the State, is a clear misuse of this opportunity for his rebuttal of any case in chief.

H.O. BROWN: Thank you, Mr. Gee.

Mr. Cunningham.

MR. CUNNINGHAM: My point was made by Mr. Gee. We have been moved from essentially last player in our direct

testimony to second player in rebuttal. Mr. Lilly's concepts that somehow we all get to rebut the previous rebuttal leaves the State at a dramatic disadvantage in this case, and perhaps explains why Mr. Lilly asked that we be moved from our previous position.

I would suggest that rebuttal here was to be contemporaneous and not serial, not to rebut somebody else's rebuttal testimony.

H.O. BROWN: Mr. Bezerra.

MR. BEZERRA: Mr. Brown, I would like just to remind everyone that cross-examination on direct was limited to -- excuse me. Parties that followed Department of Fish and Game on cross-examination were not allowed to cross-examine witnesses on new evidence brought out in Department of Fish and Game's cross. So this, to me, seems like a relatively similar situation.

H.O. BROWN: Thank you, Mr. Bezerra.

Mr. Frink.

MR. FRINK: Yes, Mr. Brown. Mr. Lilly mentioned that his question was aimed at rebutting evidence that the Department of Fish and Game presented on direct as well as on rebuttal. I think we can avoid the problem of rebutting rebuttal and so forth if the question were to focus on rebutting evidence that was presented on direct.

As Mr. Lilly explained in his mind, at least the

question is also aimed at rebutting evidence that was presented on direct. Maybe that would be the most helpful way to phrase the questions.

H.O. BROWN: Can you do that, Mr. Lilly?

MR. LILLY: I can try although we may get further objections. But why don't we take that approach and see what happens.

H.O. BROWN: Try that after lunch. We'll meet back here at 1:00.

MR. LILLY: Thank you.

H.O. BROWN: We are back on the record for a moment.

Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, Mr. Lilly tells me there are more exhibits to come. I think in all courtesy we should be able to have a chance to look at those before the end of the day. Mr. Lilly made some point yesterday about the fact he needed time to review the Department of Fish and Game's rebuttal testimony before he made an appearance.

I think at least providing us the exhibits that he wishes to use so we can look at them for an hour before returning from lunch seems only common courtesy that we would expect.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Lilly, any problem with that?

MR. LILLY: Yes, I do. This is almost comical.

Mr. Cunningham went at length yesterday to basically say on rebuttal you get the exhibits when the people start testifying. You prepare your cross-examinations questions, and if you don't have enough time to prepare, that is your problem. I think he needs to play by the rules that he insisted that the rest of us play by. It is just comical. He didn't make any attempt to offer -- to submit, circulate, his exhibits before lunch even though he had them all while Fish and Wildlife was testifying.

Now he is wanting different treatment here. All I ask for is that all parties be treated equally in this proceeding.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: We agree with Mr. Lilly. We are beyond the line of due process violations with this whole proceeding. We keep cumulating these sort of problems. And some court looking at this is going to go crazy. We have to treat everybody equally even though I think this procedure regarding rebuttal testimony is right on the edge of violation, if not over.

H.O. BROWN: Mr. Gee.

MR. GEE: I probably agree with Mr. Minasian. I fully agree with Mr. Lilly. We should all be treated equally. During my rebuttal case, Mr. Minasian and Mr. Lilly both jumped up and said I should present all my exhibits before I

proceed through my rebuttal case. As courtesy to them, I did just that. I presented all my exhibits before I proceeded through my rebuttal case. We merely ask the same be done at this time.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, we did the same thing. All of our rebuttal exhibits were made available at the start of our rebuttal case. I seem to recall sitting here, yes, I made the argument that Mr. Lilly should proceed yesterday. But I believe in equity you recognized the problems he was going to have in examining materials provided to him. You gave him the same courtesy I wish to have extended to us at the present time; that is an opportunity to see these documents. He's already started his rebuttal case. I am not even asking for him to give to us all -- he's already started his rebuttal case. Yet to give the same courtesy of showing us the exhibits he wishes to present. I gave all mine at the start of our case.

H.O. BROWN: Mr. Lilly.

MR. CUNNINGHAM: Mr. Brown, if you want to talk about due process, I think that is a red herring. I do think a question of common courtesy.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Lilly, parting comment.

MR. LILLY: I don't think common courtesy is the issue

here. It is equal treatment, and that is what we are asking for.

H.O. BROWN: Mr. Gee's argument is most persuasive.

Do you have the exhibits? Please hand them out before lunch. We will meet here at five after one.

(Luncheon break taken.)

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AFTERNOON SESSION

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H.O. BROWN: Come back to order.

Before we get started with Mr. Lilly, Mr. Frink has some words of counsel for all of us so we will be on the same page.

Mr. Frink.

MR. FRINK: Okay. I hope that this helps to clarify and expedite things. It won't always be entirely clear as to what is properly within the scope of rebuttal and what isn't. The Board's regulations, as you know, allow for establishing procedures that promote the expeditious presentation of evidence. The Board has not ordinarily had a hard and fast rule on the presentation of surrebuttal evidence, but in some instances we have done that.

The case law suggests that if someone brings out totally new evidence on rebuttal, then other parties to the proceeding are allowed an opportunity for rebuttal of that new evidence. However, if the collateral or new matter was brought out on cross-examination of rebuttal witness, then the Board may refuse to allow rebuttal of that evidence that was brought out on cross-examination on a collateral matter.

I hope that helps. I do recall at the end of the hearing before the recess, Mr. Brown directed or reminded

the parties that the scope of rebuttal that the parties should plan on presenting should be directed at rebutting the evidence that other parties had presented in their case of chief. I would certainly hope that that is the focus of everybody's rebuttal evidence and cross-examination regarding that. I don't want to be going through round three and four of this.

If we all make an effort to focus on restricting the rebuttal to what is presented in the cases in chief, in almost all instances that should work. If there is a difficult instance presented by presentation of entirely new evidence, I guess the Hearing Officer can deal with that at the time it arises.

H.O. BROWN: Thank you, Mr. Frink.

Mr. Lilly.

MR. LILLY: Following that statement and, Mr. Brown, your directions before the break, I will rephrase my final questions and I only had a few more for Mr. Mitchell in terms of rebuttal to the Department of Fish and Game's direct evidence and will not ask him questions following up on Alice Rich's testimony.

Mr. Mitchell, you are still here. Good.

Have you -- are you familiar with the Department of Fish and Game's temperature recommendation of 56 degrees at Daguerre Point Dam year-round?

MR. MITCHELL: Yes.

MR. LILLY: Are you familiar they have clarified -- they did clarify during the direct testimony that they view that as an instantaneous maximum temperature?

MR. MITCHELL: Yes.

MR. LILLY: Based on your professional experience and your extensive work of the Lower Yuba River, what is your opinion regarding that the maintenance of temperatures of 56 degrees or less at Daguerre Point Dam year-round, assuming it were possible, would have on the growth rates of chinook salmon and steelhead on the Lower Yuba River?

MR. MITCHELL: One of the effects we pointed out in past testimony is that prolonged reduced temperatures, particularly at that magnitude, could -- would be expected to result in later outmigration of juveniles because of slower growth, particularly in the reaches above Daguerre Point Dam. That in itself could result in these fish encountering higher water temperatures during migration to the Delta. If, in fact, those fish are delayed and leave during the later part or early part of May through the latter part of June.

MR. LILLY: Could the lower growth rates have effects on their survival on the Yuba River itself?

MR. MITCHELL: Yes. Potentially lower growth rates are known to increase the amount of time that fish are within a

vulnerable size range to predators. The faster a fish grows the sooner a fish reaches the size where predators cannot prey on them. Body size is also related to their ability to catch a wide variety of prey. The larger fish catch a wide variety of prey, have a greater food base. And also body size is related to temperature tolerance as well. Larger fish generally have higher temperature tolerances.

MR. LILLY: Mr. Mitchell, are you familiar with the Department of Fish and Game's proposed temperature recommendations which are 56 degrees at Marysville for nine months out of the year and 60 degrees at Marysville for six months out of the year?

MR. MITCHELL: Yes.

MR. LILLY: Assuming temperatures like that actually could be implemented, would they have adverse effects on growth rates of the chinook salmon and steelhead in the Lower Yuba River as well?

MR. MITCHELL: They would potentially reduce growth rates.

MR. LILLY: Would they have the same types of adverse effects that you just described?

MR. MITCHELL: Yes, potentially.

MR. LILLY: Let's go over to you, Mr. Bratovich. You have testified earlier in this hearing and took the oath?

MR. BRATOVICH: Yes.

MR. LILLY: You understand you are still subject to that oath today?

MR. BRATOVICH: Yes, I do.

MR. LILLY: Did you review the Department of Fish and Game's temperature recommendations for this hearing?

MR. BRATOVICH: Yes, we did. I include Dr. Bryan in that answer.

MR. LILLY: What is your understanding of the basis for the Department of Fish and Game's recommendation?

MR. BRATOVICH: My understanding is that the basis presumably was provided in S-DFG Exhibit 13.

MR. LILLY: Have you had a chance to develop an opinion regarding the DFG temperature recommendations?

MR. BRATOVICH: The Department temperature recommendations provided in Exhibit DFG-1, is a clarification?

MR. LILLY: Yes.

MR. BRATOVICH: Yes, I have.

MR. LILLY: First of all, start with a summary. What are your main points regarding your opinion?

MR. BRATOVICH: We have three main conclusions regarding those temperature recommendations from Fish and Game in DFG-1.

The first main conclusion is that those recommended temperatures are very conservative, based on review of the

literature.

Second main conclusion is that the temperatures recommended by CDFG in S-DFG-1 are not always necessary, nor do they exist in natural environments, including the Lower Yuba River.

Our third main conclusion is that apparently the Department did not consider historical water temperatures or population abundances in Lower Yuba River when recommending those temperatures.

MR. LILLY: Let's go forward to your first major point regarding the CDFG's recommendations are conservative. Would you please just elaborate on the reasons for that conclusion?

MR. BRATOVICH: Yes. As has been noted, one of the primary documents relied upon for the development of the water temperature recommendations included in S-DFG-13 was a document submitted as an exhibit, DFG-31.

May I have the first overhead, please.

This is a page excerpt out of S-DFG-1, Page A6, and the quote that is underlined here states, quote:

> The selection of the optimal ranges was based on relying on a "margin of safety" by choosing the lower temperature of two when the results of nonsite-specific studies are in conflict with one another. (Reading.)

MR. LILLY: Please just go forward now and state the other basis for this conclusion.

MR. BRATOVICH: Next overhead, please.

The overhead that is being projected now is out of S-DFG-13, Page 4. And it is the citations provided to address the issue of the recommended water temperatures for spring-run chinook salmon. You will note that they are provided by lifestage.

The first lifestage addressed in Table 2 is the adult migration lifestage.

MR. LILLY: Please state your conclusions regarding the temperatures for adult migration lifestage.

MR. BRATOVICH: What we did was for the adult migration lifestage we also did for the other lifestages. What we did, since a few weeks ago, the last time we were here, was to examine the documentation that presumably supports these recommendations.

For example, the adult migration lifestage, the recommended water temperatures for spring-run chinook salmon, included in this table, are 38 to 56 degrees as a preferred temperature.

Can we have the next overhead, please.

MR. LILLY: Why don't you point out what the citation was for that recommendation before you go to the next overhead.

MR. BRATOVICH: Certainly. It might be hard to read in the back of the room. There is one citation provided to support that recommendation. That was Bell, 1991.

MR. LILLY: Now please describe what you did as far as reviewing Bell, 1991.

MR. BRATOVICH: We did exactly that; we reviewed Bell, 1991, and we looked at the documentation and references provided in Bell, 1991, which was cited by S-DFG-3.

MR. LILLY: So go forward now to S-YCWA-44 and tell us what this is.

MR. BRATOVICH: Exhibit YCWA-44 is a compilation of these references that pertain to the adult migration lifestage as cited in the single referenced document, Bell, 1991. As you can see in Exhibit S-YCWA-44, several references were provided regarding upstream migration of adults. Most of them also were literature summaries that were repeated in citations by Bell, 1991.

I would like to point out that in this exercise since our few weeks ago that we did this, we conducted a most thorough review that we possibly could. We didn't examine each and every document. There were a couple exceptions. I do mean only a couple. We examined over 140 documents. I would like to point out because it is relevant to this lifestage, the Bell, 1991, for example, includes some references.

One of those references was an additional literature search or summary which was included, Becker, 1973. Becker, 1973, cites EPA's Columbia River thermal effects study, which also has some study elements but is a compendium of literature as well. It is like a tertiary document done on this hierarchical tree on examination.

One of those documents that was in the secondarily cited study was Book, et al., 1970. We were unable to obtain that document. It is one literally of over 140 in this instance. For this lifestage, it is only one that we were unable to obtain that may have been pertinent.

But to continue, the only actual study that was referred to as cited by Becker, 1973, which was cited by Bell in 1991, which was cited by the Department of Fish and Game in S-DFG-13 was a study conducted by Coutant in 1970 on the Columbia River. And apparently in reviewing that document it was a study that examined summer and early fall-run chinook salmon, not spring-run chinook salmon. We are not aware that any preferred upstream adult migration temperature range was concluded or provided in that document. But the document did report a lethal temperature of 70 degrees.

The remainder of these references were apparently based on literature reviews rather than actually field or laboratory studies themselves. And, accordingly, we were

unable to locate any solid scientific evidence supporting the recommended preferred temperature range of 38 to 56 degrees for adult upstream migration.

MR. LILLY: Let's go on now to the next of the lifestages in S-DFG-13, and that would be the adult holding while eggs are maturing.

MR. BRATOVICH: Next overhead, please.

In S-DFG-13 for spring-run chinook salmon the temperature -- the basis for temperature recommendation for the adult holding while egg maturing lifestage is referred as an upper limit optimal range of 59 to 60 degrees. And, again, a single reference was provided to support that conclusion. That was Hinze, 1959.

MR. LILLY: What happened when you looked at Hinze, 1959?

MR. BRATOVICH: Hinze, 1959, actually is being submitted as an exhibit, S-YCWA-45. We examined Hinze. '59, and our examination revealed that this study or observation, field observation study, did note some observations on chinook salmon from Nimbus Hatchery on the American River. However, again, these fish appear to have been fall-run, not spring-run chinook salmon because they were captured during fall at the Nimbus Hatchery. Also, our review of that document indicated that this document did not include a direct study or scientific analysis of the adult

holding while eggs are maturing lifestage. Rather this document did include some observations on the incubation of eggs.

Our conclusion in reviewing Hinze, '59, is that it does not support the Department's recommended temperatures for the lifestage represented by adult holding while eggs are maturing.

MR. LILLY: Let's go on to the next lifestage, spawning. Please discuss your analysis of that lifestage.

MR. BRATOVICH: Next overhead, please.

MR. LILLY: I think we want to go back for a minute. Why don't you briefly describe the two references that were cited in S-DFG-13.

MR. BRATOVICH: For the spawning lifestage, the recommended water temperatures for spring-run chinook salmon in Exhibit S-DFG-13 are 55 and 57 degrees, both represented in this table, in this document, the upper preferred range of temperatures.

Again, it is hard to see, and certainly in the back of the room, there is two references cited, footnotes C and D.

Footnote C is Chambers, 1956, and Footnote D is Reader and Bjorn, 1979. Reader and Bjorn was a literature review. They did recommend spring-run chinook salmon spawning temperatures. Their recommendation was 42 to 57 degrees.

The only other reference cited was, as I pointed out,

Chambers, 1956. That study or that report rather simply reported some observed temperatures that were noted at the time of spring-run chinook salmon spawning in the states of Washington, Oregon and Idaho.

In other words, they observed fish spawning and noted what the temperatures were at that time in those northern states. Accordingly, our conclusion is that we were unable to enter a documentation that supported scientifically and solidly that the upper preferred temperature range for spring-run chinook salmon spawning was 55 to 57 degrees.

MR. LILLY: Mr. Bratovich, just to clarify, during the Chamber study, did they look at -- did they have any observations where the water temperatures during spawning were higher than 55 degrees?

MR. BRATOVICH: Not to my recollection, no.

MR. LILLY: Let's go forward to egg incubation. If you can start off with just describing the references cited and go forward from there.

MR. BRATOVICH: Egg incubation has been a much more thoroughly studied lifestage. In Exhibit S-DFG-12, recommended water temperatures for spring-run chinook salmon for the egg incubation lifestage there are a few references cited, and I am actually having a hard time reading those.

Michael, can you see those?

MICHAEL: E and F.

MR. BRATOVICH: E and F. There are different reports for E and F. E is stated that an optimum of 44 to 54 degrees was reported. Less than 35. Greater than 58 and greater than 63. Are all recorded for various reasons in F; and F is a study conducted by Bellson, 1987, and E is a Rich, 1997, which was submitted as an exhibit for this hearing. I believe it was Exhibit S-DFG-31.

MR. LILLY: Let's go forward to S-YCWA-48 and please state your conclusions regarding egg incubation.

Am I jumping the gun?

MR. BRATOVICH: Before you do that, I think it is an extremely important lifestage. It is a more thoroughly studied lifestage. And it is, as we heard testimony today, perhaps the most thoroughly sensitive lifestage. For one thing, eggs, while they are incubating, certainly cannot adapt their behavior to avoid temperature regimes. They are subject to whatever areas they are experiencing. But they are a very thermally sensitive lifestage that are quite well studied. In fact, we reviewed, again, all the literature provided in these literature reviews themselves, documenting the effects of temperature on embryo incubation or egg incubation.

Our review included the exhibits submitted by DFG, DFG-10, which is a relatively recent, 1999, study on Central

Valley salmonid incubation, as well. I believe it was for fall-run and winter-run chinook salmon, actually. In the course of our review of these numerous documents, it is our opinion that when water temperatures are held constant or very relatively quite constant, then, indeed, 56 degrees may be the optimal temperature. However, we also are aware that these constant temperature regimes do not occur in the natural environments, and they certainly don't occur in the Lower Yuba River as indicated by Mr. Grinnell in his testimony.

Several studies have demonstrated, however, that embryo incubation successfully occurs under variable water temperature regimes. Any reference to the Exhibit S-YCWA-46 provides represented examples of those studies.

MR. LILLY: Please summarize the principal points in S-YCWA-46.

MR. BRATOVICH: Again, this exhibit, S-YCWA-46, contains some quotes from a number of studies. But I guess the key point in summary is that several of those quotes state that incubation can occur at temperatures of 60 or even above 60 degrees early in the incubation period, and that successfully embryo incubation will occur. And that needs to be qualified in consideration that this is in association with these warm temperatures in the early part of the incubation period, associated with declining

temperatures throughout the incubation and variable temperatures throughout the incubation period, very much like the temperature regimes we see during the early fall and incubation period in the Lower Yuba River.

MR. LILLY: Please just state or summarize your conclusion regarding egg incubation and CDFG's recommended maximum temperatures for this lifestage.

MR. BRATOVICH: The recommended maximum temperatures of 56 degrees may be overly conservative. It ignores actually temperature fluctuations that may occur in the Lower Yuba River. It does not consider the temperature gradient from initially somewhat higher temperatures down to lower temperatures during the incubation period.

MR. LILLY: Let's go forward to fry rearing, which I think will be the next overhead.

MR. BRATOVICH: Next overhead, please.

MR. LILLY: Can we go back, if we have S-DFG-1. Before that, can we have S-DFG-13 just to mention the references cited by DFG for this lifestage.

MR. BRATOVICH: There are three references cited by Exhibit S-DFG-13, Table 2, supporting the recommendation of water temperatures for spring-run chinook salmon fry rearing lifestage. The literature cited supporting this in this table.

Again, Michael, can you read it?

MICHAEL: For the fry rearing stages A, G and H -- E, G and H.

MR. BRATOVICH: That would be E, G and H. So that is indeed Rich, 1997, Boles, 1988, and Seymour 1956.

MR. LILLY: Now let's go forward to S-YCWA-47.

MR. BRATOVICH: 47 is, again, a compilation of our examination of the literature cited. As you can see in Exhibit YCWA-47, there was one direct study, an actual lab study, that was conducted that was cited in S-DFG-13. The other two citations are literature summaries.

However, one of those literature summaries, Boles, 1988, cites Brett, 1952. The actual study itself, Seymour, 1956, reported that the most rapid growth for constant temperature occurred at 55 degrees. Our examination of that document indicated variable temperatures, maximum growth was reported near 60 degrees.

The literature summaries that were included was S-DFG Exhibit 31, which reported optimal fry rearing of 50 to 54 degrees. And the lab study that was also cited by the other literature review was Brett, 1972, for spring-run chinook salmon, actually this time, and it reported a preferred range of constant temperatures of between 54 or 55 degrees for spring-run in the state of Washington.

MR. LILLY: Please just elaborate a little bit. Did you conduct the same type of literature review for the

references, including Rich, 1997, that were cited for this lifestage?

MR. BRATOVICH: Yes, we did. We thoroughly examined them, and there seems to be some confusion associated with the fry rearing lifestage in our review. Not that our review is confused, but that optimal reported temperature ranges of 50 to 54 and the numerous citations that were referred to to support that, primarily it appears that those references primarily address the effects of latent egg incubation either on fry mortality or other aspects of fry condition; I did not example fry rearing optimal temperature requirement specifically.

MR. LILLY: What do you mean by "latent egg mortality" for those of us who aren't biologists?

MR. BRATOVICH: Well, for example, examination of Seymour, 1956, it appeared upon our review of that document, to use as a very salient example, that the basic study was incubating eggs at various temperature regimes following the success of their incubation and their development, not only through the egg stage but into subsequent stages, I think, including fry and larger stages, such as juvenile.

So it was not a study that particularly addressed or its goal was to examine optimal temperatures for fry rearing. It was to examine the effects of egg incubation and subsequent lifestages.

MR. LILLY: Was there some confusion in the records regarding the lifestage as to whether it was fry or juvenile?

MR. BRATOVICH: Most of the literature doesn't distinguish. Much of the literature addresses juvenile salmonids. It is somewhat arbitrary what is a fry and what is a juvenile. Many of these studies are making conclusions or examining fish that are much longer actually or size of fish that would be considered juveniles, fingerlings or smolt-size fish.

MR. LILLY: Please state your conclusion regarding CDFG's optimal temperature range for fry rearing lifestage.

MR. BRATOVICH: Well, the optimal temperature range, again, doesn't seem to be supported by the literature and the documents cited in S-DFG-13.

MR. LILLY: Let's go on to juvenile rearing as the next lifestage.

MR. BRATOVICH: Next overhead, please.

The juvenile rearing lifestage is addressed in Table 2, S-DFG-13, in which it is recommended that water temperatures for spring-run chinook salmon are 55 to 60 degrees as an optimum.

At this point I would like to add that there was one reference document to that lifestage as well as one reference document for the next and the last lifestage addressed in this table, the smoltification lifestage. Both

of those were based upon literature review conducted by Rich, 1997, which was previously submitted at these proceedings as S-DFG-31, I believe.

Again, for the juvenile rearing lifestage and smoltification lifestage we have one reference document.

MR. LILLY: Let's go forward then and discuss S-YCWA-48. Will you please tell us your conclusions regarding your review of the sources cited in Rich --

MR. BRATOVICH: Next overhead, please.

S-YCWA-48 is, again, a compilation of the literature reviewed. Within that literature summary, identified as S-DFG-31, there -- for this lifestage there were certain pertinent studies that were actually laboratory studies, which examined the relationship between juvenile rearing and water temperatures. We included in this exhibit, however, a more recent study conducted by Cech and Myrick, 1999, on American River stock of fall-run chinook salmon. We restricted this to fall-run chinook, this exhibit, for consistency sake, because the rest of these lifestages have been restricted to chinook salmon rather than steelhead, as well.

MR. LILLY: Excuse me, you said restricted to fall-run. Did you mean restricted to chinook salmon?

MR. BRATOVICH: I meant chinook salmon because, again, perusal of the literature and documentation supporting the

recommendations indicates much of the literature is not based on spring-run but other runs of chinook salmon.

MR. LILLY: Please describe what your conclusions are regarding this lifestage and temperature requirements.

MR. BRATOVICH: Well, various investigators report various types of results for juvenile rearing and water temperature relationships. We heard a discussion about those earlier today. We heard discussion of food conversion efficiency or growth rates. So they are presented in different ways.

I won't spend the time to go through these different presentations at this time, but I will state that our review of the literature and documentation supporting the Department's recommendation during this lifestage indicates that there really is some uncertainty in the literature and uncertainty in the studies conducted, how they record the results, how the studies were conducted, and what might be recommended for juvenile rearing lifestage. There really are two major elements for this uncertainty, and I am specifically addressing the uncertainty associated with the affects of temperature between the temperature ranges of approximately 60 to 66 degrees.

MR. LILLY: Tell us what the elements are that lead to that uncertainty.

MR. BRATOVICH: The first major element of uncertainty

is really whether food conversion efficiencies and growth rates increase or decrease over this range of water temperatures, again, from 60 to 66 or so.

For example, Rich, 1987, documents a study referred to earlier, observed slight decreases in these factors over this range of temperatures.

On the other hand, Brett, 1982, which also was referred to, and Cech and Myrick conducted a local stock of fish very recently and observed slight increases in both these factors as the temperatures increased throughout this range.

MR. LILLY: What is the other element of uncertainty regarding this lifestage?

MR. BRATOVICH: I think that perhaps the largest element of uncertainty is how these laboratory studies actually pertain to recommendations and management of fisheries of the Lower Yuba River. The source of that uncertainty is whether populations of spring-run chinook salmon in the Yuba River would be adversely affected by temperatures within this range.

Several considerations must be undertaken regarding this element of uncertainty. Rich, 1987, observed increases in disease and mortality in this temperature range in her laboratory study. However, it is uncertain how disease and mortality in fish in the Lower Yuba River would or if they would be affected by changes in temperature in this

range and whether other factors like food conversion efficiencies and particularly growth rates would predominate over the potential or susceptibility to disease or mortality specifically in the overall effect on the population.

MR. LILLY: Mr. Bratovich, before we go on, could you elaborate, is there a significant difference between the occurrences of disease in the laboratory studies versus fish actually out in the river?

MR. BRATOVICH: I can't testify to direct knowledge regarding that, but I can testify to understanding of the review of literature and the common occurrence of disease in laboratory conditions. In lab conditions fish held in aquaria, they are held in confined spaces. They share the same water. There is increased probability and potential for transmittal of pathogens in a confined environment.

MR. LILLY: In contrast to in the wilds, the density of the fish per cubic feet of water are much lower?

MR. BRATOVICH: They can be. They can be much lower. But perhaps more importantly they have the ability to adjust their behavior, and they can move about in a free-flowing environment rather than being confined to a very small environment.

MR. LILLY: Do you have anything else on juvenile rearing, or shall we move on to smoltification?

MR. BRATOVICH: Let's move on.

MR. LILLY: Let's talk about smoltification.

MR. BRATOVICH: Our next overhead, please. The last lifestage addressed in Table 2 of S-DFG-13 is the smoltification lifestage. As I mentioned, there was one reference documents cited to support the temperature recommendations for the smoltification lifestage or the smoltification lifestage of these specific recommended water temperatures of 50 to 55 degrees.

MR. LILLY: What was that reference?

MR. BRATOVICH: That reference was, again, Rich, 1997.

MR. LILLY: Let's go forward to S-YCWA-49. Please describe your review of the literature cited in that literature summary.

MR. BRATOVICH: Again, we reviewed the literature contained in that literature summary, and we were able to identify, again, one actual lab study that addressed the actual smoltification process, not necessarily juvenile rearing, per se. And that study was Clarke and Shelbourne, '85, which was included in that literature summary. It was the lab study that was done on fall-run chinook salmon in British Columbia.

To the best of our knowledge in our review, that study simply reported that the best osmo regulatory preadaptation occurred at 50 to 63.5 degrees.

MR. LILLY: For those of us who don't know this field

as well you do, please tell us what osmo regulatory preadaptation is.

MR. BRATOVICH: Osmo regulatory preadaptation is the adaptive ability to make the transition from freshwater to saltwater as it is referred to in the study.

MR. LILLY: So then please state your conclusion regarding CDFG's optimal temperature range for spring-run chinook salmon smoltification.

MR. BRATOVICH: We found no cited literature that specifically identified an optimal temperature range in smoltification in our review of the cited literature.

MR. LILLY: Let's go on to the second of your general conclusions, and if you could please just summarize that conclusion and go forward and describe in a little more detail how you reached that conclusion.

MR. BRATOVICH: Well, in general, the second main reason, point, that I wanted to make based upon our collaborative review of the information was that the temperatures recommended by CDFG are not always necessary, as we indicated already in our review of the literature, nor do they always exist in a natural environment, and certainly they don't exist in the Lower Yuba River, as indicated in Mr. Grinnell's testimony.

In general, the literature base does not support the contention or the mischaracterization, if one were to have a

mischaracterization, that all deviations from some optimal number will result in population declines. The literature does also support, however, the conclusion that a less restrictive temperature regime will accomplish the goal of maintaining fall-run in good condition and continuing to contribute to the recovery of spring-run chinook and steelhead in the Lower Yuba River.

MR. LILLY: Why don't you go forward to S-YCWA-50 and please just summarize this exhibit.

MR. BRATOVICH: S-YCWA-50 emphasizes the point I just made. We included the two quotes in this Exhibit. I won't spend the time to read them. But Dr. Brett did make a extremely salient point, what I have underlined in this exhibit for the overhead purpose. The last sentence in this quote, and I read, "It is obvious that there can be no simple pronouncement of thermal requirements," when he was referring to salmonids.

MR. LILLY: Unless you have anything more on this point, let's go forward to your third general conclusion. Please state that and the basis for that conclusion.

MR. BRATOVICH: Well, the conclusion is that these temperatures recommended by the Department of Fish and Game are not always necessary as to -- in our review demonstrated by the fact that historical temperatures have not achieved these recommended temperatures by the Department in the

Lower Yuba River. These temperatures often, as MR. Grinnell testified, have been higher than CDFG's recommended temperature ranges.

MR. LILLY: Do you have a slide that has the historical temperatures?

MR. BRATOVICH: Yes, we have Exhibit S-YCWA-41, Pages 1 and 2, which were presented by Mr. Grinnell previously. Mr. Grinnell did a good job of describing these exhibits. I won't belabor and repeat everything he said, but I do want to make an important point. Mr. Grinnell did testify that historic water temperatures oftentimes have exceeded those which have been recommended by DFG in Exhibit DFG-1.

The only additional point I would like to make is that the water temperature information presented in Exhibit S-YCWA-41, Pages 1 and 2, indicate that the historic and the estimated simulated water temperatures resulting from implementation of Yuba County Water Agency's proposed flow requirements are very similar throughout the course of the year.

MR. LILLY: If you are done with that, let's go forward to Exhibit S-YCWA-51.

MR. BRATOVICH: Next overhead, please.

S-YCWA-51 is a compilation of information; some of which was provided by Mr. Mitchell regarding the timing of spawning distribution during the fall of chinook salmon. In

the upper portion of this exhibit it indicates the timing of spawning for chinook salmon at locations both at Daguerre Point Dam and in the lower portion of this specific year included in this exhibit, which again is 1992. It is for locations below Daguerre Point Dam.

MR. LILLY: Just to clarify for the record, your overhead is the second page of Exhibit S-YCWA-51; is that correct?

MR. BRATOVICH: I take your word for it.

MR. LILLY: Please go ahead; I didn't mean to interrupt, what your important points are regarding this exhibit.

MR. BRATOVICH: Again, this is a cumulative probability distribution function of chinook salmon spawning during the months of September, October, November for a range of years in this exhibit. The years include 1992 through 1998. Also included on these figures are the water temperatures. The water temperatures above Daguerre Point Dam were calculated temperatures at Daguerre Point Dam.

MR. LILLY: Just to clarify, who did that calculation or where did you get those numbers?

MR. BRATOVICH: I received this data from Mr. Grinnell's team.

MR. LILLY: Please go ahead.

MR. BRATOVICH: The lower figure is the same, the

cumulative distribution function of spawning during the months of September, October, November below Daguerre Point Dam and the temperature was actually measured, I understand, at Marysville.

MR. LILLY: First of all, what are your points regarding the variations in temperature both day to day and over the season?

MR. BRATOVICH: The key points are two. First is that in general examining this information, years 1992 through 1998, that the first important point is that the vast majority of spawning really doesn't begin to occur in the Lower Yuba River until temperatures decline to approximately 58 to 60 degrees.

The second point that is indicated by this exhibit is that in years of higher water temperatures most of the spawning occurs later in the fall than it does in years of cooler water temperatures.

I can demonstrate that if I --

MR. LILLY: Please go ahead and compare a few years.

MR. BRATOVICH: Putting 1998 directly over 1992 as far as comparison. I indicated for '92 through '98 the same information is provided for each year. Now I am overlaying 1998 on top of 1992 information. Like to focus on above Daguerre Point Dam just for explanatory purposes. This information, as you can see, by differences in the spawning

distribution that, for example, in 1992 water temperatures were relatively warm, approximately 20 percent of the run spawned during the month -- by the end of October. That can be seen by this graph.

Allow me to illustrate using a pointer on the overhead exhibits. Approximately 20 percent of the run had spawned by the end of October when water temperatures were relatively warm during this year.

During a year of cooler water temperatures, 1998, approximately 70 percent of the run had spawned by the end of October. Again, we believe these spawning distributions are in response to the actual water temperatures that occurred.

MR. LILLY: Please just state what your conclusion is regarding the need for rigorous optimum temperature requirements like those proposed by the Department of Fish and Game.

MR. BRATOVICH: For this specific element that I just examined, the first conclusion is that these rigorous optimum temperature requirements are not necessary, and that the fish in the Lower Yuba River will adapt to the temperatures that actually occur, particularly in the timing with spawning as indicated by this exhibit.

Second, the literature cited by the Department supporting their recommended flow recommendations does

really not support the imposition of rigorous maximum temperature requirements as indicated in S-DFG-1.

And then lastly and perhaps very importantly, most importantly, that examination of all this literature, as I indicated, suggest that there may be a distinction between lab study and actually field application and examination of the historical temperatures that have occurred in the Lower Yuba River indicate that the temperatures that are estimated to occur with implementation of Yuba County Water Agency proposed minimum flow schedule will result in temperatures similar to those which occurred historically. And, therefore, it is our conclusion they will continue to maintain fall-run chinook salmon in good condition and to contribute to the recovery of spring-run chinook salmon and steelhead.

MR. LILLY: Mr. Bratovich, I know you are trying to get through this quickly. Just one clarification. If the spawning of the chinook salmon in the Yuba River is delayed in response to the fact that the temperatures are warming, does that then also carry over and affect the water temperatures that the eggs are exposed to?

MR. BRATOVICH: I presume it would if the spawning doesn't really occur until temperatures decline to 58 to 60 degrees, that would have a carryover effect to the embryo incubation as well.

MR. LILLY: Basically, the dates at which the temperatures for egg incubation are relevant would be later in the years of warmer water because the spawning would occur later?

MR. BRATOVICH: I guess, based on your approach, if you're trying to mandate that the fish start spawning on a certain date, then that would be difficult given the temperatures that have occurred or likely to occur.

MR. LILLY: In contrast, this data show that the fish themselves actually vary their spawning dates depending on the water temperatures?

MR. BRATOVICH: Yes, it does.

MR. LILLY: Is that the end of your testimony or do you have anything further?

MR. BRATOVICH: That is the end of our collective rebuttal testimony.

MR. LILLY: Mr. Brown, this panel is done and ready for cross-examination.

H.O. BROWN: Thank you, Mr. Lilly.

MR. LILLY: Thank you all for trying to get through a lot of material quickly. The Hearing Officer appreciates that.

H.O. BROWN: Mr. Gee.

MR. GEE: Thank you, Mr. Brown.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY THE DEPARTMENT OF THE INTERIOR

BY MR. GEE

MR. GEE: Mr. Grinnell, Mr. Mitchell and Mr. Bratovich, my name is Edmund Gee. I am an attorney with the U.S. Department of Interior. I have a few questions to start with.

I will start with you, Mr. Grinnell. I believe you stated that it would not be feasible for Yuba County Water Agency to meet the Department of Fish and Game's temperature requirement; is that correct?

MR. GRINNELL: That's correct.

MR. GEE: Did you analyze the potential to meet these temperature requirements with the temperature control device at Englebright Dam?

MR. GRINNELL: No, we did not.

MR. GEE: Are you familiar with the temperature control device at Englebright Dam?

MR. GRINNELL: The proposed --

MR. GEE: The proposed.

MR. GRINNELL: -- temperature control device?

Yes, very much so.

MR. GEE: Would the temperature control device help Yuba County Water Agency to meet these flow requirements by the Department of Fish and Game?

MR. GRINNELL: Yes. They would lower -- the reason for a temperature control device is to lower temperature.

MR. GEE: As I understand your analysis, you stated that Yuba County Water Agency's ability to meet the temperature requirements of the state included releases from Colgate and Narrows 2; is that correct?

MR. GRINNELL: I guess -- could you ask the question again, please?

MR. GEE: As I recall your testimony, you stated that the Yuba County Water Agency's ability to meet the temperature requirements of the state are limited only to Colgate and Narrows 2.

MR. GRINNELL: That's correct. That's correct.

MR. GEE: Is there any other release points on the river, to your knowledge?

MR. GRINNELL: No. There is just New Bullards Bar. And actually the releases at Englebright through Narrows 2 since they do not have storage right in Englebright is essentially a somewhat pass-through.

MR. GEE: In Colgate as well?

MR. GRINNELL: Well, no. Colgate is -- they used to regulate New Bullards Bar. The Agency has ability to regulate storage that is there. They are a little different in how they operate.

MR. GEE: Isn't Narrows 1 another release point on the

river?

MR. GRINNELL: Yes. That's PG&E's facility.

MR. GEE: Isn't it true that Narrows 1 draws water from a different level than Narrows 2, to your knowledge?

MR. GRINNELL: There are different intakes. Could be duration. Narrows 2 is a tower. Narrows 1 is a tunnel inlet.

MR. GEE: Is the temperature of Narrows 1 releases generally cooler than Narrows 2?

MR. GRINNELL: I don't know that.

MR. GEE: You also stated that temperature goes up in the Yuba River from Narrows to Marysville; is that correct?

MR. GRINNELL: That is correct; in the warmer months, yes.

MR. GEE: That wouldn't include wintertime months such as December, January, February?

MR. GRINNELL: When the air temperature is warmer, regardless of the month, then the release temperature warms up; and when it is cooler, it actually cools.

MR. GEE: During winter months it is actually cooler; water wouldn't necessarily warm up from Narrows 2?

MR. GRINNELL: That's correct.

MR. GEE: Mr. Mitchell, I have a few questions for you.

Thank you, Mr. Grinnell.

I refer you to Exhibit, I believe it is, 103, Figure 7.

Is the data here, the Hallwood-Cordua data, representative of all the size ranges of chinook that are in the river at the times listed?

MR. MITCHELL: Probably not.

MR. GEE: In looking at this graph, Exhibit 103, my question: Are you familiar with a phenomenon called bimodal outmigration?

MR. MITCHELL: Yes.

MR. GEE: You know what that is?

MR. MITCHELL: Well, my interpretation of that is that there are two migration periods characteristic of chinook salmon, particularly fall-run, where you have an earlier fry migration followed by a bigger spring smolt migration. That is my understanding of the bimodal nature of that distribution.

MR. GEE: Is the fry outmigration, is it represented in this graph?

MR. MITCHELL: No.

MR. GEE: Is there a fry outmigration that occurs in the river?

MR. MITCHELL: Yes. Recent data from that screen trap that DFG operated indicates there is a fry migration.

MR. GEE: Thank you.

Mr. Mitchell, I believe you stated that the temperature requirements at Daguerre Point Dam and at Marysville gauge, the 56-degree requirement, I believe you stated that this tends to have an effect on the timing of the arrival of fish and spawning of fish; is that correct?

MR. MITCHELL: I was referring to the effect of those temperatures on growth and outmigration juveniles.

MR. GEE: You expressed concern about there being interbreeding between spring-run and fall-run?

MR. MITCHELL: Yes, referring to the summer period, yes.

MR. GEE: Now, did the spring-run chinook, do they react the same way as fall-run chinook to the waters?

MR. LILLY: I am going to object. The question is ambiguous if he doesn't refer to a lifestage. Clearly, there could be very different answers for juveniles versus adults.

H.O. BROWN: Mr. Gee.

MR. GEE: I will rephrase my question.

My question is: As far as temperature changes to adult fish, that is fall-run and spring-run, do they react to temperature changes in the same way?

MR. MITCHELL: I wouldn't say react. I am not sure what you mean.

MR. GEE: Such as reacting, causing early migration or

earlier spawning?

MR. MITCHELL: Well, they have very different life histories during the -- particularly during upstream migration. And most of the information we have from studies on behavior and physiology are based on fall-run. So, it is very difficult to say. It is generally believed that spring-run to respond in the same way as fall-run.

MR. GEE: Spring-run, I am trying to understand how fish, the spring-run are further along in the river than fall-run would be at a given time.

MR. MITCHELL: Adult spring-run arrive during the spring, and then will hold over in the summer and spawn in the early fall to late fall.

MR. GEE: If there is cooler water, the spring-run adult chinook would possibly arrive at an earlier time and spawn at an earlier time, given those cooler temperatures?

MR. LILLY: I am going to object. Cooler water is ambiguous if he doesn't talk about what season. Clearly, it makes a difference if he talks about spring or fall at this point.

MR. GEE: I am talking about the time where the fish may be in the river at the same time. He expressed a hybridization; that's what I am questioning about.

MR. MITCHELL: I was referring to maintaining 56 degrees and 60 degrees at Daguerre and Marysville

respectively during the summer. That would encourage the earlier migration of fall-run which normally ascend the rivers later in the summer and fall. They would be encouraged to arrive earlier, which is -- at that time of the year spring-run had already entered the river prior to that period and would be already near the spawning grounds?

MR. GEE: Given what you just said, there is no increased risk of hybridization in the spring-run and full-run if both react at the same time to cooler waters. Is that a fair thing to say?

MR. MITCHELL: The fall-run, if they are in the spawning areas early and temperatures are suitable, will begin to spawn. And generally those temperatures are the same time, would be suitable for spring-run. That is the nature of my concern, that both would be on the spawning grounds and would respond to those cues and spawn at the same time.

MR. GEE: Mr. Mitchell, you are a biologist; is that correct?

MR. MITCHELL: Yes.

MR. GEE: Is there a difference between a physiologist and a biologist?

MR. MITCHELL: Not necessarily.

MR. GEE: What are the differences?

MR. MITCHELL: A physiologist is a specialist in the

area of biology which is physiology.

MR. GEE: Any comments you would make as to fish physiology you wouldn't have any credentials to comment on?

MR. MITCHELL: I am not a fish physiologist.

MR. GEE: You made some comments, if I heard you today, that cooler temperatures slow the growth of salmonids. Is that correct?

MR. MITCHELL: Yes.

MR. GEE: Does that relate to physiology?

MR. MITCHELL: Certainly the effect is through a physiological mechanism.

MR. GEE: Did you measure these impacts, this slowing of the growth rate of salmonids?

MR. MITCHELL: No. We have --

MR. GEE: That is fine. You answered my question.

Thank you.

Is smoltification related to size?

MR. MITCHELL: Size is one of the variables controlling smoltification, yes.

MR. GEE: I believe I heard you testify today that larger fish have higher temperature tolerances; is that correct?

MR. MITCHELL: Generally.

MR. GEE: Would you agree that smolting fish are more fragile than earlier stages? When I say earlier stages, I

mean fry and fingerling.

MR. MITCHELL: When you say more fragile, I don't know what you mean.

MR. GEE: Well, I guess what I mean is as far as temperature changes affecting their physiology.

MR. MITCHELL: You will have to rephrase the question.

MR. GEE: Would you agree that smolting fish are more fragile in the physiological sense than earlier stages?

MR. MITCHELL: I guess you are going to have to be more specific.

MR. GEE: Is there something about the question you don't understand?

MR. MITCHELL: It's very vague, very general. I don't have -- I need a few more specifics to be able to answer that.

MR. GEE: Let me be more specific: Are you saying smolts have higher temperature tolerance?

MR. MITCHELL: I would ask higher than what?

MR. GEE: Rather that they have a high temperature tolerance, not higher.

MR. MITCHELL: I can't answer the question without a comparison.

MR. GEE: You stated larger fish have higher temperature tolerances, did you not, today?

MR. MITCHELL: Yes, I did. That is a general

statement.

MR. GEE: Well, my question is general in that regard. Are you saying smolts have a high temperature tolerance?

MR. MITCHELL: Again, I have to ask in comparison to what.

MR. GEE: I will move on.

Mr. Mitchell, you made a statement that you didn't observe any steelhead redds below Daguerre Point Dam?

MR.MITCHELL: Yes.

MR. GEE: Do you have data that indicates the days when these surveys were made?

MR. MITCHELL: Yes.

MR. GEE: Were these provided in this hearing?

MR. MITCHELL: No.

MR. GEE: Why weren't they provided?

MR. MITCHELL: They were not requested.

MR. GEE: Thank you.

Mr. Bratovich, a few questions for you.

This relates to Exhibit S-YCWA-45. Do you have that in front of you?

MR. BRATOVICH: Yes, Mr. Gee, I do.

MR. GEE: Do you know what the Department of Fish and Game's adult migration temperature criteria are?

MR. BRATOVICH: Criteria for what, Mr. Gee?

MR. GEE: Their temperature requirements that you have

given lengthy testimony to.

MR. BRATOVICH: Do I know what Fish and Game's criteria are?

MR. GEE: Yes, that was my question.

MR. BRATOVICH: I did not testify to that. I testified to the temperatures recommended in S-DFG-1.

MR. GEE: You mentioned that, and this relates to S-YCWA-45, you stated that Hinze, '59, did not support the Department of Fish and Game's temperature specification; is that correct?

MR. BRATOVICH: For what lifestage are you referring, Mr. Gee?

MR. GEE: I am asking you. You made that statement. I don't recall exactly what that statement was. If you can state what your comment was in that regard.

MR. BRATOVICH: I don't wish to misspeak. The best of my recollection, I was referring to the literature cited in S-DFG-13, Page 4, pertaining to specific lifestages. I recollect it was adult holding while eggs are maturing. It was a single reference to Hinze, '59.

MR. GEE: What was that single reference?

MR. BRATOVICH: Hinze, '59.

MR. GEE: My question is: What points were you making in using Hinze, '59?

MR. BRATOVICH: As I recollect, my point that I was

making was that Hinze, '59, conducted no specific study regarding adult holding while eggs are maturing, specific optimal regime. How is it that it was referred to in S-DFG-13, Page 4? It is referred to as 59 to 60 upper limit optimal range.

MR. GEE: I am assuming that you read Hinze, '59?

MR. BRATOVICH: Yes.

MR. GEE: Do you agree with Hinze, '59?

MR. BRATOVICH: I do --

MR. LILLY: I am going to object. The question is -- I don't know what happened to our Hearing Officer.

MEMBER FORSTER: I am substituting.

MR. LILLY: I looked in the corner. I saw the chair was empty. Ms. Forster, I will have to address my objections to you. I see you have a gavel; you are ready to pound.

I am going to object to the question as unclear, when it is asked do you agree with the conclusions. Obviously, a lengthy report has a lot of conclusions. I think the question needs to be more specific as to which conclusion he is talking about.

MEMBER FORSTER: Try again.

MR. GEE: I will be more specific, then.

MR. BRATOVICH: Mr. Gee, may I provide one piece of clarification? Before I was interrupted, the only words

that the recorder heard was I do. My next was "not." I want that specified.

MR. GEE: If you can turn to Page 4 of YCWA-45, and there is a section there that says water temperature; is that correct?

MR. BRATOVICH: Yes, there is. If you can read the second paragraph below that, for the record.

MR. BRATOVICH: The second paragraph in that section?

MR. GEE: Yes.

MR. BRATOVICH: I can read that.

MR. GEE: Thank you.

MR. BRATOVICH: As a singular point of context I will read the statement:

> That it was found that fish held at the cold water base in water of 40 to 50 degrees held from four to six weeks. While fish held at Nimbus in water of 59 to 67 degrees died within seven to ten days. (Reading.)

MR. GEE: Does this, in your opinion, does this not support Fish and Game's temperature requirements?

MR. BRATOVICH: I don't believe it does because in the next paragraph there is a continued discussion of all fish that died up at Kyburz station at the cold water base.

MR. GEE: Thank you, Mr. Bratovich. That is all my questions.

MR. BRATOVICH: Thank you, Mr. Gee.

MR. GEE: Ms. Forster, that is all my questions.

I thank these witnesses.

MR. BRATOVICH: Thank you.

MEMBER FORSTER: The next to cross is Mr. Cunningham of Fish and Game.

MR. CUNNINGHAM: Thank you.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY THE DEPARTMENT OF FISH AND GAME

BY MR. CUNNINGHAM

MR. CUNNINGHAM: Good afternoon, Madame Chairman. My name is Bill Cunningham, Deputy Attorney General representing the Department of Fish and Game.

I do have some questions for this panel. If you will bear with me, I will try to go in somewhat order, but following Mr. Gee some of the questions have been answered, and that leaves me with a little more scattered approach.

If I can, I do have a couple of questions about the hydrology initially as well, presupposes I can find all of this. Perhaps I can ask the question, anyway.

In looking at the testimony, Mr. Grinnell, that you provided today about temperatures on the Yuba River, you provided a document that was -- go backwards until I find it. Mr. Grinnell, Yuba County Water Agency's Exhibit 40,

you presented a thermograph, a temperature graph of the Sacramento River for 1999, and you earlier testified that you knew the year 1999 was a wet year or wetter year than normal.

What is the basis for that conclusion?

MR. LILLY: I'm going to object. Misstates his prior testimony. I think it was a cooler year than normal, not a wetter than normal.

MEMBER FORSTER: Try again.

MR. CUNNINGHAM: Madame Chair, Mr. Grinnell testified as to two things, that it was a cooler year and a wetter year. Mr. Grinnell is even shaking his head, so may I ask my question again?

MEMBER FORSTER: Yes.

MR. CUNNINGHAM: Mr. Grinnell, upon what basis did you conclude that this was a wetter year than normal?

MR. GRINNELL: I'll have to clarify my understanding of the water year for the Yuba River basin.

MR. CUNNINGHAM: What is the source for that understanding?

MR. GRINNELL: It is the DWR water estimates provided in the springtime. And we did some examination of that information in the summer of '99.

MR. CUNNINGHAM: That information available in the Board's record at present?

MR. GRINNELL: I don't know that if it has been presented or not. It is -- DWR information is published information, but I don't know if it is in the record or not.

MR. CUNNINGHAM: You also testified that it was a warmer year than normal. On what source of information did you make that conclusion?

MR. GRINNELL: No. Actually it was my opinion that it was a cooler year.

MR. CUNNINGHAM: Cooler year, I am sorry, a cooler year than normal. On what basis did you make that conclusion?

MR. GRINNELL: Just in dealing with data of summertime temperature data in preparing for these hearings.

MR. CUNNINGHAM: What summer time temperature data?

MR. GRINELL: We looked at CDEC and we looked at NCDC, National Climate Data Center, information; and that is the information that we used to examine air temperatures and that we specifically look at Marysville is where those temperatures are recorded.

MR. CUNNINGHAM: You looked at the same air temperature data for other years, other than this year to make a conclusion that this was a cooler year than normal?

MR. GRINNELL: I have a general knowledge by dealing with quite a large quantity temperature data in preparing all of your analysis, and it is based on a comparison to

that general knowledge.

MR. CUNNINGHAM: Has any of that information been put into the record for this proceeding, to your knowledge?

MR. GRINNELL: A lot of our analysis, we have provided a lot of air temperature data in Marysville. So, yes, a lot of that information is in the record.

MR. CUNNINGHAM: Mr. Grinnell, is there any reason why you provided this information for calendar year 1999?

MR. GRINNELL: Yes, there is a specific reason. We could not find any other temperature data for the Sacramento -- actually, the Sacramento and Feather River other than the '99 data. We were looking for more.

MR. CUNNINGHAM: Moving on, Mr. Grinnell, I think you were also the source of the analysis contained in Yuba County Water Agency's supplemental Exhibit 41; is that correct?

MR. GRINNELL: That's correct.

MR. CUNNINGHAM: Mr. Grinnell, the first page of this is a distribution of historic and simulated monthly average daily mean inflow averages at Daguerre Point Dam. Mr. Grinnell, let's talk a little about this.

What is the source of the information for the historic temperature data at Daguerre Dam?

MR. GRINNELL: There is USGS recorded information that we have used in developing -- I am sorry. That we have

some information within the time period of '89 to '99 for Daguerre Point Dam. You'll notice in the Footnote Number 1, that we supplemented that information by estimates from regression analysis because it wasn't a full record.

MR. CUNNINGHAM: Good point, Mr. Grinnell.

Mr. Grinnell, how many actual data points do you have for Daguerre Dam on a monthly temperature distribution for the period '88 through '99?

MR. GRINNELL: That is a tough one. I don't think I remember the number of data points. It is quite a bit less than the Marysville record.

MR. CUNNINGHAM: Isn't it true that there are -- for over half of the years you have no actual temperature data, measured temperature data, at Daguerre Point Dam?

MR. GRINNELL: That could be possible. That is a possibility. I am not remembering the specific time period for Daguerre Point Dam temperature information.

MR. CUNNINGHAM: Mr. Grinnell, it is my assumption that you then performed another regression analysis that produced the rest of the data points for the historical temperatures at Daguerre Point Dam on Page 1?

MR. GRINNELL: That is correct.

MR. CUNNINGHAM: How accurate is the regression analysis when you have only a few actual measured points and you are trying to extrapolate a total of --

MR. GRINNELL: It can be very difficult, and a lack of data can certainly be a problem in developing an understanding of the temperatures.

MR. CUNNINGHAM: Do you have any idea what the level of confidence is in the data provided here as to historical monthly temperatures at Daguerre Point Dam?

MR. GRINNELL: Statistically, I don't have these numbers available to me.

MR. CUNNINGHAM: Were you ever asked to perform such a statistical analysis?

MR. GRINNELL: We did do a statistical analysis of those regressions and examined the strength of those regressions in developing our original testimony provided.

MR. CUNNINGHAM: Did you do any of that for the testimony contained in Yuba County Water Agency Exhibit 41?

MR. GRINNELL: It is the same regression. If we went back to YCWA-18 and looked at the statistics that we provide, I believe it is in there. If I could just check for a second.

MR. CUNNINGHAM: Please.

MR. GRINNELL: We provide a temperature on Page 17 of YCWA-18. We provide a table that is labeled "Yuba River Temperature at Daguerre Point Dam versus Temperature at Marysville," providing these statistics, R-squared and standard deviation.

MR. CUNNINGHAM: Can you tell me what the level of confidence is in the accuracy of the information I'm looking at on Page 1? Is it plus or minus 5 percent? 10 percent? 20 percent?

MR. LILLY: I am going to object to the term "percent error" when you are referring to temperatures is a meaningless term.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I'm looking at the first page of Table 41. It has a bar, vertical bars, identified as the average historic monthly average -- average of historic monthly average daily mean flow temperature. And my concerns are is that information is provided to us with no measure of how accurate these bars are, especially when it turns outs these bars are based on, for the most part, statistical regression analysis of very few actual measured historic temperatures. I don't care how Mr. Grinnell tells me how accurate this is, whether it's a percentage or some other mathematical language.

The question to him is: How accurate, how confident are you that these reflect reality? Can you give me some way to measure that statistically?

H.O. BROWN: I understand the question. Answer the question if you can.

MR. GRINNELL: Well, I guess the best way I can answer

the question is by Table 17 -- on Page 17 the table relating Yuba River temperature at Daguerre Point Dam versus the temperature at the Marysville gauge, and it lists R-squared, which is the goodness of the regression, and it gives error in standard deviation.

The R-squared range is .71 to .96. Those are relatively strong R-squareds, in my opinion.

MR. CUNNINGHAM: Mr. Grinnell, are you telling me that the regression analysis you used to generate the numbers you are missing on this chart came from a regression analysis of a Marysville temperature gauge rather than any actual measurements at Daguerre Point Dam?

MR. GRINNELL: No. We also -- I'm sorry, that is based off of the Marysville gauge. We're also in the back looking for the comparison -- here we go.

This is probably the best way to show it. It's the record of information and shows an overlay of plotted -- Page B-4 of YCWA-18. It shows the recorded river temperature at Marysville -- at Daguerre Point Dam versus the estimated river temperature at Daguerre Point Dam, which says estimated by river temperatures and flows at Marysville gauge and air temperature at Marysville gauge which is used to develop the graph of YCWA-41 and shows how well that regression predicts the temperature at Daguerre Point Dam. Again, since they overlay quite well, I would say that that

regression does a pretty good job of that estimation.

MR. CUNNINGHAM: Mr. Grinnell, now that you've looked at these additional exhibits, can you tell me how many actual measurements were actually made at Daguerre Point Dam of temperatures that you provide in this analysis?

MR. GRINNELL: Kind of tough to tell how many points there are. There are quite a number of points. There are information taken from the '70s and then information taken in 1998 in order to develop that relationship.

MR. CUNNINGHAM: In the '70s and one year, 1998; is that right?

MR. GRINNELL: That's correct.

MR. CUNNINGHAM: Was the information for this table, to the extent it was derived from measurements in the 1970s from each month in the 1970s, each year?

MR. GRINNELL: I am just checking to make sure there are no -- there are gaps. Let's see if they are consistent.

Just by my eyeball, it appears it does cover all time frames. There is information for all months of the year.

MR. CUNNINGHAM: Your sole source of information is the table you are referring to in Exhibit 18?

MR. GRINNELL: Yes. I believe that is the amount of information that we used.

MR. CUNNINGHAM: Moving on, Mr. Grinnell, you also testified about the impacts of the proposed temperature

requirements of the Department of Fish and Game as far as instream flows. Then you made a statement to the effect that the flows requested would be over three times, I think, correct me if I am wrong, over three times the capacity of New Bullards Bar?

MR. GRINNELL: I believe I said several times.

MR. CUNNINGHAM: Are you assuming that all of the water that would be used to meet any thermal requirements from the Lower Yuba River would be coming from New Bullards Bar solely?

MR. GRINNELL: No. In fact, if you want to compare those numbers to the unimpaired flow of the Yuba River or the water that is available to the Lower Yuba River, you could also look at it that way.

MR. CUNNINGHAM: Just for example, let me pick one of your charts from the many that you put on. Yuba County Water Agency 33, for example, where you identify an instream flow schedule for normal and wet years that complies with the flow and temperature requirements of DFG-1. You have additional flows needed for temperature requirements just in the month of January. You put down 2,978 cfs for the month of January.

Are you suggesting that 2,978 cubic feet per second would have to be released from New Bullards Bar to satisfy this requirement?

MR. GRINNELL: No, I was not suggesting that.

MR. CUNNINGHAM: Do you know whether or not the flows from the South Fork and Middle Fork of the Yuba River would be fully sufficient to satisfy that requirement in a normal or wet year?

MR. GRINNELL: More than likely, yes. I believe in a normal or wet year, yes. I believe it should. But, again, if you look at the totals, and as I said if you wanted to compare them to the water that is available to the Lower Yuba River, they are still very large numbers.

MR. CUNNINGHAM: These totals that you have at the very bottom of each of your exhibits that are similar to this for normal and wet years, and I think you did one for dry and one for critically dry.

MR. GRINNELL: Yes.

MR. CUNNINGHAM: Each of those numbers at the bottom where you do total volumes, we should not assume that these total volumes were going to be requested or required or generated by New Bullards Bar storage alone?

MR. GRINNELL: Well, they would be a requirement of the Yuba County Water Agency to meet -- to attempt to meet the temperature requirement. For instance, the numbers, the totals, as you pointed out for YCWA-33, the Type 1 operation, 2.5 million acre-feet, that is over the unimpaired flow of the Yuba River. But I am not suggesting

that it solely comes out of storage of New Bullards Bar. That was not my intent.

MR. CUNNINGHAM: When you made these analyses did you take into account any temperature data, historical, actual historical temperature data available for the South Fork or Middle Fork of the Yuba River?

MR. GRINNELL: Well, we do -- certainly we take that into account in that we used information, historical temperature information, from the Marysville gauge which is a culmination of the releases of New Bullards Bar and the flows of the Middle and South. So, that is the basis for our analysis.

MR. CUNNINGHAM: Well, did you ever take into account any actual measured temperatures, historical measured temperatures for the South Fork or Middle Fork of the Yuba River without the North Fork component in developing your analysis for these exhibits, Yuba County Water Agency 33 through about 39?

MR. GRINNELL: I guess I don't understand the question.

MR. CUNNINGHAM: Mr. Grinnell, to the extent you looked at the Marysville gauge and worked backwards, you have no idea if you look at only the Marysville gauge how much of the water at the Marysville gauge in January of any one year was being released from New Bullards Bar or is coming

through the South Fork or Middle Fork of the Yuba River?

MR. GRINNELL: Well, we know the historic record and how much water is coming.

MR. CUNNINGHAM: I am sorry, answer my question, please. If you look only at the Marysville gauge flow data, there is no way to tell how much water at that point was coming from the North Fork, Middle Fork or South Fork of the Yuba River, is there?

MR. GRINNELL: Correct.

MR. CUNNINGHAM: If you take only the Marysville information and work backwards, how can you tell me honestly that you have addressed whether or not there are differences in temperature between the North Fork, Middle Fork and South Fork flows at any one time?

H.O. BROWN: Mr. Lilly.

MR. LILLY: I am going to object that this misstates his prior testimony. Mr. Grinnell testified both in his direct testimony that led up to this and for today, he relied on a lot of different data to develop his temperature and hydrological analysis. To the extent Mr. Cunningham is saying, "Well, you only relied on the Marysville gauge," is misstating the prior testimony.

H.O. BROWN: Good question, Mr. Cunningham. If you revise it just a little bit, I think you will get there.

MR. CUNNINGHAM: It is not worth pursuing, Mr. Brown.

I will withdraw the question and move on. We have other things to ask.

Moving on, talking to the two biologists, Mr. Mitchell and Mr. Bratovich, welcome again.

Mr. Mitchell, I have a couple questions for you very quickly. One of them is a follow-up question to a question asked by Mr. Gee.

You testified earlier today that a potential problem as you perceived it a stable flow regime. I am not going to use your words of cooler or warmer or anything else, but a stable flow regime as proposed by the Department of Fish and Game during -- let me give you the just for example months -- August, September and October, I think this summarizes your testimony, would in your opinion produce potentially an earlier spawning for fall-run salmon; is that correct?

MR. MITCHELL: That is not correct.

MR. CUNNINGHAM: What did you say?

MR. MITCHELL: My comments were related to water temperature and the affect of water temperature on migration timing.

MR. CUNNINGHAM: Mr. Mitchell, the specific question that was asked by Mr. Gee and the specific testimony you made was that the Department of Fish and Game's proposed flow temperatures would produce potentially earlier spawning in fall-run salmon; is that true or not?

MR. MITCHELL: That's not true, no. Strictly referred to temperature.

MR. CUNNINGHAM: The Department's proposed -- does the Department's proposed temperature for the months of August, September and October produce an earlier spawning of fall-run chinook salmon?

MR. MITCHELL: That was my testimony; the potential was there to encourage fish to come up earlier in the year.

MR. CUNNINGHAM: I am sorry, spawning, Mr. Mitchell, not migration, does it encourage earlier spawning of fall-run chinook salmon?

MR. MITCHELL: Yes, potentially, yes.

MR. CUNNINGHAM: What authority do you have for this proposition?

MR. MITCHELL: The arrival of the fish on the spawning grounds would be expected to be earlier in years when water temperatures are cooler in the summer. The fish would already be on the spawning grounds at the time when temperatures dropped to the suitable level and, therefore, would start spawning.

MR. CUNNINGHAM: Let me back up. Perhaps I misspoke. Do you have any written citation or authority for this position?

MR. MITCHELL: This is based on our observations in the field during our own spawning escapement surveys.

MR. CUNNINGHAM: You actually reduced the temperature of the Yuba River in August and September of any year and watched for earlier migration; is that my understanding?

MR. CUNNINGHAM: No. These refer to observations that were made in years when water temperatures were lower in the summer, and we did observe earlier upstream migration of adult fall-run chinook salmon in those years.

MR. CUNNINGHAM: Waters were lower; are we talking lower temperature?

MR. MITCHELL: Lower temperatures, yes.

MR. CUNNINGHAM: Mr. Mitchell, as I understand from testimony of Mr. Grinnell and you earlier, are you of the opinion then that a cool water release on the order of 56 or 58 degrees in Yuba River would initiate new migration from the ocean of fall-run chinook salmon through the Sacramento and Feather to arrive at the Yuba River?

MR. LILLY: I will object. The question is vague when he says 58 degrees, but does not specify location. Obviously, release at Narrows is very different from temperature at Marysville.

H.O. BROWN: Mr. Cunningham, would this be a good time to take a break?

MR. CUNNINGHAM: Yes, Mr. Brown.

H.O. BROWN: We will take our afternoon break.

(Break taken.)

H.O. BROWN: On the record.

MR. LILLY: Mr. Brown, before Mr. Cunningham resumes the cross-examination I did want to talk scheduling. Based on informal discussions with Mr. Cunningham and Mr. Frink, it looks like the cross-examination of this panel will go to about 3:30. We have two other witnesses, Donn Wilson who is here and ready to testify today, will probably not take very long. But it is possible we finish at a quarter to four earliest. I want to know if I need to call Stewart Robinson who is visiting his parents in Dixon right now before they leave for a month out of the country. I can if it is necessary; it will only be for 15 minutes at the end of the day. We clearly are going to have to come back on the 16th anyway.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: Board Member Brown, I have a very brief matter that I could put on for South Yuba and Brophy if you need some filler time.

H.O. BROWN: Again, we will try to adjourn today about five or ten minutes before four. So we will work on the schedule.

MR. LILLY: All Right. I won't call Mr. Robertson. I am sure he appreciates the accommodation.

H.O. BROWN: That will be fine.

MR. LILLY: Thank you.

H.O. BROWN: Mr. Cunningham, are you ready?

MR. CUNNINGHAM: Thank you, Mr. Brown, yes.

Mr. Mitchell, back to you. Start again on the line of questioning we were still following.

Mr. Mitchell, the question to you is: The Department of Fish and Game's recommended temperature criteria for the Yuba River at Daguerre Point Dam is 56 degrees year-round, I believe. And it is my understanding of your testimony that such a temperature could encourage early immigration and spawning of fall-run chinook salmon?

MR. MITCHELL: Yes, that's correct.

MR. CUNNINGHAM: Can you tell me how does this temperature encourage early immigration of adult fall-run chinook salmon from the Pacific Ocean?

MR. MITCHELL: That wasn't my testimony.

MR. CUNNINGHAM: Correct me if I am wrong. The salmon we are talking about here reside for several years in the Pacific Ocean; isn't that correct?

MR. MITCHELL: That's correct.

MR. CUNNINGHAM: In order for them to arrive at the Yuba River they must come in from the ocean, up the Delta, up the Sacramento and Feather before they come to the Yuba River?

MR. MITCHELL: That's correct.

MR. CUNNINGHAM: Are you testifying today that the

temperature of 56 degrees in August, for example, hypothetically, on the Yuba River is going to induce a fall-run chinook salmon beyond the Golden Gate to immigrate into the river system and all the way up to the Yuba River?

MR. MITCHELL: No, of course not. The water temperature in that month will attract adult fall-run chinook salmon in the Feather near the mouth of the Yuba possibly, but certainly as they approach the mouth of the Yuba and experience lower temperatures in the Yuba will be and could very well be attracted into the Yuba because of these temperatures.

MR. CUNNINGHAM: Do you know of any studies or surveys or research that establishes the presence of fall-run chinook salmon, matured fall-run chinook salmon, ready to enter at Yuba River from the Feather or Sacramento in the month of August, the populations, numbers, the existence of?

MR. MITCHELL: The data we have from carcass surveys shows and our observations during the summer indicate that fall-run chinook salmon are arriving and can arrive in the summertime as early as July when water temperatures are low in the Lower Yuba River below Daguerre Point Dam.

MR. CUNNINGHAM: That wasn't quite responsive to my question. My question to you is: Do you have any knowledge through studies, surveys, reports, other documents, of the actual existence of these fish waiting outside the mouth of

the Yuba River, the Feather or Sacramento during the month of August? Have you done a survey in the Feather River, for example?

MR. MITCHELL: No.

MR. CUNNINGHAM: Have you done a survey in the Sacramento River, for example?

MR. MITCHELL: No.

MR. CUNNINGHAM: Isn't it true that your only knowledge is based on what you see in the Yuba River at present, isn't that so?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Can you for a -- can you make the following statement: That the fish you have seen in early immigration to the Yuba River did not also come up through the Sacramento River or Feather River that was also equally cool to encourage early immigration?

MR. MITCHELL: Our observations indicate that the fall-run chinook salmon in the Yuba River are there earlier when the water temperatures are lower. That is the extent of our observations.

MR. CUNNINGHAM: You have no idea whether those temperatures are also lower in the Feather, do you? You never made a comparison, have you?

MR. MITCHELL: I believe I have, and I don't recall the results of that analysis.

MR. CUNNINGHAM: Did you ever do any comparison with the Sacramento River temperatures at the same time?

MR. MITCHELL: We have done that analysis that I -- as I recall, to examine those temperatures. And I have to admit I am not familiar with -- have to refresh my memory as to those results.

MR. CUNNINGHAM: Safe to say then that your concerns about the early immigration of adult fall-run chinook salmon into the Yuba River, hypothetically encouraged by the proposed Department of Fish and Game flow, would only become a problem if temperatures in the Feather River and Sacramento River and Delta were also conducive to early migration; isn't that true?

MR. MITCHELL: No, not necessarily.

MR. CUNNINGHAM: What do you base that statement on?

MR. MITCHELL: That statement is based on the number of years when we have had low temperatures in the Yuba River where we have observed fall-run chinook salmon arriving early in the river.

MR. CUNNINGHAM: Mr. Mitchell, as I understand it, at least today for this hearing, you cannot give me any comparison of those years with temperatures in the Feather or the Sacramento; isn't that true?

MR. MITCHELL: I don't have data here, no.

MR. CUNNINGHAM: You don't know as you sit here today

whether or not those years you found early immigration in the Yuba River were years when the Feather River and the Sacramento River were also equally cooler in temperature; isn't that true?

MR. MITCHELL: Without the data I cannot tell you.

MR. CUNNINGHAM: Are you familiar with the spawning habitats of spring-run chinook salmon, Mr. Mitchell?

MR. MITCHELL: I am familiar in the sense that I know the spawning process of chinook salmon, yes.

MR. CUNNINGHAM: In fact, didn't you earlier testify, in fact, I think you testified on direct that there were no identifiable spring-run chinook salmon in the Yuba River?

MR. MITCHELL: No, I did not testify to that.

MR. CUNNINGHAM: Are you willing to admit today that there are spring-run chinook salmon in the Yuba River?

MR. MITCHELL: Based on the occurrence of adults during the spring migrating up river, I believe there are spring-run in the Lower Yuba River.

MR. CUNNINGHAM: Do you know whether or not adult chinook salmon arriving in the Yuba River in July or August are spring-run chinook salmon or fall-run chinook salmon?

MR. MITCHELL: Our observations indicate that there are fall-run chinook salmon when we have observed bright -- when I say bright, silvery bright fish, indicating recent ocean residence in the summer below Daguerre Point Dam. Those we

believe are fall-run.

MR. CUNNINGHAM: Do you have any way to establish that they are not late-arriving spring-run chinook salmon?

MR. MITCHELL: No way other than appearance.

MR. CUNNINGHAM: Then once these spring-run chinook salmon are in the Yuba River system, Mr. Mitchell, are you aware of exactly when they spawn?

MR. LILLY: Excuse me, I think -- I object. The question is ambiguous. He said these spring-run salmon; yet the testimony had just been about fall-run. I think it would be helpful if counsel would clarify which salmon he is talking about as far as location and timing.

MR. CUNNINGHAM: I will restate the question.

H.O. BROWN: Okay.

MR. CUNNINGHAM: To the extent you have any knowledge of spring-run salmon in the Yuba River, spring-run chinook salmon in the Yuba River, are you aware of when these spring-run chinook, the ones in the Yuba River, spawn?

MR. MITCHELL: No.

MR. CUNNINGHAM: How did you conclude that then that fall-run chinook salmon that might be encouraged to spawn earlier would overlap with and hybridize with spring-run chinook salmon?

MR. MITCHELL: Well, the general timing of spring-run chinook salmon begins in September through November, and we

have observed spawning as early as September.

MR. CUNNINGHAM: For which?

MR. MITCHELL: For chinook salmon in general. We cannot -- when they are spawning at that time, there is no way to determine whether they are, in fact, fall-run or spring-run. That is why we cannot determine when the spring-run is spawning.

MR. CUNNINGHAM: Mr. Mitchell, if you can't determine when spring-run are spawning, how can you conclude that fall-run would hybridize with those fish?

MR. MITCHELL: If there is a distinct spring-run of chinook salmon in the Yuba River, we would expect they would behave and have a life history similar to other spring-run chinook salmon in the Central Valley. They would be expected to spawn as early as September and through the fall months.

MR. CUNNINGHAM: Mr. Mitchell, you also testified earlier you saw anglers angling for steelhead trout in the Yuba River this year; isn't that true?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Did you observe any of these anglers actually catching spawning steelhead trout?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Actually observed them catch steelhead trout?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Actually spawning steelhead trout. Were these fish actually being caught, the redds?

MR. MITCHELL: Yes, I believe so. In fact, when I examined one of the fish that was caught, the male was actually exuding milt.

MR. CUNNINGHAM: I am sorry, Mr. Mitchell. Did you actually observe whether or not this adult was taken from an existing redd?

MR. MITCHELL: Not directly, no.

MR. CUNNINGHAM: Are you aware of the fact current sport fishing regulations in the Yuba River require that all steelhead be released?

MR. MITCHELL: Yes. And that doesn't refer -- pertain to hatchery trout, I believe.

MR. CUNNINGHAM: You don't know that for a fact, though, do you?

MR. MITCHELL: I have seen the regs. I know that hatchery trout, there is a possession limit for hatchery trout, but no wild trout are to be kept.

MR. CUNNINGHAM: You presuppose that hatchery trout would be fin-clipped so you could identify them?

MR. MITCHELL: Yes. I believe that is the way anglers determine whether they are hatchery or not.

MR. CUNNINGHAM: Are there any hatchery on the Yuba

River?

MR. MITCHELL: No.

MR. CUNNINGHAM: So on the Yuba River right now it is safe to say that all steelhead caught would be released by an angler pursuant to the current regulations?

MR. MITCHELL: No.

MR. CUNNINGHAM: Why?

MR. MITCHELL: There have been reports of anglers of clipped fish, indicating there are hatchery fish.

MR. CUNNINGHAM: Any existing strain of steelhead specifically focused and living in and indigenous to the Yuba River, to your knowledge, are currently protected by a catch and release requirement?

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Mr. Bratovich, I'll spend some time with you for a few minutes.

To the extent you examined the supporting testimony for DFG Exhibit 1 and DFG Exhibit 13, the testimony of Deborah MeKee, and examined the literature sources cited by Ms. McKee, it is my understanding or is it your opinion that references for the derivation of a biological opinion are not acceptable if they are summaries of other research?

MR. BRATOVICH: Would you please repeat that?

MR. CUNNINGHAM: Let me -- you examined critically the references cited by Ms. McKee in her testimony on behalf of

the Department of Fish and Game. Is it my understanding that from your opinion references that are summaries of other works are not suitable references to form an expert's opinion?

MR. BRATOVICH: My testimony stated that the references cited did not support the Department's recommendation in DFG-1. I did not extend my testimony beyond that conclusion, and I don't know.

MR. CUNNINGHAM: Mr. Bratovich, you specifically identified which of those references were literature summaries. Is it your opinion that the literature summaries can or cannot be relied on by an expert in forming an expert opinion?

MR. BRATOVICH: At face value, no. I think if one is attempting to use the literature summaries, then one should examine the supporting documentation, which we attempted to do.

MR. CUNNINGHAM: Mr. Bratovich, have you ever formed expert opinion and provided it in a proceeding like this proceeding, based upon a literature summary?

MR. BRATOVICH: I am trying to recollect the proceedings I have been in, so give me a moment.

MR. CUNNINGHAM: Let me help you out. I am looking at Yuba County Water Agency Supplement Exhibit 19, Page 3-25, in which a compilation of temperature information is

presented in a graphic form or, I should say, table form. If I can have you examine that.

MR. BRATOVICH: Yes, I have that in front of me.

MR. CUNNINGHAM: I see a variety of sources cited for the number that has been included in this table, about 12 of them. Is it my understanding that every one of these sources cited here is not a literature summary?

MR. BRATOVICH: No, that is not correct. Some of these are literature summaries.

MR. CUNNINGHAM: Isn't this table reflective of your opinion that you presented in direct testimony earlier in this proceeding?

MR. BRATOVICH: Regarding what, Mr. Cunningham?

MR. CUNNINGHAM: I am looking at the name of the table. The table was optimal water temperature ranges reported in the literature for various lifestages of chinook salmon, steelhead and American shad. And you cite a total of 12 citations.

Are any of these citations for this summary, literature summaries?

MR. BRATOVICH: Yes, they are.

MR. CUNNINGHAM: Is it your opinion that none of those are valid and actually arriving at optimal water temperatures for chinook salmon?

MR. BRATOVICH: I thank you for reading the title

because that is exactly and only what it was intended to convey, that these are optimal water temperatures reported in the literature for various lifestages of salmon, steelhead and American shad. It was provided for context and background.

And right below that, on the same page, is a discussion of the most recent local studies conducted by Cech and Myrick.

MR. CUNNINGHAM: Then let me understand this. Again, let me go back to my question: Do you consider an opinion formed which uses in part a literature summary to form that opinion an unacceptable expert opinion?

MR. BRATOVICH: If examination of underlying literature is not conducted to support a specific point, then perhaps it is an unacceptable opinion.

MR. CUNNINGHAM: Mr. Bratovich, do you consider an expert opinion formed upon a laboratory, and these are all talking about fisheries biology opinions, formed upon only a laboratory study or survey an acceptable basis for a expert's opinion?

MR. BRATOVICH: Regarding results of those specific laboratory studies, yes, probably.

MR. CUNNINGHAM: Do you have any reservations yourself about the use of laboratory results in application with fieldwork for physiological issues?

MR. BRATOVICH: Yes, I do.

MR. CUNNINGHAM: Mr. Bratovich, in preparing your original testimony and today again in testimony you referred to the study of Cech and Myrick.

Is that a laboratory study?

MR. BRATOVICH: Yes, it is.

MR. CUNNINGHAM: In making the opinion you formed in Exhibit 19, you rely upon that laboratory study?

MR. BRATOVICH: I rely upon that laboratory study to make my point, which is that there is uncertainty associated with the Department of Fish and Game's recommended optimums, whether they are really optimum. Most importantly you are making my point for me, Mr. Cunningham. I am most concerned with regarding the direct application of laboratory studies to the field. I believe there is significant uncertainty associated with that.

MR. CUNNINGHAM: That is fine with me, Mr. Bratovich. But my question to you is: Did you rely upon a laboratory study in concluding that the Cech and Myrick information is the basis for your conclusions, for your recommendations?

MR. BRATOVICH: Cech and Myrick is not the basis for my conclusion. In fact, we didn't make temperature requirement recommendations in this proceeding.

MR. CUNNINGHAM: I am sorry, Mr. Bratovich, flip the page, please, to 326 of Exhibit 19, Table 4, in which it

says preferred temperatures and critical thermal maximum for steelhead and chinook salmon.

MR. BRATOVICH: Reported by Cech and Myrick, correct.

MR. CUNNINGHAM: I am sorry, Mr. Bratovich, read the title for me. It says Table 4, read the title for me, please.

MR. BRATOVICH: Preferred temperatures and critical thermal maximum for steelhead and the chinook salmon.

MR. CUNNINGHAM: Where does it say only as to Cech and Myrick in that table, please?

MR. BRATOVICH: That table is imbedded in the narrative included on Page 325, which is subsequent to Table 3, which is specifically and only pertaining to Cech and Myrick.

MR. CUNNINGHAM: It is your statement today that Yuba County Water Agency has presented no opinion as to the appropriate or optimal temperatures for any lifestage of salmon or steelhead in the Yuba River?

MR. BRATOVICH: That is not correct.

MR. CUNNINGHAM: Why not?

MR. BRATOVICH: Because the manner in which we conducted our assessment and analysis involved establishing and developing a flow regime and doing a hydrologic analyses associated to the actual flows that would be realized according to the modeling simulations performed by Mr. Grinnell's team to estimate, again, the actual flows that

would occur in the Lower Yuba River. We also utilized the temperature relationships, the flow temperature relationships and the estimated resultant water temperatures to form the conclusions regarding our opinion on the implementation of Yuba County Water Agency water --

MR. CUNNINGHAM: Let me stop you, Mr. Bratovich. My question to you is: That is all interesting. That is all flow information.

MR. BRATOVICH: No, sir. My statement was that we used the flow temperature relationships --

H.O. BROWN: Wait a minute. Wait a minute.

MR. CUNNINGHAM: Mr. Brown, if I might finish my question.

H.O. BROWN: Mr. Cunningham, you ask the question and then --

MR. CUNNINGHAM: Mr. Bratovich, I appreciate that there is flow temperature elements of that. But correct me if I am wrong, in order to actually decide what temperatures are appropriate for the various lifestages of steelhead and chinook salmon, you must arrive at some conclusions about what is necessary for each of the lifestages as far as temperatures, not what is available but what is actually either optimal or desirable for those lifestages; isn't that true?

MR. BRATOVICH: It was a long question. I hope I

respond appropriately. I rely upon the data that we have to examine and what indicate what is appropriate for the Lower Yuba River. Our conclusion is that, based upon the population estimation information provided by Mr. Mitchell, and the hydrology and water temperature relationships provided by Mr. Grinnell's team, that the temperatures that would result from implementation of Yuba County Water Agency's proposed flow regime would be appropriate to maintain fall-run chinook salmon in good condition and continue to contribute to the recovery of spring-run and steelhead. That is the basis for my conclusion.

MR. CUNNINGHAM: Mr. Brown, I find myself in a quandary. If I would have the time, I will bring in the transcript of Mr. Bratovich's earlier testimony in which he makes quite a different statement, and I don't think that it is appropriate right now to spend time trying to impeach this witness. Again, we are dealing with rebuttal and rapidly approaching far outside the scope of rebuttal. I am concerned about the nature of this statement, keeping salmon in good condition.

H.O. BROWN: Would you mark that place and then if you'd like to research the records, come the 16th, I believe that is our next meeting, I will give you time to discuss that issue.

MR. CUNNINGHAM: Thank you, Mr. Brown.

H.O. BROWN: That would be appropriate.

MR. LILLY: Mr. Brown. I don't appreciate the gratuitous comments from Mr. Cunningham. They are inappropriate. If he thinks there is an inconsistency in Mr. Bratovich's testimony, he can point that out in his closing brief. At this point he needs to focus on the rebuttal testimony that was given today.

As he told you many times when other witnesses were being cross-examined, the cross-examination is limited to the scope of rebuttal. I suggest right now we should get back on track and do just that.

H.O. BROWN: What I perceive here is there is some confusion and/or misunderstanding in the testimony, and I don't take it quite as negative as it may appear. If there is confusion on Mr. Cunningham's part as well as Mr. Bratovich's part, let's see if we can straighten it out. If there is a difference, I am sure it can be explained.

Mr. Cunningham has the right to question that difference and try to determine why it exists. If there was -- I think I will leave it at that. Mark that and if there is a difference, we will find out what it is and clear it up.

MR. CUNNINGHAM: Thank you, Mr. Brown. I will move on.

Mr. Bratovich, have you yourself conducted any studies or evaluation of water temperature needed to affect critical

lifestages of salmon and steelhead?

MR. BRATOVICH: I have done numerous evaluations associated with evaluating potential effects associated with proposed actions, including assessments of water temperature, yes, sir.

MR. CUNNINGHAM: Mr. Bratovich, have you done any studies, have you done any field or laboratory studies of water temperatures needed to protect critical lifestages of salmon or steelhead?

MR. BRATOVICH: What do you mean by a study, Mr. Cunningham?

MR. CUNNINGHAM: A scientific study, Mr. Bratovich. Have you been in a laboratory or in the field in which you have essentially established or tried to control all variables but one and arrived at data that you then analyzed specifically as to water temperature or critical lifestages of steelhead or salmon?

MR. LILLY: I am going to object now. We are beyond the scope of their rebuttal testimony.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: If I might, Mr. Brown. Earlier in Mr. Bratovich's testimony he spent considerable amount of time suggesting, for example, that references relied upon by other experts to the extent they were summaries or to the extent they used only laboratory work were suspect.

Therefore, qualified, and, therefore, a way to examine, critique, an expert's opinion.

I am trying to figure out whether or not this person himself, this witness himself, in making that expert opine or opinion has himself done any of the kinds of fieldwork, laboratory work or other work that he somehow suggests is the appropriate way to form the opinion.

I am sorry, I am as entitled as Mr. Lilly was to examine the qualifications of this expert to form an opinion.

H.O. BROWN: Mr. Lilly.

MR. LILLY: Well, that is just my point. When I was asking cross-examination, Mr. Cunningham was objecting that we were getting beyond the scope of direct when the questions did not relate to the direct testimony. Mr. Bratovich has not talked about his own personal work in either the lab or the field, so I don't see how this is within the scope of rebuttal testimony.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Frink, do you have an opinion on this one?

MR. FRINK: At this point, no.

H.O. BROWN: I will overrule. Answer the question if you can.

MR. BRATOVICH: Yes, I have.

MR. CUNNINGHAM: Do you form your professional opinions

about fisheries physiology issues, specifically salmon and steelhead physiology issues, based solely on the studies or evaluations, the actual laboratory or field studies you have performed?

MR. BRATOVICH: No, I do not.

MR. CUNNINGHAM: Do you, in fact, rely upon other sources of authorization?

MR. BRATOVICH: Yes, I do.

MR. CUNNINGHAM: Then do you rely on literature surveys?

MR. BRATOVICH: Yes. Understanding the nature of those summaries, yes.

MR. CUNNINGHAM: Do you rely on somebody else's laboratory results and survey?

MR. BRATOVICH: For evaluation and comparison, yes, occasionally I do.

MR. CUNNINGHAM: Do you rely upon other laboratory or field studies from watersheds other than the watershed that you are currently evaluating?

MR. BRATOVICH: Yes.

MR. CUNNINGHAM: Do you rely upon studies, laboratory or field, conducted on the species analogous to the species you are evaluating?

MR. BRATOVICH: Analogous? Could you clarify that for me, please?

MR. CUNNINGHAM: Mr. Bratovich. To the extent I were to ask you a question, this is a hypothetical, about the fry temperature requirements for spring-run chinook salmon, would you rely upon information available for temperature requirements on fry for fall-run chinook salmon, an analogous piece of information in evaluating temperature conditions?

MR. BRATOVICH: In evaluating temperature conditions, I probably would. I am not sure I would specifically state that I would recommend that for that species or for that run.

MR. CUNNINGHAM: If you had no other source of direct information, would you use such an analogous piece of research?

MR. BRATOVICH: To recommend temperatures to establish optimal temperatures; is that your question?

MR. CUNNINGHAM: Yes.

MR. BRATOVICH: I am not sure that I would. I am not sure that I have or haven't in this instance, and in this proceeding, recommended optimal temperatures or temperature requirements.

MR. CUNNINGHAM: If you were to be asked. It is a hypothetical. If you were to be asked to generate a temperature requirement for protection of spring-run juvenile or spring-run chinook salmon juveniles on the Yuba

River and you had no actual field research done on the Yuba River, would you use other sources of information to make that recommendation?

MR. BRATOVICH: I would use -- yes, I would. I would use the most important and relevant sources that I could.

MR. CUNNINGHAM: Bear with me a minute, Mr. Brown. I am down to the last couple of questions.

Mr. Bratovich, I think you were the witness who presented Yuba County Water Agency Exhibit Number 48; is that correct?

MR. BRATOVICH: I spoke to it, yes.

MR. CUNNINGHAM: Did anybody else speak to Exhibit 48?

MR. BRATOVICH: In this proceeding, no.

MR. CUNNINGHAM: I call your attention to the last citation that you added there, Cech and Myrick 1999, the bottom line of Exhibit 48. And you have what appears on the third column to be an attempt to summarize the conclusions of each of those studies. And you concluded -- did you make this conclusion on the third column for Cech and Myrick? Is that your summation that you wrote down there?

MR. BRATOVICH: Yes.

MR. CUNNINGHAM: You concluded that the Cech and Myrick study itself stated that maximum food conversion efficiency took place at 66 degrees Fahrenheit for chinook salmon juvenile rearing?

MR. BRATOVICH: Yes, that is what is indicated in the exhibit.

MR. CUNNINGHAM: You have examined the Cech and Myrick study?

MR. BRATOVICH: Yes, I have.

MR. CUNNINGHAM: Are you aware of the fact that the Cech and Myrick study, the authors of that study concluded, "We did not detect a significant temperature effect on full ration salmon gross conversion efficiency."

MR. BRATOVICH: I'm sorry, would you please repeat that?

MR. CUNNINGHAM: Are you aware of the fact that the authors of this study concluded, "We did not detect a significant temperature effect on full ration salmon gross conversion efficiency."

MR. BRATOVICH: That is correct.

MR. LILLY: Excuse me, Mr. Brown. If Mr. Cunningham is going to keep asking the witness questions about this exhibit, it is only fair to let the witness have the exhibit in front of him and to know what page these questions are coming from, otherwise there is a risk of the quotation being taken out of context.

H.O. BROWN: Do you need some assistance, Mr. Bratovich?

MR. BRATOVICH: It would be helpful. I trust Mr.

Cunningham's accuracy --

H.O. BROWN: Any time you need assistance or clarification, by all means ask for it.

MR. CUNNINGHAM: If I might help out, Mr. Brown.

Specifically, Mr. Bratovich, would you look at Page 21 of the Cech and Myrick report, starts on the second full line down from the top.

MR. BRATOVICH: I have that in front of me.

MR. CUNNINGHAM: Is it safe to say then that the statement itself speaks for itself:

> We did not detect a significant temperature effect on full ration salmon gross conversion efficiencies.
>
> (Reading.)

I will read the rest of the sentence.

> Although an increasing trend with increasing temperatures was seen. (Reading.)

Is that what it says?

MR. BRATOVICH: Yes, that is what it says. Do you know what that means?

MR. CUNNINGHAM: Yes, I do, Mr. Bratovich.

Mr. Bratovich, can you tell me where in this study the Cech and Myrick authors concluded that maximum food conversion efficiency occurred at 66 degrees Fahrenheit?

MR. BRATOVICH: Give me some time, and I will try to

thumb through and find that for you.

MR. CUNNINGHAM: Be my guest, Mr. Bratovich.

H.O. BROWN: Off the record for a moment to give you a chance to review that report.

(Break taken.)

H.O. BROWN: Ready, Mr. Cunningham?

MR. CUNNINGHAM: Mr. Bratovich indicates he is ready.

H.O. BROWN: Back on the record.

MR. CUNNINGHAM: Mr. Bratovich, can you show me where that is done?

MR. BRATOVICH: Yes, sir. You read the quote yourself.

> We did not detect a significant temperature effect on full ration salmon gross conversion efficiency. Although an increasing trend with increasing temperature was seen on Page 21.
>
> (Reading.)

MR. CUNNINGHAM: Mr. Bratovich, my question to you: Can you tell me where there it says maximum? Your statement here on Yuba County Water Agency 48 says maximum growth and food conversion efficiency at 66 degrees Fahrenheit, Cech and Myrick.

MR. BRATOVICH: Well, maximum reported food conversion efficiency for chinook salmon is represented on Page 63, Table 9. It was the highest temperature included in that

evaluation, gross conversion of efficiency was reported at 29.5 in this study, which was the highest reported.

MR. CUNNINGHAM: Excuse me, Mr. Bratovich, I will take a look at Page 63. Let's take a look at conversion efficiency. It says gross conversion efficiency. I think you actually used this exhibit earlier in an overhead.

Is it your understanding that the gross conversion efficiency defined there is the same as food conversion efficiency in your statement on Exhibit 48?

MR. BRATOVICH: It was intended to be a comparable, yes.

MR. CUNNINGHAM: I am sorry, are you aware of whether or not it is the same? You have made a statement. I am trying to figure out if your statement actually reflects what this study says. You say maximum food conversion efficiency. I am looking at Table 63. It says gross conversion efficiency. Are you telling me those are the same?

MR. BRATOVICH: I should have put maximum gross conversion efficiency on the tables.

MR. CUNNINGHAM: Mr. Bratovich, I will call your attention to Table 1 of this same study, and specifically Table 1 is on Page 55. And I am looking at the right -- second from the right-hand column. It says gross conversion efficiency.

Mr. Bratovich, says for 19 degrees a ration level of 88 percent with a gross conversion efficiency is 23 plus or minus 11; is that correct?

MR. BRATOVICH: For steelhead, that is correct, which is this table, yes.

MR. CUNNINGHAM: Is there a comparable table in here for salmon?

MR. BRATOVICH: Well, let's thumb through it. Perhaps we'll find one.

Yes, there is information presented on Page 57.

MR. CUNNINGHAM: On Page 57 it says gross conversion over on the far right of that chart. It says 29. -- I am reading from 19 degrees centigrade, a hundred percent ration level. Goes over here and reading gross conversion, and it says 29.5 plus or minus 1.2; is that correct?

MR. BRATOVICH: Yes, that is correct.

MR. CUNNINGHAM: Let me read up two columns and it says 15, that is, degrees centigrade at 100 percent ration. And it says over to the far right, 27 plus or minus .4.

Let me figure this out. 29.5 minus 1.2 is about 28.3. 27 plus .4 is 27.4.

Is there a statistical difference between 27.4 and 28.3 in gross food conversion efficiency, in your mind?

MR. BRATOVICH: I haven't examined nor testified to that.

MR. CUNNINGHAM: Mr. Bratovich, you said maximum food conversion efficiency takes place at 66 degrees Fahrenheit pursuant to Cech and Myrick study.

MR. BRATOVICH: That's correct.

MR. CUNNINGHAM: Are you tailing me that is an accurate statement and summation of Cech and Myrick study?

MR. BRATOVICH: As indicated on Page 57, that is the maximum gross conversion efficiency; that is correct.

MR. CUNNINGHAM: It is your expert testimony then that difference between conversion efficiency at 27 -- at 19 degrees centigrade and 15 degrees centigrade and even at 11 degrees centigrade is not significant? I am looking at 11 degrees centigrade, Page 57. It says 11 degrees centigrade, 100 percent ration level, conversion efficiency is 23.7 plus or minus 4.4.

23.7 plus 4.4, Mr. Bratovich, is 28.1. Are you telling me that there is a statistical difference between what was found by Cech and Myrick at 11 degrees centigrade for gross conversion efficiency and what they found at 15 degrees centigrade and 19 degrees centigrade are different and that one of them can be unambiguously concluded to be a maximum rate?

MR. LILLY: I am going to object that the question is compound. He needs to either ask what was the maximum figure observed or whether there is a statistically

significant difference. It is confusing to have both of them folded into one question.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Cunningham, I am kind of getting confused here myself in trying to follow this. Perhaps it would be helpful for all if you could break it down.

MR. CUNNINGHAM: I will attempt that, Mr. Brown. I apologize for the confusion.

My first question asked to the witness was whether or not there was any statistical difference between the three conclusions reached, between any of the conclusions reached in the Cech and Myrick study on salmon gross conversion efficiency.

This witness, I believe, testified that -- I am not sure what he testified to. What he said was the maximum growth rate was at 66 degrees Fahrenheit, which, I guess, is 19 degrees centigrade.

I will try it again.

H.O. BROWN: Okay.

MR. CUNNINGHAM: Mr. Bratovich, I will call your attention to the first line of this chart. It starts with 11 degrees centigrade.

What is the gross conversion efficiency there?

MR. BRATOVICH: Perhaps we can expedite this, Mr. Cunningham. The text does state that no significant

difference was defected among those gross conversion efficiencies, but the maximum rate was observed at 19 degrees centigrade.

MR. CUNNINGHAM: So your statement in Yuba County Water Agency 48 is not completely accurate; is that what you are saying?

MR. BRATOVICH: Well, it is not. Gross conversion efficiency is a representation of food conversion efficiency. To be specifically correct that word "food" should be changed to "gross."

MR. CUNNINGHAM: Last question for you, Mr. Bratovich.

In your testimony you presented Yuba County Water Agency Exhibit 51 --

MR. BRATOVICH: Yes, sir.

MR. CUNNINGHAM: That is the temperature and spawning bracket; isn't that correct?

MR. BRATOVICH: Yes, sir, that is correct.

MR. CUNNINGHAM: Mr. Bratovich, in looking at that table, and I believe the conclusions you derive from it, which were that years that had cooler temperatures reflected earlier spawning initiation.

What was your point?

MR. BRATOVICH: Simply that, sir. That this exhibit and information contained therein indicate that in years where temperatures are cooler, the fish appear to spawn

sooner than they do when the temperatures are warmer.

MR. CUNNINGHAM: There is no intent then to suggest that earlier versus later spawning is good, bad or different; is that what I understand?

MR. BRATOVICH: I am not testifying that it is good or bad. I am testifying that that is what this data seems to indicate.

MR. CUNNINGHAM: Your data for the above Daguerre Dam information was based upon Mr. Grinnell's testimony about the temperatures in his testimony? That is where you got the testimony information?

MR. BRATOVICH: That is correct.

MR. CUNNINGHAM: If I might have 30 seconds, Mr. Brown. We will be there.

I do want to explore one last line of questions with you, Mr. Bratovich. Bear with me. I do think this is important.

Mr. Bratovich, you went through, I believe, three analysis elements in looking at DFG's temperature recommendations. And one of your concerns was that the Department's recommendations identified temperatures that did not exist naturally in the Lower Yuba River. Is that correct?

MR. BRATOVICH: I don't believe that is totally correct. I believe I said they do not always exist.

MR. CUNNINGHAM: Mr. Bratovich, if the Yuba River were unimpaired by any dam or obstruction, and the spring-run, fall-run chinook salmon and steelhead would migrate to their original watershed locations for spawning, would the Department's recommendations reflect conditions at those original points of habitat?

MR. BRATOVICH: I do not know.

MR. CUNNINGHAM: Is it your opinion that to the extent we have a watershed that no longer allows fish to reach the originally designated or identified spawning and rearing locations, that we should then not manage or make any attempts to manage, to reproduce those kinds of conditions in the water that is available?

MR. LILLY: I'm going to object. This question is beyond the scope of rebuttal and also beyond the scope of this witness' expertise. That is clearly a policy question for this Board, rather than a fishery biology question.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Very briefly, Mr. Brown. My understanding that this witness concluded that DFG's temperature recommendations were, in his opinion, suspect because they did not reflect the naturally occurring conditions in the Lower Yuba River. I guess my question to him is: What are we supposed to do?

H.O. BROWN: Okay. Mr. Lilly.

MR. LILLY: That is now a different question, but now it is vague. What are we supposed to do is just vague. If Mr. Cunningham could be more specific, maybe we can get through this. I think it needs to relate to something in the witness' area of expertise and testimony.

MR. CUNNINGHAM: I'm sorry, Mr. Brown. I didn't mean to reask the question in that rather glib tone.

H.O. BROWN: Reask it again, Mr. Cunningham.

MR. CUNNINGHAM: Mr. Bratovich, to the extent the salmonids in the Lower Yuba River can no longer reach their original spawning and natal areas, is it your opinion that no efforts should be made to address and attempt to reproduce those conditions in the Lower Yuba River, that that is not the thing to do for fisheries management there?

MR. BRATOVICH: I can't answer your question. If you were to tell me exactly what those conditions are, perhaps I could be helpful.

MR. CUNNINGHAM: You testified you don't know what the original salmonid habitat was like on the Yuba River; isn't that so? When I say original, pre-any diversion, pre-man. You don't know what the original habitat was like?

MR. BRATOVICH: I have no direct knowledge of that.

MR. CUNNINGHAM: You don't know what the temperatures were in that habitat?

MR. BRATOVICH: No, I do not.

MR. CUNNINGHAM: You don't know even what the temperatures were in the Lower Yuba River at that point in time, do you?

MR. BRATOVICH: Before construction of the dams?

MR. CUNNINGHAM: Yes.

MR. BRATOVICH: Actually, I believe that Mr. Grinnell's team did provide some temperature information pertinent to an unimpaired temperature regime, to the best of my recollection, that is.

MR. CUNNINGHAM: But you yourself don't know it right now?

MR. BRATOVICH: No, I can't make statements to that.

MR. CUNNINGHAM: Mr. Bratovich, to the extent that the Department of Fish and Game has attempted with a temperature recommendation to provide some of those conditions, so of those thermal conditions necessary for salmonid survival in the Lower Yuba River, are you suggesting that that is improper because those do not mirror the original conditions in the Lower Yuba River?

MR. BRATOVICH: Did you say that it was -- let me repeat your question to see if I understand.

Did you ask me that it is not appropriate to mirror temperature conditions in the Lower Yuba River that would have existed prior to construction of the dams? Is that what you are asking me?

MR. CUNNINGHAM: My question to you is: To the extent that the Department has tried through its temperature recommendations to provide some habitat conditions, thermal conditions for salmonids in the Yuba River, is it -- are you telling us it is not appropriate to do that to the extent they do not mirror the original Lower Yuba River water temperature conditions?

MR. BRATOVICH: I am confused with double negatives. It is not appropriate to establish that do not mirror. I am not trying to be obfuscatory. I am trying to understand.

MR. CUNNINGHAM: I appreciate that, Mr. Bratovich.

MR. BRATOVICH: Could you repeat it again without double negatives for me, please?

MR. CUNNINGHAM: Mr. Bratovich, it is your understanding from Mr. Grinnell's research and materials that conditions in the Lower Yuba River watershed below Englebright Dam are different than at present and are different than those thermal conditions proposed by the Department of Fish and Game; is that right?

MR. BRATOVICH: Yes, I believe that is correct.

MR. CUNNINGHAM: Is it safe to say for the most part they would have lower flows and warmer temperatures for the summer months, for example?

MR. BRATOVICH: Under unimpaired conditions prior to construction of the dams in the Lower Yuba River?

MR. CUNNINGHAM: Yes.

MR. BRATOVICH: I will defer to Mr. Grinnell, but my understanding from his exhibits and what is presented, in the Lower Yuba River, yes, under unimpaired flow conditions that the temperatures would be higher and the flows lower during the summer and early fall than they are today.

MR. CUNNINGHAM: Do you consider it inappropriate for the Department to recommend thermal temperatures for salmonids in the Lower Yuba River that do not mirror that original undiverted thermal picture?

MR. BRATOVICH: Do I consider it appropriate for the Department to recommend temperatures that are different than the unimpaired temperatures that would have occurred prior to the dam? Is that the question?

MR. CUNNINGHAM: I asked it do you consider inappropriate, but if you want to consider it appropriate. Do you consider it appropriate that the Department recommend conditions different than those originally found in the unimpaired Lower Yuba River?

MR. BRATOVICH: Yes, I do.

H.O. BROWN: How much more time?

MR. CUNNINGHAM: That is the last question I had for Mr. Bratovich. I have one question for Mr. Mitchell.

H.O. BROWN: All right.

MR. CUNNINGHAM: Mr. Mitchell, you have a graphic that

was the annual fall-run chinook salmon spawning escapement, Yuba County Water Agency 43, that you presented today I think some additional analysis. Mr. Mitchell, let me ask you one question on that.

In looking at it you have a line identified from the period of about 1953 through 1971, a dashed line, that comes horizontally across the graphic. It says average equals 12,906 adult chinook salmon spawning escapement?

MR. MITCHELL: That is correct.

MR. CUNNINGHAM: Then you have another line that you put in here that is a small -- I want to say -- dotted line that says average. This is from the years '72 through '99, and it says average equals 14,421.

MR. MITCHELL: Yes.

MR. CUNNINGHAM: Is that correct?

Mr. Mitchell, is there any statistical difference between 12,906 and 14,421 when looking at a salmon escapement?

MR. LILLY: I'm going to object. The question of statistical significance, I believe, requires a comparison of one variable to another. Right now the question just has one variable and not another, so it is ambiguous.

H.O. BROWN: So the answer would be?

MR. LILLY: Excuse me?

H.O. BROWN: So the answer would be, by the witness, "I

don't know."

MR. LILLY: My objection is it is ambiguous. You can rule on the objection as you deem appropriate.

H.O. BROWN: Mr. Cunningham, we have an objection.

MR. CUNNINGHAM: Mr. Brown, I was asking -- the witness earlier testified today that this graphic once again establishes that there is an increase in salmon escapement, fall-run chinook salmon escapement, post-project. But I am looking at two lines that are provided by Mr. Mitchell. One of them says 12,906 fish on average before 1971; and one says 14,421 fish after 1971.

My question to Mr. Mitchell is, was and remains: Is there any statistical significance in the difference between those two. I am counting. The difference is less than 1,500 fish over a number, much larger number.

Is that statistically significant to allow you to arrive at a conclusion that things are better post-project?

H.O. BROWN: If you understand the question, you may answer it.

MR. MITCHELL: Without a measure of the air associated with the estimates, it's impossible to determine that.

MR. CUNNINGHAM: So your conclusion that there are more -- that things are better because there are more fish, adult fall-run chinook salmon in the Yuba River post-project

is qualified on the fact that you haven't actually done an analysis to consider these differences? Is that what I hear?

MR. MITCHELL: The statistical analysis -- size.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: It seems to me that the exhibit put in by John Nelson showed increasing escapement over the whole period as well.

Is Mr. Cunningham proposing to withdraw DFG-39?

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: I missed the point, Mr. Brown. We aren't proposing to withdraw our exhibit. I thought I was examining very specifically this witness on a statement made in rebuttal. His conclusion was that post-project salmon spawning escapement was better than pre-project. I am trying to find out whether he had any statistical analysis to support that condition. I am not proposing to withdraw any exhibit. Mr. Nelson's testimony already stands on the record, already has been submitted.

H.O. BROWN: I understand the question. Mr. Mitchell, answer it.

MR. MITCHELL: No, I really don't.

MR. CUNNINGHAM: Thank you, Mr. Brown.

Members of the panel, thank you very much. You have been very patient with me, and I appreciate the ability to

address questions coming at you randomly.

H.O. BROWN: Mr. Cunningham, before you leave, is there still an issue at hand here with that one remaining question we have for Mr. Bratovich?

MR. CUNNINGHAM: I am going to take Mr. Lilly's sentiments to the heart. Mr. Brown, to the extent I find in my own mind a remaining ambiguity, I will choose to address it in our closing arguments rather than to spend more time. I want to thank Mr. Lilly for probably raising the more proper point.

Thank you.

H.O. BROWN: Thank you.

Panel, thank you very much for your time and patience. It has been a long day.

Mr. Lilly.

MR. SANDERS: Mr. Brown, I had cross-examination of this panel.

H.O. BROWN: We are going to adjourn for the day.

MR. SANDERS: I thought I was being cut off.

H.O. BROWN: Staff, do you have cross-examination also?

MR. LILLY: Can we just ask for time estimates? If we have only a few more minutes, otherwise these people have to come back when they wouldn't have to.

H.O. BROWN: I will do that.

How much time?

MR. SANDERS: Unfortunately, I would say 45 minutes.

H.O. BROWN: Staff, how much time do you have?

MR. FRINK: Fifteen.

H.O. BROWN: An hour.

Mr. Minasian.

MR. MINASIAN: Twenty-five minutes.

H.O. BROWN: There is an hour and a half.

I don't know about you, but we've had a pretty full day, this panel. So we will meet back here the 16th.

Is that right, Mr. Frink?

MR. FRINK: That is right.

H.O. BROWN: The 16th at 9:00.

(Hearing adjourned at 3:50 p.m.) ``````

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REPORTER'S CERTIFICATE

STATE OF CALIFORNIA)
) ss.
COUNTY OF SACRAMENTO)

I, ESTHER F. WIATRE, certify that I was the official Court Reporter for the proceedings named herein, and that as such reporter, I reported in verbatim shorthand writing those proceedings;

That I thereafter caused my shorthand writing to be reduced to typewriting, and the pages numbered * through *** herein constitute a complete, true and correct record of the proceedings.

IN WITNESS WHEREOF, I have subscribed this certificate at Sacramento, California, on this 13th day of May 2000.

_____
ESTHER F. WIATRE
CSR NO. 1564