

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA
HON. OLIVER W. WANGER, JUDGE

NATURAL RESOURCES DEFENSE)
COUNCIL, et al.,)
)
Plaintiffs,)
)
vs.)
)
DIRK KEMPTHORNE, Secretary,)
U.S. Department of the Interior,)
et al.)
)
Defendants.)
_____)

No. 05-CV-1207-OWW
HEARING RE INTERIM REMEDIES
DAY 2

Fresno, California

Wednesday, August 22, 2007

REPORTER'S TRANSCRIPT OF PROCEEDINGS

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1 Wednesday, August 22, 2007 Fresno, California

2 9:00 a.m.

3 THE COURT: We're back on the record in NRDC versus
4 Kempthorne. Mr. Wall, you are going to call another witness?

5 MR. WALL: Yes, Your Honor. We'd like to call Dr.
6 Christina Swanson.

7 THE COURT: All right.

8 CHRISTINA SWANSON,
9 called as a witness on behalf of the Plaintiffs, having been
10 first duly sworn, testified as follows:

11 THE CLERK: Please state your full name for the
12 record and spell your last name.

13 THE WITNESS: My name is Christina Swanson. Last
14 name is S-W-A-N-S-O-N.

15 THE COURT: And before you start your examination,
16 let me try to give a little direction to the parties. My
17 sense, as we are going through the evidence in this case, is
18 that there is some dispute between the parties about the
19 extent of the decline of the species, the extent of its
20 jeopardy and the causes.

21 What I see is that we have about a six-year period
22 where I think everybody agrees and certainly government agrees
23 that the species is in decline and the Court's already found
24 the extent of jeopardy that exists.

25 What we're doing in this remedies hearing is

1 determining, if we can, the extent of that jeopardy and what
2 should happen in the next year before the Biological Opinion
3 is completed as required by the ESA.

4 Now, there have been proposed, by the plaintiffs on
5 the one hand and the government on the other, certain interim
6 remedies that would address project operations in relation to
7 protection of the species.

8 And I will tell you where my mindset is so you can
9 perhaps be effective in focusing your questions and the
10 evidence you're going to present.

11 We have a problem. The problem needs to be
12 addressed. We need a remedy. And so the idea that we're not
13 going to have any kind of measures in effect that somehow
14 address the problem, that's not going to happen.

15 So if you want to spend a lot of time cross-examining
16 on whether or not there is a problem, I've not pre-judged this
17 case in any way, but that's been decided. We have a legal
18 decision that's in place.

19 And so what we're talking about is the most effective
20 way to deal with this, as you know. I've said in every one of
21 these cases, since 1991, that the Court is not going to run
22 the projects, the Court is not going to tell the government
23 how to run the projects. The government has to do it.

24 But what I'm going to say is this: The evidence more
25 than preponderates, the evidence is clear and convincing the

1 government hasn't been able to do that.

2 And so given where we are, something has to be done,
3 something is going to be done. So that's where you ought to
4 be focusing.

5 Anybody have any questions? I'm happy to entertain
6 your questions if you have them.

7 I don't see any questions. You may proceed.

8 MR. WALL: Your Honor, with that in mind, we'll spend
9 a little bit of time describing the causes of the decline
10 because that relates to the remedy. But we'll try to get to
11 the remedy.

12 THE COURT: Well, I think you should do that. I'm
13 not trying to foreclose, I'm just trying to help everybody
14 focus because I want to be as efficient -- we have only this
15 week and I want to be as efficient as we can in making
16 productive the use of our courtroom time.

17 MR. WALL: We'll do our best to satisfy that concern.

18 DIRECT EXAMINATION

19 BY MR. WALL:

20 Q. Dr. Swanson, could you please introduce yourself to the
21 Court?

22 A. My name is Christina Swanson. I'm senior scientist for
23 The Bay Institute, one of the plaintiffs in this case.

24 Q. Could you briefly describe your educational background?

25 A. I received my bachelors degree from Cornell University in

1 1980 and my Ph.D. in biology from UCLA in 1991. Starting in
2 1991, I continued work as a post doctoral researcher at UC
3 Davis.

4 Q. What was the subject of your dissertation?

5 A. My dissertation studied the ecology, physiology and
6 behavior of a marine fish called the milkfish.

7 Q. And could you describe your work at UC Davis?

8 A. My work at UC Davis focused primarily on the ecology,
9 physiology and behavior of fishes that live in the Sacramento
10 San Joaquin Estuary, the Delta and the Sacramento-San Joaquin
11 Watershed.

12 Q. Did a portion of your work focus on the delta smelt?

13 A. It did.

14 Q. Could you briefly describe that portion of your work?

15 A. My early work with delta smelt concerned examining the
16 environmental tolerances and habitat requirements of the
17 species in regards to temperature and salinity. I also
18 examined their swimming behavior and capabilities and then, in
19 later years, the research became -- used information from that
20 preliminary foundational work to examine the behavioral and
21 physiological responses of the fish to water diversions and,
22 in particular, to fish screens on water diversions.

23 Q. Have you had occasion to publish the results of your
24 research in peer review journals?

25 A. I have.

1 Q. Could you briefly describe the scope of your publications
2 in peer review journals?

3 A. The first journal article that I published on delta smelt,
4 with several co-authors, of course, described our work trying
5 to develop techniques to reliably collect and keep alive delta
6 smelt collected from the San Francisco Bay Delta Estuary and
7 to successfully get them back to the laboratory for use in
8 laboratory based research experiments.

9 Subsequent publications examined the environmental
10 tolerance of the species, often in comparison to other species
11 that live in the same habitat. Other research described the
12 swimming behavior of the species and its capabilities. And
13 the more recent publications have examined in detail how the
14 fish responds to the flow of water being diverted through a
15 fish screen.

16 Q. Over what period of years have you published articles on
17 the delta smelt in peer review journals?

18 A. My first article on delta smelt was published in 1996 and
19 the most recent article was published earlier this year in
20 2007.

21 Q. And have you published articles in peer review articles on
22 fishes other than delta smelt?

23 A. Yes. Those include the work that I did on my dissertation
24 on the milkfish. I've also published articles on Chinook
25 salmon.

1 Q. In your more recent time at The Bay Institute, have you
2 continued to publish articles in peer review journals on the
3 delta smelt and other fishes?

4 A. I have been working with The Bay Institute since 1999,
5 yes, and I have published several articles since that time.

6 Q. Do you serve as a peer reviewer for any peer review
7 journals?

8 A. Yes, I have for some years. Those journals include
9 Journal of Fish Biology and International Journal of Fish
10 Biology. Transactions of the American Fishery Society and
11 most recently I reviewed a journal article for the Journal San
12 Francisco Estuary and Watershed Science.

13 Q. Have you been -- have you served on CALFED Delta
14 Authorities Adaptive Management Planning Team for Delta
15 Ecosystem Restoration?

16 A. Yes, I have and I still do.

17 Q. Have you served on other interagency or agency pointed
18 teams looking at native fishes in California?

19 A. Yes. For several years I worked on a team of scientists
20 organized by National Marine Fisheries to study the status and
21 potential recovery efforts --

22 THE REPORTER: I'm sorry. You lost me somewhere.

23 THE WITNESS: I'm sorry.

24 THE COURT: A measured pace, if you please. She's
25 got to keep up.

1 THE WITNESS: I served as a member of the Central
2 Valley Technical Recovery Team, which was a group convened by
3 the National Marine Fisheries Service to evaluate the status
4 and potential recovery actions for listed salmon species in
5 California central valley.

6 MR. WALL: Your Honor, I move that Dr. Swanson be
7 qualified as an expert in biology of the native fishes of
8 California.

9 THE COURT: Is there any objection?

10 The Court accepts the tender and finds that Dr.
11 Swanson is qualified to render opinions about the biology of
12 central California fishes.

13 BY MR. WALL:

14 Q. Dr. Swanson, do you have -- have you reached a conclusion
15 about the present risk of extinction of the delta smelt?

16 A. I believe the delta smelt is at imminent risk of
17 extinction in the near future.

18 Q. What are the factors you would look at to characterize
19 that risk of extinction?

20 A. I believe the risk of extinction for delta smelt can be
21 characterized on the basis of at least four different factors.
22 The first, of course, is the abundance of the species. And
23 the abundance of delta smelt, as we already discussed, has
24 reached record low levels and has been at record low levels
25 for the past consecutive three years.

1 A second characteristic of the species which
2 potentially increases its risk for extinction is the
3 distribution of that species within its habitat. As a species
4 that is more broadly distributed within its habitat is at less
5 risk. In contrast, a species that has been concentrated in
6 small areas within its habitat, as, for example, we observed
7 in earlier this year when the entire spawning population of
8 delta smelt was concentrated in the north Delta. When species
9 are concentrated in a small geographic area, they are
10 vulnerable to a catastrophic event because all of the entire
11 species is in the same place.

12 In addition, another important criteria for a viable
13 species that helps define its risk for extinction is the
14 diversity of the species. Frequently, this is expressed in
15 terms of genetic diversity of a species. And there are
16 concerns that when the genetic diversity of the species
17 declines to a low point, it has less genetic material
18 available to respond to changes in its environment.

19 However, diversity can also be expressed in terms of
20 the phenotypic diversity of a species. In other words, how --
21 differences in life history patterns, for example, differences
22 in the timing at which the species spawn in the year.

23 I believe delta smelt has experienced, in
24 particularly these recent years, a decline in the diversity of
25 its population. And I will use as an example the age

1 structure of the population. Dr. William Bennett's research
2 has shown that, at least in recent years that he has looked
3 at, the entire population or the vast majority of the delta
4 smelt population is comprised of fish that were born during
5 a -- or hatched during a very short period of time of the
6 year.

7 We know, for example, the Delta smelt's spawn and the
8 larvae are hatched over multiple months usually from March
9 through May. But, in fact, Dr. Bennett's work has shown that
10 in recent years, only those fish that were hatched during an
11 approximately month long period from mid May -- excuse me, mid
12 April to mid May survive to contribute to the population.
13 Therefore, the delta smelt population diversity, in terms of
14 its age structure, is lower than it was in the past.

15 The final characteristic that can be used to describe
16 the risk of extinction to a population, the term that is used
17 by National Marine Fisheries is productivity. Essentially
18 it's the rate at which the population grows or shrinks. And
19 for delta smelt, the population has been shrinking for the
20 past -- since 1999. So productivity of the species is very
21 low.

22 In addition, I would add to that particular
23 criterion. We also have evidence that the delta smelt is now
24 in such a condition that it is less able to respond to
25 favorable or perhaps less unfavorable conditions within its

1 habi tat wi th posi tive popul ati on growth.

2 For example, 2005 and 2006 were generally considered
3 to be relatively good years in terms of the hydrology in the
4 system. They were moderately wet, flows were generally good.
5 However, del ta smelt popul ation, despite expectations of many
6 scientists, did not increase. This suggests that the
7 resilience of the species has been reduced.

8 In addition to these criteria, I think another
9 important piece of evidence that characterizes the risk of
10 extinction to this species was the popul ation vi abi lity
11 studies conducted by Dr. William Bennett and published in his
12 2005 paper.

13 In those analyses, he clearly showed that based on
14 past popul ation trends and status, that the del ta smelt was at
15 relatively high risk of extinction of falling below certain
16 popul ation levels that he termed or that he identi fied to mean
17 extinction wi thin the next 20 to 50 years.

18 Q. Dr. Swanson, I'm going to hand you a document to look at.
19 But first let me give it to counsel.

20 THE COURT: Are you going to mark this as pl ai nti ff' s
21 next?

22 MR. WALL: Pl ai nti ff' s 6, Your Honor.

23 THE COURT: 6. Thank you.

24 (Pl ai nti ff' s Exhi bi t 6 was marked for
25 i denti fi cati on.)

1 BY MR. WALL:

2 Q. Dr. Swanson, are you familiar with the document you're
3 looking at?

4 A. I am.

5 Q. Could you describe what it is?

6 A. This is a table that shows the results of four different
7 surveys conducted by the California Department of Fish & Game,
8 which collect delta smelt within their habitat in the estuary
9 and at different lifestages. It shows the results from those
10 surveys from 1967 until 2007, for which we only have results
11 for three of the four surveys. The fourth has not yet been
12 completed for this year.

13 Q. Dr. Swanson, are you the author of this table?

14 A. I compiled this table using data from the California
15 Department of Fish & Game.

16 Q. Does this table accurately reflect the data you got from
17 the State of California?

18 A. Yes.

19 MR. WALL: Your Honor, I move to have this admitted
20 in evidence.

21 THE COURT: Any objection?

22 Exhibit 6 is received in evidence.

23 (Government's Exhibit 6 was received.)

24 BY MR. WALL:

25 Q. Dr. Swanson, would you briefly characterize the recent

1 trend in population abundance?

2 A. All four surveys show that in recent years, from the late
3 1990s, 1999, for most of them, the population abundance of
4 delta smelt, as measured by each of these surveys, has
5 declined. For each of these surveys, the most recent numbers,
6 the 2007 numbers or alternatively, the 2006 for the Fall
7 Midwater Trawl, which has not yet been completed, represent
8 record low levels or the second or third record lowest level
9 of abundance as measured by that survey for the duration that
10 it has been conducted.

11 MR. WALL: May I approach the witness and provide
12 another exhibit?

13 THE COURT: You may.

14 MR. WALL: This is Plaintiff's 7.

15 THE COURT: You can put these on the screen and then
16 you won't have to approach.

17 (Plaintiff's Exhibit 7 was marked for
18 identification.)

19 MR. WALL: Right. I would have to figure out how to
20 do that.

21 THE COURT: The courtroom deputy can help you.

22 MR. WALL: If the Court would prefer that. I would
23 still need to hand the exhibit to -- she'll look at it on the
24 screen.

25 THE COURT: You can put it on there and she'll see it

1 on the screen and she can identify it on the screen.

2 MR. WALL: Would the Court prefer that?

3 THE COURT: I would if it's not logistically
4 impossible.

5 THE CLERK: If you put it on there, it will display
6 on all the screens.

7 MR. WALL: Thank you. I went to law school before we
8 had these technological advances.

9 THE COURT: Yes.

10 BY MR. WALL:

11 Q. Dr. Swanson, could you describe what Plaintiff's Exhibit 7
12 is?

13 A. This graph represents the data in the table we just
14 reviewed in graphical form. The only difference in the data
15 presented on the graph is that for one of the surveys, the
16 Summer Townt Survey, which was first begun in 1959, the graph
17 shows the data from the earlier years whereas the table does
18 not.

19 I should also point out that for the Summer Townt
20 Survey, during years 19 -- I think it was '66 through '69 or
21 possibly '67 through '69 and the Fall Midwater Trawl in 1974
22 and 1979, the surveys were not conducted.

23 And so the blank spots on the graph do not represent
24 low abundance of delta smelt or zero abundance, they represent
25 the fact that no data exists for those years for those

1 surveys.

2 Q. Dr. Swanson, do these -- does -- do these figures
3 accurately represent the information that's set forth in the
4 exhibit marked as Plaintiff Exhibit 6?

5 A. Yes.

6 MR. WALL: Your Honor, I move to have Exhibit 7
7 received.

8 THE COURT: Any objection?

9 Exhibit 7 is received in evidence.

10 (Plaintiff's Exhibit 7 was received.)

11 BY MR. WALL:

12 Q. Dr. Swanson, could you characterize the variability of
13 these indices?

14 A. Particularly the two long-term surveys, the Summer Towner
15 Survey and the Fall Midwater Trawl demonstrate that the
16 population abundance of delta smelt, at least as measured by
17 these surveys, has always been somewhat variable.

18 There are periods during which the abundance is quite
19 high, for example, during the 1970s. And there are periods
20 when the abundance falls to relatively low levels as it did
21 during the 1980s. In the 1990s, abundance increased according
22 to the two long-term surveys, although not to the same high
23 levels that were measured 10 and 20 years earlier.

24 And as I've mentioned before, since 1999, abundance
25 has once again declined, this time to levels which are

1 substantially lower than the low levels previously measured
2 during the 1980s.

3 Q. Dr. Swanson, is some degree of variability inherent in the
4 population of this fish species?

5 A. Yes, it is, as with all fish species.

6 Q. Do you have an understanding of whether the variability
7 you see represented in this chart represents the natural
8 variability of that species?

9 A. That's difficult to say given that over the time period
10 for which these data were collected, environmental conditions
11 and ecological conditions and human management of delta smelt
12 habitat has changed over time.

13 Q. Dr. Swanson, are you familiar with an estimate provided in
14 this litigation by Dr. Charles Hanson of the total population
15 of the delta smelt?

16 A. I am.

17 Q. Are you familiar with the methodology that Dr. Hanson used
18 to develop that population estimate?

19 A. Yes, I am. To the extent that he described it in his
20 declaration.

21 Q. Is that methodology reliable?

22 A. No. Not for calculating an estimate of delta smelt
23 population abundance that is accurate.

24 Q. Could you explain that?

25 A. The calculations that Dr. Hanson used to essentially

1 convert data from, in the case of his calculation, one of the
2 survey -- or several of the surveys of the 20 millimeter
3 survey, are based on a number of assumptions about how delta
4 smelt are distributed within their environment as well as the
5 efficiency of the nets in the survey that were used to collect
6 those delta smelt.

7 All of the assumptions upon which Dr. Hanson based
8 his calculation are known to be invalid and therefore they
9 represent a cumulative error that is just accumulated in all
10 the subsequent calculations that are made in order to arrive
11 at this estimate of the total number of delta smelt within a
12 system.

13 If I may offer an example. One of the assumptions is
14 that the distribution of delta smelt within a large area of
15 their habitat, is that delta smelt will be distributed within
16 that habitat at the same density, the average density that
17 they're collected at a series of fixed sample sites within
18 that portion of the habitat. And one of the things we know
19 about delta smelt is that they are not evenly distributed
20 within their habitat.

21 If I may use an analogy for an example. If you were
22 to make a transect across this country searching for oil. You
23 started out in San Francisco and you dug and you would find
24 zero oil. You went to Texas, you dig and you find a lot of
25 oil, we'll say a hundred barrels of oil. You then went

1 further east and -- east and north and went to Iowa, you might
2 find four barrels of oil. Then if you finally went to New
3 York, you'd probably find zero.

4 And if you were then to calculate the average amount
5 of oil, the average density of oil from those that you
6 calculated from those four sample sites, you would find that
7 you might try to make a prediction that, on average, across
8 the United States, there's an average of 26 barrels of oil per
9 area within the United States.

10 And as we're all aware, oil is not evenly distributed
11 across the country. And that average would be wrong. And it
12 would mischaracterize the distribution of oil within this
13 country. The exact same thing is true for delta smelt within
14 their habitat.

15 A second assumption is that delta smelt -- that means
16 delta smelt distribution sort of laterally across the area of
17 their habitat is known to not be even. It's also known that
18 delta smelt are not evenly distributed in the water of the
19 estuary on a vertical basis. In fact, delta smelt are
20 principally a fish that lives near the surface of the water,
21 usually in the first ten to 12 feet of the water column. And
22 they are present, if at all, at much lower numbers deeper down
23 in the water.

24 When Dr. Hanson extrapolated, in other words, sort of
25 multiplied his survey data numbers, he included habitat

1 volumes that were much deeper than the typical habitat of
2 delta smelt. Assuming that delta smelt would be present in
3 deeper waters at the same density at which they had been
4 surveyed by surveying only in surface waters. This, as an
5 example, represents a way to grossly overestimate the number
6 of delta smelt that are present in the survey.

7 Q. Do you know whether Dr. Hanson's estimate of the
8 population of delta smelt is too high or too low?

9 A. No. To be -- the only thing we know about that number is
10 that it's wrong.

11 Q. Did Dr. Bennett, in his -- are you familiar with a
12 monograph published by Dr. Bennett in 2005 on the delta smelt?

13 A. I am.

14 Q. And did he provide an estimate of the population of delta
15 smelt?

16 A. He did. He calculated estimates of delta smelt population
17 from two surveys, the Summer Townet Survey and the Fall
18 Midwater Trawl Survey.

19 Q. And in his article, did he provide -- did he articulate a
20 view of the reliability of those estimates?

21 A. He considered them to be based on unrealistic assumptions
22 and that therefore they needed to be considered, at best, a
23 first order estimate of the population of the species. And
24 that they needed to be considered with extreme care and very
25 cautiously when using them to do analyses or make predictions

1 or make comparisons.

2 Q. Did he provide confidence intervals for his estimates?

3 A. He did. For his estimates for each year, from each of the
4 two surveys, he made a series of calculations that tried to
5 accommodate known errors within his assumptions. And for each
6 estimate, for each year, for example, in 1994, the -- he
7 estimated that the -- using Fall Midwater Trawl data,
8 the -- he estimated that the Fall Midwater Trawl data
9 corresponded to 86,000 some odd adult delta smelt.

10 However, he provided the information on his
11 confidence, the range of which he thought he had confidence in
12 that value. The confidence limit, the 95 percent confidence
13 limit, which is the metric that he provided, essentially tells
14 you that there's a 95 percent chance that the real answer is
15 within the upper and lower bounds of the confidence limit
16 around your central number of 86,000.

17 For the 1994 population estimate of 86,000 some odd
18 number of fish, based on visual examination of the graph, the
19 confidence limits ranged from zero to about 160,000 fish.

20 THE COURT: Before the next question is asked, I'd
21 like, if you would, please, to go back to an answer that you
22 gave that expressed a criticism of the population estimate
23 developed by Dr. Swanson -- I'm sorry, by Dr. Hanson. And
24 this had to do with the vertical range.

25 And how does the calculation reach a status of error?

1 You've indicated this 10 to 12 foot range from the surface is
2 where the species is normally found. And did the survey or
3 the data Dr. Hanson utilized, did it distribute the species at
4 greater depths that, in effect, you say the species doesn't
5 exist?

6 THE WITNESS: To the best of my knowledge, the 20
7 millimeter survey samples delta smelt in areas of the water
8 near the surface and it does not sample delta smelt near the
9 bottom. So the data that Dr. Hanson used on fish density,
10 which he then multiplied by the volume of the habitat, were
11 from surveys for the fish conducted by dragging the net only
12 through the surface waters.

13 So to the best of my knowledge, he has no information
14 on whether young delta smelt were present in the deeper waters
15 and, if so, whether they were present at similar or different
16 densities.

17 THE COURT: Would that not, however, be a limitation
18 and would that make his estimate more conservative because it
19 is excluding what fish would be at the deeper levels?

20 THE WITNESS: As I understand the methods used by Dr.
21 Hanson, he assumed that the density of fish collected in the
22 surface water will be the same for all waters that were deeper
23 than that. And when he multiplied the density of fish to the
24 volume of water, he included the volumes of water that were
25 deeper than 12 to 15 feet, whatever it was, with no evidence

1 that, in fact, delta smelt really were present in those areas
2 of the habitat.

3 THE COURT: So by the simple process of
4 multiplication, you would overestimate because you are
5 attributing the presence of fish where they're absent?

6 THE WITNESS: Where they are probably absent, yes,
7 you're correct.

8 THE COURT: In the deeper regions?

9 THE WITNESS: Yes. Other surveys have shown that
10 delta smelt are much less numerous in deeper waters than they
11 are in surface waters, so yes, that --

12 THE COURT: And are you satisfied that the volume
13 metric figure that is in this multiplier is an accurate one
14 for the area that is surveyed? I'm assuming it's either the
15 north Delta or the Delta.

16 THE WITNESS: I'm assuming that the numbers that Dr.
17 Hanson reports in his declaration, which if I recall
18 correctly, he attributes to the US Geological Survey, are
19 accurate. I did not check them nor do I have any way of
20 checking them.

21 THE COURT: And is the unit of measure, acre feet or
22 some other?

23 THE WITNESS: The unit of measure was acre feet.

24 THE COURT: Thank you. You may proceed.

25 BY MR. WALL:

1 Q. Dr. Swanson, are there other ways in which Dr. Hanson's
2 calculations could potentially overestimate the
3 population -- I'm sorry, underestimate the population?

4 A. Dr. Hanson assumed that the net used to collect the fish
5 for the 20 millimeter trawl was equally efficient at all
6 stations and for all of the different places that he collected
7 delta smelt. One of the things that we do have evidence on is
8 that the ability of the 20 millimeter net, the gear, the
9 sampling gear, the efficiency of the gear is greatest for fish
10 that are larger than 20 to 30 to 40 millimeters compared to a
11 lower efficiency for the smaller size classes.

12 During the period in which the 20 millimeter survey
13 is conducted, there is a very wide range of sizes of delta
14 smelt present in the habitat. The sizes of the fish,
15 depending on where they are in the system, can vary from
16 substantially less than 20 millimeters in length to greater
17 than 40 or 50 millimeters in length.

18 Dr. Hanson assumed equal efficiency. And I think
19 that it is likely that in those stations where the fish were
20 predominantly smaller, that would tend to be the stations
21 upstream in the Sacramento River closer to the spawning
22 grounds. The efficiency of the net was probably less, so it's
23 likely that in those areas he was underestimating delta smelt
24 densities and, by calculation, the population of delta smelt
25 there. However --

1 THE COURT: Why? Is that by taking -- I'm sorry to
2 interrupt. Is that by taking what's actually in the net,
3 which is less efficient, may not be as much as is represented
4 in the water?

5 THE WITNESS: The 20 millimeter net would probably be
6 not as good at catching delta smelt in areas where the size of
7 the population of delta smelt was -- where the size of the
8 fish in the population was smaller. And compared to areas of
9 the estuary where the size of the fish was larger, where the
10 net would be more efficient. He assumed equal efficiency in
11 his large calculation where he extrapolated out the
12 population.

13 THE COURT: And that doesn't balance out?

14 THE WITNESS: You mean underestimating on one side?

15 THE COURT: Right.

16 THE WITNESS: No. And whether it does, we have no
17 idea.

18 THE COURT: Thank you.

19 BY MR. WALL:

20 Q. Is this related, the -- I think what you might
21 characterize as the rather wide confidence intervals on Dr.
22 Bennett's characterization of such population estimates?

23 A. I'm sorry? Could you repeat that question?

24 Q. That was a poorly formed question. Let me try it again.
25 You've mentioned several different assumptions that you

1 characterize as invalid that were the basis of Dr. Hanson's
2 population estimate. Correct?

3 A. Yes.

4 Q. And that some of them could have led to underestimation
5 and some to overestimation.

6 A. Yes.

7 Q. Does this contribute in some way to the breadth of the
8 confidence intervals or error bars around the population
9 estimate that might be calculated?

10 A. Yes.

11 Q. Did Dr. Hanson provide any confidence intervals around his
12 population estimate?

13 A. Not in his declaration, no.

14 Q. And so do we have any idea what the confidence intervals
15 around his estimates are?

16 A. Other than that they are almost certainly very large, no.

17 Q. If the population of delta smelt were near the lower end
18 of the confidence interval given by Dr. Bennett before 1994,
19 what would that mean for the risk of extinction of the delta
20 smelt?

21 A. If the population were -- the numbers of fish, were, in
22 fact, near the lower number of calculation of numbers that he
23 did not calculate, it would mean that there were very few
24 juvenile delta smelt present in the habitat.

25 And given that we know, from basic fish biology, that

1 the mortality rate from the juvenile life fishery stage to
2 adult is typically very high for most fishes, particularly
3 fishes of this kind, small pelagic planktonic fishes. A lower
4 number of juveniles will translate into a much lower number of
5 adults.

6 MR. WALL: I'm going to need to have another exhibit
7 marked. One moment.

8 MR. WALL: Will the Elmo work for the multi page
9 document?

10 THE COURT: Yes, it will. One at a time. Unless you
11 put them side by side.

12 MR. WALL: Dr. Swanson, I'm going to place a document
13 on the Elmo and I believe it will show up on your screen
14 there. This has been marked as Plaintiff's Exhibit 8 for
15 identification.

16 THE COURT: Was the last EXHIBIT 6?

17 THE CLERK: No, 7.

18 (Plaintiff's Exhibit 8 was marked for
19 identification.)

20 THE WITNESS: May I request that I get a hard copy?

21 MR. WALL: Sure.

22 THE WITNESS: My eyes are not good enough.

23 MR. WALL: May I approach?

24 THE COURT: You may.

25 BY MR. WALL:

1 Q. Dr. Swanson, do you recognize this document?

2 A. I do.

3 Q. Could you tell us what it is?

4 A. It's the declaration of Charles Hanson in response to
5 interim remedy proposals of DWR and the federal defendants
6 dated August 21, 2007.

7 Q. I believe -- could you look at the date at the very top of
8 the page.

9 A. Filed? Is that the date, correct?

10 Q. Yes.

11 A. It's filed -- did I just say August? I meant July. I beg
12 your pardon. It says July 23, 2007.

13 Q. Dr. Swanson, could I have you look at Exhibit 4 of that
14 document.

15 Do you have an understanding of what Dr. Hanson is
16 representing in this exhibit?

17 A. I believe I do.

18 Q. Could you describe that for us?

19 A. What Dr. Hanson did is he applied his methodology for
20 estimating the total population size in terms of numbers of
21 delta smelt to the individual survey results for the
22 individual sequential surveys that make up California
23 Department of Fish & Game's 20 millimeter survey. He
24 estimated delta smelt population from the catch data for those
25 surveys.

1 For survey number four, which was conducted in late
2 April; survey number five, which was conducted in early May;
3 survey six, seven, eight and nine. The final survey was
4 conducted in the first week of July.

5 Q. And Dr. Swanson, to the extent you're able to determine it
6 from this figure, could you tell us what the population is
7 that he estimated for the seventh survey?

8 A. I would estimate that it is less than 100,000 fish based
9 on the height of the bar on the graph.

10 Q. And those would be juvenile fish?

11 A. Yes.

12 Q. How would you characterize their rate of survival to
13 adulthood?

14 A. Based on the estimates that we have for other fish
15 species, as well as those taken from Dr. Bennett's article, of
16 overall perhaps four percent survival from the juvenile stage
17 to the adult stage. Four percent of 100,000 would be 4,000
18 fish.

19 Q. And when was that survey, the seventh survey conducted?

20 A. June 4 through June 9.

21 Q. If you could look at survey number eight. When was that
22 conducted?

23 A. That was conducted two weeks later from June 18 to June
24 23.

25 Q. And how would you characterize -- to the extent you're

1 able to determine from this figure, do you have an
2 understanding of what population Dr. Hanson was calculating
3 two weeks after the seventh survey?

4 A. Using data from survey number eight, he estimated the
5 population of delta smelt in terms of the numbers of delta
6 smelt present in the habitat to be around 800,000 fish.

7 Q. And how much later was survey number nine conducted?

8 A. Survey number nine was conducted two weeks later.

9 Q. And what's the population he estimated then?

10 A. Two weeks later, in the first week of July, he estimates
11 that there are 1.8 million juvenile delta smelt present in the
12 habitat.

13 Q. So roughly what's that increase in the population of delta
14 smelt in two weeks, according to this graph?

15 A. More than double. Almost triple.

16 Q. Would that be a lot of delta smelt to be born in two
17 weeks?

18 A. Yes.

19 Q. Dr. Swanson, if I could ask you to look at page five,
20 paragraph 11 of Dr. Hanson's declaration. It -- actually
21 paragraph 11 starts on page four. So maybe if you could just
22 read that paragraph for us and I'll attempt to look at the
23 page on the Elmo when we get to the page.

24 A. Paragraph 11 starts, "The receipt of the most recent mid
25 June through early July 20 millimeter survey data has

1 substantially increased the estimate of the current population
2 of delta smelt. A population estimate based on the
3 pre-June/July data would have been extremely low." He cites
4 Exhibit 4. "And would have increased the vulnerability of the
5 delta smelt to significant impacts associated with various
6 sources of mortality. With the increase in delta smelt
7 abundance observed during the late June and early
8 July" -- excuse me, "during late June and early July, it
9 appears that the 2007 delta smelt population has higher
10 abundance than earlier expected. This suggests that with
11 higher population abundance, the 2007 delta smelt cohort will
12 be more resistant and resilient to various factors affecting
13 population dynamics and that through implementation of the
14 various protective measures to reduce and avoid significant
15 mortality during the remainder of the summer, fall and winter,
16 an increased abundance of adult delta smelt would be expected
17 in the spawning populations during the winter and early spring
18 of 2008."

19 Q. Dr. Swanson, do you believe that the abundance of delta
20 smelt increased significantly between June and July?

21 A. I do not.

22 Q. Could you explain -- do you have an understanding of what
23 phenomenon is explaining the abundance changes that Dr.
24 Hanson's report?

25 A. Based on my understanding of his methods as well as the

1 assumptions that he made, I believe the increase in the
2 numbers of population -- of numbers of fish that he estimates
3 are present in the population are related to the increasing
4 size of the juvenile fish that were being sampled by the
5 survey.

6 As I mentioned earlier, the efficiency of the net to
7 catch delta smelt increases as the size of the fish increase.
8 And essentially what we're seeing here is not an increase in
9 the numbers of delta smelt present in the habitat, but an
10 increase in the number of fish that are successfully captured
11 by the net.

12 Q. And so does that mean that all of the fish being counted
13 in the final survey were not being counted in the earlier
14 surveys?

15 Maybe I'll rephrase that question. I'll withdraw
16 that question.

17 Is it your suggestion -- are all the -- when the
18 fourth through eighth surveys were conducted, were there delta
19 smelt in the system that were just not being detected by these
20 surveys?

21 A. Yes.

22 THE COURT: Is this a matter of the fish simply
23 getting larger as they grow in their life cycle?

24 THE WITNESS: The fish are growing during this
25 period. And the increase in the numbers of fish being caught

1 in the survey reflect the increasing efficiency of the net for
2 catching them.

3 THE COURT: Because the fish is bigger.

4 THE WITNESS: Exactly.

5 BY MR. WALL:

6 Q. So are those -- are these surveys able to reliably find
7 those smaller adult smelt?

8 A. Not this survey.

9 Q. Now, I think you were discussing a population estimate
10 that Dr. Hanson gave based on --

11 THE COURT: Can I ask one more question?

12 MR. WALL: Yes. I'm sorry, Your Honor.

13 THE COURT: Thank you. Can you give me your opinion,
14 Dr. Swanson, about the numbers that we see here in these last
15 two surveys relative to population estimate beginning at about
16 1.8 million.

17 In other words, would you express your opinion if --
18 you have already stated that you believe that that's
19 overestimating, can you tell us by how much and why?

20 THE WITNESS: I cannot. I think this number, the
21 only thing that we know about this number is that it's wrong.
22 We don't necessarily know whether it's too high or too low.
23 And for the purposes of evaluating the status or the
24 extinction risk to the species, it is not meaningful or
25 informative except possibly to be used in comparison with

1 numbers similarly calculated from other years. And to
2 evaluate trends over time. But as an absolute number, it has
3 no practical application in my view.

4 THE COURT: Well, do you know how it was derived? We
5 have a finite number of fish that are in the net.

6 THE WITNESS: Yes.

7 THE COURT: And so from that number, how do you get
8 to 1.8 million?

9 THE WITNESS: You get there by multiplying the number
10 of the fish that you caught in the net per the volume that you
11 sampled times the volume of the habitat in which you assume
12 those fish are now evenly distributed. The multiplication
13 factors are huge.

14 For example, the results of the 20 millimeter survey
15 are expressed on the Delta -- excuse me, on the fish and game
16 website and that is where Dr. Hanson says he got the data
17 from. As numbers of fish caught per 10,000 cubic meters of
18 water. 10,000 cubic meters of water translates to eight acre
19 feet. The volumes of the habitat that he is extrapolating
20 these fish densities to, I would -- actually I suppose I could
21 refer to this. I think it's in here. In Exhibit 3 of Dr.
22 Hanson's declaration.

23 The volumes areas of the habitat range from area A1,
24 which is five million acre feet. There are several that are
25 the volumes of the habitat regions that he uses are 500,000

1 acre feet, 200,000 acre feet. So it's a huge multiplier.

2 And so even very small differences in the numbers of
3 fish caught in the survey translated to extremely large
4 differences in the ultimate population that he estimates based
5 on those numbers.

6 THE COURT: And do you share Dr. Moyle's opinion that
7 the fish are not evenly distributed in the habitat?

8 THE WITNESS: Yes.

9 THE COURT: Proceed.

10 BY MR. WALL:

11 Q. Now, are you aware that Dr. Hanson provided two different
12 estimates of the total population of delta smelt?

13 A. He provided the estimates in his first declaration and in
14 his second declaration he provided estimates based on the
15 results of a different Fish & Game survey.

16 Q. What was the estimate that he gave in his first
17 declaration of the total population of delta smelt?

18 A. The estimate based on the results of survey nine of the 20
19 millimeter survey from this first declaration was that there
20 were 1.8 million delta smelt present in the habitat in the
21 first week of July.

22 Q. In the first week of July. And what was the estimate that
23 he provided in his second declaration?

24 A. In his second declaration, he used data from the Fish &
25 Game's -- Fish & Game Department's Summer Townet Survey. And

1 would it be helpful if I could refer to the declaration to
2 make sure that I correctly --

3 Q. Sure. Let me have Dr. Hanson's supplemental declaration
4 marked as Plaintiff's Exhibit 9.

5 THE COURT: Do you want Exhibit 8 in evidence?

6 MR. WALL: Not at this time, Your Honor.

7 THE COURT: This is the supplemental declaration of
8 Dr. Hanson?

9 MR. WALL: Yes, Your Honor.

10 (Plaintiff's Exhibit 9 was marked for
11 identification.)

12 MR. WALL: May I approach the witness?

13 THE COURT: You may.

14 THE WITNESS: I believe it's paragraph ten.

15 BY MR. WALL:

16 Q. Dr. Swanson, have you had an opportunity to review
17 paragraph ten of Dr. -- I'm sorry. Could you please tell us
18 if you have an understanding of what Plaintiff's Exhibit 9 is?

19 A. This is the supplemental declaration of Charles Hanson in
20 support of the State Water Contractors' reply to the
21 plaintiff's proposed remedies filed August 13, 2007.

22 Q. And Dr. Swanson, have you had an opportunity to review
23 paragraph ten?

24 A. I have.

25 Q. And does Dr. Hanson provide a new estimate of the total

1 population of delta smelt?

2 A. He does.

3 Q. What is that new estimate?

4 A. He estimated the population using similar methods that he
5 used for the 20 millimeter survey. This time using catch
6 results from Fish & Game Department's Summer Towner Survey.
7 The survey that he used was the one that was completed between
8 July 4 -- excuse me, 7 and 14. And his estimate was that the
9 population of delta smelt was 680,000 fish.

10 Q. And tell us again what was his estimate for the population
11 the week before that?

12 A. 1.8.

13 THE COURT: It's 1.8.

14 BY MR. WALL:

15 Q. So what is the difference in population between those two
16 weeks according to Dr. Hanson?

17 A. I believe 680,000 is approximately 60 percent lower
18 than -- maybe 70. I need to do the math. It's substantially
19 lower. It's less than half of the estimate provided in his
20 earlier declaration.

21 Q. Do you have a view on whether those fish died during that
22 week-long period?

23 A. I think the difference between the 1.8 million and 680,000
24 fish, it's unrealistic to assume that that represents
25 mortality of those fish. Instead, I believe the disparities

1 between these population estimates are a very good example of
2 the magnitude of the error inherent in this approach for
3 calculating population estimates for the species.

4 Q. If this type of population estimate were published in peer
5 review literature, would you expect it to be accompanied by a
6 confidence interval?

7 A. Absolutely.

8 Q. If we were to assume that Dr. Hanson's population
9 estimates for the delta smelt in July, 2007 were correct,
10 would you have a view on whether the delta smelt was in
11 jeopardy of extinction?

12 A. 680,000 juvenile delta smelt, I believe, represents an
13 extremely low number of fish for -- or number within the
14 population for a fish this size at this early lifestage. As
15 we have already discussed, mortality rates between -- natural
16 mortality rates between the juvenile stage and the adult stage
17 of the species, as they approach reproductive maturity, is
18 extremely high. We're also dealing with a very small fish
19 that lives in a very large environment.

20 And in the context of adult fish numbers, which would
21 be substantially below this just based on an estimate using
22 regular mortality rates for other pelagic fishes, the numbers
23 of adult fish that would need to find other fish to
24 successfully reproduce when they are making this migration
25 upstream to reproduce and potentially going to different

1 places in the Delta at slightly different times of the year.

2 This is an extreme -- it corresponds if you apply that
3 mortality value to an extremely low number of delta smelt.

4 Q. Do we know the total population that is needed -- I'm
5 sorry, Your Honor, did you --

6 THE COURT: I'm working toward the same question you
7 are. Why don't you ask your question and then I'll ask a
8 question.

9 MR. WALL: Okay.

10 Q. Dr. Swanson, do we know the total population that is
11 needed for successful survival of the species?

12 A. We do not.

13 Q. And do we know the total population that would be needed
14 for this species to no longer be likely to be in jeopardy of
15 extinction in the foreseeable future?

16 A. No.

17 THE COURT: Let me ask now, Dr. Swanson. If each of
18 these surveys or studies, there are four of them, that have
19 been identified gives us a limited view based on what the
20 individual study depicts, that's one part of the question.
21 Then couple that with, based on the present quantitative
22 methods that are known and available, it doesn't appear that
23 we can get to population figures either for a total population
24 or for minimum survival of the species. What confidence do we
25 have in the opinions that are expressed about the current

1 status of the species?

2 Because what I'm understanding -- and this is a
3 complicated question. I'm going to make one anecdotal
4 comment. As I'm trying to understand it, what either
5 statistical, mathematical or scientific considerations go into
6 trying to extrapolate from these limited samples to get to
7 population estimates that truly tell us the status of the
8 species. Is my question unintelligible or can you answer it?

9 THE WITNESS: No. And I think I would answer it this
10 way. And my answer is that we don't need these kinds of
11 population estimates to allow us to determine what the status
12 of the species is or what its risk of extinction is.

13 THE COURT: And why is that?

14 THE WITNESS: We have ample information contained in
15 the data from the different surveys conducted by the
16 Department of Fish & Game where the important part of that
17 information is not what the absolute number is, it's how that
18 number relates to where it was in the past.

19 Those surveys are designed not to look at the
20 absolute abundance of delta smelt, but to look at the relative
21 abundance. How abundant is it this year compared to what it
22 was last year and the year before that and 20 years back. The
23 results of all of those surveys clearly indicate the delta
24 smelt are substantially less abundant now than they were in
25 the past. So we can use that to infer the fact that we have a

1 trend of decline in populations.

2 THE COURT: And from what you know, this is your
3 field of expertise, this is a species in which you specialize;
4 correct?

5 THE WITNESS: Yes.

6 THE COURT: What you know today, as of July 27th,
7 2007, of the scientific opinion on this question of the
8 jeopardy status of the delta smelt, is this opinion that we
9 have before us from Dr. Hanson, is that an outlier? Is it
10 essentially a distinct minority or is this a reasonable
11 opinion that's held by other scientists of comparable
12 qualifications to your own?

13 THE WITNESS: Do you mean his opinion with regard to
14 the utility of population estimates or his opinion as to the
15 status of the species?

16 THE COURT: Status of the species.

17 THE WITNESS: Dr. Hanson reports that he thinks the
18 status of the species, based on these numbers, is better than
19 we expected and better than it was last year.

20 THE COURT: Yes.

21 THE WITNESS: I do not agree with that.

22 THE COURT: And if you can, are you familiar with,
23 have you studied or surveyed other scientific opinions in the
24 field in this specialty species, the delta smelt?

25 THE WITNESS: Based on my conversations with

1 colleagues from state and federal agencies and academia and
2 other non-governmental organizations, their scientists, the
3 overwhelming consensus is that this species is on the verge of
4 extinction and at high risk of extinction and is in a
5 condition that is worse than it has ever been based on our --

6 THE COURT: And other than Dr. Hanson, do you know of
7 any other fishery biologists who have the expertise to opine
8 who, in effect, are saying the species is okay at this time?
9 Better than last year?

10 THE WITNESS: No.

11 THE COURT: Thank you. You may proceed.

12 BY MR. WALL:

13 Q. Dr. Swanson, I'd like to ask you if you could briefly
14 describe for us some of the principle factors which the
15 decline of the delta smelt has been attributed.

16 A. The general consensus among the scientific community is
17 that there are multiple factors which affect the population
18 abundance of the species. They include the effects of water
19 management operations, both the direct impacts of those
20 operations killing delta smelt, essentially take at the
21 facilities, as well as the indirect effects of those
22 operations on the quantity and quality of delta smelt habitat.

23 There is strong suspicions that contamination of
24 their habitat with toxic materials may periodically be
25 affecting their population abundance. But there is very

1 little evidence to either detect or support that.

2 There is, I believe --

3 THE COURT: You know, if you don't mind, let me
4 interrupt just a moment. Do you agree with what we've heard
5 before that when we talk about habitat here, we're talking
6 about water?

7 THE WITNESS: Yes. And the quality -- the certain
8 environmental characteristics of that water and where that
9 sweep of environmental characteristics occurs within the
10 geographic scope of the estuary.

11 THE COURT: All right. And have you already broken
12 that down so that we have it clearly? There's nothing that
13 hasn't been said about, if you will, the description and
14 delineation of the habitat?

15 THE WITNESS: In terms of delta smelt critical
16 habitat?

17 THE COURT: Absolutely.

18 THE WITNESS: I -- delta smelt critical habitat has
19 been defined already. In fact, delta smelt exists in areas
20 outside the confines of the critical habitat in some years.

21 THE COURT: All right. But we don't need to revisit
22 this?

23 THE WITNESS: I don't think so.

24 THE COURT: Thank you. All right. I interrupted
25 you. You may continue.

1 THE WITNESS: I had mentioned water project
2 operations and toxics. I think there is some evidence that
3 the overall reduction in the zooplankton abundance and biomass
4 in the estuary, that the decline in zooplankton and biomass in
5 abundance occurred in the late 1980s has probably been a
6 contributor to lower population numbers that we've seen since
7 that time.

8 I think there's also good evidence that one of the
9 causes of reduced zooplankton biomass and abundance in the
10 system is directly related to the invasion and establishment
11 of the overbite clam, a non-native species which first
12 appeared in 1986 and became abundant in 1987.

13 And so frequently when scientists are talking about
14 in shorthand what are the causes of the delta smelt decline,
15 they'll list water project operations, toxics and invasives.
16 And when we refer to "invasives," it's usually in relation to
17 the effect of those invasives on the planktonic food web in
18 delta smelt habitat.

19 I would add one other point, if I may. One of the
20 things that we see with this species, which is very typical of
21 an annual species and common in many fish species, is that the
22 population abundance of the species that you measure in the
23 fall, for example, the relative abundance of adult delta smelt
24 surveyed by the Department of Fish & Game's Fall Midwater
25 Trawl Survey is also strongly dependent, meaning it's affected

1 by how many juvenile delta smelt were present in the system
2 earlier in the year.

3 This relationship between the abundance of juvenile
4 fish and then the subsequent abundance of adults later in the
5 year is referred to as a stock recruitment relationship. The
6 numbers of adults you get depends on how many juveniles you
7 started out with.

8 In addition, the number of juveniles you get depends
9 on how many adults were around to produce them. This
10 relationship is strong for delta smelt. And, in fact, it
11 affects the population abundance sort of on top of the effects
12 of all of these other factors.

13 Q. So Dr. Swanson, in view of this stock recruitment
14 relationship, what would be the effect over time of an
15 incremental but repeated diminishment of the population?

16 A. All other factors causing the decline of the smelt being
17 equal with that, you would see a steadily declining
18 population.

19 Q. So if some cause were taking a modest fraction of the
20 population each year, how would that translate into the total
21 abundance or prospects of survival for the species?

22 A. If, for example, you started out with an abundance of
23 delta smelt of 100 and each year you took five percent of that
24 away. And assuming all other factors are equal and there's no
25 other factors driving the population up or down, the

1 population would just steadily decline by increments of five
2 percent of whatever the amount was the previous year.

3 Q. And the same would be true if the -- something was taking
4 one percent of the population.

5 A. True. It would just be a slightly less steep decline.

6 THE COURT: Now, I'm going to jump ahead here and ask
7 you, now that you've identified the causes. You know what the
8 argument is here. The argument is that the project operations
9 aren't the problem, that it's all the additional factors that
10 are causing the decline perhaps in increasing intensity.

11 And so what is your opinion about the effects of the
12 project operations and the reasons for it as to -- yesterday
13 Dr. Moyle said it couldn't be quantified. But there must be
14 some explanation that can be given about what the real life
15 and realistic effects of project operations are on this
16 species year in and year out.

17 THE WITNESS: I think there's overwhelming scientific
18 evidence that clearly shows that both the direct affects of
19 the water projects on individual delta smelt, in terms of
20 killing them or entraining them at the facilities, and the
21 indirect of water project operations on the quality and
22 quantity of delta smelt habitat are a significant contributor
23 to the population decline that we have seen in recent years as
24 well as in the past.

25 The relative magnitude of the adverse impacts of

1 water project operations compared to potential adverse impacts
2 associated with low food or a toxic event are unknown and
3 probably vary from year to year.

4 But I think it is indisputable that water project
5 operations are adversely affecting the species and adversely
6 modifying its habitat.

7 THE COURT: And how can you say that? In other
8 words, what reasons do you cite?

9 THE WITNESS: There are multiple published and
10 unpublished scientific studies that have shown these effects.
11 I'll use just two examples.

12 The recent research by Dr. William Bennett, which
13 follows up his 2005 paper and which, as Dr. Moyle said,
14 unfortunately has not yet been published indicates that water
15 project operations, and in particular export operations,
16 lethally entrain large components of the population of
17 juvenile delta smelt during the spring and early summer.

18 He knows this on the basis of studies that he's done,
19 looking at the age structure of the population by examining
20 the otoliths or the ear bones and determining the birth dates
21 of the fish.

22 And he's found that fish that were born in March and
23 early April generally do not survive to contribute to the
24 population. Whereas fish that were born from mid April to mid
25 May, a period during which exports of the SWP and the CVP are

1 substantially reduced to comply with water quality
2 requirements and the Vernalis Adaptive Management Plan, which
3 is also referred to as the VAMP, V-A-M-P. Fish hatched during
4 that period do survive and are found as juveniles and adults
5 in the population. Fish hatched after that period don't.

6 His interpretation is that fish hatched at periods
7 when exports are high are lost to the population most likely
8 due to lethal entrainment at the facilities. That represents
9 a direct and substantial impact of operations on significant
10 components of the delta smelt population reducing both its
11 abundance and, as I mentioned, I believe, diversity.

12 THE COURT: All right.

13 THE WITNESS: Second, recently published research has
14 looked at the characteristics of delta smelt habitat. And
15 they have examined survey data and water quality data and used
16 that to define what is good habitat for delta smelt in terms
17 of three environmental variables. And those environmental
18 variables are temperature, salinity and the clarity of the
19 water, also referred to as turbidity.

20 And they have determined that the amount of good
21 delta smelt habitat has declined over time. When they dig
22 into their analyses, they determined that one of the factors
23 driving the decline in habitat quality -- and they made this
24 study, I should have mentioned, during the fall period, from
25 September through December. They determined that one of the

1 factors driving the decline in habitat quality of delta smelt
2 was reduced fresh water outflows to the Delta.

3 During the fall fresh water outflow to the Delta is
4 almost always entirely controlled by water project operations.
5 So this represents -- and they also showed that in recent
6 years, fresh water outflows from the Delta into the upper
7 estuary have declined compared to where they were in past
8 years, 10 and 20 and 30 years ago.

9 THE COURT: Would this be anything other than spring
10 flow, fresh water flows?

11 THE WITNESS: The decline could result from either
12 reduced inflows to the Delta and consequent reduced outflows
13 or the same amount of inflow to the Delta and higher exports.
14 The authors of the study can look at overall runoff patterns
15 and asked the question, "Well, is it just drier now? Is there
16 less water?" And the answer to that was no. Overall runoff
17 patterns have not changed in this way.

18 THE COURT: Is this the Feyrer study?

19 THE WITNESS: It is.

20 THE COURT: All right. So that represents a -- an
21 effect of water project operations on delta smelt habitat
22 where water project operations are clearly degrading the
23 quality and quantity of delta smelt habitat. Or adversely
24 modifying their habitat.

25 THE COURT: Because the operations --

1 THE WITNESS: Have reduced.

2 THE COURT: -- determine quantity and also direction
3 and flow.

4 THE WITNESS: This is more the issue of the quantity
5 of fresh water flowing out of the Delta into the upper
6 estuary, which is the area of the estuary which delta smelt
7 inhabit at this particular life history stage.

8 During the fall, delta smelt aren't in the Delta much
9 and they're not really close to the pumps, they're further
10 downstream because they prefer to live at that life history
11 stage in the slightly salty water.

12 THE COURT: So this is what part of the Delta that
13 the flows are -- it goes out --

14 MR. WALL: Your Honor, would it be helpful for me to
15 bring the map?

16 THE COURT: Yes.

17 THE WITNESS: Where in the Delta and west of the
18 Delta, delta smelt are found --

19 THE COURT: Turn, if you would, the exhibit so
20 everybody could see it. Thank you.

21 THE WITNESS: Delta smelt are found anywhere from
22 here and here --

23 THE COURT: You have to describe for the record.

24 THE WITNESS: I do. You're right.

25 THE COURT: Otherwise "here and here" --

1 THE WITNESS: Anywhere from the vicinity of the
2 confluence of the Sacramento and San Joaquin Rivers down into
3 Suisun Bay, that large embayment there where, within that
4 habitat, the bulk of the population is found depends on how
5 much fresh water outflow there is. Because the fish are not
6 looking for a geographic location, they're looking for
7 specific salinity conditions.

8 In recent years, during the --

9 THE COURT: Low salinity.

10 THE WITNESS: Lowish, yes. Anywhere from one to five
11 or six or seven parts per thousand. What these authors showed
12 was that in recent years, the amount of outflow from the Delta
13 had been reduced. Effectively that shifts delta smelt habitat
14 upstream more towards the confluence and less in Suisun Bay.
15 And by doing that, the overall quality of the habitat for the
16 species is reduced as well as the quantity.

17 THE COURT: Thank you. You may continue.

18 BY MR. WALL:

19 Q. Dr. Swanson, I'd like to ask you to elaborate on a couple
20 of points that you've been discussing with the Court, if you
21 would.

22 You mentioned that the Bennett research on -- if I
23 have this correct -- ear otoliths and the survival of certain
24 age groups of delta smelt are -- has not yet been published;
25 is that correct?

1 A. That is correct.

2 Q. Has it been presented in scientific circles?

3 A. It has. I have myself seen the presentation at least two
4 or three times at different scientific and technical work
5 group fora.

6 Q. And do you have an understanding as to how that
7 presentation has been received within the community of
8 scientists working on these issues?

9 A. Based on my conversations with many of my colleague
10 scientists, Dr. Bennett's results are very compelling.
11 Largely because what he has done is he has drawn together
12 multiple lines of evidence from multiple data sets, survey
13 data sets, data sets on maturation state of delta smelt, data
14 sets on time when larvae are present in the system and where
15 they are, data sets on what are water management operations at
16 these different times of the year.

17 As well as really the critical data set, which allows
18 him to link these together, which is his examination of the
19 age structure of delta smelt collected in the surveys during
20 the summer and the fall and his determination as to the birth
21 dates of the fish that survive. It's a very, very compelling
22 integrated comprehensive body of research that I find very
23 interesting and, as I say, very compelling.

24 I also firmly believe, and based on my experience
25 with him, Dr. Bennett is an extremely careful scientist. And

1 he does not present this kind of information until he's quite
2 certain that he has all of the pieces lined up together such
3 that he has a story that stands out.

4 Q. Given the time period in which Dr. Bennett has conducted,
5 and I gather completed this research, would you expect it to
6 have been published?

7 A. No. I'm hoping he will manage to get a manuscript
8 together and perhaps submitted by late this year or early
9 next. That's the hope on my part. But this is brand new
10 cutting edge hot off the presses research.

11 Q. Dr. Swanson, you -- if I understand you correctly, just to
12 direct you back to your previous testimony, you said that Dr.
13 Bennett was finding that fish hatched during the period of
14 VAMP were surviving to produce, but fish hatched or delta
15 smelt hatched on either side of VAMP were not surviving to
16 reproduce or at least were not surviving to reproduce in the
17 same numbers; is that correct?

18 A. That's correct. And it's mostly the fish that hatch
19 before the VAMP. By the time the VAMP is done, most of the
20 hatching is over. But based on surveys for spawning adults,
21 we know that delta smelt are arriving and spawning, by
22 evidence of having spent fish, fish that it's clear that
23 they've already spawned, in March and early April.

24 The 20 millimeter survey conducted by Fish & Game
25 detects the presence of delta smelt larvae often throughout

1 the Delta in March and early April, as well as in April and
2 May.

3 However, Dr. Bennett's analysis of the birthdates of
4 fish collected later in the year, usually either by the summer
5 townet or the Fall Midwater Trawl show that the population is
6 comprised of fish only those -- or almost only those fish that
7 were hatched during this one-month period of the VAMP, which
8 is typically between mid April and mid May. And so these fish
9 that were hatched earlier that we knew were there are not
10 appearing in the population later.

11 Q. Dr. Swanson, you mentioned several other possible causes
12 of the Delta smelt's decline, including, if I understood you
13 correctly, toxic chemicals and invasive species; is that
14 correct?

15 A. Yes.

16 Q. Would you have any reason to expect the effects of those
17 other causes to vary between March, April and May consistent
18 with the timing of the VAMP?

19 A. Conceivably they could vary. However, I am not aware that
20 we have any data to suggest that they do.

21 Q. For example, is there any reason to think that the
22 application of organophosphates is different in -- between
23 April 10th and April 20th?

24 A. I have no knowledge to suggest that's so. I do not know.

25 Q. But if I understood you correctly, Dr. Bennett is finding

1 a difference in the survival rate between smelt born on April
2 10th and April 20th?

3 A. Yes.

4 Q. And one thing that does happen during that time period is
5 that VAMP begins to increase flows through the Delta?

6 A. Yes. That is really the predominant visible difference in
7 environmental conditions in the habitat during that period is
8 a substantial change in water export operations as well
9 as -- in that exports are reduced during the VAMP, as well as
10 inflows from the San Joaquin River are also increased during
11 the VAMP. So there's rather dramatic changes in the condition
12 of delta smelt habitat in that entire southern Delta region in
13 terms of directions and magnitudes of flows and overall
14 hydrodynamic conditions.

15 THE COURT: Let me ask you two questions about this
16 subject location. When is the time of the year that -- I'm
17 going to call it downstream, that probably isn't, at least in
18 vertical terms, an accurate characterization. When do the
19 fish go -- I'm talking here in all cases about delta smelt.
20 When do the fish go to the bay, if you will, toward Suisun Bay
21 or even further toward the Pacific?

22 THE WITNESS: Juvenile delta smelt or larval delta
23 smelt that are hatched in the upper Delta typically March,
24 April and May make their migration downstream to get to the
25 confluence and further downstream of that really throughout

1 that period and beyond. The surveys start to detect juvenile
2 delta smelt down near the confluence frequently as early as
3 April, more delta smelt arrive in May and June and July.
4 Usually by July, the bulk of the population of delta smelt has
5 moved to or downstream of the confluence and has arrived in
6 the brackish low salinity water habitat, which they will then
7 rear in until the winter.

8 THE COURT: Which is where?

9 THE WITNESS: Depends on what the outflow is. If the
10 outflow is at minimum levels required currently under water
11 quality control, the water quality control plan, that brackish
12 water habitat that delta smelt prefer tend to be rather near
13 the confluence of the Sacramento and San Joaquin Rivers.

14 If outflows are higher, for example, in a really wet
15 year like 2006 was, then that low salinity brackish water
16 habitat will be located more in Suisun Bay, further downstream
17 10 or 15 more kilometers.

18 THE COURT: And we heard at an earlier hearing in
19 this case that the fish move to the northwest, which would be
20 even out beyond Suisun Bay. What is your observation
21 experience with that?

22 THE WITNESS: By "northwest," do you mean into the
23 northern portions of Suisun Bay?

24 THE COURT: Yes. Or out more toward the ocean.

25 THE WITNESS: They rarely get beyond the upstream

1 portions of San Pablo Bay. And the reason is that by the time
2 you get that far downstream in the estuary, salinities
3 typically are getting into the 10 to 12 and higher parts per
4 thousand. So almost one-third sea water, which is the upper
5 limit of their preferred salinity.

6 So delta smelt are not typically found downstream of
7 Suisun Bay unless there is a very large amount of fresh water
8 outflow into the estuary that has pushed that low salinity
9 habitat that far down the estuary.

10 THE COURT: So in a year such as this, 2007, where we
11 don't have a lot of fresh water flowing in, you would or would
12 not expect to see delta smelt -- I'm calling it northwest
13 because that's the way we referred to it, but in effect out
14 beyond Suisun Bay?

15 THE WITNESS: No. Not now.

16 THE COURT: Thank you. You may continue.

17 BY MR. WALL:

18 Q. Dr. Swanson --

19 THE COURT: Well, not now or go back through June.
20 Start June the 1st and go through the present.

21 THE WITNESS: No. They would not have been there.

22 BY MR. WALL:

23 Q. Dr. Swanson, will you describe the type of year in which
24 you might find delta smelt out beyond the Suisun Bay?

25 A. It takes a very wet year to -- and sort of a late spring

1 as well to have enough fresh water going out into the estuary
2 in the -- it would have to be the May -- excuse me, March,
3 April, May, June period.

4 So a year like 1983, it was a huge El Niño year, I
5 think there were some fish detected -- I'd have to review the
6 Fish & Game surveys. But it would take a very wet year with a
7 very large spring outflow pulse to create the kind of habitat
8 the delta smelt utilize in San Pablo Bay.

9 Q. Dr. Swanson, is there other evidence of impacts from CVP,
10 Central Valley Project, and State Water Project, SWP,
11 operations on the delta smelt?

12 A. Other than the direct impacts that I described in terms of
13 lethal entrainment and the indirect impacts of their effects
14 on habitat quality and quantity?

15 Q. What I'm wondering is if there are other -- any other
16 principle studies on this subject that you would point to or
17 if you identified the main ones on which you'd rely at this
18 point?

19 A. Well, with regard to the effects of water project
20 operations on delta smelt habitat, I discussed the effects of
21 reduced outflows on the quality and quantity of the habitat
22 for the fish during the fall when the fish are living and
23 rearing in low salinity habitat.

24 Earlier in the year, when the fish are moving through
25 the fresh water portions of the habitat, either on their way

1 up to spawn as adults or on their way down from hatching
2 grounds towards -- downstream towards the brackish water
3 habitat, large areas within delta smelt critical habitat in
4 the Delta, the overall habitat and flow conditions in those
5 channels are also affected by CVP and SWP water operations.
6 Largely the export operations, as well as reduced inflows from
7 the San Joaquin.

8 The combined effects of that are that they reverse
9 the net flow of water in these channels. All of these
10 channels are, of course, tidal. The water flows back and
11 forth. It sloshes back and forth in these channels in
12 response to high and low tides.

13 However, absent the operations, absent -- if export
14 operations were not going on, in general, flow in all of these
15 channels would be on a net basis after you've filtered out the
16 effects of the tidal swings back and forth, the flow would be
17 net downstream.

18 When the CVP and the SWP facilities are exporting at
19 moderate to high rates, the effect of their diverting large
20 volumes of water from these relatively small channels is, in
21 fact, to reverse the net flow of water in many of these
22 channels, such that after you filtered out the effects of the
23 tides, the net flow is in the direction towards the pumps,
24 which is upstream for all of these channels, compared to net
25 flow downstream.

1 For delta smelt, which, as Dr. Moyle described, is
2 pretty small and not a particularly good swimmer, and which
3 use a form of movement through these very dynamic, tidally
4 dynamic habitats called tidal transport, where they use the
5 tide, the tidal flow in a particular direction to help them
6 move up or downstream, depending on which life history stage
7 you're talking about, the effect of the water projects is to
8 essentially reduce the ability of the fish to successfully do
9 that.

10 There is no longer, in many portions of the south
11 Delta under conditions of moderate to high exports, a net flow
12 of water downstream. And so delta smelt trying to use tidal
13 transport where they're taking advantage of that are unable to
14 successfully migrate through, mostly out of the Delta.

15 So that represents another way in which water project
16 operations are affecting delta smelt habitat. They're
17 changing the flow dynamics in the channels, making it harder
18 for the fish to be able to successfully migrate through those
19 channels to get either to spawning habitat or for the larvae
20 to get down to rearing habitat.

21 THE COURT: All right. We're going to take the
22 morning recess at this time. We're going to stand in recess
23 until 10 minutes before 11.

24 (Recess.)

25 THE COURT: We're back on the record in NRDC versus

1 Kempthorne. And we have Dr. Swanson on the stand. Mr. Wall,
2 you may continue.

3 MR. WALL: Thank you, Your Honor.

4 Q. Dr. Swanson, you mentioned -- I believe you discussed a
5 study by Feyrer, et al., relating habitat quality to the
6 location -- or habitat quality on the delta smelt; is that
7 correct?

8 THE COURT: And if we could, let's spell Feyrer for
9 the record.

10 THE WITNESS: It's F-E-Y-R-E-R.

11 THE COURT: Thank you.

12 BY MR. WALL:

13 Q. Could you tell us how they defined "habitat quality"?

14 A. The researchers defined habitat quality for delta smelt by
15 using data from the Fall Midwater Trawl Survey, which samples
16 fish from September through December. And at every station at
17 which they caught a delta smelt, they also concurrently
18 measured the water temperature, the salinity and the clarity
19 of the water using a secchi disk. Secchi is S-E-C-C-H-I.

20 And then they then use these results, the fact
21 that -- they were able to define the envelope of those
22 environmental variables in which delta smelt are found.

23 And from those three variables, those three water
24 quality variables, they then were able to develop what they
25 called an environmental quality index. Roughly what that

1 index measures is the quantity of delta smelt habitat as it is
2 characterized by these environmental conditions, which define
3 what represents quality habitat for delta smelt.

4 Q. And that the quantity of that quality habitat was related
5 to what period?

6 A. For delta smelt, the two most important variables were
7 salinity and the clarity of the water or the secchi disk
8 depth. Temperature was also a factor that they included in
9 their analysis, but the relative contribution that temperature
10 made to defining what delta smelt habitat was relatively
11 small.

12 So the researchers concluded that the two most
13 important characteristics that defined delta smelt habitat
14 were salinity and the clarity of the water.

15 Q. And how did the findings about habitat relate to Delta
16 smelt's abundance?

17 A. There's two steps in that analysis. The first thing they
18 did was they look at trends over time in the value of the
19 environmental quality index. Essentially asking the question
20 has the quantity of delta smelt habitat, as defined by this
21 index, changed over time? And they found that since 1987,
22 that the habitat index for Delta -- excuse me. The
23 environmental quality index for delta smelt had declined.
24 And, in fact, in the past several recent years, the most
25 recent three years for which they had data, which I believe is

1 through 2005, it had declined sharply.

2 They next related the trends in time of the
3 environmental quality index with the trend in delta smelt
4 population abundance. And found that they were statistically
5 significantly related. And the relationship was such that
6 when their environmental quality index was high, indicating
7 that there was lots of delta smelt habitat, that corresponded
8 to years in which there were lots of delta smelt. The
9 abundance was high. When the environmental quality index was
10 low, that corresponded to years in which delta smelt
11 population abundance was lower.

12 And, in fact, the recent decline in -- for the most
13 recent years of their analysis in the habitat
14 quality -- excuse me, environmental quality index corresponded
15 to the most recent population decline for the species.

16 Q. Dr. Swanson, is there a relationship between environmental
17 quality or habitat quality as defined in this study and
18 outflow through the Delta?

19 A. Yes. In general, the amount of preferred salinity
20 habitat, which was one of the drivers -- which was one of the
21 important contributors to the environmental quality index was
22 related to the amount of fresh water outflow in the sense that
23 higher amounts of fresh water outflow pushed down preferred
24 delta smelt habitat further downstream in the estuary
25 effectively creating more habitat for the delta smelt.

1 In a separate analysis, the -- for the -- and
2 discussi on conducted by the Del ta Smel t Working Group and
3 reported in their notes of August 21, 2007. They related the
4 value of the -- they called it in these notes, the habi tat
5 quality index, but it is the results of the research conducted
6 by Feyrer, et al. They related the value of the index to X2,
7 which was -- that was measured during that September through
8 December period.

9 X2 is a measurement -- it's a measurement that we use
10 to characterize the amount of fresh water outflow from the
11 Del ta into the upper estuary in terms of the location of low
12 salinity habi tat. It's -- X2 is defined as the location of
13 the two parts per thousand salinity isohaline near the bottom
14 of the channel measured as kilometers from the Golden Gate
15 Bri dge.

16 So when outflows are high, X2, the location of low
17 salinity habi tat, is much closer to the Golden Gate Bri dge so
18 the number, as kilometers is lower and when outflows are low,
19 low salinity habi tat shi fts further upstream and the X2 number
20 gets higher.

21 These researchers related the habi tat index to the X2
22 that was measured during thi s September through December
23 period and found that for X2 values, 80 kil ometers and
24 lower -- so the amount of outflow needed for 80 kil ometers or
25 more outflow in order to maintain that -- the habi tat quality

1 index was generally higher than for outflow conditions where
2 X2 was upstream of 80 kilometers.

3 And so here is an example where they have directly
4 related the habitat quality index to the amount of outflow
5 from the Delta into the estuary.

6 Q. Dr. Swanson, I'd like to take you through a couple of
7 things you were just describing. First you were describing
8 the article by Feyrer, et al. Correct?

9 A. I was.

10 Q. And who were the authors of that? Where did they work?

11 A. There were three authors, they are all scientists employed
12 by the California Department of Water Resources.

13 Q. And then you mentioned an organization called the Delta
14 Smelt Working Group. Would you tell us what that organization
15 is.

16 A. The Delta Smelt Working Group is a group of scientists who
17 work for state and federal -- the state and federal agencies,
18 fish and water, as well as US Environmental Protection Agency.
19 And have been convened by the US Fish & Wildlife Service to
20 review the available scientific and monitoring data on delta
21 smelt and to make specific recommendations for protective
22 actions to protect the species and to minimize the adverse
23 impacts of water project operations on a real time basis.

24 Q. And have you -- how were you familiar with the work of the
25 Delta Smelt Working Group?

1 A. I'm not a member of the Delta Smelt Working Group.
2 However, the working group regularly publishes detailed notes
3 describing the content of the discussions of their meetings
4 and also the recommendations made by the Delta Smelt Working
5 Group for specific protections.

6 Q. And if I heard you correctly, you referred to a meeting of
7 the Delta Smelt Working Group on August 21, 2007.

8 A. I --

9 Q. I don't think that date has come yet, so I just --

10 A. I beg your pardon. I meant August 21st, 2006 Delta Smelt
11 Working Group notes.

12 MR. WALL: May I approach the witness?

13 THE COURT: You may.

14 MR. WALL: Your Honor, I've shown the -- handed the
15 witness a document identified -- marked for identification as
16 Plaintiff's Exhibit 10.

17 THE COURT: All right.

18 (Plaintiff's Exhibit 10 was marked for
19 identification.)

20 BY MR. WALL:

21 Q. Dr. Swanson, do you recognize the document marked as
22 Plaintiff's Exhibit 10?

23 A. I do.

24 Q. Would you describe what that document is?

25 A. I'm sorry. I missed the question.

1 Q. Could you describe for the Court what that document is,
2 Plaintiff's Exhibit 10 for identification.

3 A. This is the meeting notes for the Delta Smelt Working
4 Group meeting. It appears they did it by conference call,
5 according to the heading, which is dated August 21, 2006. It
6 includes a list of participants in the meeting and then the
7 various topics they discussed. The last few pages present
8 graphical analyses that were part of their discussions.

9 Q. How were you aware what this document is?

10 A. The Delta Smelt Working Group notes are posted on the Fish
11 & Wildlife Service website for the delta smelt and are
12 therefore publicly available.

13 Q. And did you access these notes from that website?

14 A. I did.

15 Q. Does the document identified as Plaintiff's Exhibit 10, is
16 that a true and accurate representation of the document posted
17 on the Fish & Wildlife website?

18 A. I believe so.

19 MR. WALL: Your Honor, I move to have admitted
20 Plaintiff's Exhibit 10 in evidence.

21 THE COURT: Any objection?

22 Exhibit 10 is received in evidence.

23 (Plaintiff's Exhibit 10 was received.)

24 BY MR. WALL:

25 Q. Dr. Swanson, could you please tell us what portion of

1 these notes you were referring to when describing the
2 relationship between salinity and habitat?

3 A. The easiest reference point is on the second to the last
4 page, figure two.

5 Q. Could you describe figure two or your understanding of
6 what figure two shows.

7 A. Figure two shows a graph that relates the fall habitat
8 index, which they describe in their caption as the delta smelt
9 habitat index based on specific conductance, water clarity and
10 water temperature. And they're relating the value of that
11 habitat index shown on the Y axis with the mean or average
12 September through December X2 location.

13 As I mentioned, the location of X2 is directly
14 related to the amount of fresh water outflow from the Delta
15 into the estuary. When X2 is high, like 90 or 100, that
16 corresponds to very low fresh water outflow conditions. When
17 X2 is low, 50 or 60 kilometers, that corresponds to high
18 outflow where low salinity habitat is located well downstream
19 in Suisun Bay.

20 This X2 is measured during the period from September
21 through December. That's the same period that the habitat
22 quality index was measured using data on those environmental
23 characteristics and the presence or absence of delta smelt and
24 the Fall Midwater Trawl.

25 What the graph shows -- each point represents a

1 single year -- is that when X2 is located between 60 and 80
2 kilometers during this period in the estuary, which
3 corresponds to moderate fresh water outflow conditions during
4 this period, the habitat quality index is generally higher
5 than at other times.

6 When X2 is located upstream of 80 kilometers, you'll
7 see that all the points between 80 and 95 X2 values are for
8 low habitat indexes.

9 Given that the habitat index is essentially a rough
10 indication of the volume of delta smelt habitat, this suggests
11 that during the fall, outflows that result in the location of
12 X2 or low salinity habitat at or downstream of 80 kilometers
13 typically correspond to better habitat conditions than when X2
14 is located upstream of 80 kilometers during this period.

15 Q. Dr. Swanson, if you could refer to the beginning of that
16 document. And particularly at the top of the first page, the
17 list of participants. Do you have -- do you recognize the
18 names that are listed there?

19 A. I do.

20 Q. Can you tell us generally -- are these individuals of a
21 particular profession?

22 A. They're -- I think -- let me see. They're all fisheries
23 biologists. I would also point out that one of the
24 participants in this meeting, Matt Nobriga, is one of the
25 co-authors of the Feyrer, et al. paper.

1 Q. And do you know what agencies employ these scientists?

2 A. The agencies are listed next to their names, so yes.

3 Q. It would include the Fish & Wildlife Service, the Bureau
4 of Reclamation.

5 A. Yes. Fish & Wildlife Service, Bureau of Reclamation.
6 California Department of Fish & Game, California Department of
7 Water Resources, US Fish & Wildlife Service and that's it.

8 Q. Had there been other studies that have attempted to relate
9 salinity and delta smelt abundance?

10 A. Yes.

11 Q. Could you describe those studies for us?

12 A. For many other fish species in this estuary, their
13 population abundance has been shown to be directly related to
14 the location of low salinity habitat during the spring period
15 from February through June. Or some fraction of those months.

16 And the typical relationship found for most of those
17 other fish species is that in years when fresh water outflows
18 to the estuary are high and low salinity habitat is located
19 downstream, X2 values are low, later in the year you will have
20 higher population abundances for those species.

21 In contrast, when you have low outflow conditions
22 during the spring and X2 low salinity habitat is located
23 further upstream in the estuary, perhaps near the confluence,
24 the population abundance of those fish is measured later in
25 the year will be lower.

1 Delta smelt does not exhibit this relationship with
2 X2 during the spring. However, it does appear to exhibit
3 something similar with regard to this habitat quality index,
4 which incorporates X2 or incorporates an alternative measure
5 of habitat that is dependent upon the location of X2, during
6 the fall.

7 During the fall for this species is the important
8 rearing period where the fish are growing rapidly, having
9 arrived in the low salinity habitat a few months earlier.
10 They're growing rapidly in preparation of beginning
11 reproductive maturation and their upstream migration for
12 spawning in the winter and early spring.

13 Q. Did the Contra Costa Water District conduct an analysis
14 related to this study?

15 A. Contra Costa Water District conducted an analysis where
16 they examined the relationship between the salinity at a
17 specific geographic location in the Delta, specifically at
18 Jersey Point. And they related the value of salinity, what
19 the salinity at Jersey Point was during the fall. And they
20 related that to the population abundance of delta smelt
21 juveniles measured the following summer.

22 They used data from 1987, I believe, through 2005.
23 And they found that there was a statistically significant
24 relationship between the salinity measured at Jersey Point,
25 which is just upstream of the confluence and subsequent

1 abundance, of juvenile delta smelt.

2 When salinity in the fall at Jersey Point was
3 relatively high, the following year the abundance of delta
4 smelt was low. When salinity at Jersey Point was relatively
5 low, meaning it was less salty and it was more fresh water
6 going through the system, the abundance of delta smelt
7 juveniles measured the following summer was higher.

8 Q. Dr. Swanson, do you recall what years Contra Costa Water
9 District included in its analysis?

10 A. I would prefer to check the documents, but I believe it
11 was from 1987 to 2005.

12 Q. Did you refer to that Contra Costa Water District analysis
13 in one of your declarations in this case?

14 A. I did.

15 Q. And since preparing that declaration, have you received
16 additional information related to Contra Costa Water
17 District's analysis?

18 A. Yes. In the declaration of Mr. Stephen Ford, he updated
19 the analysis that I presented in my declaration by including
20 the abundance, the juvenile abundance data and the fall
21 salinity data for 2006 and 2007. And he found that inclusion
22 of those additional data points in the analysis by increasing
23 the variability in the response between delta smelt abundance
24 and fall salinity the previous fall was such that the
25 relationship between those two variables was no longer

1 statistically significant.

2 The abundance of delta smelt measured during the most
3 recent three years, which includes the '05 data point which
4 was included in the original analysis, but the data for '05,
5 2005, 2006 and 2007 are markedly lower, the abundances of
6 delta smelt during those three years are markedly lower than
7 the abundance that was formally predicted on the basis of fall
8 salinity by the Contra Costa Water District's original
9 analysis.

10 Q. Can you draw any conclusions from that new information?

11 A. At this point, it's premature to conclude that fall
12 salinity, in fact, does not affect population abundance of
13 delta smelt. The population decline suffered by the species
14 during the most recent three years is a very significant and
15 sharp drop, which may represent the species declining to a new
16 population, low population level. Some people refer to this
17 as a step decline. I think it's premature to actually
18 conclude that yet, but it might be the case if we continue to
19 get really low numbers in future years.

20 My interpretation of the inclusion of these new
21 points was mostly as another indication of high level of
22 concern that we should have for the species. Because what the
23 analysis suggests is that salinity conditions during the fall,
24 which for the previous 18 years, corresponded to particular
25 population levels for delta smelt, no longer did. And that,

1 in fact, the population had dropped to some lower level. I
2 would also interpret this as another indication of the reduced
3 resilience of the population to respond to more favorable
4 conditions with positive population growth.

5 The salinity -- the fall salinity conditions for
6 those three most recent years were not extremely bad. They
7 were roughly in the middle of the range and, based on the
8 original analysis, would not have been expected to correspond
9 to such low population abundance for delta smelt.

10 Q. Does this mean that -- does the new information have any
11 implication for how delta smelt would respond to a salinity
12 point that was further upstream?

13 A. No. Not that I can think of.

14 Q. Does this new information affect your thinking about the
15 Feyrer, et al. article?

16 A. No. Not really. I consider the Feyrer, et al. analysis
17 to be far more rigorous and robust. They looked at multiple
18 environmental factors. They looked over the entire geographic
19 range of delta smelt distribution. They conducted far more
20 sophisticated statistical analyses to create their habitat
21 index.

22 And just the quality and the quantity of data
23 incorporated into the analysis conducted by Feyrer and the
24 quality and quantity of the statistical analysis that they
25 conducted using those data is far more robust than the Contra

1 Costa analysis. And, in my view, much more meaningful with
2 regard to how habitat conditions affect the species and offers
3 much more useful information to develop potential actions to
4 improve delta smelt habitat quality.

5 Q. Dr. Swanson, let me actually ask. There was an exhibit
6 marked yesterday as Plaintiffs' 4. Can you provide that to
7 the witness? I'm not sure where it is. This was the
8 declaration of Christina Swanson in support of plaintiffs'
9 reply on remedies.

10 THE COURT: You want the witness to have this?

11 MR. WALL: Yes, please, Your Honor. Thank you, Your
12 Honor.

13 THE COURT: You are quite welcome.

14 BY MR. WALL:

15 Q. Dr. Swanson, if I could ask you to -- should I wait for
16 the Court to have a copy? Maybe I can put it on the Elmo.

17 Dr. Swanson, I'd ask you to turn to page 34 of
18 Plaintiffs' Exhibit 4. There is a table or a graphic on that
19 page. Could you describe to us what that represents?

20 A. This graph represents a simple analysis that I conducted
21 using data on delta smelt abundance from the Fall Midwater
22 Trawl and relating the abundance of delta smelt to the average
23 combined State Water Project plus CVP project exports during
24 the December through March period earlier in the same year.

25 What the results show is that the abundance of delta

1 smelt as measured by the Fall Midwater Trawl -- so this is the
2 relative abundance of the adult fish -- is significantly
3 related to water export rates at the two facilities. And the
4 relationship is such that population abundance is lower in
5 years in the fall following a year -- the abundance measured
6 in the fall is lower in years where the winter export rates of
7 the two facilities were high and the abundance is high in
8 years when the winter exports were low.

9 Q. Does this relationship prove anything to you?

10 A. It shows that there is a statistically significant effect
11 of water export rates during the winter on the subsequent
12 population abundance of delta smelt.

13 Q. And can you draw any conclusions from that?

14 A. The general conclusion to be drawn from this is that
15 wintertime exports at very high rates would be expected to
16 result in low population abundance of delta smelt.

17 The -- when you do a relationship like this, relating
18 these two variables, this kind of relationship is frequently
19 criticized as a correlation and not a direct measure of some
20 cause and effect relationship.

21 In this case, this analysis was conducted essentially
22 to test the hypothesis, which was that exports affect delta
23 smelt population abundance. And it was designed to test it in
24 such a way that was meaningful given what we know about how
25 exports could potentially affect delta smelt and their life

1 history patterns.

2 As we're aware from delta smelt life history, during
3 the December through March period, the adult fish are making a
4 migration through the Delta towards upstream spawning habitat
5 areas. We also know that the take of adult delta smelt at the
6 facilities typically occurs between December and March.

7 So it's reasonable to ask a question, well, is the
8 magnitude of the export rates that were occurring during the
9 period when the fish were making this migration related to
10 their subsequent population abundance?

11 That is what this analysis does. And this analysis
12 represents a first step at better understanding the
13 relationship and the potential effects of water project
14 operations on delta smelt population abundance.

15 By itself, it can be interpreted very, very coarsely
16 to suggest that in order to protect delta smelt and
17 maintain -- allow them to return to higher populations, we
18 need to have much lower exports during the winter.

19 However, as I mentioned, it represents only a first
20 step. Exports in and among -- as a metric, as a measurement
21 to evaluate the effect of water project operations on the
22 species are one of only several different measurements that
23 could be examined. And they're actually a relatively coarse
24 metric.

25 We have other information about delta smelt which

1 tells us that the -- or suggests that the magnitude of the
2 effect of exports and perhaps in terms of the numbers of fish
3 that are entrained is related not just to the export rate, but
4 also to the concurrent inflow conditions or installation of
5 in-Delta channel barriers.

6 Q. Dr. Swanson, I'm going to give you a document marked as
7 Plaintiffs' Exhibit 11 for identification. May I approach the
8 witness?

9 THE COURT: You may. This is 11?

10 MR. WALL: Yes, Your Honor.

11 (Plaintiffs' Exhibit 11 was marked for
12 identification.)

13 BY MR. WALL:

14 Q. Dr. Swanson, do you recognize this document?

15 A. I do.

16 Q. Could you describe what it is?

17 A. This is my declaration in support of the plaintiffs'
18 proposed interim remedies. It was filed on July 23, 2007.

19 Q. It's a fairly long document. Does it have a series of
20 exhibits attached to it?

21 A. It does.

22 Q. And those were exhibits to your declaration?

23 A. That is correct.

24 MR. WALL: Your Honor, I move this in evidence.

25 THE COURT: Any objection?

1 THE COURT: Exhibit 11 is received in evidence.

2 (Plaintiffs' Exhibit 11 was received.)

3 BY MR. WALL:

4 Q. Dr. Swanson, if you could page through there and find
5 Exhibit S, I would appreciate it. I would say, by my
6 estimate, about three-quarters of the way through.

7 A. S.

8 Q. Actually, no, I don't want to move to Exhibit S yet, I'm
9 sorry. There was something else I wanted to do first. Let me
10 withdraw that and ask you to look at page 12 of the
11 declaration, Figure 8.

12 Could you describe for us what that represents?

13 A. Figure 8 is a reproduction of a graph produced by Dr.
14 Peter Smith of the US Geological Survey that was also
15 reproduced in the Delta Smelt Working Group notes for October
16 10th, 2006 as is noted in the caption.

17 The graph shows the relationship between the numbers
18 of delta smelt salvaged or counted as take at the combined
19 Central Valley Project and State Water Project facilities in
20 relationship to the combined flow on Old and Middle River.

21 And the only kind of flow that's being shown here on
22 the axis is when flow on Old and Middle River is negative,
23 meaning that the net flow of water is upstream towards the
24 pumps and not downstream towards the confluence.

25 Q. Dr. Swanson, I'd like to talk a little bit about a word

1 you just used and is used in this figure. Salvage. Could you
2 describe for us what salvage is?

3 A. Salvage is a term -- is used to -- it's the number of fish
4 that are taken by the facilities that are counted. Delta
5 smelt that are entrained in to the state or federal water
6 project facilities -- by "entrained," I mean the fish are
7 essentially trapped in the flow of water heading towards the
8 pumps and are either unable to escape that flow because it's
9 faster than they can swim or they're not responding
10 appropriately because they may not detect that they're being
11 drawn towards the pumps.

12 For both facilities, the fish are supposed to be
13 diverted from the water that's heading towards the export
14 pumps by means of a series of screens. The generic term is
15 fish screens. The type of screens that are present at both
16 the state and federal facilities are, in fact, called louvers,
17 they look like vertical Venetian blinds and, in fact, it's
18 unlike more modern fish screens, they don't physically exclude
19 the fish from the diverted water, they behaviorally deflect
20 them.

21 For those fish that are successfully deflected by
22 these screens, they are collected in holding tanks. And
23 periodically, the fish being diverted into the holding tanks,
24 a subsample of that is taken by personnel at the facilities
25 and the numbers of delta smelt that are caught in that holding

1 tank are counted. That count is then extrapolated up to a
2 daily count on the basis of what fraction of the time the
3 subsample, from which they were counting, they actually did it
4 during the day.

5 Q. Dr. Swanson, what happens to delta smelt that are diverted
6 into this holding tank where they're counted?

7 A. After they have been held in the tanks for a while,
8 usually depends on how much fish they're collecting per unit
9 of time, then the tanks are drained and the fish and some
10 water are transferred to a tanker truck and the truck is
11 driven to a location in the central Delta and the fish are
12 discharged out of the tanker truck into the Delta channels via
13 pipes.

14 Q. And how do delta smelt do during that process?

15 A. All of the available evidence that we have that I'm aware
16 of indicates that virtually none of the fish survive this
17 process.

18 Q. The delta smelt?

19 A. None of the delta smelt survive this process.

20 Q. So the term "salvage" here with respect to delta smelt
21 refers to the fish that are -- do not survive the process?

22 A. Yes. And for delta smelt, the numbers of fish salvaged
23 are assumed to be the numbers of fish taken by the facilities
24 or killed. They are assumed to be all killed, but salvage is
25 not an appropriate description.

1 Q. Dr. Swanson, are -- have you done some -- has some of your
2 research been conducted on fish screens?

3 A. Yes. But not the kind of screens at these facilities.

4 Q. But you're familiar with the screens at these facilities?

5 A. I am.

6 Q. And you're familiar with the research on the effectiveness
7 of these screens?

8 A. I am.

9 Q. Do you have an understanding of whether the fish screens
10 at the State Water Project and the Central Valley Project
11 pumping facilities are effective at diverting delta smelt into
12 these holding tanks?

13 A. In general, they are not very effective for successfully
14 diverting delta smelt into the holding tanks. And, in fact,
15 the numbers of delta smelt that are counted as salvaged
16 represents a substantial underestimate of the total number of
17 delta smelt that are, in fact, legally entrained and directly
18 killed by export operations.

19 There's a number of reasons for that. First of all,
20 in particular, at the State Water Project, water that
21 is -- diverted water is first diverted into a large forebay
22 referred to as Clifton Court Forebay. The water is entrained
23 into the forebay by opening a gate at the entrance to the
24 forebay at certain times in the tide and the water flows into
25 the forebay and then they close the gate. So at that point, a

1 delta smelt that has become entrained into the facilities is
2 now in Clifton Court Forebay and it will never get out.

3 Studies of other species have shown that most of the
4 fish entrained into Clifton Court Forebay, in fact, do not
5 survive to actually reach the fish screens, which are at the
6 opposite end of the forebay. So large numbers of fish are
7 considered and thought to be lost. They are either eaten or
8 they die for some other reason before they reach the screens,
9 at which point they should be deflected into the holding
10 tanks.

11 In addition to that loss, which is referred to as
12 pre-screen loss -- and it is not known what the magnitude of
13 pre-screen loss is for delta smelt. The louvers used by both
14 facilities are known to be not very efficient for successfully
15 diverting delta smelt. And, in fact, large numbers, a
16 substantial proportion of the delta smelt that approaches a
17 louver actually goes right through the louvers because they're
18 not positive barriers, they don't physically exclude the fish
19 from the diverted water.

20 In fact, the way that louvers are designed to
21 function is as what's referred to as a behavioral barrier.
22 And the vertical Venetian blind sort of design of the louvers,
23 what it does is it creates a turbulent flow field on the face
24 of the louver panel. And the way it is supposed to deflect
25 fish is for fish moving in the water flowing to the louvers,

1 when they detect that turbulent barrier, they're supposed to
2 respond behaviorally by avoiding it and swimming away from the
3 turbulent barrier. Depending on the size of the fish and its
4 ability to swim, fish that do not swim in the opposite
5 direction of the turbulent field can physically fit through
6 the louvers and, in fact, are passed through the louvers and
7 at that point they go directly to the pumps and they are never
8 seen or counted.

9 The efficiency of louvers for deflecting and
10 successfully diverting delta smelt out of the exported water
11 is known to be low.

12 The third reason that salvage can be a very, very
13 problematic number in terms of using it to determine what the
14 direct impact of the projects on delta smelt are, in terms of
15 the numbers of fish they kill, is that fish that are smaller
16 than 20 millimeters in length, even if they are successfully
17 diverted by the louvers and end up in the holding tanks, and
18 even if they are in the holding tank and are contained in a
19 subsample that's going to be counted per take, any fish
20 smaller than 20 millimeters is not counted. So even if
21 they're seen and detected, they're not counted as take.

22 So particularly for juvenile delta smelt, the numbers
23 of fish that are counted particularly early in the season
24 represents a very, very large underestimate of the total
25 number of fish that are being entrained.

1 THE COURT: What's the reason for not counting them?

2 THE WITNESS: I understand that the assumption is
3 that the louvers are not efficient for diverting fish smaller
4 than 20 millimeters and that therefore it wouldn't be
5 worthwhile that count fish. That's my understanding of the
6 rationale.

7 THE COURT: Is the purpose of the count to know
8 what's there at the screens?

9 THE WITNESS: That would be my assumption.

10 THE COURT: Why then would we not count what's there?

11 THE WITNESS: Beyond what I said, I don't think I can
12 answer that question for you, Your Honor.

13 THE COURT: Thank you.

14 BY MR. WALL:

15 Q. Dr. Swanson, how would you affect a -- how would you
16 expect a larval juvenile smelt to respond to the behavioral
17 barrier created by these fish screens?

18 A. Given their size and very limited swimming ability, I
19 don't think a louver type fish screen would be at all
20 effective at diverting larval delta smelt from the exported
21 water.

22 Q. Do the state or federal projects make any attempt to count
23 or determine whether larval delta smelt are diverted by the
24 fish screen?

25 A. To the best of my understanding, no.

1 Q. So if larval delta smelt were being pulled through the
2 louvers and, as you put it, never seen again, would we have
3 any information about the extent of that take?

4 A. No.

5 Q. If larval juvenile smelt were pulled in the salvage
6 facility -- and I believe your testimony was they would be
7 counted there; right?

8 A. That's correct.

9 Q. And are you able to estimate in any way how the number of
10 larval juvenile smelt entrained by these facilities might
11 relate to the total number of fish that are counted in salvage
12 holding tanks?

13 A. I can think of some methods that might be minimally
14 useful. I have never done it myself. Some other researchers
15 have. I think it would be very difficult to do with any
16 degree of accuracy.

17 Q. Would you expect the number of -- to be larger than the
18 number that's actually counted?

19 A. I think the number --

20 MR. WILKINSON: Objection. Calls for speculation.

21 THE COURT: Is there any basis for answering this
22 question without guessing?

23 THE WITNESS: The basis would be that during the
24 early months of the spring, March, April and May --

25 THE COURT: I'm going to overrule your objection and

1 make it subject to a motion to strike after I hear the answer.

2 THE WITNESS: We have information on the size
3 structure of the delta smelt juvenile population from results
4 from the 20 millimeter surveys. An estimate could be made,
5 based on the proportion of the population at any given time,
6 that was below 20 millimeters. You could estimate -- you
7 could assume that the fish 20 millimeters and larger were
8 being counted and estimate what portion of the population
9 those fish represented and then use that to estimate what
10 additional fish might have been salvaged that were not
11 counted. It would be a very forced estimate.

12 BY MR. WALL:

13 Q. What would the relationship be in terms of, you know,
14 during those months, the relationship between the number of
15 larval smelt and the number of smelt that would be large
16 enough to be counted --

17 A. In the months of March and April, when the majority of the
18 population is smaller than 20 millimeters, because the fish
19 are all very young, there would be no -- in fact, there
20 usually isn't any detectable salvage of delta smelt juveniles
21 because the fish are all smaller than 20 millimeters.

22 Later in the season, when the majority of the
23 population is greater than 20 millimeters, those fish, which
24 were successfully diverted into the holding tank during a
25 sampling period, would be counted. But that's the extent to

1 which you can make that comparison.

2 Q. If I could direct your attention back to Plaintiffs'
3 Exhibit 11. Excuse me. Have we moved this into evidence?

4 THE COURT: Exhibit 11?

5 THE CLERK: Yes.

6 BY MR. WALL:

7 Q. Page 12, Figure 8. Do you have any information -- are you
8 aware of any criticisms of this chart?

9 A. Yes.

10 Q. Could you describe those criticisms and the comment you
11 may have on them?

12 A. This graph shows the numbers of fish salvaged in relation
13 to the magnitude of negative or reverse flows on Old and
14 Middle Rivers combined. And the object was to determine
15 whether the magnitude of the reverse flow -- the object of the
16 analysis was to determine whether the magnitude of reverse
17 flow conditions was related to the total numbers of delta
18 smelt taken. And they show here a statistically significant
19 linear relationship between negative flows and take indicating
20 that at high negative flow conditions, take is high. And that
21 at low or zero negative flow conditions, take is low.

22 The criticism that I have heard about this particular
23 portrayal of this analysis is that two of those points down in
24 the bottom left-hand corner that show up at the zero/zero on
25 the axis essentially, right at the bottom corner. And those

1 points are for 1997 and 1998.

2 In fact, during those years and during this period,
3 which is January through February, by the way, flows on Old
4 and Middle River were -- in fact, they weren't negative and
5 they weren't zero, they were, in fact, positive flows. Net
6 flow on Old and Middle River was, in fact, downstream instead
7 of upstream. And the criticism has been the inclusion of
8 those two points at the zero/zero axis of the graph.

9 Q. Could you elaborate on how that criticism would affect the
10 relationship shown on this graph?

11 A. The inclusion of three points down there, 1999, of course,
12 is slightly negative flow with a little bit of take. The
13 inclusion of the additional two points from a statistical
14 perspective tends to pull the regression line down because
15 there's more points down there pulling it that way. And the
16 effect is to make -- to increase the sample size, likely
17 increase the R squared value, the statistic for the
18 relationship, and essentially to fix what's called the
19 intersect at the zero point.

20 Q. Do you have any view on whether -- do you have any
21 understanding of -- let me strike that.

22 I believe you testified that the purpose -- your
23 understanding of the purpose of this figure was to evaluate
24 the relationship between negative flows on Old and Middle
25 River and salvage at the CVP and the State Water Project

1 facilities?

2 A. I believe that was the case, yes.

3 Q. In view of that purpose, do you have any view on whether
4 the years 1997 to 1998 could have been simply left off of the
5 chart?

6 A. I think they probably could have, yes.

7 Q. And why is that?

8 A. I don't think they -- removal of those two data points
9 does not change the shape of this relationship.

10 Q. But why would it have been appropriate to take two years
11 off of this chart?

12 A. I think it could be argued either way as to whether it's
13 appropriate to include them or not. And it doesn't change the
14 ultimate result or interpretation of the analysis. If the
15 points are included -- if you extend the X axis way out into
16 the positive values to accommodate the actual Old and Middle
17 River flows on those points, the relationship is no longer
18 linear.

19 And instead, the relationship would really best be
20 analyzed by some sort of a step regression where you analyze
21 Old and Middle River flow conditions that are zero or positive
22 as one discrete set of data and Old and Middle River flows
23 that are negative in another.

24 Q. And if you did that when you were analyzing negative Old
25 and Middle River flows, those two data points would not

1 appear; is that what you're saying?

2 A. That would be correct. As I say, the shape of the
3 relationship would still be the same. Very possibly the line
4 towards the left side of the line might shift up very slightly
5 to get closer to that point labeled 1999.

6 Q. Does the criticism that has been -- you've articulated
7 with respect to this figure affect your view of the value of
8 this figure for assessing the relationship between fish that
9 are salvaged at the pumping facilities and negative flows on
10 Old and Middle River?

11 A. It does not. My interpretation of this graph, this is a
12 very simple and coarse analysis. It's useful, but it's
13 simple. Is that it shows that the only time take of delta
14 smelt is reliably low during this period is at Old and Middle
15 River flows that are less negative than about minus 4,000
16 cubic feet per second.

17 So between zero and 4,000, you don't have very many
18 data points, which is a problem with the analysis. But it's
19 really only -- those are the only conditions under which take
20 appears to be reliably low. And when Old and Middle River
21 flows are more negative than about 4,000, you get relatively
22 high numbers of adult delta smelt taken at the facilities.

23 The relative numbers of that increases the more
24 negative Old and Middle River flow gets.

25 Q. Are you aware of a re-interpretation statement by the

1 Department of Water Resources?

2 A. I am.

3 Q. And could you describe that re-interpretation?

4 A. They did a couple of things with regard to their analysis
5 of these same data that I consider highly questionable. They
6 did address this concern that they'd already raised about the
7 fact that those two years Old and Middle River flows were
8 positive. The more serious problem has to do with their
9 decision to arbitrarily split the data which for this graph,
10 as you can see, is for the January through February period.
11 And they arbitrarily split it into single calendar months.
12 And so now they have two graphs. But for each of those
13 graphs, they've only got half the salvage data, generally.

14 And the reason it's a problem is that, if I can use
15 an example, salvage of adult delta smelt when it occurs at the
16 facilities occurs as a single continuous event. And what it
17 represents, the reason -- what's going on that delta smelt are
18 being salvaged at the facilities, these are the fish that are
19 beginning to move upstream from their brackish water habitat
20 towards fresh water areas for spawning in the Delta, in the
21 upstream portions of the Delta.

22 Take of the fish is essentially -- it's detecting the
23 passage of the population past the area of the Delta in which
24 they're vulnerable to the pumps. It is a continuous event.
25 It's not fish going back and forth. These fish are -- this

1 is -- they're being taken as they move from brackish water
2 habitat to upstream habitat.

3 Typically, if you look at the data, sometimes you
4 start to take delta smelt adults at the pumps indicating
5 they're beginning their migration or they're partway through
6 their migration as early as December. Sometimes take doesn't
7 start until late January or early February.

8 By taking the data for individual calendar months,
9 the effect of that is to split up this continuous take event.
10 For example, if delta smelt began migrating up the system
11 perhaps a little later than usual, such that the take of delta
12 smelt really didn't start to happen until the last week in
13 January. And during that week, maybe a thousand fish were
14 taken. And during that month, Old and Middle River flows
15 might have averaged minus 6,000 cubic feet per second. That
16 yields a data point which suggests only a thousand fish were
17 taken at a relatively high magnitude of reverse flow and
18 essentially excludes consideration of the fact that this
19 represented a small proportion of the total adult population
20 that was being taken in the event.

21 Likewise, if the remainder of the population were
22 taken in February, maybe 6,000 fish were taken in February and
23 again, Old and Middle River flows averaged minus 6,000 cubic
24 feet per second, the interpretation for the February graph
25 says that that represents high take at that level of Old and

1 Middle River flows.

2 It's actually -- in my view, there's no biological
3 rationale to it, it's statistically unjustified and it tends
4 to -- what's the word I want? It basically is disguising the
5 information and the data.

6 THE COURT: Distorting?

7 THE WITNESS: I'm sorry?

8 THE COURT: Distorting?

9 THE WITNESS: Distorting is a better word, Your
10 Honor. Thank you.

11 THE COURT: Let me ask, going to the effect of the
12 reverse flows. It was implicit, but I don't think you stated
13 it specifically. Do the reverse flows carry the fish
14 essentially back to the pumps or do they end up locating them
15 in the south Delta?

16 THE WITNESS: Reverse flows are measured on two
17 channels. May I use the map?

18 THE COURT: Yes.

19 THE WITNESS: On two channels, which lead directly
20 towards the escort facilities. These two and the metric is
21 the combination of those two reverse flows. The magnitude of
22 the flow of the water towards the pumps -- and it is being
23 drawn towards the pumps, it's negative because it's being
24 drawn towards the pumps largely.

25 The effect of reverse flows is to -- for a fish, a

1 delta smelt that has become located in either of these two
2 channels, the net movement of water is towards the pumps and
3 in all likelihood the fish will be unable to escape from the
4 channel and will, instead, be drawn towards the pumps and
5 salvage facilities.

6 THE COURT: Do the channels have designations?

7 THE WITNESS: I refer -- let me see. This is Old
8 River and this is Middle River here.

9 THE COURT: Thank you. You may continue.

10 MR. WALL: Your Honor, do you have any estimate of
11 when we might break for lunch?

12 THE COURT: I had thought we would break around noon.
13 I have a sentencing proceeding at the noon hour.

14 MR. WALL: Okay. We have about five minutes left
15 just so I can form my question. Thank you.

16 Q. Dr. Swanson, are you -- you had an opportunity to review
17 Dr. Hanson's declarations in this case; right?

18 A. I did.

19 Q. And are you aware that he draws a comparison between his
20 estimate of the population of delta smelt in early July and
21 the salvage counts of delta smelt that are salvaged at the
22 state and federal water project pumping plants?

23 A. I am.

24 Q. Do you believe that that comparison is informative?

25 A. No.

1 Q. Could you tell us why?

2 A. As we discussed earlier, the population estimates, we have
3 no idea of the accuracy of those population estimates. The
4 only thing that, in my view, we know is that the number is
5 wrong. In contrast, the number of fish salvaged at the
6 facilities, we also know is wrong. But we know it is too low.
7 So he's comparing a number that is known to be wrong to a
8 number that is known to be too low and drawing a conclusion
9 from it. I consider the comparison without any merit or
10 value.

11 Q. Dr. Swanson, if -- I'm going to ask you to assume that the
12 operations of the federal and state pumping facilities near
13 Tracy directly entrain only a small portion of the delta smelt
14 population. Would the loss of that relatively small
15 proportion of the delta smelt population, over time, affect
16 the Delta smelt's prospects for survival?

17 A. Yes. And the magnitude of its effect on the prospects for
18 survival of the species depends on the status of the species
19 at the time. And even a small adverse impact or a direct take
20 of these fish, relatively small in proportion to their
21 population, has a greater effect on the status and risk of
22 extinction for a species when its overall population
23 abundance, not to mention the other criteria that I
24 identified, distribution, diversity and productivity, are
25 already known to be low.

1 Q. Is there evidence on whether these pumping facilities are
2 taking an increasing proportion of the total delta smelt
3 population?

4 A. There are some analyses that were conducted by Dr. Bruce
5 Herbold of the United States Environmental Protection Plan as
6 part of the research into the pelagic organism decline where
7 he examines salvage levels during the winter, for the peak
8 generally salvage of adult delta smelt, over the period from
9 1993 to -- the most recent data I think he had was 2004 or '5.

10 Q. Dr. Swanson, if I could --

11 A. Yes, it's in my declaration.

12 Q. Yeah. If you could turn to Plaintiffs' 11 at page 11, if
13 that would help you.

14 A. The last date of the year. He did it from 1994 to 2005.
15 And he first looked at the total numbers of adult delta smelt
16 salvage per year. The period he used was, I believe, November
17 through March. So he had a slightly longer period.

18 Q. Dr. Swanson, I'm sorry to interrupt you. Could you just
19 indicate which of these figures you're referring to?

20 A. I beg your pardon. It's Figure 6, page 11 of my
21 declaration. The first step in Dr. Herbold's analysis was to
22 just look at the numbers of delta smelt that were salvaged
23 each year over this period from 1994 to 2005. And he found
24 that in recent years, the total numbers of delta smelt counted
25 as salvage at the facilities had increased compared to the

1 earlier years.

2 He next asked the question whether that increase in
3 salvage reflected an increase in the amount of water being
4 exported from facilities during that time. To do that, he
5 related the numbers of fish salvaged to the total volume
6 diverted during that period and essentially calculated the
7 numbers of delta smelt salvaged per acre foot of water
8 exported.

9 When he did that, he found that the recent years
10 still showed disproportionately high take of delta smelt. The
11 densities of delta smelt, the number of fish per acre foot
12 taken during the winter at the facilities, was higher in
13 recent years than it was during the earlier 1990s.

14 The third thing that he recognized was that during
15 this period, the population abundance of delta smelt had been
16 quite variable. It had increased from 1994 up to 1999; but
17 since 1999, it had declined markedly to much lower levels.
18 And to accommodate for the fact that there were different
19 numbers of delta smelt out in the habitat, he then related his
20 fish density to the abundance of the population by effectively
21 dividing the density by the abundance index, I believe.

22 When he did this analysis -- so this is looking at
23 sort of the impacts of the take of those fish relative to
24 their population size. And he found still that in recent
25 years, and in particular 2003, 2004 and 2005, the relative

1 take of adult Delta smelts was higher than in almost all
2 previous years.

3 Q. And by "relative take" you mean in proportion to the
4 population?

5 A. This is a way of describing the impact of take relative to
6 the population abundance of delta smelt, yes.

7 MR. WALL: Your Honor, it's now noon. If this is a
8 good stopping point, maybe we could take up the remedy issues
9 immediately after lunch.

10 THE COURT: Yes. And give me a time estimate on the
11 balance of your direct if you would, please.

12 MR. WALL: I would hope to move through it in an hour
13 or maybe an hour and a half.

14 THE COURT: All right. Thank you. Anything further
15 before we recess?

16 All right. We're in recess until 1:15.

17 (Lunch recess.)

18 THE COURT: Good afternoon, ladies and gentlemen.
19 Please be seated. We're back on the record in NRDC versus
20 Kempthorne. We're going to resume Dr. Swanson's testimony.
21 Mr. Wall.

22 MR. WALL: Thank you, Your Honor.

23 Q. Dr. Swanson, one last thing I'd like to touch on with you
24 before turning to your proposed remedial measures. Are you
25 familiar with the concept of take limits?

1 A. I am.

2 Q. What is your understanding of that term?

3 A. A take limit is a fixed number of delta smelt that the US
4 Fish & Wildlife has identified for each month of the year with
5 different take limits for different water year types between
6 dry water year types and wetter water year types.

7 Presumably if more fish than -- or if the take limit
8 is reached and/or exceeded, it requires that the state and
9 federal water projects reinitiate consultation with the Fish &
10 Wildlife Service regarding the need -- possible need for
11 additional protection for the species. That's my
12 understanding of how it works.

13 Q. I believe I just heard you testify that the take limits
14 vary by water year type; is that correct?

15 A. Yes.

16 Q. Do they vary by other factors?

17 A. They are different for each month.

18 Q. Were the -- are you familiar with the take limits that
19 were in the Biological Opinion on the OCAP, the 2005
20 Biological Opinion on the OCAP which is the subject of this
21 litigation?

22 A. I am. I couldn't recall the specific numbers, but I am
23 familiar with the numbers that were there, in general terms,
24 and in relation to the earlier Biological Opinion.

25 Q. And do you have a view on the adequacy of those take

1 limits for insuring that CVP and State Water Project
2 operations did not appreciably increase the delta smelt risk
3 of extinction?

4 A. I do. In my judgment, the take limits are insufficient to
5 provide adequate protection to the species and avoid
6 jeopardizing it for a number of reasons. I think one of the
7 most important reasons the take limits provide literally an
8 unknown level of protection to the species is that the take
9 limit is not related in any way to the abundance, the
10 population abundance of delta smelt as measured by any one of
11 the abundance indices from Fish & Game surveys.

12 Therefore, a take limit that, for example, allowed
13 the take of 1,000 fish, if that take limit were reached when
14 the population was very large might represent a relatively
15 small impact on the species.

16 In contrast, taking that number of fish under -- in a
17 year in which the population abundance of delta smelt were
18 very low, for example in these recent years, most likely
19 represents a much larger impact on the species.

20 Second of all, it's well known that the numbers of
21 delta smelt that are counted as take at the two facilities is
22 a substantial underestimate of the total numbers of fish that
23 are actually killed by the facilities.

24 And given that we actually don't know by how much
25 take underestimates the total numbers of fish killed, the take

1 limits were developed and identified with no basis for
2 understanding to what degree they represent some limit,
3 allowable limit of direct mortality that can be imposed on the
4 species by the projects.

5 Q. Dr. Swanson, have you developed recommendations for
6 protection of delta smelt and, in particular, recommendations
7 for protective measures that could be implemented by the
8 Central Valley Project and the State Water Project to protect
9 the delta smelt?

10 A. I did. I developed a suite of interim remedy protections
11 that, in my judgment, should be implemented during the next
12 year or until a long-term Biological Opinion is put in place.
13 And I believe that these protections are necessary to prevent
14 water project operations from jeopardizing the continued
15 existence of the species and from adversely modifying their
16 habitat.

17 Q. What did you consider in developing your proposed
18 protective measures for the delta smelt?

19 A. I considered all of the available published and
20 unpublished scientific research on the species of which I was
21 aware, including information and analyses discussed by
22 technical working groups, such as the Delta Smelt Working
23 Group, and that presented in scientific and technical work
24 group fora, such as Dr. William Bennett's research that has
25 not yet been published. As well as other published research,

1 including my own experience with the species based on my own
2 scientific research on it.

3 Q. Dr. Swanson, are your recommendations set forth in writing
4 somewhere?

5 A. They are. They are attached as an appendix to my most
6 recent declaration, which was the --

7 Q. I believe that's --

8 A. -- August 13th declaration.

9 Q. Yes. I believe that's Plaintiffs' Exhibit 4 in evidence.

10 Dr. Swanson, would you please turn to the appendix to
11 Plaintiffs' Exhibit 4. And let's give a moment to everybody
12 to find a copy.

13 Would the Court prefer I put this on the Elmo?

14 THE COURT: Well, Dr. Swanson has had some difficulty
15 reading it on the Elmo.

16 THE WITNESS: I prefer to read it from hard copy,
17 Your Honor.

18 THE COURT: All right. Then you may proceed.

19 BY MR. WALL:

20 Q. Dr. Swanson, do you have the appendix to your second
21 declaration, Plaintiffs' 4, in front of you?

22 A. I do.

23 Q. At the top it says revised recommendation -- re?

24 THE REPORTER: I'm sorry?

25 MR. WALL: I'm not sure how to get that going, so

1 I'll just read it slowly.

2 THE REPORTER: That's fine.

3 MR. WALL: It says across the top, "Revised
4 Recommended Interim Protection Actions for Delta Smelt."

5 Q. Dr. Swanson, across the top --

6 THE CLERK: Counsel, if you would like to try putting
7 it on? Somehow it got turned off while I stepped out earlier.
8 There you go.

9 BY MR. WALL:

10 Q. Across the top of that page, there's a series of column
11 headings. Could you explain to us what those represent?

12 A. Certainly. In the first column, on the left, I identify
13 each of the interim protection actions that I have identified
14 by number. There are ten in total.

15 The second column identifies the timing or the time
16 of the year during which the action is to be implemented.

17 The third column labeled "lifestage" identifies the
18 life history stage of delta smelt that the interim protection
19 is directed at.

20 The fourth -- excuse me, the fourth column labeled
21 "trigger" or "triggers" identifies the conditions, either
22 environmental conditions or results of survey monitoring,
23 which would trigger implementation of the action.

24 The fifth column identifies the action itself and
25 describes it.

1 The next column identifies when the action would end.

2 The next column identifies the objective of the
3 action.

4 And the final column on the right briefly identifies
5 the sources of information and the rationale that underlie the
6 action.

7 Q. Could you give us an overview of these actions and then
8 we'll ask you to talk about them more specifically.

9 A. There are basically four types of actions. The first type
10 has to do with improving -- with maintaining or improving our
11 current monitoring capacity and improving our ability to
12 detect the presence and distribution of the fish within the
13 system. There are three specific actions under that -- in
14 that type.

15 Q. Are those actions one through three?

16 A. Those are actions one through three.

17 The second main type or main -- the second type of
18 actions is designed to prevent entrainment and take of adult
19 delta smelt that are moving upstream to spawn in the habitat.

20 The third type of action is designed to minimize
21 entrainment of larval delta smelt and to minimize larval and
22 juvenile delta smelt and to minimize and/or eliminate the
23 numbers of those fish that are legally taken at the export
24 facilities.

25 And the final type of action is designed to reduce

1 the degree to which water project operations adversely modify
2 delta smelt habitat during the fall concurrent with the
3 sub-adult life history stage of the species.

4 Q. And that final category of actions that is designed to
5 benefit the sub-adult lifestage, which action is that?

6 A. That is action number ten.

7 Q. I'd like to start, then, by asking you about action number
8 ten. Which is on, I believe, the last page of that appendix.

9 Could you walk us through this action?

10 A. Action ten is designed to reduce the degree to which water
11 project operations adversely modify delta smelt habitat during
12 the fall by reducing overall fresh water outflows from the
13 Delta during that period.

14 The timing of the action, the action is intended to
15 occur from the month of September through December and it's
16 designed to provide improved habitat conditions for the
17 juvenile and sub-adult life history stage of delta smelt that
18 at that time in their life, and at this time of the year, are
19 downstream in low salinity or brackish water habitat rearing.
20 And, as Dr. Moyle said, growing rapidly in preparation of
21 making their upstream migration later in the winter for
22 spawning.

23 Q. Dr. Swanson, could you show us on the map where the delta
24 smelt might be during that lifestage?

25 A. The location of delta smelt during this period would

1 be -- the location of the bulk of the population would be
2 dependent upon the amount of fresh water outflow from the
3 Delta into the estuary at this time.

4 But under conditions that have been typical for most
5 years, recently the majority of the population would likely be
6 located in and around the confluence of the Sacramento and San
7 Joaquin Rivers and somewhat downstream of that. But would not
8 likely be located way far down in Suisun Bay.

9 Q. And why is that?

10 A. The location of delta smelt within their habitat is
11 largely determined by the location of low salinity habitat.
12 And the fish tend to congregate in areas where the salinity
13 ranges from one or some -- one or somewhat less than one part
14 per thousand into areas where the salinity is reaching as high
15 as five to six or seven parts per thousand. They're sometimes
16 found further down, but not very often. The location in the
17 estuary where that habitat is, as I mentioned, dependent upon
18 the amount of fresh water outflow.

19 Q. What is your tenth proposed action, what would the
20 agencies need to do?

21 A. The action proposes or recommends that, starting in
22 September, if the location of X2, the location of the two
23 parts per thousand isohaline and roughly low salinity habitat
24 is, at that point, upstream of 80 kilometers, which is in the
25 vicinity or somewhat downstream of the confluence, then water

1 project operations should be modified to increase outflows to
2 a minimum level of 7500 cubic feet per second or an
3 alternative metric to maintain X2 as the 14-day running
4 average at a location that is at or actually downstream of 80
5 kilometers.

6 THE COURT: How far downstream?

7 THE WITNESS: They need to locate X2 and modulate the
8 outflow they let out of the Delta such that X2 is at 80
9 kilometers or below, I should say.

10 THE COURT: So as close to 80 kilometers as possible.
11 Because downstream could mean anything.

12 THE WITNESS: 80 kilometers is a fixed location
13 within the estuary.

14 THE COURT: I'm with you on that. But you said or,
15 in the alternative, downstream. So that would apparently
16 be --

17 THE WITNESS: The action offers two alternative ways
18 to measure compliance with the measure. One is to maintain a
19 minimum Delta outflow of 7500 cubic feet per second.

20 THE COURT: So is that going to be a reduction or an
21 increase at that time of year?

22 THE WITNESS: It would most likely be an increase
23 compared to current minimum requirements for outflow during
24 those months. According to my calculations, a steady outflow
25 of 7500 cubic feet per second will maintain X2 at 80

1 kilometers in the estuary, assuming you've gotten it there
2 first.

3 The alternative metric is to base compliance upon the
4 location of X2 and the recommendation for that is that the
5 14-day running average of X2 be located at downstream of 80
6 kilometers.

7 The action also goes on to suggest that of these two
8 alternatives, whichever one requires less fresh water outflow,
9 would be the one that could be used as the compliance metric.

10 THE COURT: And it is this alternative that I still
11 don't understand. Because you're not maintaining it at 80
12 kilometers, you're maintaining it downstream, but how far
13 downstream? Because it's going to take a certain amount of
14 water to achieve the salinity level that you want.

15 THE WITNESS: According to my calculations, using
16 equations that have been developed to calculate and predict
17 the location of X2 on the basis of Delta outflow, a relatively
18 steady outflow of 7500 cubic feet per second should correspond
19 to an X2 location of 80 kilometers.

20 MR. WALL: Your Honor, I might be able to elicit an
21 answer that's responsive if I ask a couple of questions.

22 THE WITNESS: I'm sorry.

23 THE COURT: All right. I still don't understand, but
24 maybe you can --

25 MR. WALL: I'm going to try to help you. Feel free

1 to talk some more with the witness.

2 THE COURT: You may proceed.

3 BY MR. WALL:

4 Q. Dr. Swanson, when you say "downstream of 80 kilometers,"
5 do you mean at out at the Farallones?

6 A. No.

7 Q. Do you mean in San Pablo Bay?

8 A. No. It means just anywhere that's -- it means just
9 immediately downstream of 80 kilometers.

10 Q. So effectively at or equal to 80 kilometers?

11 A. At or just --

12 THE COURT: Why not just make it that?

13 THE WITNESS: That would be another way to express
14 this, yes.

15 THE COURT: This, quite frankly, is hopelessly
16 ambiguous because it doesn't tell us where downstream. It
17 could be one inch, it could be 600 kilometers, it could be a
18 mile downstream.

19 THE WITNESS: I believe the objective of the language
20 that I intended when I wrote it was that so long as it was
21 downstream of 80 kilometers, regardless of how far downstream
22 of 80 kilometers, that was okay. With the expectation that
23 the -- it would be unlikely that higher levels of outflow that
24 would result in X2 further, much further downstream than 80
25 kilometers would, in fact, be operated for.

1 THE COURT: Remember, part of the reason that this
2 Biological Opinion was invalidated was for doing just what
3 you're now proposing to do. To make it so indefinite and
4 uncertain that there was not required precision that would
5 enable the operator to operate and for everybody to know under
6 what conditions the standards have to be met.

7 If what you're trying to achieve is just that it is
8 either at or downstream from the X2 80 kilometer mark, that's
9 all you should say. So long as it is either at or downstream
10 from. But if you simply say "downstream" without saying the
11 80 kilometers in your second standard, then it's open-ended.

12 THE WITNESS: Uh-huh.

13 THE COURT: Do you understand?

14 THE WITNESS: I think I do. And I think that would
15 represent a fairly simple revision to be made in the language
16 here.

17 THE COURT: But that is what you intend?

18 THE WITNESS: Yes.

19 THE COURT: Proceed.

20 MR. WALL: Thank you, Your Honor.

21 Q. During what time period would this tenth protective
22 measure be implemented?

23 A. This action should be implemented from the beginning of
24 September through the end of December, unless in the second
25 half of December there were a -- there was a winter storm or a

1 rain or flow pulse event that would cause Sacramento -- which
2 we call -- let me see, that would cause river inflows to the
3 Delta to increase sharply over a short three-day period, which
4 constitutes the trigger for one of the other protective
5 actions.

6 If this winter pulse flow event doesn't occur, then
7 action ten should be continued to be implemented through the
8 end of December.

9 THE COURT: And if you know, is this water normally
10 in storage that would be required to maintain flows of 3500
11 cfs in the system?

12 THE WITNESS: Currently minimum flow requirements
13 require between 3,000 and 4500 -- depending on the month and
14 water year type -- minimum Delta outflows already. In order
15 to achieve the target outflow of this represents an increase
16 of outflow between three and maybe 5,000 or 4500 or 4,000
17 cubic feet per second.

18 The source of that water is not specified by this
19 action. But there are -- based on my working knowledge of
20 water project operations in this system, the increased outflow
21 could be implemented by increasing releases from reservoirs to
22 increase inflows and outflows to the Delta. Or alternatively,
23 by decreasing the water export rates from the Delta and
24 allowing a greater proportion of existing levels of Delta
25 inflow to pass through the Delta to the -- into the estuary or

1 some combination of both.

2 THE COURT: And do you know what the export rates at
3 that time of year are?

4 THE WITNESS: I do. And I had specified average
5 export rates for those months in one of my declarations.

6 BY MR. WALL:

7 Q. I think it's in the declaration in front of you.

8 A. I think you --

9 Q. Plaintiffs' 4. And it may be in -- let me find the
10 paragraph and direct your attention to it.

11 THE COURT: While he's looking for that. The
12 ultimate objective of this is to do what with the smelt, get
13 them to move to the spawning grounds or something else?

14 THE WITNESS: This objective is for juvenile and
15 sub-adult delta smelt during this fall period. And the
16 objective is to reduce the adverse modification of delta smelt
17 habitat caused by reduced outflows and which result from
18 current levels of water project operations and improve the
19 quality and quantity of delta smelt habitat.

20 The scientific basis for the action is principally
21 the research published by Feyrer, et al., which showed that
22 delta smelt habitat quality was a function of outflow. And
23 that in recent years outflows during this period had been
24 lower than they were in the past. And that that was not a
25 result of changes in hydrological patterns. And that

1 decreased habitat quality, using the index they developed,
2 corresponded to reduced population of hundreds of delta smelt.

3 THE COURT: And what we're talking about, again,
4 habitat, is water quality, clarity, salinity.

5 THE WITNESS: Those three characteristics which the
6 authors use to characterize delta smelt habitat quality. This
7 one principally addresses the salinity aspect of habitat
8 quality and improves the habitat quality index largely by
9 shifting the location of low salinity habitat just a little
10 bit further downstream, increasing the overall amount of
11 habitat available to the species.

12 THE COURT: But this is not the time when the fish
13 are starting to move upstream?

14 THE WITNESS: This is just before the fish start to
15 move up. This is while they're still rearing in this low
16 salinity brackish water habitat. They're feeding and they're
17 growing.

18 THE COURT: September to December?

19 THE WITNESS: September through December. It's
20 possible, if a flow pulse occurred in December, that that
21 would trigger or cue the fish to begin their migration.

22 THE COURT: Thank you. Find it?

23 MR. WALL: Yes, I believe so.

24 Q. Dr. Swanson, if you could look at page 19 and 20 of
25 Plaintiffs' 4 at paragraph 21. This may be what you're

1 thinking of.

2 A. It is. I calculated the average monthly water export rate
3 from the combined CVP and SWP export facilities for the months
4 of September, October, November and December for the period
5 since 1994 through 2007.

6 I found that overall average export rates during the
7 month of September were 9,598 cubic feet per second. The
8 range was between roughly 7,000 and 11,500 cubic feet per
9 second.

10 In October, the average export rate combined for the
11 two facilities was 8,026 cubic feet per second.

12 In November, the average export rate for the two
13 facilities was 7,721 cubic feet per second.

14 And in December, the average export rate for the
15 facilities was 7,866 cubic feet per second.

16 Q. Dr. Swanson, you mentioned that a principle basis for this
17 action was the Feyrer, et al. findings. Were there any other
18 factors that went into your development of this?

19 A. There are other analyses which tend to support the finding
20 that reduced outflows during the fall are detrimental to delta
21 smelt. In particular, the analysis conducted by Contra Costa
22 Water District, which showed the statistically significant
23 relationship between the salinity measure at Jersey Point in
24 the fall and the population abundance of juvenile delta smelt
25 measured the following spring for the period of 1987 through

1 2005. This relationship is statistically significant and
2 indicates that in years when outflows during this period are
3 lower, such that salinity at Jersey Point is higher, the
4 population abundance of delta smelt the following summer is
5 lower than following years where there's greater amounts of
6 outflow and lower salinity at Jersey Point.

7 Inclusion of the most recent population abundance
8 data for delta smelt, the last two years, has rendered the
9 statistical relationship between these two variables to be no
10 longer significant, at least at the probability level of .05
11 or five percent.

12 However, I think the presence of the significant
13 relationship based on the majority of the data before the
14 population collapsed to its current low levels still provides
15 some rationale for this action.

16 In addition, there has been some discussion that
17 elevated salinity levels in the western Delta during this
18 period may have allowed the invasive overbite clam to extend
19 its range upstream, further upstream from where it had
20 previously been distributed and encroaching somewhat more
21 towards Delta channels.

22 Given that there is some concern that the presence of
23 the clam has adverse effects on the zooplankton food supply
24 for these species, it's possible that increased range and
25 potentially overall population abundance for the clam species

1 could also adversely affect delta smelt by further reducing
2 their habitat. Although at this point I am not aware of a
3 great deal of empirical evidence to support that part of the
4 hypothesis.

5 Collectively, those sets of information informed my
6 development of this action. But as I mentioned, the really
7 principle source was the research conducted by Feyrer, et al.
8 and published.

9 THE COURT: Once the clam is established, if the
10 salinity in the water is reduced, does that have any effect on
11 the presence of the clam?

12 THE WITNESS: Apparently, as I understand it, the
13 overbite clam, it is a brackish water clam. It lives in
14 slightly salty water. It can tolerate fresh water for some
15 period of time, although I think the duration is not known,
16 before it dies.

17 But, in fact, there is evidence that I have heard
18 that, under fresh water conditions, the clam does not feed.
19 It essentially closes its shell and does not filter the water
20 and remove the phytoplankton and the zooplankton.

21 THE COURT: You may proceed.

22 BY MR. WALL:

23 Q. Dr. Swanson, are there other clams that are present in the
24 habitat of the delta smelt?

25 A. There is another invasive clam species that has been

1 present in fresh water habitats for a longer period of time, I
2 believe, named Corbicula. Corbicula is a fresh water clam.
3 It does not tolerate salty or brackish water conditions.
4 Q. Are you aware of any hypothesis about how the Corbicula
5 clam -- and you might want to spell that for us. How the
6 Corbicula clam would respond to an increasing zone of low
7 salinity habitat?

8 THE COURT: We had the spelling. C-O-R-B-I-C-U-L-A.
9 We had it yesterday.

10 MR. WALL: I appreciate it, Your Honor.

11 THE WITNESS: Well done. Some people have suggested
12 that if we extend the area of fresh water habitat further
13 downstream, that the Corbicula clam may extend its range
14 further downstream and therefore -- and potentially have the
15 same effects of --

16 THE COURT: And can you show us on the map where,
17 generally speaking, the clam species are established?

18 THE WITNESS: In a general sense, I can, Your Honor.

19 THE COURT: Generally.

20 THE WITNESS: In general, the Corbula clam, the
21 overbite clam, is distributed in this area of the estuary.

22 THE COURT: Downstream?

23 THE WITNESS: Downstream of the confluence. I do not
24 know to the extent which they're in the areas of the
25 confluence right now.

1 Corbicula is distributed within the Delta here and,
2 in fact, most concentrated through the center of the Delta, as
3 I understand it.

4 THE COURT: So you would say it's having the most
5 jeopardizing effect than the other?

6 THE WITNESS: Based on everything I've heard, I do
7 not believe Corbicula has nearly as important an effect via
8 its impacts on the planktonic food web pattern as Corbula
9 does. Largely because delta smelt spend most of their time in
10 overbite clam habitat, not Corbicula habitat.

11 MR. LEE: Your Honor, I am going to object generally
12 to this line of questioning. We've now heard the witness say
13 "based on things that I have heard" now twice in this process.
14 Aside from the hearsay objection, we don't know the source of
15 what she's heard from, whether the people have -- who have
16 made those statements are qualified to make them. So I'm
17 going to object to this line of what we have heard reasoning.

18 THE COURT: You mean to the answer?

19 MR. LEE: To the answer, yes.

20 THE COURT: And the Court's understanding is that an
21 expert can rely on hearsay. Most do. And if you want
22 identification of this underlying information foundationally,
23 I'll permit you to voir dire. Is that what you want to do?

24 MR. LEE: We'd simply ask the witness to identify
25 precisely the sources that she's relying upon if she's going

1 to move in this area.

2 THE COURT: All right. To your best knowledge, from
3 whom or what source have you heard the information you just
4 provided us about the clams?

5 THE WITNESS: I have heard these descriptions and
6 discussions of the clam biology distribution and population
7 dynamics in a number of scientific and technical fora,
8 including a recent CALFED science workshop on the effects of
9 variable salinities in the Delta, which was held earlier this
10 year.

11 THE COURT: Thank you. Objection is overruled.

12 BY MR. WALL:

13 Q. Dr. Swanson, did Professor Peter Moyle participate in that
14 particular workshop?

15 A. I believe he did.

16 Q. Have you discussed this relationship with Professor Moyle
17 as well?

18 A. Briefly.

19 Q. Dr. Swanson, is there some uncertainty about the
20 effectiveness of your proposed protective action number ten?

21 A. In my judgment, based on my understanding of the research
22 done by Feyrer, et al., there is very little uncertainty that
23 increases in outflow to shift the location of low salinity
24 habitat during the fall would improve the value or the
25 measured value of their habitat quality index.

1 There's also little uncertainty that habitat quality,
2 in part driven by reductions in outflow during the fall, has
3 declined over the past few years compared to 10 and 20 years
4 ago.

5 There is uncertainty as to how the delta smelt
6 population -- or how the delta smelt would respond with regard
7 to changes in population abundance.

8 So with we -- we can be fairly certain that this
9 action improve delta smelt habitat quality and reduce the
10 degree to which water project operations adversely modify that
11 habitat. There is less certainty with regard to whether this
12 improved habitat conditions during this one part of the year
13 will be sufficient by itself to improve conditions for delta
14 smelt such that their population can increase.

15 Q. Dr. Swanson, were you present in the courtroom yesterday
16 when Professor Peter Moyle was cross-examined?

17 A. I was.

18 Q. Do you recall counsel cross-examining Professor Moyle
19 regarding a document that was known as the Pelagic Fish Action
20 Plan, as I recall correctly, pelagic action plan?

21 A. I do.

22 Q. And do you recall some discussion of a measure that would
23 have increased outflow through the Delta in the summer and
24 fall months?

25 A. Yes.

1 Q. Would it be helpful if I provided the Pelagic Fish Action
2 Plan for you?

3 A. Yes.

4 Q. I believe it's State Water Contractor Exhibit C. If you
5 could turn to page 47, please.

6 A. I do not have a copy of the document. What was the page
7 again, please?

8 THE COURT: 47.

9 BY MR. WALL:

10 Q. There's a discussion -- there's a heading that says
11 "Maintain X2 west of Collinsville during May-December
12 (summer/fall)." Do you see that discussion?

13 A. Yes.

14 Q. Are you familiar with this measure as described in the
15 Pelagic Fish Action Plan?

16 A. Yes.

17 Q. Is this the same action as you proposed in action number
18 ten?

19 A. It is similar, but it is not exactly the same.

20 Q. How does it differ?

21 A. It differs in the duration over which the action is to be
22 implemented. This action -- this action calls for X2 to be
23 maintained at or down -- an average X2 position west or
24 seaward of 80 kilometers from May through December. In
25 contrast, action 10 in the -- of the recommended interim

1 protections that I developed, this action is to be implemented
2 only during September through December.

3 Q. What was the rationale for -- that's listed on page 47 for
4 the action in the Pelagic Fish Action Plan?

5 A. I will read from the report. It says, "Higher Delta
6 outflow in the summer and fall can increase the amount of
7 habitat for delta smelt. If smelt use this habitat and their
8 distribution is wider and shifted downstream, subsequent
9 entrainment in the winter will be reduced."

10 Q. Now, why did you not propose an action that would last
11 from May through December?

12 A. In part, other protection actions that we -- that are
13 proposed in my interim protections cover a portion of that
14 period from May through June and perhaps longer, depending on
15 other triggers, and provided protection which was likely
16 comparable or perhaps better than this.

17 But the most important reason that I recommended
18 implementing this action for the September through December
19 period was because the action is based on the research
20 conducted by Feyrer, et al.

21 Q. Which action? I'm sorry.

22 A. Action ten is based on the research by Feyrer, et al.

23 Q. Your action.

24 A. My action ten is based on that, yes. And Feyrer, et al.
25 developed their habitat, their environmental quality index,

1 which characterizes delta smelt habitat quality using data
2 from only the period from September through December. And I
3 did not feel as comfortable extrapolating the results to other
4 times of the year for which I did not have data or scientific
5 basis to make that recommendation.

6 Q. Dr. Swanson, if you could turn the page -- actually, let
7 me back up for a second. I'll strike that question.

8 If you could look at Plaintiffs' Exhibit 10, please.
9 This is the Delta Smelt Working Group meeting notes from
10 August 21, 2006. And if you could look at the second page.
11 Unfortunately, the pages are not numbered. But the second
12 page, under the heading "Fall Flows."

13 Is there a discussion on that page of whether the
14 Delta Smelt Working Group should recommend fall flows similar
15 to those that you have proposed in your tenth protective
16 measure?

17 A. There is.

18 Q. If you could look at the second sentence under that little
19 table there and read that for us.

20 A. The sentence starting "currently"?

21 Q. I'm sorry. The third sentence.

22 A. "Over the range of fall X2 positions observed since 1970,
23 delta smelt habitat quality does not increase detectably until
24 X2 passes seaward of Broad Slough." They refer to Figure 2
25 and 3.

1 Q. And is Broad Slough, where does that lie relative to 80
2 kilometers?

3 A. According to the reference made to Broad Slough in the
4 Pelagic Fish Action Plan, Broad Slough roughly corresponds to
5 the location of 80 kilometers.

6 Q. Do you have -- could you read the rest of the paragraph.

7 A. The paragraph continues, "The amount of environmental
8 water required to move X2 seaward of Broad Slough to Chipps
9 Island and keep it throughout the fall is three to four times
10 the annual EWA" -- that's Environmental Water
11 Account -- "budget."

12 Q. So Dr. Swanson, is it -- do you have an understanding,
13 based on that, why the Delta Smelt Working Group might not
14 have recommended your proposed action?

15 MR. LEE: Objection, Your Honor, would require
16 speculation.

17 MR. WALL: I did ask for the witness' understanding.

18 THE COURT: All right. I will first ask if the
19 witness has any basis to answer the question.

20 THE WITNESS: I believe the basis is contained in the
21 content of these notes.

22 THE COURT: All right. The objection is overruled.
23 You may answer.

24 THE WITNESS: My interpretation of the discussion in
25 these notes, as well as other working group notes, which also

1 refer to the fall action, is that the expectation was that
2 implementing an action that increased Delta outflow during
3 this period would require them to use large amounts of the
4 fixed and finite supply of environmental water resources that
5 the Delta Smelt Working Group had access to to implement all
6 of their protective actions for delta smelt.

7 And they determined that first this action would
8 require using up a large amount, if not more than they
9 actually had in the Environmental Water Account, and that
10 therefore they chose not to recommend implementation of this
11 action and to save that limited amount of environmental water
12 for later in the year to implement protections aimed at other
13 life history stages.

14 BY MR. WALL:

15 Q. Could you describe, in a brief way, your understanding of
16 the Environmental Water Account?

17 A. The Environmental Water Account is a supply of water that
18 is largely acquired through purchase by the water project
19 agencies that is available for the fisheries agencies to use
20 in a discretionary way to compensate the water projects for
21 any reductions in water deliveries that might result from them
22 implementing a change in water export operations.

23 And by "change," I usually mean a reduction of the
24 water exports that were recommended for the purpose of
25 protecting delta smelt or some other endangered species.

1 Effectively the Environmental Water Account is used to
2 compensate the water projects for the amount of water that
3 they are unable to export at one time of the year. And to
4 compensate for those reductions, Environmental Water Account
5 water is given to the water projects to be exported or
6 delivered, if it's already south of the Delta, to compensate
7 for those losses at some other time of the year.

8 Typically Environmental Water Account actions
9 to -- or mediated actions to curtail exports occur during the
10 spring. Typically most Environmental Water Account water is
11 purchased from sources in the north of the Delta, frequently
12 from the Yuba River. And typically Environmental Water
13 Account water is transferred through the Delta by increasing
14 export rates during the late summer and fall for the purpose
15 of delivering this compensatory water to the projects south of
16 the Delta.

17 Q. I'm going to ask you to assume that you could decide what
18 was best for the delta smelt to prevent jeopardy to the delta
19 smelt and to ensure that the projects don't reduce the value
20 of their critical habitat for recovery or for survival. And
21 I'm going to ask you to assume that you are not limited by any
22 amount of water that has been set aside in an Environmental
23 Water Account.

24 Based on your knowledge of the biology of the delta
25 smelt and the peer review literature, would you recommend that

1 those -- protective measure ten proceed?

2 A. Yes.

3 Q. Dr. Swanson, when you were generally describing your
4 protective measures, you also indicated that there was a group
5 of measures relating to continuing or improving monitoring for
6 delta smelt. Could you describe those, please?

7 A. Yes. Those are actions one, two and three on this table.
8 Action one is just a recommendation that the currently -- the
9 current monitoring programs that are ongoing right now and
10 conducted by the Department of Fish & Game, in particular the
11 Kodiak trawl survey, the 20 millimeter survey, the Summer
12 Townet Survey and the Fall Midwater Trawl Survey be continued
13 and fully implemented in the future.

14 The second action to improve -- so that's essentially
15 maintain current monitoring efforts, which are so important
16 for determining both the status of the species as well as
17 their distribution in the habitat.

18 The second action recommends that the current salvage
19 monitoring operations at the Central Valley Project fish
20 facilities be enhanced by increasing the frequency with which
21 they subsample exported water for the purposes of counting the
22 numbers of fish salvaged.

23 Currently the CVP salvage facility samples water for
24 the purpose of counting salvaged fish about eight percent of
25 the time that they're exporting. This is lower than the

1 sub-sampling effort conducted at the State Water Project.

2 And it was my opinion that this needed to be -- the
3 frequency of the effort needed to be increased for a couple of
4 reasons. One is I think there's evidence that the efficiency
5 of the salvage sampling program at the CVP is less than that
6 of the SWP.

7 The second is that delta smelt population abundance
8 is currently so low that we run the risk of making an error
9 when we're sampling infrequently and, for example, not
10 detecting any fish, but we may, in fact, be really missing
11 fish that are really there just because we sampled for such a
12 short period of time.

13 So that was the basis for recommending that they
14 increase the frequency of salvage monitoring at the Central
15 Valley Project.

16 The third action applies to both of the water project
17 facilities. And that is that both of them implement a
18 monitoring program for the purpose of being able to detect the
19 presence of larval and small juvenile delta smelt that are
20 smaller than 20 millimeters in length.

21 As discussed earlier, current monitoring at the
22 facilities specifically does not either detect, count or
23 measure fish that are smaller than 20 millimeters. And given
24 the new science which suggests that, in fact, one of the more
25 important impacts, adverse impacts of water project operations

1 may be lethal entrainment of these very small life history
2 stages, I felt it was essential that monitoring for those
3 lifestages of delta smelt at the facilities be implemented.

4 THE COURT: Do you have any knowledge what the view
5 of the respective agencies, the state and federal agencies
6 that are in this case, is toward your proposals, these I'm
7 going to call them informational enhancing proposals?

8 THE WITNESS: One of the reply declarations that I
9 reviewed discussed my recommendation for this. It was from
10 Mr. Stephen Ford of the Department of Water Resources. Am I
11 correct in that? I think.

12 He rejected it on three bases. He said -- he first
13 expressed concern that it was too dangerous to sample for
14 these fish because it required putting a very small mesh net
15 out in water that was flowing very rapidly.

16 This, I think, is not a legitimate criticism because
17 there's many alternative ways to sample these fish that does
18 not require doing it in the high velocity export flow. Larvae
19 could be sampled at the holding tanks at the SWP. Larvae
20 could be sampled from Clifton Court Forebay.

21 I've not proposed a quantitative monitoring program.
22 This is strictly a monitoring program to detect the presence
23 of these fish here, to give us an idea of when they first
24 arrive.

25 THE COURT: Any other objections?

1 THE WITNESS: There were and I'm trying to remember
2 what they were. Can I review my -- it's in here. If I may.

3 THE COURT: And these would be performed exclusively
4 by agency personnel --

5 THE WITNESS: In my view --

6 THE COURT: -- state and federal?

7 THE WITNESS: -- it conceivably represents an
8 extension of the current monitoring program that is already
9 ongoing at the two facilities.

10 THE COURT: Well, they can tell us when we get there.
11 As long as there is objection, that's all we need to know for
12 now so not to take the time. Let's move on.

13 MR. WALL: Okay, Your Honor.

14 THE WITNESS: It is responded to in my reply
15 declaration as well.

16 MR. WALL: We won't --

17 THE COURT: What page?

18 MR. WALL: -- go into that now. It's page --

19 THE WITNESS: Page 23, paragraph 28.

20 THE COURT: That's your first or second?

21 THE WITNESS: Second declaration.

22 MR. WALL: It's Plaintiffs' 4.

23 THE COURT: You may proceed.

24 BY MR. WALL:

25 Q. Dr. Swanson, would you next describe for us your fourth

1 proposed protective measure.

2 A. Action four is to be implemented during the winter for the
3 purpose of protecting pre-spawning adult delta smelt. The
4 action is triggered by an environmental cue that research and
5 analysis suggests is an important trigger to stimulate delta
6 smelt to begin their migration upstream toward spawning
7 habitat. And that is the rapid increase in fresh water
8 inflows to the Delta from either the Sacramento or the San
9 Joaquin River. I specify quantitative criteria for that.

10 In almost all of my actions, I offered multiple
11 triggers in the event that one trigger doesn't occur or in the
12 event that a second trigger, based on survey information, is
13 unable to detect the fish. For this action, the first
14 alternative trigger is this increase in Sacramento or San
15 Joaquin River inflows.

16 Alternatively, if either the Fall Midwater Trawl or
17 the Kodiak survey detect the presence of delta smelt moving
18 upstream toward delta smelt habitat, in other words, they're
19 moving beyond their low salinity habitat into fresh water
20 areas of the Delta, that would trigger implementation of the
21 action.

22 And absent either of those triggers occurring, by
23 January 15th, I specify that the action should be triggered.
24 The action has two parts. The first part is implemented
25 immediately following the trigger event and the action is to

1 modify water project operations or restrict export operations
2 such that the combined flow on Old and Middle River is not
3 limited. Meaning greater than or equal to positive, zero or
4 positive cubic feet per second based on a five-day average.
5 This action should go on for a minimum of ten days following
6 the trigger event. Following that initial action --

7 THE COURT: The water cost of that would be
8 approximately what? Assuming what the normal flows are at
9 that time of year.

10 THE WITNESS: Your Honor, I didn't calculate the
11 water cost for these. My colleague did, Mr. Rosekrans, and he
12 has submitted a declaration identifying the costs for that.

13 THE COURT: So it's in there.

14 THE WITNESS: Yes, it is.

15 The second part of the action, following the ten-day
16 period during which Old and Middle River flows should be
17 reduced to prevent entrainment of delta smelt towards the
18 central and south Delta and loss at pumps is to moderate water
19 project operations and to allow Old and Middle River flows to
20 average minus 3500 cubic feet per second.

21 I provided a range of 3500 plus or minus 750 cubic
22 feet per second. So the action specifies that Old and Middle
23 River flows should be between minus 2750 cubic feet per second
24 and 4250 cubic feet per second calculated on the basis of a
25 five-day average. If --

1 BY MR. WALL:

2 Q. Dr. Swanson -- I'm sorry.

3 A. No, go ahead.

4 Q. What's the objective of this protective measure?

5 A. The objective is to prevent or reduce the entrainment of
6 delta smelt, of pre-spawning adult delta smelt who are moving
7 upstream through the Delta towards upstream Delta spawning
8 habitats to prevent their entrainment into the south and
9 central Delta and to prevent their entrainment into the water
10 export facilities.

11 Q. And could you describe the information you took into
12 account in developing this recommendation?

13 A. This action, the development -- this action was developed
14 largely based on discussions of the Delta Smelt Working Group
15 as they analyzed data trying to determine what are the
16 triggers for delta smelt upstream movement and potential
17 protective actions that they were considering recommending.
18 It's similar, but not exactly the same as their
19 recommendations.

20 THE COURT: What's actually happening to cause the
21 need for this recommendation?

22 THE WITNESS: This action needs to be implemented at
23 the time when adult delta smelt begin to move up into the
24 Delta and are vulnerable as they pass by the influence of the
25 pumps of becoming entrained into that portion of the habitat

1 or into the pumps. So it's triggered not necessarily by a
2 date, but by environmental conditions and a biological
3 response of the species.

4 The level of Old and Middle River flow recommended
5 after the initial ten-day period during which Old and Middle
6 River flows are recommended to be at zero cubic feet per
7 second. The minus 3500 is also based on working group
8 recommendations and discussions and some of which were also
9 incorporated into parts of actions in the Delta Pelagic Fish
10 Action Plan.

11 The 3500 value, the minus 3500 value is -- it's the
12 lower end of the flow range recommended by the working group
13 in their -- in their recommendations. They made a
14 recommendation that Old and Middle River flows range no more
15 negative than between 3500 and 5,000.

16 Given our heightened level of concern for the
17 species, I felt a more protective level was better. And this
18 flow level also recommends negative flow conditions that are
19 generally better than those that have been measured in recent
20 years during the months of January and February. The recent
21 years that I used for my calculations were the 1999 through
22 2005 period. I excluded water year 2006 because it was
23 extremely wet. But I did include data from 2007.

24 BY MR. WALL:

25 Q. Do you have an understanding of whether the Delta Smelt

1 Working Group considered a proposal like yours?

2 A. Based on their notes, they discussed similar types of
3 actions, including sharp reductions in exports in response to
4 pulse flow events to avoid entraining the fish that are
5 immediately moving up into the pumps.

6 And as I mentioned, the level of Old and Middle River
7 flows recommended for the subsequent, the second part of the
8 action, is similar although at the low end of the recommended
9 flow levels that they ultimately used.

10 Q. Do you recall whether their notes reflect a biological
11 basis for not proposing those flow levels?

12 A. I do not.

13 Q. Could I ask you to turn to Exhibit S of this declaration.
14 It's about three-quarters of the way through.

15 A. Okay. That's not this declaration.

16 Q. It's Plaintiffs' Exhibit 4 at the top of it, it should
17 say -- well, it will be Plaintiffs' Exhibit 4 on the cover.
18 And it was actually filed originally two documents, one was
19 421 and the exhibits were filed as separate documents because
20 they were too lengthy, so the top of Exhibit S has document
21 422 on it.

22 A. I do not think my copy has that.

23 Q. Are you looking at a declaration that says -- I'm sorry.

24 THE COURT: Plaintiffs' 4 is --

25 MR. WALL: It's Plaintiffs' 11.

1 THE COURT: Is --

2 MR. WALL: It's Plaintiffs' 11. I apologize for
3 that.

4 THE WITNESS: Exhibit S, you say?

5 BY MR. WALL:

6 Q. Yes.

7 A. Yes, I have it.

8 THE COURT: Let me suggest one thing counsel, here.

9 MR. WALL: Yes.

10 THE COURT: In consideration of time. What you're
11 doing now is anticipating, quite frankly, what the federal
12 defendants may or the state defendants may say about this or
13 the state intervenors. And my sense is just put your best
14 foot forward and let them take care of objecting or arguing
15 with what you're proposing.

16 MR. WALL: Sure, Your Honor. Actually --

17 THE COURT: I think that would be preferable.
18 Because we're going to run out of time at the pace we're
19 going.

20 MR. WALL: Okay, Your Honor. We'll just move on and
21 we can deal with this exhibit later if we need to.

22 THE COURT: Thank you.

23 BY MR. WALL:

24 Q. You mentioned --

25 THE COURT: I mean, you don't remember, at the

1 present time, what the agency objections were to this proposal
2 number four specifically?

3 THE WITNESS: No.

4 THE COURT: All right. Then let's go -- if you're
5 going to go to number five, let's go to number five.

6 BY MR. WALL:

7 Q. Perhaps you could take five through seven as a group and
8 explain those to the Court.

9 A. Actions five, six and seven are timed to occur from the
10 onset of spawning and the first occurrence of larvae, delta
11 smelt larvae in the system, to the end of the period which
12 larvae are present in the Delta.

13 And the object of the actions is to prevent or reduce
14 the entrainment of primarily the larvae and young juveniles,
15 but also any remaining spawning adults that haven't completed
16 spawning. And also, excuse me, to facilitate the transport of
17 larval and juvenile delta smelt downstream from the Delta and
18 from their upstream spawning areas downstream to their rearing
19 habitat in brackish waters beyond the confluence and in Suisun
20 Bay.

21 The action requires -- the action is, as I say,
22 triggered by the detection that spawning has occurred and/or
23 that larval delta smelt are present in the system. And there
24 are multiple triggers, again, in case one is unable to detect
25 the presence of delta smelt, there are alternative triggers.

1 For example, the presence of spent delta smelt is an
2 indication that spawning has occurred. Water temperatures
3 greater than 12 degrees mean that the temperature is now
4 within a spawning range for the species. And/or the deduction
5 of larval delta smelt by either Fish & Game surveys or this
6 new monitoring program that we've recommended be implemented
7 at the export facilities.

8 The action is to modify water project operations to
9 achieve combined Old and Middle River flows that are between
10 minus 750 cubic feet per second and minus 2250 cubic feet per
11 second. The middle of that is minus 1500 cubic feet per
12 second.

13 THE COURT: So let me hear that -- it's -- the middle
14 is minus 1500.

15 THE WITNESS: I should have said the average, Your
16 Honor.

17 THE COURT: The average, yes. So we're at -- what
18 are the two outer limits?

19 THE WITNESS: The object of providing a range in the
20 target flows for the Old and Middle River was based on
21 practical considerations. There have been concerns expressed
22 in some reply declarations by water project operators saying
23 that it was extremely difficult for them to actually manage at
24 a specific fixed target level, particularly given the tidal
25 nature of the estuary. And they argued that a range made it

1 easier for them to --

2 THE COURT: So from zero to minus 3,000?

3 THE WITNESS: The range that I've given them -- first
4 of all, the target that I initially identified was Old and
5 Middle River flows at minus 1500 cubic feet per second. In
6 this revised version, instead of specifying the target as a
7 single number, I've specified the target as that -- a range
8 around that. It's essentially minus 1500 plus or minus 750
9 cubic feet per second. So there's a range of 1500 cubic feet
10 per second. They have a 1500 cubic feet per second range to
11 work within.

12 THE COURT: Understood. So minus 750 to minus --

13 THE WITNESS: 2250.

14 THE COURT: -- 2250.

15 THE WITNESS: Correct. This level of Old and Middle
16 River flow is based on the results of research conducted by
17 Dr. William Bennett. It's -- this research that he's done
18 that has shown that only delta smelt larvae that hatch during
19 the period of the VAMP, the Vernalis Adaptive Management Plan,
20 a period during which regular water project exports are
21 severely curtailed and inflows from the San Joaquin River are
22 increased.

23 And Dr. Bennett's research has shown that only during
24 the period when these conditions exist in the Delta during the
25 spring and early summer, that's the only period from which

1 Larvae hatched in that period survive to contribute to the
2 population later on.

3 THE COURT: We discussed that earlier.

4 THE WITNESS: We did. To address this, I also
5 examined the Old and Middle River flow data from the months
6 preceding VAMP and after VAMP to determine what those Old and
7 Middle River flow conditions were. And I presented that
8 information graphically in my first declaration as Figure 9.

9 BY MR. WALL:

10 Q. This is Plaintiffs' 11. Figure 9 at page 12.

11 THE COURT: I think we've got that. So why don't we
12 go eight.

13 THE WITNESS: Okay. That was, as I mentioned, that
14 was the basis for the level of --

15 THE COURT: Yes.

16 THE WITNESS: -- Old and Middle River flows that was
17 established for this action.

18 Action six specifies just that the VAMP be continued,
19 that is generally expected to be continued.

20 Action seven continues the protection for the period
21 after the VAMP is concluded until such time as monitoring and
22 survey data indicate that delta smelt larvae have successfully
23 immigrated from the Delta down to their brackish water
24 habitat.

25 THE COURT: So that's approximately mid May?

1 THE WITNESS: Mid May is the usual conclusion of the
2 VAMP. And action seven begins at the end of the VAMP and
3 extends until such time as the larvae have successfully
4 gotten --

5 THE COURT: In practical experience, based on all
6 your observations, when is that? When are we done with this
7 larval, the sub-juvenile stage?

8 THE WITNESS: According to analyses presented in one
9 of the declarations of the defendants or defendant
10 intervenors, I believe, the median time for the end of salvage
11 of juvenile delta smelt in recent years has been mid July.
12 However, in recent years, Old and Middle River -- Old and
13 Middle River flow conditions during the period after VAMP have
14 been for extremely high magnitude negative flows. And --

15 THE COURT: That's the time the water is needed in
16 the south.

17 THE WITNESS: That's the time when exports are
18 typically extremely high, yes. And it's, in my view, likely
19 that salvage of delta smelt is more protracted and extends
20 further into the year because of the higher reverse flow
21 conditions which tend to retain the Delta -- excuse me, the
22 larvae within the Delta.

23 THE COURT: But they haven't grown up by then?

24 THE WITNESS: They're growing, but they're -- they
25 haven't managed to successfully reach their rearing habitat in

1 brackish water.

2 THE COURT: Thank you.

3 THE WITNESS: Action eight and nine prohibit the
4 installation of a set of in-Delta channel barriers that are
5 typically installed. These are temporary rock barriers which
6 are installed on several south delta channels and also at the
7 junction of the San Joaquin River and Old River. That barrier
8 is referred to as the Head of Old River Barrier. Installation
9 and operation of these barriers has been shown to exacerbate
10 entrainment of delta smelt in to the water export facilities
11 and also to exacerbate and increase the magnitude of negative
12 flows in Old and Middle River.

13 THE COURT: Why? Because more water is flowing?

14 THE WITNESS: The barriers, the Head of Old River
15 Barrier functions to prevent flow from the San Joaquin River
16 from turning left at Old River and flowing into the south
17 Delta down towards the pumps and the confluence, reducing that
18 inflow from that area makes negative flows worse.

19 The agricultural barriers, of which there are three,
20 function as tidal barriers. And the way they work is they
21 have flap gates on them. When the tide comes in and the water
22 flows upstream into the Delta, the flap gates open and allow
23 the water to flow past the barrier into the channel upstream.
24 When the tide goes out, the barrier closes and the water is
25 unable to flow back out. That also functions to exacerbate

1 negative flows.

2 THE COURT: Those aren't the head gates?

3 THE WITNESS: I'm not certain what you mean by the
4 "head gates."

5 THE COURT: Well, we've seen reference to head gates
6 and them being in place or removed. And I don't know whether
7 they're the same, synonymous with these agricultural barriers
8 or whether they're something different. Who can tell us?

9 MR. WILKINSON: Your Honor, what was the question?

10 THE COURT: Are these agricultural barriers that have
11 just been referred to as flap gates the same as what is
12 referred to in, for instance, the agency proposals about
13 removing head gates at various times of operations. I want to
14 know if these are different from or they are the head gates
15 that are referred to.

16 MR. WALL: Your Honor, they may be -- I believe
17 there's a distinction between the Head of Old River Barrier,
18 which is the subject of Dr. Swanson's next protective measure,
19 and the agriculture barriers which are the subject of --

20 THE COURT: That I understand. I know they're
21 different. And I'm asking semantically to know whether the
22 flap gates are the head gates or whether there's three
23 different kinds of, if you will, barriers or gates. Because
24 the first that are talked about are rocks, the second are
25 tidal barriers or flap gates and then I want to know if head

1 gates are yet a third type of barrier.

2 MR. MAYSONETT: Your Honor, this is James Maysonett
3 for the federal defendants. My understanding is that there is
4 the Head of Old River Barrier and that separately there are
5 the agricultural barriers which rely on flap gates.

6 THE COURT: All right. And that's all. Those are
7 the only barriers.

8 MR. MAYSONETT: Those are the only two, to my
9 understanding.

10 THE COURT: Thank you. Is that your understanding,
11 too, Dr. Swanson?

12 THE WITNESS: I believe so, Your Honor.

13 THE COURT: Thank you.

14 BY MR. WALL:

15 Q. And Dr. Swanson, if you could briefly describe protective
16 measure nine.

17 A. Protective measures eight refers to the three south Delta
18 agricultural barriers --

19 THE COURT: We just did that.

20 THE WITNESS: Protection action nine refers
21 specifically to the Head of Old River Barrier and both of the
22 actions preclude installation of those barriers until larvae
23 are no longer present in the Delta.

24 THE COURT: All right. Well, let me be clear then.
25 Action six pertains to VAMP. And then seven, does that extend

1 the time for flow adjustment after the VAMP period to mid July
2 or did I understand that that addressed the Head of Old River
3 Barrier?

4 THE WITNESS: Action --

5 THE COURT: Seven.

6 THE WITNESS: -- seven extends the reduced Old and
7 Middle River flow conditions through June 15th or until the
8 larvae have departed the -- the larvae and the juveniles have
9 departed the Delta.

10 THE COURT: All right. I have it. Thank you.

11 BY MR. WALL:

12 Q. Dr. Swanson, that covers the ten protective measures
13 you've proposed; correct?

14 A. It does.

15 MR. WALL: Your Honor, I'd like to approach the
16 witness and have her look at the protective measures proposed
17 by the Fish & Wildlife Service.

18 THE COURT: All right.

19 (Plaintiffs' Exhibit 12 was marked for
20 identification.)

21 BY MR. WALL:

22 Q. Dr. Swanson, I've shown you what has been marked as
23 Plaintiffs' 12 titled declaration of Cay Collette Goude. And
24 I'd ask you to please look at the page that says "8 of 24" in
25 the top right corner.

1 A. I have that.

2 Q. It says at the top "Exhibit 2 delta smelt Action Matrix
3 for Water Year 2008." Is it your understanding that this
4 document sets forth proposed remedial measures put forth by
5 the US Fish & Wildlife Service?

6 A. It is.

7 Q. Could you, in the interest of time, as expeditiously as
8 possible, describe for the Court the differences between this
9 set of proposals and your proposals and why you believe that
10 your proposals are more appropriate?

11 If you could just start with number one and compare
12 it to which action you have for it.

13 A. Action one and two are of the Fish & Wildlife Service's
14 recommended protections are similar to action four in the
15 plaintiffs' recommended protections. They're both designed to
16 protect adults, pre-spawning adult delta smelt that are making
17 their migration through the Delta, to the delta smelt spawning
18 habitat.

19 The first action identified by Fish & Wildlife is
20 upon -- they use, instead of a trigger based on increase,
21 rapid increases in river flows, they use a trigger based on
22 increases in turbidity, which is highly correlated with rapid
23 increases in inflows. And the action is to modify water
24 project operations such that Old and Middle River flows do not
25 exceed negative 2000 centimeter -- cubic feet per second for a

1 ten-day period.

2 Following this, they recommend that water project
3 operations be modified to maintain Old and Middle River flows
4 no more negative than minus 4 -- excuse me -- minus 4500 cubic
5 feet per second. They also propose to use a 14-day running
6 average for the purpose of calculation of what Old and Middle
7 River flow will be.

8 THE COURT: So your recommendations are more
9 aggressive than this?

10 THE WITNESS: That is correct. They are more
11 protective.

12 THE COURT: Understood.

13 THE WITNESS: The third action proposed by the Fish &
14 Wildlife Service is for the purpose of protecting juvenile and
15 larval and juvenile delta smelt before -- let me see, I want
16 to make sure I get this right. Before and for two weeks after
17 the VAMP, which is typically implemented between mid April and
18 mid May.

19 The action specifies that Old and Middle River flows
20 be moderated somewhere between zero and minus 4,000 cubic feet
21 per second. This -- not on this table, but the other
22 Attachment A of this exhibit describes the decision process
23 the Fish & Wildlife Service proposed to use to determine what
24 the specific level of Old and Middle River flow should be to
25 provide what they consider would be necessary protection for

1 delta smelt.

2 THE COURT: Do you have any criticism of it?

3 THE WITNESS: I do. I have two main criticisms of
4 it. The first is that, based on our scientific understanding
5 of the relationship between take and Old and Middle River
6 flows, which is largely based on the relatively simple
7 relationships between take and Old and Middle River flows
8 developed by the US Geological Survey, I do not think that we
9 have either sufficient resolution or precision in our
10 understanding of that relationship to have any meaningful
11 basis for making a decision between protecting delta smelt by
12 calling for minus 3,000 cubic feet per second versus minus
13 4,000 cubic feet per second. So I'm uncertain as to how
14 they -- what will we be -- the real rationale and basis for
15 that.

16 THE COURT: Well, how much more does yours call for
17 in the same period?

18 THE WITNESS: Mine is based on a different piece of
19 scientific evidence than theirs. Theirs is based, as far as
20 I'm able to determine, on this relationship between take and
21 Old and Middle River flows, which shows that the more negative
22 the flows, the more fish are taken.

23 The recommended levels for old and middle flows that
24 I developed in my protections for the purpose of protecting
25 larvae in juveniles are based on the research of Dr. Bennett.

1 And they're based on the level of -- the average level of Old
2 and Middle River flows that have been measured during the past
3 six to seven years during the VAMP.

4 Dr. Bennett's research has shown that only larvae
5 hatched during the VAMP survive. Therefore, the level of Old
6 and Middle River flow that I recommended was based on the
7 conditions that occurred during the period during which --

8 THE COURT: That's 750 negative --

9 THE WITNESS: -- that range --

10 THE COURT: -- to 2250.

11 THE WITNESS: That range that's centered around minus
12 1500.

13 THE COURT: So again, requiring more protection in
14 terms of water to achieve.

15 THE WITNESS: It is more protective and it's based on
16 research that suggests that under those conditions delta smelt
17 larvae hatched during those periods will survive. There's no
18 comparable evidence for Old and Middle River flow conditions
19 that are different than that.

20 The other concern I have with Fish & Wildlife's
21 protective action three is the protocol they have identified
22 for making and implementing the decision to do the protection.
23 And what they have done is they're suggesting that the working
24 group will first evaluate the data on delta smelt
25 distributions. They will also use tools, such as Particle

1 Tracking Model , to evaluate the risk of entrainment for the
2 delta smelt. That's part of my concern is that I don't know
3 that those tools provide sufficient precision or validation.

4 THE COURT: You said they're not needed because your
5 plan doesn't. Correct?

6 THE WITNESS: Correct.

7 THE COURT: You don't need to talk about it and test
8 for it and send it on to the Water Operations Management Team.

9 THE WITNESS: Exactly. And that represents my second
10 concern with the protocol is that the Fish & Wildlife proposes
11 to make a recommendation to the Water Operations Management
12 Team with no certainty that the Water Operations Management
13 Team will, in fact, implement that protection. So I
14 consider --

15 THE COURT: That's back to the DSRAM.

16 THE WITNESS: It appears to be similar to that, yes,
17 Your Honor.

18 Action four is intended to provide some unspecified
19 level of protection for delta smelt for a little later in the
20 season, after June 1st. Again, based on survey data and their
21 determination of entrainment risk. And as I understand it,
22 using the same decision protocol.

23 THE COURT: It's going to be the DSRAM process again.

24 THE WITNESS: I believe so, Your Honor.

25 The fifth action is essentially very similar to my

1 actions eight and nine. They actually say that the Head of
2 Old River Barrier will not be installed, similar to mine. And
3 that the flap gates on the agricultural barriers will be tied
4 open. But only for the 31-day period during the VAMP, which,
5 as we know, encompasses only a portion of the period during
6 which larval delta smelt are vulnerable to entrainment and to
7 water project operations.

8 THE COURT: All right.

9 BY MR. WALL:

10 Q. Just two quick questions about this and then I'd like to
11 move on to Dr. Hanson's proposal.

12 First question is: Does the Fish & Wildlife Service
13 proposal provide for any improvements in monitoring?

14 A. No, it does not.

15 Q. And do some of their actions trigger off of whether or not
16 they detect salmon -- sorry, delta smelt?

17 A. That appears to be the case, yes. They're using detection
18 and information on distribution of larval delta smelt as
19 determined by the 20 millimeter surveys.

20 Q. And do you believe those triggers that they propose are
21 adequate without improvements in long term?

22 A. I do not. And I think we saw a very excellent example
23 this past year of the kind of concern we should have over
24 relying on those kinds of monitoring programs. Monitoring is
25 essential, but with delta smelt populations so low, it's clear

1 that our regular ongoing survey programs may not be able to
2 detect delta smelt in the low numbers that they are currently
3 present in the habitat.

4 THE COURT: Well, let's assume for the purpose of
5 this question that the monitoring of all of these, the four
6 existing methods plus the two additional that you recommend,
7 were conducted 25 percent of the time. That being conducted
8 by the agencies.

9 Given the uncertainty about overall information on
10 all of these issues, is it your opinion that that would
11 provide -- I'm going to call it a realistic, it's an ambiguous
12 term, but I mean an effective benefit, having more of that
13 information or is that just an exercise in futility?

14 THE WITNESS: I firmly believe that having more
15 information, in particular about larval delta smelt and their
16 presence at the facilities, is essential. Fish & Wildlife is
17 essentially proposing to evaluate entrainment risk using the
18 survey data which this year was unable to detect delta smelt
19 in the south Delta. And Particle Tracking Model, which is
20 useful but not perfect. And they're using that to evaluate
21 entrainment risk. They have no idea whether that is an
22 effective way of evaluating entrainment risk because they're
23 not measuring entrainment.

24 THE COURT: Thank you. Let's take the afternoon
25 recess at this time. We're going to stand in recess until ten

1 minutes after three.

2 (Recess.)

3 THE COURT: We're back on the record in NRDC versus
4 Kempthorne. We're going to continue the testimony of Dr.
5 Swanson.

6 BY MR. WALL:

7 Q. Dr. Swanson, were there any other principle concerns you
8 had with the Fish & Wildlife Service Action Matrix that you
9 wanted to call to our attention?

10 A. The major deficiency -- other than the fact that the
11 levels of water project operation modification for the purpose
12 of reducing entrainment, are less protective than those
13 recommended in ours -- is there is no action to address the
14 known effects and known adverse modification of water project
15 operations on delta smelt critical habitat at any time of the
16 year.

17 Q. So is there anything comparable to your fall action, your
18 action ten?

19 A. There is not.

20 Q. Dr. Swanson, I believe you may have in front of you or
21 with you, Plaintiffs' 8. Do you have that there?

22 A. I do.

23 Q. It's the declaration of Charles Hanson.

24 A. I have it.

25 Q. And I'd like to ask you about Dr. Hanson's proposed

1 remedy. Have you had an opportunity to review this
2 declaration?

3 A. I have.

4 Q. You're generally familiar with his proposed remedy?

5 A. I am generally familiar with it, yes.

6 Q. Does it have three tiers?

7 A. Yes. It proposes protections based on three tiers of
8 different levels of changes in water management operations.

9 Q. Could you briefly describe tier one as Dr. Hanson
10 describes it, or at least some -- what you view as some key
11 features and your views on those features.

12 A. For this tier one protection, which Dr. Hanson recommends
13 go from December through June, he recommends that water
14 project operations be modified such that net flows in the
15 Lower San Joaquin River be in a net westerly direction. By
16 that, I interpret it to mean non-negative flows in the Lower
17 San Joaquin River. He proposes that this level of protection
18 be implemented until other events suggest that concern that be
19 higher.

20 My major concern with this particular action is,
21 first of all, it's actually very unclearly unspecified as to
22 exactly what he means. It's not clear what part below the San
23 Joaquin River he's talking about, where there will be a
24 specific compliance point.

25 However, I did make some assumptions as I evaluated

1 his action, and I assume that he meant net westerly flows on
2 the northern San Joaquin River at Jersey Point as is
3 calculated by DWR's DAYFLOW data set and it's described in
4 that data set as a term -- the term they use is Q west. Q
5 usually means velocity. West means velocity in the western
6 direction of the river. So I assume he meant something
7 similar to Q west of zero or greater.

8 This particular variable or this particular condition
9 in the estuary when flows on the Lower San Joaquin River can
10 be zero or net westerly doesn't really correspond to any other
11 particular environmental variable in the system. Doesn't
12 correspond in any particular way to the level of negative
13 flows on Old and Middle River. It's -- it's not a
14 particularly useful metric for identifying specific levels of
15 environmental conditions in the estuary.

16 In addition, this particular variable, Q west, has,
17 to the best of my knowledge, no known relationship with delta
18 smelt abundance, distribution, survival or habitat quality.

19 And so, in my view, Dr. Hanson proposed an action for
20 which he has no idea whether it provides any benefit one way
21 or the other for delta smelt.

22 Q. Dr. Swanson, if I could direct you to page eight of
23 Plaintiffs' Exhibit 8.

24 A. I'm sorry. Which exhibit? Ours? Or Dr. Hanson's?

25 Q. It's Dr. Hanson's declaration.

1 A. Yes.

2 Q. Page eight.

3 A. I'm on page eight.

4 Q. And there's a sentence that begins at line nine with the
5 word "results." Could you read that sentence to us, please?

6 A. "Results of these Particle Tracking Modeling exercises
7 indicate that by maintaining a net" -- excuse me, "a positive
8 net westerly flow of water within the Lower San Joaquin River
9 through regulation of a combination of flow through the Delta
10 cross-channel, San Joaquin River flow, and SWP and CVP exports
11 during the period extending from approximately December 1
12 through June 30, the vulnerability of sub-adult, adult,
13 larval, and early juvenile life stages of delta smelt to
14 project export effects can be substantially reduced or
15 eliminated."

16 Q. Do you have an understanding as to how Dr. Hanson is using
17 this Particle Tracking Modeling exercise in developing this
18 proposal?

19 A. Only to the extent that it is described in his
20 declaration, which is extremely briefly. He has not
21 described, other than net westerly flow conditions in the
22 Lower San Joaquin, what are the other environmental or
23 operational conditions in the system. For example, what are
24 export rates, what are Old and Middle River flow rates, what
25 are Sacramento River inflow rates? Those are not specified in

1 his description of the -- of the model and its results. So I
2 am unable to interpret his results.

3 However, I also have particular concerns with his
4 reliance on Particle Tracking Model to infer or predict the
5 movement and distribution of adult delta smelt. And
6 particularly at this -- at that life history stage.

7 Q. Why is that?

8 A. As Dr. Moyle described, particle tracking essentially is a
9 computer simulation of the flow conditions in-Delta channels.
10 And then on a computer, you can inject neutrally buoyant
11 particles into Delta channels and the tracking model will tell
12 you where they will go on the basis of the flow of the water,
13 it incorporates the tidal fluxes and whatever input variables
14 you want to include.

15 As Dr. Moyle reported, the difficulty with directly
16 interpreting Particle Tracking Model to infer the behavior of
17 fish is that fish behave. And, in fact, even larval fish
18 behave. Small juvenile fish may not be able, delta smelt may
19 not be able to swim very fast, but they are able to take
20 advantage of differential flow velocities in different
21 portions of the channel by going up and down in the water
22 column. Some -- a behavior that we have observed already in
23 this species.

24 In regards to using particle tracking for predicting
25 the movements or distribution of adult delta smelt, I think

1 it's even more of a problem. The reason is that not only are
2 adult delta smelt larger and can swim faster utilizing all the
3 same behavioral tricks that smaller fish would use, adult
4 delta smelt, particularly during the period from December,
5 January and February, are not responding to flow in a sense
6 that they're going where the flow is. They are, in fact, in
7 the process of making a focused volitional directed migration
8 upstream against this net westerly flow that Dr. Hanson has
9 suggested would prevent them from going up this river.

10 So I have no confidence that the results of Particle
11 Tracking Model that he describes here, in fact, would mean
12 anything meaningful to delta smelt, particularly at that life
13 history stage.

14 Q. Dr. Swanson, moving on to Dr. Hanson's tier two action.
15 Do you have an understanding of what that would provide for?

16 A. Dr. Hanson suggests that in the event the tier one action
17 were insufficient from preventing the fish from becoming
18 entrained into the south Delta and/or being salvaged at the
19 facilities, this tier two action would be implemented. He has
20 based this action on the -- what I believe is flawed
21 re-interpretation of the salvage versus Old and Middle River
22 flow, negative flows relationship originally developed by Dr.
23 Peter Smith of US Geological Survey.

24 And the specific action recommended as the tier two
25 protection is that in the event delta smelt are detected in

1 the southern and central Delta by surveys or as salvage at the
2 facilities, that water project operations be modified such
3 that negative flows are no more negative than minus 6,000
4 cubic feet per second.

5 Based on my interpretation of the original graph,
6 which contains all the salvage data for any particular year as
7 well as all the flow data, minus 6,000 cubic feet per second
8 represents conditions under which take can be quite high and
9 therefore is not particularly protective.

10 I would also note that I examined data on average Old
11 and Middle River flows during the months that this tier two
12 protection might be implemented, January, February, March,
13 April, and found that for most of the months, minus 6,000
14 cubic feet per second on Old and Middle River was, in fact,
15 more negative than average negative flows measured for Old and
16 Middle River for most years during the past six to seven
17 years.

18 And therefore, this particular protection potentially
19 represents managing for conditions, Old and Middle River flow
20 conditions, that are actually worse than the conditions we've
21 had during many months in the past years and during the period
22 when the delta smelt population collapsed.

23 Q. Dr. Swanson, I think you mentioned that this action as
24 proposed by Dr. Hanson would trigger off of detection of delta
25 smelt; is that correct?

1 A. I believe so. This action would be implemented
2 immediately in the event that fishery surveys and salvage
3 monitoring demonstrate increased vulnerability of delta smelt
4 to export related events. That was on page eight at the
5 bottom, first paragraph 19.

6 Q. And do you have a view on the appropriateness of that
7 particular trigger?

8 A. I think it represents a trigger that is likely to
9 implement what Dr. Hanson has suggested he thinks is
10 protective, which I do not, that is already too late because
11 it's clear that overall flow conditions have already allowed
12 the fish to become entrained in to the area of the southern
13 Delta, where they're vulnerable to being taken and/or being
14 taken at the salvage facilities.

15 Once delta smelt are entrained into that area, it is
16 very difficult for them to get out. And as Ms. Goude reported
17 in her declaration, the most important way to reduce
18 entrainment is to prevent the fish from coming into near
19 proximity of the facilities. In other words, to prevent
20 entrainment rather than to respond to it.

21 Q. Dr. Swanson, are you -- could you briefly describe for us
22 Dr. Hanson's tier three action and your views of that.

23 A. The final level of protection recommended by Dr. Hanson,
24 the tier three level, is triggered by an incidence of -- or I
25 believe his words were a dramatic increase in salvage of delta

1 smelt at the facilities.

2 In response to such an event, Dr. Hanson recommends
3 that Old and Middle River flows be further moderated to -- I'm
4 looking for the level -- it's possible he does not specify the
5 level. But they would be further reduced, curtailed to a
6 minimum level necessary to meet health and safety requirements
7 for a period of four days. It's not clear what would happen
8 after four days, although there is, I believe, an assumption
9 that it would continue its salvage continued at high rates.

10 In my view, this represents essentially something
11 equivalent to locking the barn door after the horse has gotten
12 out. This is implementing reduction in exports and reduction
13 in Old and Middle River flows for the purpose of preventing
14 salvage after salvage of delta smelt has already become a
15 serious problem.

16 It is also likely that the effectiveness of this
17 action, because the fish have already been entrained into the
18 south Delta, will be greatly reduced compared to how effective
19 it would have been if it had been implemented earlier to
20 prevent salvage.

21 Q. Dr. Swanson, does Dr. Hanson propose any remedial measures
22 to provide benefits for delta smelt during the fall months?

23 A. No.

24 Q. Dr. Swanson, do you have any other significant concerns
25 that you'd like to highlight with Dr. Hanson's proposed set of

1 remedies?

2 A. Viewed in whole, this proposal appears to be recommending
3 actions that will have the effect of perpetuating what really
4 are the same kind of conditions as we have been operating for
5 the past several years.

6 For example, the tier one protection, net westerly
7 flows on San Joaquin River, regularly corresponds to Old and
8 Middle River flows that are more negative than 6 to 9,000
9 cubic feet per second.

10 The tier two protection is as bad, if not worse than
11 average Old and Middle River flow conditions that we've had
12 during the past six to eight years.

13 The tier three protection is very short duration,
14 more dramatic decrease in exports and Old and Middle River
15 flow conditions. Is very similar to what we have been trying
16 to do during the past few years using the Environmental Water
17 Account, which, as I mentioned, was a supply of water used by
18 the fisheries agencies to get the water projects to agree to
19 cut exports to protect fish, delta smelt in most cases, now
20 and with the promise of compensating them using Environmental
21 Water Account later.

22 Exhaustive reviews of the Environmental Water
23 Account, which uses this reactive approach and short duration
24 export curtailments for the object of reducing the numbers of
25 delta smelt taken -- exhaustive review of the Environmental

1 Water Account by an independent panel of scientists, this
2 review has been done five times since the EWA was first
3 implemented in 2000, 2001, has found no evidence that use of
4 this approach and this tool has done anything to either
5 protect effectively or promote the recovery of the delta
6 smelt.

7 So I do not consider Dr. Hanson's recommendations for
8 protections to be really anything better than what we're
9 currently doing to manage the system and to try to protect
10 delta smelt with these very minimal tools. And given the
11 trends and population of delta smelt that we've seen during
12 that time, I think this proposal is clearly inadequate to
13 prevent water project operations from jeopardizing the species
14 and adversely modifying its habitat.

15 Q. Dr. Swanson, I have just one more short line of
16 questioning on a different topic and then I think the direct
17 testimony will be concluded.

18 Are you familiar with -- are you aware that one of
19 the experts that's been designated to testify for intervening
20 defendants is a Dr. William Miller?

21 A. I am.

22 Q. And are you familiar with Dr. Miller's analysis with
23 respect to delta smelt and food?

24 A. I am.

25 Q. Could you please briefly describe that analysis and your

1 views of that analysis and its reliability.

2 A. Dr. Miller has developed an analysis which he claims is
3 designed to investigate the effect of food availability on
4 delta smelt population abundance. Rather than taking a direct
5 approach to the analysis of comparing the amount of food
6 available in the estuary to delta smelt numbers, he has
7 instead created an analysis where he has effectively created a
8 new variable. A new piece of data. By combining information
9 on the abundance of juvenile delta smelt and the co-occurring
10 abundance of zooplankton food.

11 So he has a new datum, which come combines
12 information on two different things. And then he relates that
13 variable to the population of delta smelt measured later in
14 the year. And he has found that, at least for the short
15 period between 1996, I believe, and 2005, possibly '6, that he
16 claims there's a very strong relationship between the numbers
17 of delta smelt that occur with food in their environment and
18 the numbers of delta smelt that are measured later in the
19 system.

20 The problem I find with this analysis, other than
21 some statistical irregularities, is that he's combined two
22 variables which may affect delta smelt population into a
23 single one. We already know that delta smelt population
24 abundance measured in the fall depends on how many delta smelt
25 were measured in the system during the summer. And we already

1 know that that -- if there's few delta smelt in the summer,
2 there will be few delta smelt in the fall. If there's a lot
3 of delta smelt in the summer, there will be a lot of delta
4 smelt in the fall.

5 Because of that, I find it impossible to interpret
6 Dr. Miller's results because I can't tell whether it's the
7 numbers of delta smelt that are driving the relationship or
8 the food. Is it the amount of food that's driving the
9 population abundance in the fall? You can't tell because you
10 can't tease apart the two parts of the variable.

11 And as a consequence, partly based on the fact that
12 we already know there's a relationship between the number of
13 juvenile delta smelt and the numbers of adult delta smelt, my
14 interpretation is that the effect of the amount of food
15 available where those numbers of juvenile were probably has a
16 small effect. But it's impossible to detect from this
17 analysis. So I find it --

18 THE COURT: How do you calculate it?

19 THE WITNESS: The more straightforward approach would
20 have been to do a multiple regression model, Your Honor, which
21 is where you're essentially asking the question does the
22 abundance of delta smelt in the fall depend on the abundance
23 of juveniles or the amount of food or some interaction between
24 those variables?

25 THE COURT: What is the measure of the amount of

1 food?

2 THE WITNESS: Dr. Han -- excuse me, Miller, I
3 believe, used density of -- and he also used only two
4 zooplankton species, so that would be -- I believe, from what
5 I can detect from his declarations, the number of those two
6 species of zooplankton per volume of water. And --

7 THE COURT: And is there any generally accepted or
8 scientifically recognized measure of what quantity of
9 these -- what are they -- microscopic organisms exist in any
10 body of water?

11 THE WITNESS: The amount of zooplankton organisms
12 present in the water of the Delta is regularly surveyed in the
13 system. And Dr. Miller is using those data. So it
14 would -- it's -- there's no reason not to do an analysis where
15 you ask the simpler question: Is the population abundance of
16 delta smelt dependent on how much food is available in the
17 habitat? And it's my --

18 THE COURT: What's the historical experience about
19 variation in the quantity of the food year to year?

20 THE WITNESS: The amount of zooplankton in this
21 estuary has changed dramatically. It does fluctuate to some
22 extent from year to year. But the largest change occurred in
23 the 1980s following the introduction of the Corbula overbite
24 clam. Following the introduction of that clam, the total
25 amount of zooplankton, whether you're measuring it in terms of

1 numbers of zooplanktons or numbers per volume of water,
2 declined substantially.

3 THE COURT: And what's been the experience, for
4 instance, in the last ten years?

5 THE WITNESS: My understanding of the data is that
6 over the last ten years, and, in fact, since 1987, so almost
7 20 years, in general the overall abundance of zooplankton has
8 not changed. It's low, but it has not markedly changed.

9 Now, I do want to qualify that by saying that this is
10 beyond my own research and analytical expertise and I'm basing
11 my statements on presentations that I have heard others make.

12 THE COURT: Thank you.

13 BY MR. WALL:

14 Q. Dr. Swanson, do you consider Dr. Miller's analysis to be
15 reliable?

16 A. I don't know whether it's reliable. What I do think is
17 it's not useful because it doesn't -- it cannot be
18 interpreted. Therefore it's probably not a reliable predictor
19 of abundance because we don't know what's predicting
20 abundance.

21 Q. Dr. Swanson, has -- to your knowledge, has Dr. Miller
22 published this analysis in any peer reviewed literature?

23 A. To my knowledge, no.

24 MR. WALL: Thank you. I think we've concluded with
25 our direct examination with this witness, Your Honor.

1 THE COURT: Mr. Maysonett, cross-examination.

2 MR. MAYSONETT: Yes, Your Honor.

3 CROSS-EXAMINATION

4 BY MR. MAYSONETT:

5 Q. Good afternoon, Dr. Swanson. I'm James Maysonett, the
6 attorney for the federal defendants. I'd like to ask you just
7 a few questions in cross-examination.

8 Let's talk about monitoring for a minute, if we can.
9 Dr. Swanson, the plaintiffs have proposed a new monitoring
10 program for the delta smelt smaller than 20 millimeters to be
11 conducted at the projects; is that right?

12 A. I would consider it an extension of the ongoing monitoring
13 program to include fish smaller than 20 millimeters, but yes,
14 it is additional effort compared to what is currently being
15 done.

16 Q. Would it be fair to say it would be a new aspect of the
17 monitoring program?

18 A. Yes.

19 Q. And under the plaintiffs' proposal, who would conduct that
20 monitoring?

21 A. We did not specify that, but I would assume that it would
22 be conducted by the same entities that are conducting the
23 current salvage monitoring.

24 Q. And do you know who those entities are?

25 A. I believe the monitoring program is the responsibility of

1 the bureau and DWR at their respective facilities.

2 Q. And how would the monitoring that you propose be
3 conducted?

4 A. That also is not specified in our interim remedies
5 recommendation because -- in part, because I think there's a
6 number of ways that it could be done. The object of the
7 monitoring is for -- is to detect the presence of small larval
8 delta smelt at the facilities for the purpose of having more
9 information to evaluate the overall entrainment risk and the
10 distribution of the species during this early life history
11 stage and for the purposes of refining, if necessary, any
12 necessary protections for that life history stage.

13 Q. And when the delta smelt hatch, Dr. Swanson, how small are
14 they?

15 A. Approximately five millimeters in length.

16 Q. So under the monitoring that you're proposing, would we be
17 looking for delta smelt between five millimeters and 20
18 millimeters?

19 A. Yes.

20 Q. Is that the idea?

21 A. Yes.

22 Q. And you said that there will be several possible designs
23 for that sort of monitoring; is that correct?

24 A. I believe there could be, yes.

25 Q. Could you identify some of those designs?

1 A. It could be as simple as regularly taking a plankton net
2 or some other net designed to catch fish in this size class
3 and setting it in water flowing towards the export facilities.
4 If the velocities of that water were too high, it could be set
5 in, for example, at the state, at Clifton Court Forebay, where
6 the large area of the forebay, the large volume and area
7 attenuate local water velocities.

8 Conceivably you could also pump water from the fish
9 holding tanks through some sort of a small mesh net to detect
10 these larvae. I will not profess to be an expert as to how
11 this could be accomplished. However, I do know that there
12 have been, at least short duration, mostly research efforts,
13 to monitor for larvae at the facilities in the past. And I
14 would assume that they would have some experience with this
15 and would apply that experience to design an appropriate and
16 safe program.

17 Q. And if you, for example, had proposed that perhaps one
18 method might be to put a plankton net as you described it in
19 the flow somewhere, the mesh of that net would have to be
20 small enough to capture the five millimeter smelt; isn't that
21 correct?

22 A. That is correct.

23 Q. And do you have any knowledge as to what extent such a net
24 would catch other debris or items in the flow?

25 A. I don't.

1 Q. And the plaintiffs haven't proposed any sort of
2 engineering design for the monitoring program. We've
3 confirmed that; haven't we?

4 A. No. I mean yes, we have not.

5 Q. We have not. And are you aware of any design for this
6 sort of monitoring that's been proposed in papers or subject
7 of peer review?

8 A. Not that I can recall at the moment.

9 Q. And would this kind of monitoring, would the agencies be
10 able to conduct this kind of monitoring at the projects using
11 the gear that they currently use for their monitoring program?

12 A. I don't know what gear they currently use, so I don't
13 know.

14 Q. Dr. Swanson, will there be other larvae present in the
15 water when it's inspected for delta smelt smaller than 20
16 millimeters?

17 A. Yes.

18 Q. And is it easy to distinguish between delta smelt larvae
19 between five millimeters and 20 millimeters in size and the
20 larvae of other species?

21 A. I am not an expert at distinguishing larval fish species.
22 However, it is done for the California Department of Fish &
23 Game 20 millimeter survey, which collects larvae other than
24 delta smelt. I do know that keys to -- that can be used to
25 identify the characteristics that distinguish the different

1 species of the different larvae do exist.

2 BY MR. MAYSONETT:

3 Q. And when you say it's done for the 20 millimeter survey,
4 you mean when they catch larvae of the 20 millimeter size or
5 larger, that they're distinguished from other similarly sized
6 larvae?

7 A. The 20 millimeter survey catches delta smelt from five
8 millimeters in length all the way to in excess of 40 and 50
9 millimeters in length.

10 Q. So you're saying they do catch larvae between five and 20
11 millimeters during the 20 millimeter survey and that they
12 distinguish those larvae from the other larvae present in the
13 Delta?

14 A. Based on the data that I've seen, yes.

15 Q. And did you say the California Department of Fish & Game
16 does that?

17 A. Yes.

18 Q. And what kind of personnel make those distinctions, are
19 they trained biologists?

20 A. I don't know.

21 Q. Do we have any data from previous years on the detection
22 of delta smelt smaller than 20 millimeters at the projects?

23 A. I don't know. I do believe that there have been some
24 short-term research efforts to do it in past years, but other
25 than that I do not know.

1 Q. And have you seen the results of those --

2 A. I have not.

3 Q. -- research efforts?

4 And the larval monitoring program, the sub-20
5 millimeter monitoring program that plaintiffs have proposed,
6 when would that begin?

7 A. That typically begins in March, I believe.

8 Q. And when would it typically stop?

9 A. Middle of July.

10 Q. Is it fair to say, Dr. Swanson, that part of the value of
11 the existing surveys and monitoring that we have for the delta
12 smelt is that they have been conducted for some number of
13 years?

14 A. Yes.

15 Q. And because they've been conducted for some number of
16 years, it means we could compare the results from year to year
17 and draw conclusions; is that right?

18 A. That is correct.

19 Q. So would the results of the sub-20 millimeter larval
20 monitoring that you've proposed be less useful in light of the
21 fact that we do not have the results of that sort of
22 monitoring from previous years?

23 A. Given the objective of the program that I have proposed is
24 simply the detection of the presence of that life history
25 stage at the facilities and not necessarily the relative

1 abundance or density of the fish, the lack of data from
2 earlier years is irrelevant.

3 Q. And just to confirm, you're -- the monitoring program you
4 have, the plaintiffs have proposed, does not purport -- does
5 not propose to count the number of sub-20 millimeter delta
6 smelt larvae, but simply to detect whether they're present?

7 A. That would probably be sufficient. Actually counting them
8 would add information to the exercise.

9 Q. And can you -- but can you tell me which -- what do the
10 plaintiffs propose specifically?

11 A. At a minimum, detection.

12 Q. Okay. We could move on. Let's discuss the so-called fall
13 action, the X2 action a bit. You said that you -- the
14 plaintiffs, of course, have proposed in their action ten that
15 the X2 be maintained at a certain position or that minimum
16 Delta outflows be maintained at 7500 cfs; is that correct?

17 A. That is correct.

18 Q. And you've said that you're fairly certain that that would
19 improve habitat quality for the delta smelt?

20 A. Based on my understanding of the research that's been
21 conducted, yes.

22 Q. And can you quantify in any way the benefit to improving
23 habitat quality that this action ten would provide?

24 A. The way to do that would be to quantify the effect of the
25 action on the delta smelt habitat quality index. Or

1 alternatively referred to as the environmental quality index
2 by Feyrer, et al.

3 Q. And have you done so?

4 A. No.

5 Q. But it's your position that it would be possible, based on
6 Feyrer's work, to derive an environmental quality index value
7 for the plaintiffs' proposal; is that correct?

8 A. I believe it would be possible.

9 Q. And would it be similarly possible to assess an
10 environmental quality index value for the current requirements
11 under the State Water Quality Control Board for minimum flows
12 during that same period?

13 A. Yes. The difficulty is that we're proposing to manipulate
14 only a single of the three variables that comprise the index.
15 So assumptions would need to be made about the values of the
16 others.

17 Q. But it is -- at least in theory, it would be possible to
18 make some sort of comparison and arrive at a conclusion about
19 the actual quantified benefit of this action ten?

20 A. I believe so, yes.

21 Q. But you have not done so.

22 A. I have not.

23 Q. And Dr. Swanson, are you familiar with, I believe you're
24 probably familiar by now with the Pelagic Fish Action Plan.
25 This has been marked as State Water Contractors Exhibit C.

1 A. I am.

2 Q. Could we provide a copy of State Water Contractors Exhibit

3 C. Do you already have one, Dr. Swanson?

4 And when you get a chance, if you would, please turn
5 to page 47, which we've seen several times already during the
6 proceedings.

7 MR. WALL: Counsel, I'm sorry, could I have that page
8 number again, please?

9 MR. MAYSONETT: I'm sorry. It's page 47.

10 MR. WALL: Thank you.

11 Q. And Dr. Swanson, I believe you testified that the proposal
12 that's discussed here on page 47 of the Pelagic Fish Action
13 Plan is similar, but not identical to the plaintiffs' proposed
14 action number ten; is that correct?

15 A. That is correct.

16 Q. Dr. Swanson, could you look at the section headed
17 "Maintain X2 West of Collinsville"?

18 A. Yes.

19 Q. And looking at the second paragraph, could you read for me
20 the second sentence beginning, "This action might be
21 implemented."

22 A. "This action might be implemented if the current water
23 year type is 'above normal' or wetter, which is largely
24 determined by precipitation and runoff in the previous winter
25 and spring."

1 Q. And could you continue on to read just the next sentence,
2 please.

3 A. "This action would not be considered for implementation if
4 the water year is 'below normal' or drier year because water
5 costs would exceed 1 million acre-feet and such flows cannot
6 be provided by storage releases without dramatic effects on
7 storage levels and temperature conditions for fish upstream in
8 the fall."

9 Q. Thank you. Dr. Swanson, could you turn to the next page,
10 please, page 48. I promise there's only -- only two more
11 sentences to read. If you could look at the section marked
12 "Costs," please. And beginning with the second sentence.

13 A. "In below normal water years, the water costs would exceed
14 1 million acre-feet and such flows cannot be provided by
15 storage releases without dramatic effects on storage levels
16 and temperature conditions for fish upstream in the fall."
17 Shall I continue?

18 Q. Yeah, please, just that last sentence.

19 A. "Therefore, it is impractical to provide such flows in
20 below normal and drier years."

21 Q. Thank you, Dr. Swanson.

22 So is it fair to say that in the Pelagic Fish Action
23 Plan, they express some concerns about the effects that this
24 sort of proposal would have on storage levels and temperature
25 conditions?

1 MR. WALL: Objection as to form.

2 THE COURT: The objection is sustained to the extent
3 the question is compound. You have two subjects. Break it
4 down.

5 BY MR. MAYSONETT:

6 Q. I'll start again, Dr. Swanson.

7 Is it fair to say, Dr. Swanson, that in this section
8 of the Pelagic Fish Action Plan they express concerns about
9 the kind of effects of this proposed action?

10 A. Yes.

11 Q. And what, in your opinion, were those concerns?

12 A. The concerns expressed have to do with implementing the
13 action by way of increased releases from storage reservoirs
14 and the potential effects of those increased releases on the
15 ability to later provide sufficient cold water for fish in
16 streams below the reservoirs.

17 Q. And when they said "sufficient cold water," is it your
18 understanding that that would be for endangered salmon
19 species?

20 A. Yes.

21 Q. Do you share any of the concerns raised by the -- in this
22 Pelagic Fish Action Plan about the possibilities of a fall
23 action?

24 A. First let me clarify that the Pelagic Fish Action Plan
25 action is different than the one that we proposed in ours. In

1 particular, with regard to its duration, which is nearly twice
2 as long.

3 Q. Having clarified that, would you let me know whether you
4 share their concerns about possible water costs of a fall
5 action?

6 MR. WALL: Objection. I think it misstates the
7 Pelagic Fish Action Plan. The Pelagic Fish Action Plan does
8 not discuss a fall action, it discusses an action from May
9 through December as the witness just pointed out.

10 MR. MAYSONETT: I'll --

11 THE COURT: The objection is sustained. You may
12 rephrase.

13 BY MR. MAYSONETT:

14 Q. To rephrase the question, Dr. Swanson. Having clarified
15 the differences between the action proposed in the Pelagic
16 Fish Action Plan and your action, the plaintiffs' proposed
17 action number ten, do you share any of the concerns identified
18 here on the possible effects and water costs of the action
19 proposed in the Pelagic Fish Action Plan with the action
20 proposed by the plaintiffs?

21 MR. WALL: Objection as to form.

22 THE COURT: Do you understand the question?

23 THE WITNESS: I am uncertain whether to compare the
24 concerns between --

25 THE COURT: Then we'll have it rephrased.

1 THE WITNESS: -- the two actions --

2 THE COURT: The objection is sustained.

3 MR. MAYSONETT: I'll try one more time.

4 Q. The Pelagic Fish Action Plan --

5 THE COURT: Perhaps you could ask the question
6 directly. Eliminate the "Pelagic Fish Action Plan" and just
7 ask her whether she's concerned about the water cost effects
8 of implementing the plan that the plaintiffs propose.

9 MR. MAYSONETT: Thank you, Your Honor. I'll take
10 that suggestion.

11 Q. Dr. Swanson, do you --

12 THE COURT: That's a wise lawyer. Can you answer the
13 question?

14 BY MR. MAYSONETT:

15 Q. Do you have concerns about the water costs of the
16 plaintiffs' proposed action plan -- the fall action plan?

17 A. I do not. Because those concerns are based on the
18 assumption that the action will be implemented either
19 exclusively or in large part through increased releases from
20 selected reservoirs.

21 Q. Okay.

22 THE COURT: Where else would the water come from?

23 THE WITNESS: Alternative approaches for implementing
24 the action could include reductions in export levels, which,
25 as I testified earlier, are typically between 7500 cfs and

1 9,000 cfs during that period. Alternatively, water could be
2 released from reservoirs below which listed salmonid species
3 do not exist and therefore there are no temperature concerns.
4 Alternatively, water from other sources could be acquired by
5 the water projects, for example, water from the Yuba River
6 could be purchased for release during this period.

7 Either implementation of the action through export
8 reductions or releases from other reservoirs or acquisition of
9 water from other sources individually or in combination would
10 allow the implementation -- the action to be implemented in a
11 way that has no effect on listed salmonids and/or coldwater
12 pool in the reservoirs that the concerns are being raised
13 about.

14 BY MR. MAYSONETT:

15 Q. So is it your testimony, Dr. Swanson, that the fall action
16 plan could be implemented certainly without having any effect
17 on the coldwater poolage, the Shasta Reservoir, for example,
18 through the combination of reduced export levels, purchasing
19 waters from sellers and release of the water from other
20 reservoirs?

21 A. Yes.

22 Q. And is it your position that that will always be true
23 regardless of the hydrologic conditions in the Delta?

24 A. I don't know that I can answer that question. I don't
25 have --

1 THE COURT: If you had a doomsday drought, the answer
2 would be -- if we had the 1928 to the 1934 conditions
3 existing, then there probably wouldn't be enough water.

4 THE WITNESS: I cannot answer without examining those
5 data.

6 MR. MAYSONETT: Well --

7 THE COURT: I think you're being asked, within what
8 we would call reasonable scientific certainty, can you foresee
9 drought or other water shortage conditions in the operational
10 history that you know of and that you expect to reasonably
11 occur in the future where existing supplies would be
12 insufficient to implement the plan you propose for fall, if
13 you will, protection?

14 THE WITNESS: Yes. But I don't think conditions this
15 year are in that state.

16 THE COURT: Thank you.

17 BY MR. MAYSONETT:

18 Q. And let's -- let me focus a little bit on those issues.

19 Is it correct to say, Dr. Swanson, that it has been classified
20 as a critically dry year on the San Joaquin?

21 A. That is my understanding.

22 Q. And has it been classified as a dry year on the
23 Sacramento?

24 A. I believe so.

25 Q. To your knowledge, Dr. Swanson, are there any forecasts on

1 whether next year will be a dry year?

2 A. I'm not aware of any.

3 Q. Is it your testimony, Dr. Swanson, that if the coming year
4 is a dry year, that reduced pumping alone would be sufficient
5 to implement the fall action proposed by the plaintiffs?

6 A. Yes.

7 THE COURT: If you'll accept a friendly word of
8 advice. When you ask the witness "is it your testimony"
9 before you preface the predicate of the question, you've asked
10 two questions. And so instead of asking it in compound form,
11 it's also argumentative, why don't you ask the question
12 directly.

13 MR. MAYSONETT: Thank you, Your Honor.

14 Q. Dr. Swanson, could you identify the reservoirs that might
15 be drawn on by water for fall action?

16 A. To the best of my knowledge, the State Water Project
17 controls Oroville Reservoir, the Central Valley Project
18 controls Shasta Reservoir, the Folsom Reservoir and New
19 Melones Reservoir. I could also add that the Central Valley
20 Project controls Friant or Millerton Reservoir as well.

21 THE COURT: You have San Luis and Delta-Mendota here.

22 BY MR. MAYSONETT:

23 Q. Do you know what the current levels of those reservoirs
24 are, Dr. Swanson?

25 A. I do not.

1 Q. And have you made -- have you done any analysis of what
2 levels those reservoirs might be at if the fall action is
3 implemented next year?

4 A. I have not --

5 Q. That is to say if the fall action is implemented, do you
6 have any analysis of what the reservoir levels will be next
7 year?

8 A. I have not done such an analysis, no.

9 Q. And if next year is a dry year and we implement the fall
10 action, have you done any analysis on what the reservoir
11 levels might be in subsequent years?

12 MR. WALL: Objection. Incomplete hypothetical.

13 THE COURT: Are you able to answer the question based
14 on its present content?

15 THE WITNESS: Could I hear the question repeated,
16 please?

17 THE COURT: Yes. Can you read it back, please, miss
18 reporter.

19 (Record read as requested.)

20 THE WITNESS: No.

21 BY MR. MAYSONETT:

22 Q. Dr. Swanson, would you assume for me that we're entering a
23 critically dry year on both the Sacramento and San Joaquin
24 Rivers and that the plaintiffs' actions are, including the
25 fall action, are implemented over the next year.

1 If the year after is also dry and we were again
2 required to implement the fall action, have you done any
3 analysis of whether it would be necessary to draw on the
4 coldwater pool at Shasta?

5 A. No.

6 Q. Dr. Swanson, you've indicated, I think, several times
7 that -- strike that.

8 Dr. Swanson, is it fair to say that you have based
9 the proposal the plaintiffs put forward in part on the
10 analysis of the Delta Smelt Working Group?

11 A. Yes.

12 Q. Could we provide the plaintiff with a -- I'm sorry, Dr.
13 Swanson with a copy of Plaintiffs' Exhibit 10, please. This
14 is the August 21st, 2006 Delta Smelt Working Group notes.

15 A. I have it.

16 THE COURT: You have it?

17 BY MR. MAYSONETT:

18 Q. Dr. Swanson, could you turn to the second page for me.
19 Dr. Swanson, is it fair to say that the -- in this set of
20 Delta Smelt Working Group notes, the Delta Smelt Working Group
21 analyzed a fall action that is similar to the action proposed
22 by plaintiffs?

23 A. Yes.

24 Q. And could you read that, the third sentence of that first
25 paragraph for me.

1 A. The first paragraph titled "Fall Flows"?

2 Q. Yes, doctor, beginning "The working group is not opposed."

3 A. Third sentence starts with "Note"? Or is -- I beg your
4 pardon, is it "The working group"?

5 Q. Yes, please. "The working group is not opposed." .

6 A. "The working group is not opposed to this action, but did
7 not recommend it because 7,000 cfs is not enough flow to
8 detectably change physical habitat quantity/quality for delta
9 smelt and will not likely change overbite clam distribution or
10 abundance (attachment, Figure 2)."

11 Q. Thank you, Dr. Swanson. And could you read the last
12 sentence of that section, the Fall Flows section, please, also
13 begins with "The working group."

14 A. "The working group believes"?

15 Q. Yes, thank you.

16 A. "The working group believes that any fall flow control
17 action should be set up as a full-fl edged experiment to test
18 competing hypotheses, (i.e., reduction in clam distribution or
19 abundance or reduction in entrainment susceptibility of adult
20 delta smelt during winter or reduction of larval
21 susceptibility to entrainment the following spring, et
22 cetera.)"

23 Q. So Dr. Swanson, the -- is it fair to say the Delta Smelt
24 Working Group considered a fall action similar to the action
25 proposed by the plaintiffs but chose not to recommend it?

1 A. Yes.

2 Q. And to your knowledge, has the Delta Smelt Working Group
3 ever recommended a fall action similar to the fall action
4 proposed by the plaintiffs?

5 A. To my knowledge, no.

6 Q. Dr. Swanson, the plaintiffs' proposed fall action is based
7 in part on the research of Dr. Feyrer; is that correct?

8 A. It's Mr. Feyrer, yes.

9 Q. Mr. Feyrer. Isn't it true, Dr. Swanson, that two of the
10 co-authors of the paper authored by Dr. Feyrer on this issue
11 are -- sit on the Delta Smelt Working Group?

12 A. I'm not completely positive of the official membership of
13 the Delta Smelt Working Group. Matt Nobriega's name appears on
14 the notes for this August 21st notes. But I cannot speak
15 beyond that.

16 Q. Dr. Swanson, could we move on to another subject.
17 Specifically the population estimate by Dr. Bennett that you
18 discussed in your direct testimony. Yesterday Dr. Moyle
19 characterized Dr. Bennett's population estimate as really
20 terrible given its own acknowledged limitations. Do you agree
21 with Dr. Moyle's opinion?

22 A. I think --

23 MR. WALL: Objection. I'm not sure that accurately
24 characterizes Dr. Moyle's testimony.

25 MR. MAYSONETT: I believe that it does.

1 MR. WALL: You know, I --

2 THE COURT: Thank you. What I'm going to suggest is
3 let's just assume that Dr. Moyle is critical of Dr. Bennett's
4 monograph. Do you agree or disagree with that criticism?

5 THE WITNESS: Actually, I think Dr. Moyle is quite
6 impressed with most of the content of the monograph. He
7 recognized the assumptions upon which Dr. Bennett based his
8 calculation of the population estimates were unrealistic and
9 that therefore the estimates were --

10 THE COURT: Unreliable?

11 THE WITNESS: And uncertain.

12 BY MR. MAYSONETT:

13 Q. Is it your opinion, Dr. Swanson, that it's better to use
14 the sorts of indices generated by the surveys than the sorts
15 of population estimates that Dr. -- population estimate that
16 Dr. Bennett developed in his paper?

17 A. Could you clarify what you mean by "use," use for what?

18 Q. Let me try to rephrase the question. Actually let me try
19 to get at it a different way.

20 When you are reaching conclusions about the status of
21 the delta smelt, have you relied on Dr. Bennett's population
22 estimate?

23 A. No.

24 Q. Why not?

25 A. Because I think there's more information to be found in

1 the results of the multiple surveys conducted by Department of
2 Fish & Game. And I evaluate those in the context of multiple
3 criteria that provide information on the current status and
4 risk of extinction of delta smelt, which includes their
5 abundance and relative abundance and changes in abundance in
6 time but also includes other information, for example, their
7 distribution within their habitat.

8 Q. And in reaching conclusions about the status of the smelt,
9 how would you characterize the usefulness of population
10 estimates in general?

11 A. Minimal.

12 Q. Dr. Swanson, I believe you testified that it is your
13 opinion -- allow me to rephrase the question.

14 Dr. Swanson, is it your opinion that the actions
15 identified in the plaintiffs' action plan are necessary to
16 avoid jeopardizing the continued existence of the delta smelt?

17 A. Yes.

18 Q. And is it your understanding, Dr. Swanson, that under the
19 Endangered Species Act, the service, the US Fish & Wildlife
20 Service reaches that sort of conclusion in a Biological
21 Opinion?

22 A. I'm not exactly certain of the gist of your question. I
23 apologize. Could you repeat?

24 Q. I'll attempt to rephrase to get it more clearly. Dr.
25 Swanson, is it fair to say you've reviewed biological opinions

1 in the past?

2 A. I have.

3 Q. And you've reviewed the Biological Opinion for the delta
4 smelt that was the center of this lawsuit until recently?

5 A. I did.

6 Q. And is it your understanding, Dr. Swanson, that the
7 purpose of a Biological Opinion is to reach a conclusion about
8 whether or not certain actions may jeopardize the existence of
9 a species?

10 A. Yes.

11 Q. And in reaching that conclusion, is it your understanding
12 that the Fish & Wildlife Service analyzes several issues,
13 including the status of the species and the environmental
14 baseline, the effects of the action; is that correct?

15 A. It is my understanding that is what they're supposed to
16 do.

17 Q. And as part of that, the service may identify steps to be
18 taken to reduce the effects of the action; is that correct?

19 A. I believe so.

20 Q. And they might identify take limits also in a Biological
21 Opinion; is that correct?

22 A. Yes.

23 Q. Now, you have reached your own conclusion on jeopardy, on
24 whether or not the current operations of the projects may
25 jeopardize the continued existence of the delta smelt; is that

1 correct?

2 A. I have.

3 Q. And in doing so, have you written a Biological Opinion?
4 Have you written that sort of document?

5 A. No.

6 MR. WALL: Objection, Your Honor.

7 THE COURT: It's been asked and answered.

8 BY MR. MAYSONETT:

9 Q. And is your analysis of those issues set out in writing
10 anywhere -- I'm going to rephrase.

11 Is your analysis of those issues set down in writing
12 anywhere other than the declarations that you've submitted as
13 part of this litigation?

14 MR. WALL: Objection as to form. It's vague.

15 THE COURT: Do you understand the question?

16 THE WITNESS: I think so. And the answer is no.

17 THE COURT: Objection is overruled.

18 BY MR. MAYSONETT:

19 Q. We discussed take limits or, I beg your pardon, you
20 discussed take limits briefly during your direct testimony.
21 Have you identified any proposed take limits that would be
22 appropriate as part of the plaintiffs' proposed action plan?

23 A. I have not.

24 Q. Dr. Swanson, can I ask you to turn briefly to Plaintiffs'
25 Exhibit 12. This is the declaration of Cay Goude.

1 A. I do not have a copy here.

2 Q. It's got the chart of the Service's proposed actions.

3 A. I'm sorry. I think I do have a copy here.

4 Q. I think we were discussing it --

5 A. 12.

6 Q. Yes.

7 A. Uh-huh. Excuse me, Your Honor.

8 THE COURT: Yes.

9 THE WITNESS: May I correct an answer to a question
10 that was recently answered?

11 THE COURT: If you feel the need. Do you have any
12 objection, Mr. Maysonett?

13 MR. MAYSONETT: I don't, Your Honor.

14 THE COURT: All right.

15 THE WITNESS: The question referred to whether I had
16 written anything other than my declarations describing my
17 evaluation of the status and risk of extinction of delta
18 smelt.

19 BY MR. MAYSONETT:

20 Q. Yes.

21 A. I have also written two petitions to change the listing
22 status of delta smelt. One was submitted to the Fish &
23 Wildlife Service in 2006, the other was recently submitted to
24 the California Department of Fish & Game in 2007. Those in
25 effect, I believe, represent the kind of document that you

1 were describing and I apologize for having forgotten that.

2 Q. Thank you.

3 Turning to Plaintiffs' Exhibit 12. Could you look
4 for me, please, at the proposed action number three.

5 A. Are we on the table?

6 Q. Yes, please. This is -- it's listed as page eight.

7 A. I have it.

8 Q. I'm sorry. And in the service's proposed action number
9 three, what range of flows is identified?

10 A. In the column labeled "Action," the range of flows for Old
11 and Middle River is from zero to -- it actually says -- oh, it
12 says upstream, which means negative Old and Middle River flows
13 from zero to 4,000.

14 Q. So it's fair to say it's zero to negative 4,000; is that
15 correct?

16 A. That is, I believe, correct.

17 Q. And what are the comparable flows under the plaintiffs'
18 proposed action?

19 A. We have recommended flows averaging minus 1500 cubic feet
20 per second plus or minus 750. So within the range of minus
21 750 to minus 2250 cubic feet per second is our recommended
22 range.

23 Q. Is it fair to say, Dr. Swanson, that if the target were
24 set at zero cfs, that would be more protective than flows of
25 negative 750 cfs?

1 A. Yes.

2 MR. MAYSONETT: I think that's all I have, Dr.
3 Swanson.

4 THE COURT: Thank you. Mr. Lee, do you wish to
5 cross-examine?

6 MR. LEE: Yes, Your Honor.

7 CROSS-EXAMINATION

8 BY MR. LEE:

9 Q. Good afternoon, Dr. Swanson. I'd like to start out with
10 some questions relating to monitoring, if I could. And I'd
11 like to talk specifically about larval sampling at the Clifton
12 Court Forebay or the State Water Project pumping facilities.

13 What level of expertise would be required, in your
14 professional opinion, to tell the difference between a delta
15 smelt larval, a larvae between 5 millimeters and 20
16 millimeters, a longfin smelt larvae or a Wagasaki larvae, what
17 type of expertise?

18 A. I would assume the same level of expertise that is
19 currently present in the personnel for the Department of Fish
20 & Game that conduct those monitoring evaluations. The
21 specific level of expertise, I cannot specify.

22 Q. You would have no idea of what qualifications? Would a
23 masters in biology do this?

24 A. I think that with appropriate training, a staff person
25 would not require an advanced degree in order to make these

1 i d e n t i f i c a t i o n s .

2 Q. Is there -- are there a large number of people that have
3 this area of specialization to determine the difference
4 between larval smelt of these sizes?

5 A. I do not know.

6 Q. How long would it take to determine, upon receipt of the
7 smelt in the holding tanks, whether they were, in fact, delta
8 smelt larvae or longfin smelt larvae or Wagasaki larvae?

9 A. I don't know.

10 MR. WALL: Objection. Incomplete hypothetical.

11 THE COURT: You're asking for the identification of
12 the species or subspecies.

13 MR. LEE: Yes. How long will it take to identify.

14 THE COURT: Overruled. The answer will stand.

15 BY MR. LEE:

16 Q. Is it your testimony that 100 percent of the juvenile and
17 larvae smelt salvaged die after salvage?

18 THE COURT: I thought we stipulated to that in this
19 litigation, that salvage means death.

20 BY MR. LEE:

21 Q. Well, I -- the question was whether 100 percent of the
22 larvae and juveniles, in fact, die upon salvage.

23 A. That is my understanding from all of the information and
24 research that I have read.

25 Q. Thank you. I would like to ask a question about some of

1 your testimony that was earlier today. It was my
2 understanding that you said that the delta smelt larvae and
3 juveniles are not particularly good swimmers, but they use the
4 tides as a transportation mechanism. Is that correct?

5 A. That is what the available research on the species
6 suggests.

7 Q. Okay. Does that mean that they float with the tides or do
8 they choose to benefit from tides, either one set of tides or
9 the other set of tides?

10 MR. WALL: Objection as to form.

11 BY MR. LEE:

12 Q. How do the tidal transport --

13 THE COURT: The question has been amended.

14 MR. LEE: I'm sorry. Withdraw the question.

15 Q. How does the tidal transportation mechanism work?

16 A. Based on my understanding of the research that has been
17 done on this --

18 Q. Yes.

19 A. -- with delta smelt and other species, small larval fishes
20 do have very low swimming capabilities.

21 Q. Yes.

22 A. In fact, early larvae don't have very well developed fins
23 at all. And, in fact, they do tend to move with the movement
24 of the water.

25 The way fishes utilized tidal transport is by

1 regulating their depth in the water column in a channel and
2 utilizing different areas of the channel where the flow may be
3 at different velocities and conceivably, in some areas,
4 actually in different directions in regards to tidal flow.

5 And depending on the direction that the fish
6 are -- for example, for a downstream migrating larval delta
7 smelt, those fish would be riding the ebb tide downstream.
8 And when the tide switched and it began to flood, they would
9 seek refuge in some other portion of the channel where the
10 velocity of the water was lower so they would be transported
11 upstream less far. It's a zig-zag sort of ratcheting
12 movement.

13 Q. So they would be in effect tidal riders. They would
14 choose the currents, is that correct, they choose the currents
15 that they feel would be most beneficial to them?

16 A. To the extent that a fish chooses.

17 Q. Yes. So, for example, the larval fish that want to move
18 downstream, they would choose, to the extent fish choose,
19 occurrence when they are moving downstream; is that correct?
20 Or tidal currents moving downstream.

21 A. My interpretation is that they would move to a position in
22 the channel where they maximized their ability to catch the
23 ebb flow going downstream during the period when the tide was
24 ebbing.

25 Q. And when the converse occurs, when tide was not ebbing,

1 what would the larval smelt be doing?

2 A. Presumably what they do is they move to some other
3 position in the channel, probably near the bottom where water
4 velocities are lower. And so that they would move less far
5 back up on the flood tide.

6 Q. Thank you very much. That's been very helpful.

7 Now, I'd like to apply that analyses --

8 THE COURT: I had to admonish Mr. Wilkinson
9 yesterday, so today it's your turn. Please don't comment on
10 the answer of the witness.

11 MR. LEE: Thank you.

12 Q. The criticism, I believe that you have mentioned the
13 Particle Tracking Models, is that particles do not have
14 capability of movement; is that correct?

15 A. That is my understanding, yes. And by "movement," I mean
16 in a different place in the channel.

17 Q. In a different --

18 A. Up and down vertically in the channel.

19 Q. You were moving your hand up and down, and that was not
20 apparent in the transcript. So could you repeat that with a
21 verbal clarification what you were saying.

22 A. It's my understanding with Particle Tracking Models, which
23 actually use, I believe, only one or two dimensional model of
24 movement of flow through these channels, that they are not
25 able to impart behavior of the particles such that it moves a

1 different amount downstream on a flow relative to the amount
2 it moves upstream on a floor.

3 Q. Given your discussion about the capacity of the larval
4 delta smelt to move, wouldn't that mean that the Particle
5 Tracking Models, to the extent they were mimicking larval
6 smelt would have a relatively conservative determination of
7 the smelt's presence in terms of location to the pumps?

8 MR. WALL: Objection as to form.

9 THE COURT: Do you understand the question?

10 THE WITNESS: No.

11 THE COURT: Rephrase. The objection is sustained.

12 BY MR. LEE:

13 Q. Given your testimony regarding the movement of the delta
14 smelt, would the Particle Tracking Models so similarly move as
15 the smelt? Would the particles in the Particle Tracking Model
16 move similarly as the smelt would move?

17 A. The assumption is that they move similar to small larval
18 smelt. How correct that assumption is unknown.

19 Q. If the smelt are moving downstream because of tidal
20 influences, would that movement occur under the Particle
21 Tracking Model?

22 A. If there were net downstream flow.

23 Q. If the particle -- if the delta smelt, under your
24 testimony, were moving to the lower end of the water column
25 and avoiding the incoming tide, would their movement also

1 mimic the Particle Tracking Model as to incoming tide?

2 A. No.

3 MR. WALL: Objection.

4 THE COURT: It's been answered.

5 MR. LEE: Thank you.

6 Q. In your supplemental declaration of August 13th, 2007, you
7 were critical of the US Fish & Wildlife Service's delta smelt
8 Action Matrix. And the defendant intervenors' variant of that
9 matrix on the grounds that they were dependent upon, I
10 believe, inadequate monitoring programs.

11 In paragraph seven of your supplemental declaration
12 dated August 13th, you state, "Delta smelt numbers have fallen
13 to such low levels that they are below the detection limits of
14 at least two key California Department of Fish & Game surveys
15 (i.e., the 20 millimeter survey and the Summer Townet Survey),
16 and there is no monitoring to detect the presence critical
17 early life stages of delta smelt, (i.e., fish smaller than
18 millimeters in length) at the water export facilities.
19 Misplaced confidence in these unreliable results to determine
20 the entrainment risk of delta smelt could delay or preclude
21 the implementation of needed protections and/or reduce the
22 magnitude of protective actions."

23 In addressing this, I'd like you to look, if you have
24 that with you, DWR Exhibit A. This would be attachment A.

25 A. I do not think I have that.

1 MR. LEE: Well, Your Honor, I'm going to try this.

2 THE COURT: Well, we're going to find it right now.

3 THE CLERK: What was the number again?

4 MR. LEE: Your Honor, I have a copy here.

5 THE COURT: Perhaps we could use your copy in the
6 interest of time.

7 MR. LEE: May I approach the witness?

8 THE COURT: You may.

9 MR. WALL: What's the title of that so I can find it?

10 BY MR. LEE:

11 Q. I would like to have you focus on paragraph two of the
12 first page of attachment A. First of all, and read the -- and
13 read paragraph two including the lettered bullet points.

14 A. The DSWG --

15 Q. By yourself, please.

16 A. I'm sorry.

17 Q. Just by yourself and tell me when you've completed.

18 Are you completed reading paragraph two, Dr. Swanson?

19 A. I have.

20 Q. Is the Summer Towner Survey expressly included in
21 paragraph two?

22 A. No.

23 Q. Does paragraph two mention other sources of real time
24 information other than the 20 millimeter survey?

25 A. It mentions the Spring Kodiak Trawl Survey, salvage

1 information from the CVP and SWP facilities and Delta
2 temperature data.

3 Q. Is Delta temperature data a useful indicator of the onset
4 of adult spawning?

5 A. It is believed to be.

6 Q. And would the presence of spawning adult smelt, as
7 determined by the temperature data, be a useful indicator of
8 the subsequent presence of larval smelt?

9 A. Yes.

10 Q. After the smelt have spawned, how long -- how many days
11 would it be before the eggs become larvae? Hatch and become
12 larvae?

13 A. The time to hatch is dependent upon water temperature.
14 But within the range of temperatures the delta smelt typically
15 spawn in, the duration of incubation for eggs is approximately
16 one to two weeks.

17 Q. Okay. Does the data from the Kodiak survey serve as a
18 useful indicator of the maturation stage of delta smelt or the
19 presence of spent smelt?

20 A. Yes.

21 Q. And would this real time information be a useful indicator
22 of the presence of larval smelt?

23 A. Yes.

24 Q. Does the plaintiffs' fish actions number three, five,
25 eight and nine include water temperature as a trigger action?

1 A. Three, five --

2 THE COURT: Eight and nine.

3 THE WITNESS: Yes.

4 BY MR. LEE:

5 Q. Do the plaintiffs' fish actions two, three, four, five,
6 eight and nine rely on the Kodiak survey data as a trigger
7 action?

8 A. Two --

9 THE COURT: All of them or any of them?

10 THE WITNESS: Actions two, three, four, five, those
11 four -- wait, eight and nine use information from the Kodiak
12 trawl survey as a trigger.

13 BY MR. LEE:

14 Q. Based upon the temperature data and the Kodiak survey
15 data, wouldn't we likely to see spawning adults before we see
16 larval smelt?

17 A. Probably, yes.

18 Q. Has the Delta Smelt Working Group expressly recommended
19 new sampling for larval fish near the State Water Project
20 pumping facilities?

21 A. Not that I'm aware of.

22 Q. Did the March 2007 Pelagic Fish Action Plan recommend the
23 adoption of new sampling for larval fish at the State Water
24 Project pumping plants?

25 A. Not that I'm aware.

1 Q. On page 12 of your supplemental declaration, you are
2 critical of the US Fish & Wildlife Service matrix because
3 quote, "The US Fish & Wildlife Service clearly recognizes the
4 limitations of the current survey programs to accurately
5 detect the presence and determine the distribution of delta
6 smelt."

7 MR. WALL: Would you give us the line number?

8 THE WITNESS: I'm not certain it's page 12.

9 BY MR. LEE:

10 Q. On paragraph 12. Excuse me. I'm sorry.

11 A. Yes.

12 Q. And after that quotation, there is a citation to the Goude
13 reply declaration at paragraph six; is that correct?

14 A. There is.

15 MR. LEE: Your Honor, the State of California would
16 like to mark as Exhibit D for the Department of Water
17 Resources the August 3rd, 2007 declaration of Cay Collette
18 Goude.

19 THE COURT: Let me -- we have the July 3rd
20 declaration of Ms. Goude. And so this is the August 3rd
21 declaration. It will be marked Exhibit -- DWR Exhibit D for
22 identification.

23 (Defendant's Exhibit DWR D was marked for
24 identification.)

25 THE COURT: Let me ask this, Mr. Lee. What's your

1 estimated time to completion of cross?

2 MR. LEE: I'm afraid, Your Honor, I have -- I have at
3 least 45 minutes to an hour of cross.

4 THE COURT: All right. You want to go another 15
5 minutes?

6 MR. LEE: Your Honor, that would be fine with me.

7 THE COURT: Does everybody agree? Hearing no
8 objection, you may proceed.

9 MR. LEE: Thank you, Your Honor.

10 Q. Would you take a look at pages 4 and 5 of the DWR Exhibit
11 D? Have you received a copy?

12 A. Is that number 396-5?

13 Q. 433-4.

14 MR. LEE: Your Honor, I don't believe the witness has
15 a copy. May I approach the witness?

16 THE COURT: You may.

17 BY MR. LEE:

18 Q. Is the reference that you discuss on paragraph 12 of your
19 supplemental declaration on paragraph six or is it on
20 paragraph five?

21 A. I believe the correct reference would be to paragraph five
22 rather than paragraph six. Or reference to the limitations of
23 the survey programs to accurately detect the presence of
24 larval delta smelt.

25 Q. Could you please read paragraph five.

1 THE COURT: Out loud?

2 MR. LEE: Yes. Out loud.

3 THE WITNESS: "Action three, minimize larval .
4 entrainment: This action is intended to minimize the
5 larval delta smelt entrained at the export
6 facilities. Delta smelt larvae less than 15
7 millimeters in total length are not sampled
8 efficiently by the CDFG 20 millimeter survey. In
9 addition, delta smelt larvae less than 20 millimeters
10 in total length are not counted at the projects' fish
11 salvage facilities. These sampling constraints
12 result in uncertainty in the distribution of delta
13 smelt larvae in the Delta and their occurrence at the
14 export pumps. Recently the low abundance of delta
15 smelt may have resulted in lower sampling
16 efficiencies, which has further limited the
17 reliability of the survey information. Therefore,
18 because of the inherent limitations in the survey
19 data, other factors are used to infer the presence of
20 delta smelt larvae. Most successful delta smelt
21 spawning occurs in the range of 12 to 18 degrees
22 centigrade. Therefore, where Delta water
23 temperatures have risen to 12 degrees centigrade, the
24 presence of delta smelt larvae may be inferred."

25 ///

1 BY MR. LEE:

2 Q. In light of your review of paragraph five of the Goude
3 declaration, isn't it therefore true that the criticism of the
4 survey programs by Ms. Goude is limited to the 20 millimeter
5 survey?

6 A. With reference to the ability of the 20 millimeter survey
7 to efficiently and accurately detect the presence of delta
8 smelt larvae, yes.

9 Q. Thank you. I would like to talk briefly about the fall
10 action measures with you.

11 In paragraph 21 of your August 13th, 2007
12 supplemental declaration, you stated that the project can meet
13 the plaintiffs' September through December fall actions
14 through the reduction of private exports from the south Delta.

15 What was the basis for this conclusion?

16 A. The basis for the conclusion that implementation of the
17 fall action could be fully met by export reductions was based
18 on my understanding of the current minimum flow requirements
19 for Delta outflow during those months required by the State
20 Water Resources Control Board and the current or the recent
21 past average export levels from the CVP and SWP facilities
22 during that period.

23 Q. What averaging period did you use in making that
24 calculation?

25 A. I used an average of the days within a single month. So

1 it was a monthly average.

2 Q. I'm sorry. My question was not very clear. What -- what
3 years did you use for the averaging purpose?

4 A. For the average export levels?

5 Q. Yes.

6 A. As stated in my declaration, I used the years since 1994
7 through 2007.

8 Q. How many of those years were wet years and how many of
9 those -- how many of those years were wet years?

10 A. I would have to consult a reference identifying year type
11 to be explicit and correct on that answer.

12 Q. Did you, in reaching your conclusion, review how many of
13 those years were wet years, how many of those years were above
14 normal years or any other year type analysis?

15 A. I did not.

16 Q. I see. Doesn't the water year type, in your opinion,
17 commonly affect the amount of export?

18 A. It can.

19 Q. Did your analysis consider this year's water year type on
20 the likely exports from the south Delta with regard to
21 compliance with the fall action?

22 A. If I may ask for clarification. Do you mean forecasted
23 export rates?

24 Q. I'm talking about this year's hydrologic conditions.

25 A. And you're asking me to predict export rates for the

1 September through December period?

2 Q. That's correct.

3 A. I can't do that.

4 Q. I see. Did your analysis consider the impact of meeting
5 the fall actions in the plaintiffs' action ten through export
6 reductions on the storage levels at San Luis Reservoir?

7 A. No.

8 Q. Then do you have any opinion as to whether reliance on
9 export reductions would have reduced San Luis Reservoir to
10 under 300,000 acre feet?

11 A. No.

12 Q. Do you have any opinion as to whether reliance on export
13 reductions would reduce storage at San Luis Reservoir to under
14 80,000 acre feet?

15 A. No.

16 Q. In paragraph 21 of your August 13th, 2007 declaration, you
17 state that projects could meet the fall action by
18 releasing water, quote, "from their other reservoirs including
19 Oroville, Folsom and New Melones, instead of relying so
20 heavily or exclusively on Shasta Reservoir."

21 In reaching this conclusion, did you consider the
22 impact of using Oroville Reservoir storage to meet the fall
23 action on Oroville Reservoir's ability to release water for
24 the protection of spring-run salmon and steelhead in the
25 Feather River?

1 A. No.

2 Q. In reaching this conclusion, did you consider the impact
3 of requiring Folsom Reservoir to release storage for the
4 protection of salmon under your -- excuse me, smelt under your
5 fall action on Folsom Reservoir's ability to release water for
6 the protection of steelhead in the American River?

7 A. No.

8 Q. Are the central valley spring-run salmon a listed species?

9 A. Yes.

10 Q. Are the central valley steelhead a listed species?

11 A. Yes.

12 Q. In paragraph 21 of your August 13th, 2007 supplemental
13 declaration, you state that projects could meet fall action by
14 acquiring -- by, quote, "Acquire water to increase Delta
15 inflows from other rivers," end of quote.

16 Are you aware of specific willing sellers of water,
17 quote, "from other rivers" that would allow the projects to
18 meet the fall action starting this September through voluntary
19 purchases of water by the CVP or the SWP?

20 A. No.

21 Q. Do you know how much water would actually be available
22 over the next year to meet the fall action through voluntary
23 purchases of water by the CVP or the SWP?

24 MR. WALL: Objection. Incomplete hypothetical.

25 THE COURT: Do you understand the question?

1 THE WITNESS: Yes. And the answer is no.

2 THE COURT: Overruled. You may answer. The answer
3 stands.

4 BY MR. LEE:

5 Q. Isn't the suggestion that there is sufficient water
6 available through voluntary transfers to materially assist the
7 projects in meeting the fall action simply speculation on your
8 part?

9 MR. WALL: Objection.

10 THE COURT: Overruled. You may answer. Do you know?

11 THE WITNESS: I'm not certain that I suggested that
12 voluntary transfers --

13 THE COURT: Well, "acquisition" is the word I think
14 you used.

15 THE WITNESS: Okay. And now please repeat the
16 question.

17 BY MR. LEE:

18 Q. Isn't it the suggestion that there is sufficient water
19 available through voluntary acquisitions of water to
20 materially assist the projects in meeting the fall action
21 simply speculation on your part?

22 MR. WALL: Objection. This misstates testimony or
23 the declaration.

24 THE COURT: The objection -- do you understand the
25 question? Take the word "voluntary" out of it and -- let me

1 ask the question.

2 You propose that one of the ways to supply water for
3 the implementation of the fall plan would be to acquire water
4 in the open market. Did you do any research to determine what
5 the availability of water would be to do that --

6 THE WITNESS: I did not.

7 THE COURT: -- purchase?

8 Thank you. You know that the agencies have gone out
9 and in this year have already spent five million dollars
10 acquiring water to meet protection --

11 THE WITNESS: I'm not familiar with the specifics.

12 THE COURT: -- measures.

13 THE WITNESS: But I am aware that they have acquired
14 water.

15 THE COURT: Thank you.

16 BY MR. LEE:

17 Q. In paragraph nine of your July 23rd, 2007 declaration, you
18 reproduce a graph designated as Figure 4 from the Gurein,
19 Gartrell and Denton 2006 presentation. Regarding linkages
20 between fall salinity Delta outflow and delta smelt.

21 Have you reviewed the update of that graph provided
22 in the Stephen Ford declaration that adds juvenile smelt
23 abundance data from 2006 and 2007?

24 A. May I correct your interpretation of this?

25 THE COURT: Actually, you can't ask the questions.

1 You have to accept the question as propounded. But your
2 attorney can object.

3 MR. WALL: Yeah, I would object as to -- I'm still
4 trying to figure out what document you were referring to. I
5 couldn't even get that far.

6 THE COURT: On that high note, let us call these
7 proceedings to a halt today. And we will resume tomorrow
8 morning -- can everybody be here at 8:30?

9 MR. LEE: Yes, Your Honor.

10 THE COURT: All right. Let's resume at 8:30 a.m. and
11 let's let the court reporter free.

12 Do you want DWR D in evidence?

13 MR. LEE: Yes, I like to move Exhibit D in evidence.

14 THE COURT: Any objection?

15 DWR D is received in evidence.

16 (Defendant's Exhibit DWR D was received.)

17 THE COURT: These are Plaintiffs' Exhibits. 8, 9 and
18 12. Two of those were declarations of Dr. Hanson, as I
19 remember.

20 MR. WALL: You know, at this time I don't see any
21 need to put them in evidence.

22 THE COURT: All right. They're not admitted into
23 evidence then.

24 All right. We're now concluded. We're in recess
25 except we're going to talk without the court reporter. We're

1 going to talk off the record about logistics.

2 (Off the record.)

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