UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

HON. OLIVER W. WANGER, JUDGE

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs,	No. 05-CV-1207-OWW
vs.	HEARING RE INTERIM REMEDIES DAY 1
DIRK KEMPTHORNE, Secretary, U.S. Department of the Interior, et al. Defendants.	

Fresno, California Tuesday, August 21, 2007

REPORTER'S TRANSCRIPT OF PROCEEDINGS

Volume 1, Pages 1 through 255, inclusive

Reported by: KAREN LOPEZ, Official Court Reporter

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PLAINTIFFS' WITNESSES:

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EXHIBITS

Tuesday, August 21, 2007 Fresno, California
8:57 a.m.

THE CLERK: The Court calls item number one. Case number 05-CV-1207. Natural Resources Defense Council, et al., versus Gale A. Norton, et al. Motion to amend and file second supplemental complaint.

THE COURT: Will the parties please enter their appearances.

MR. ORR: Good morning, Your Honor, Trent Orr for the plaintiffs and with me is Andrea Treece.

MR. WALL: Good morning, Your Honor, Michael Wall for the plaintiffs.

MS. JAISWAL: Good morning, Your Honor, Anjali Jaiswal for the plaintiffs.

MS. KYLE: Good morning, Your Honor, Selena Kyle for the plaintiffs.

MR. MAYSONETT: Good morning, Your Honor, James Maysonett for the federal defendants and with me is Jim Monroe from the solicitor's office.

MR. LEE: Good morning, Your Honor, Clifford Lee from the California Attorney General's Office representing defendant intervenor Department of Water Resources.

MS. WORDHAM: Good morning, Your Honor, Deborah Wordham, Deputy Attorney General of the Attorney General's office also on behalf of the California Department of Water

Resources.

MR. WILKINSON: Good morning, Your Honor, Greg Wilkinson on behalf of the defendant intervenors State Water Contractors and with me this morning is Mr. Steve Anderson of my office and Mr. Minus Masouredis with the Metropolitan Water District.

MR. O'HANLON: Good morning, Your Honor, Daniel O'Hanlon appearing on behalf of the San Luis and Delta Mendota water authority and the Westlands Water District.

MR. BUCKLEY: Good morning, Your Honor, Chris Buckley on behalf of the California Farm Bureau Federation and with me this morning is Chris Scheuring from the Farm Bureau.

MR. HITCHINGS: Good morning, Your Honor, Andrew Hitchings for defendant intervenors Glenn-Colusa Irrigation District, et al.

THE COURT: We are convened to take up the issue of what remedies are appropriate following the Court's order invalidating the Biological Opinion in connection with the 2004/2005 OCAP for the Central Valley Project and its related effects on the State Water Project.

There are two matters preliminarily that I indicated to you -- one I specifically indicated to you that we would cover and that's the matter of the state of pleadings and the motion to amend to essentially assert a supplemental complaint by the plaintiffs. And then the other is that there have been

lodged -- I should say filed evidentiary objections by the plaintiffs to evidence that would go to, in effect, a traditional injunctive standard that considers the balance of the hardships relative to whether or not injunctive relief is appropriate. And I intend to take those two subjects up preliminarily and in that order.

So let us start with the issue of the amendment by way of supplement to the first supplemental complaint. And here, the issues are centered on the addition of parties and the addition of claims. The proposed second supplemental complaint is for declaratory and injunctive relief. And it essentially seeks to add a claim for violation of duties under Section 7 of the Endangered Species Act against the head of the United States Bureau of Reclamation, which is, the parties have previously stipulated in the case, an administrative agency of the United States.

We do not have what I would describe as any definitive indication of what the exact legal and jurisdictional relationship of the Bureau of Reclamation and the Department of Interior and the Secretary of Interior, who is the appropriate governmental official, is named as a party to the case. That's Dirk Kempthorne. And the appropriate government official Steven Williams, who is the director of the US Fish & Wildlife Service, is also appropriately named for that agency.

And the parties have various arguments that center on a number of subjects, including whether or not there has been justifiable delay, whether or not, after dispositive relief has been granted, in effect the case is still in a state that is sufficiently viable to permit additional pleadings and further claims which would require the assertion, both of Rule 12 motions and, when responses were filed, pleadings including affirmative defenses.

There is also raised the issue of whether the supplemental complaint in its present form would in effect be futile because it's alleged that the notice required under the Endangered Species Act, we refer to it as the 60-day notice, the parties, defendant and the intervenors, claim that the timing of that notice relative to when Section 7 duties were performed and completed by the agency in effect ended. And that in the interim period, that the notice, which is the 2006 notice that's referred to by the proposed supplemental complaint, that in effect, under the law, that that does not complain of actions or activities that were -- I don't know if ripeness is the right term, but were ones that could be complained about.

And there are additionally what would be in effect standing objections that are raised, although the Court's view is that we have implicitly, if not explicitly, faced that issue in the case as it has progressed.

And so let me give you my tentative views on this motion and then if anybody wishes to argue, you may.

The policy that underlies Rule 15(a) and (b), that permits the amendment or supplemental filing of a pleading that will expand or enhance an existing pleading starts out with a policy of liberality and the liberal policy can be affected by the passage of time, it can be affected by what could be found to be delay that causes prejudice. That's another iteration of the equation for saying that the delay is unreasonable.

And the third subject that a court looks at in determining whether or not a supplement and/or amendment should be permitted is to determine whether the proposed supplement, in effect, states a claim because if, under rule 12(b)(6), the claim would be legally insufficient and there is no set of circumstances under which the plaintiff could cure, by amendment, the substance of the pleading, then under the futility exception, the pleading should not be allowed.

Now, in this case, it is helpful to, one, look at the history, the pleading history of the case. And two, the substantive history where the case is, by virtue of its practical status, in what has been done and what remains to be done.

And I'm referring now to the first supplemental complaint for declaratory and injunctive relief. This is

document 40-1. It was filed May the 20th of 2005 by the present plaintiffs. And at that time it was filed against Gale Norton, who was the then Secretary of the Interior, Your Honor. And Matthew Hogan in his official capacity as acting director of the USFWS.

And this complaint sought to invalidate, under the Administrative Procedure Act of the United States, the Biological Opinion that was issued under terms required by United States Endangered Species Act addressing proposed operational changes to the federal Central Valley Project and the State Water Project, which we have referred to variously as the OCAP, which is a mnemonic O-C-A-P.

And the complaint essentially alleged that the Biological Opinion was infirm because, under the 7(a)(2) ESA requirement that the federal agency, in consultation with the secretary, had to ensure that any activity which it authorizes, funds or carries out -- and here, that is the operation of these two water projects in the OCAP -- is not likely to jeopardize the continued existence of any threatened or endangered species.

And in this case, the threatened species is the delta smelt, which had previously been listed as threatened before these biological opinions were issued. And the second prohibition in the statute is that the action must not destroy or adversely modify any listed species' critical habitat. And

actually jeopardizing, within the meaning of ESA, if it reasonably would be expected to reduce appreciably the likelihood of both survival and recovery of the species in the water.

And under 1536(b)(3)(a) of Title 16, a Biological Opinion must, in essence, evaluate those statutory objectives and it must use the best scientific and commercial data available to reach the conclusion that in this case was reached. Because in this case, after extended consultation, reconsultation and in effect further study, there was a finding of no jeopardy made under the Biological Opinion.

And take limits were established relative to the law that requires it. And those take limits, I think the parties do not argue, in effect, depending upon the status of at present, where the Biological Opinion has been invalidated, would essentially go back to 1995 where there was the last unchallenged, and therefore it is presumed to be lawful, take limit that would pertain to the operation of these projects.

In essence, the allegations of the original complaint included that there had been a violation of the Endangered Species Act because there was an improper reliance on uncertain measures to base the no jeopardy opinion on. That there had been either an omission, an exclusion, a failure to consider and improperly analyze what data existed that the actions cumulatively could not be found to be non-jeopardizing

and that the data and the entire record, the administrative record that represented the Biological Opinion, could not support the no jeopardy finding because the smelt was not only in jeopardy, but it was on the verge of extinction.

The original -- this is the supplemental complaint, also attacked the use of an adaptive management plan, the DSRAM, which was found to be uncertain, unenforceable and legally insufficient to provide what the Court found would be legally sufficient mitigation and/or protection to prevent cumulative effects from destroying or adversely modifying critical habitat.

So both, under 7(a), the original complaint that attacked the jeopardy of the species and its potential destruction and the jeopardy and potential destruction of the habitat. And those claims were clearly before the Court, they were clearly joined for analysis.

It is true that they were joined in the context of an APA rather than the direct ESA context, but all the claims were based on the Endangered Species Act. That was the law that has been, first of all, alleged to be applicable. That's the law we have in effect applied. That's the law under which the summary judgment motions were brought and decided.

And then, of course, there was a further claim that, in violation of Section 7(a)(2) of the ESA, the agency charged with the responsibility for the Biological Opinion, which was

the Fish & Wildlife -- US Fish & Wildlife Service, failed to use and consider the best available science. That also was found to be the case in invalidating the biological opinions.

What the new proposed supplemental complaint in effect alleges is that, in addition to the Secretary of the Interior -- and as I said, nobody has briefed or argued whether in effect the Bureau of Reclamation is jurisdictionally within the authority, is directed or otherwise controlled by the Secretary of the Interior or whether it's a stand alone agency.

However, the plaintiffs strenuously argue that pleadings that refer to, whether it's inadvertently, mistakenly or intentionally, the Bureau as a defendant, most of the evidence, because it's the action agency as to who's doing what in this case, has referred to the Bureau, because in addition to the Fish & Wildlife Service, the Bureau has its own fishery biologist. It has its own experts. And since it's the operator of the Central Valley Project, its activities, its evaluations and its actions have been before the Court from the day this case started. And it is true that the bureau has not been a party defendant.

The complaint also -- and let me briefly discuss the Department of Water Resources. The Department of Water Resources sought to intervene and was granted legal authority to do that under an order permitting its intervention. And so

it's here because it wants to be here. And there is no question that the Department of Water Resources of the State of California is a party and it has unlimitedly subjected itself to the jurisdiction of the federal court.

As to the intervenors, here they have all sought to be included as parties and moved to intervene and continue to assert that they have protectable interests and rights which would be jeopardized both in an intervention of rights or with an intervention sense. And they are a real party in interest then and they each claim to have severable and identifiable interests that are worthy of their participating, if you will, severally so that we end up with at least five to seven legal memorandum on every issue that's raised in the lawsuit.

As to the timeliness of the amendments, the plaintiffs in effect suggest that the last action in February of 2005, when the second reconsultation on the Biological Opinion and some modification to the OCAP occurred, within approximately a year February -- I'm sorry, March 20 of 2006, the plaintiffs sent the Bureau of Reclamation, as an action agency, a letter which was captioned 60-day notice of intent to sue for violations of the Endangered Species Act. And that was regarding the impacts of the Central Valley Project and the State Water Project Operations Criteria & Plan, the OCAP, on threatened delta smelt. And there is also reference to its habitat.

The Court understands that there's a six-year statute of limitations for an Endangered Species Act claim and there is no temporal limits. Not like filing a government claim on when the 60-day notice has to be sent. No party has argued or alleged that the 60-day notice is untimely. There's only this argument or allegation that it's ineffective because Section 7 responsibilities allegedly terminated when the OCAP and the BiOp, as of February of 2005, in effect became the agency's final action, which is the subject of the present complaint and the proposed subject of the supplemental complaint.

In effect, the plaintiffs' Section 7(d) claims have been before the Court in the APA claim and we have analyzed and applied ESA law, that's what this lawsuit is all about. So in the sense that is there a new unanticipated potentially prejudicial effect that this supplement would have, how can there be? Is the case in effect over so that we don't need an amendment? Well, the presence of all of you in this courtroom belies that suggestion.

It is estimated by the agency that is responsible for the BiOp, which is the US Fish & Wildlife services, that they may be able to get the reconsultation, which was initiated after the BiOp was invalidated, that that may be done by next August. But, of course, there is no way of knowing.

And because the Endangered Species Act law very much controls what remedy is permitted, what remedy is necessary

and appropriate and what standard for the remedy that is to apply, which is the subject of the second motion. The Court has the historical feeling -- and I will refer to approaching 17 years of experience with over 33 of these cases, that this case is far from over.

And so in the sense that is there a re-opening or a reinstitution or a re-initiating of a suit that we don't need to have before the Court, is that going to -- in effect going to save the parties' resources, serve judicial economy and prevent yet another in the proliferation of the water project cases prevent a 34th, a 35th case? The answer to that is no.

The Court does believe that, in effect, by their actions that, if not expressly, the bureau has impliedly participated, its scientists and its officials have submitted declarations from the time that we started having court proceedings in this case in the summary judgment process, in the hearings that have related to relief, both when injunctive relief was sought and when the project's operations were interdicted and attenuated in June and at other times.

And so not only is there no prejudice, but the Court believes that it's an absolute necessity that the bureau is here and there was no Rule 19 motion made by the government when the supplemental complaint was before the Court, in other words, arguing that the bureau was indispensable. There was no suggestion that a failure to join at that time caused

prejudice.

And I don't think that the government can seriously say at this time that it would be caused prejudice by the joinder of the bureau. I don't think anybody else has standing to raise whether or not the bureau's a proper party defendant here, other than the United States.

And so my tentative decision is -- we're going to give you more reasons in the written decision, but I don't want to prevent -- because we have time pressures with regard to this evidentiary hearing.

My tentative decision is to permit the supplement to the complaint, to add the Bureau of Reclamation, to add the Endangered Species Act claim. They're not new. They're not different. Of course, the purpose of supplementing a complaint is to permit, as developments occur, and as more bases for claims arise while a lawsuit is pending. And this lawsuit is pending.

That the vehicle to do that is not an amendment, but rather it's a supplement and that's what the plaintiffs have proposed to do. And this is, as in all matters concerning water, an evolutionary and a fluid, if you will, situation where things continue to progress and therefore the Court doesn't find that there will be any prejudice.

The Court finds that it's timely, that in effect with a six-year statute of limitations, no express requirement when

the ESA notice be filed, the 2006 ESA notice filing to the federal agency was certainly appropriate. And under those circumstances, the Court rejects the assertion that in effect, with 70 obligations that, in effect, open quotes, "ended" when what has been found to be unlawful Biological Opinion and finding of no jeopardy was made, that in effect that there was nothing to complain about.

Well, obviously, the complaint that was filed complained about the unlawfulness of the BiOp and the rest of the matters that I'm not going to repeat and we've already gone over.

Now, turning to the Department of Water Resources. It complains that it hasn't received a 60-day notice and it can't be sued under the Endangered Species Act. There is authority that says another governmental agency being sued under the Endangered Species Act should get a 60-day notice. And I'll let the plaintiffs address that relative to when and to what extent the Department of Water Resources is mentioned in any prior 60-day notice.

Rather than go any further with this, I'm now going to let the parties, if anybody wants to argue this. I don't think it's a very close call, quite frankly. But if somebody thinks I'm dead wrong, now is your time.

MR. ORR: Your Honor, would you like me to address the last point with the DWR?

THE COURT: Yes.

MR. ORR: If we were seeking right now, or pursuing a violation against the DWR of Section 9, that is the take prohibition of the Endangered Species Act. If our claim was that they were unlawfully at this moment taking smelt, we could only bring that claim if we had given them 60 days notice. That goes to any violation of Section 9.

The Section 7 duties we're raising and DWR itself admits it kind of tangentially in its pleadings, attach to federal agencies. When you read Section 7, federal actions are what are covered, federal agencies are the ones that are required to consult.

So the simple reason that we did not serve DWR with a Section 7 notice letter is that they had no duties under Section 7. They're not -- they're here because they're in this unusual situation of being joined at the hip and the shoulder and everything else, being --

THE COURT: They're a joint operator.

MR. ORR: -- intertwined. Exactly. And so that is exactly why they came into the Court, invoked this Court's jurisdiction, as Your Honor noted, put themselves before the Court. That being the case, there just isn't any legitimate question about the Court's --

THE COURT: Authority over them. There is no question. And whatever relief is going to be awarded will be

either denied or awarded as against the Department of Water Resources because they've made a general appearance, they've submitted to the jurisdiction of the Court for all purposes. And if their actions are violating the Endangered Species Act with regard to Section 7 duties, that's one thing. If you're claiming that their operations are violating, for instance, a take requirement, then that's going to be a different story.

MR. ORR: Yeah, no, and that is not the matter before the Court at this point, Your Honor. And I think that's all I have to say.

THE COURT: All right. Thank you, Mr. Orr.

Who wishes to be heard. Mr. Lee.

MR. LEE: Clifford Lee representing the Department of Water Resources. Your Honor, the plaintiff's second amended complaint adds two paragraphs in their prayer for relief that was not present in the original complaint. That's paragraphs D and E that are directly directed against defendant intervenors such as the Department of Water Resources. While we recognize that we have appeared and that we have waived any question of personal jurisdiction, that is not the issue here.

THE COURT: And subject matter. Well, subject matter jurisdiction can always be raised. It's not waivable.

MR. LEE: We argue that there's no subject matter jurisdiction before this court to order the relief in paragraphs D and E of their prayer for relief because subject

matter jurisdiction, under that -- under that prayer for relief, requires legitimate 60-day notice.

The 60-day notice that was appended to the complaint in its very first sentence says it's directed against the Bureau of Reclamation. It does not say it was directed against the Department of Water Resources. And we don't believe that there can be a contingent 60-day notice under Section 7. There has to be -- or derivative 60-day notice.

Also you can look at the two claims for relief that they have added here. Never is the Department of Water Resources directly mentioned under those claims for relief as engaging in unlawful conduct. So there is no underlying legal theory set forth for relief. And there is no appropriate subject matter jurisdiction because there, in fact, has been no notice.

So we have raised this issue at this time because --

THE COURT: And you can raise it by appropriate motion. It doesn't prevent the supplement if there's an infirm pleading, then you can move under Rule 12(b) and essentially that's your remedy.

MR. LEE: Your Honor, we understand that. But we submit that the futility defense to the motion to amend the complaint can raise Rule 12(b) issues.

THE COURT: I've already said why the supplemental complaint is legally sufficient. If portions of it are

legally inappropriate, you're asking me to deny the entirety of the amendment based on the tail wagging the dog and the answer is you can attack, as a matter of pleading, if what you have just argued is your legal position. But it's not going to prevent the complaint from being supplemented.

MR. LEE: I understand, Your Honor. We would suggest only that the paragraphs D and E in relief, the prayer for relief against the Department of Water Resources, be expressly struck.

THE COURT: That is not a remedy that's included in a 15(a) motion in opposition. You attack it by a pleading motion under Rule 12 --

MR. LEE: Thank you, Your Honor.

THE COURT: -- under the Federal Rules of Civil Procedure.

MR. LEE: Thank you, Your Honor.

THE COURT: Anybody else wish to be heard?

MR. MAYSONETT: Your Honor, James Maysonett, federal defendants.

THE COURT: Yes, Mr. Maysonett. And let me just ask the court reporter. Do you want counsel at the lectern?

THE REPORTER: It's okay for right now.

MR. MAYSONETT: Is it okay if I use the lectern?

THE COURT: You may. That's what it's there for.

MR. MAYSONETT: Your Honor, I don't want to try the

Court's patience and belabor these issues for too long. I think there's a few matters worth addressing.

As you pointed out, the underlying issues that have been raised all along here are Endangered Species Act issues, but the question is were they Endangered Species Act claims. That is claims brought under the citizens' suit provisions of the Endangered Species Act and they weren't.

The plaintiffs brought the claims under the provisions of the Administrative Procedure Act, not under the ESA citizens' suit provisions. And I think that does restrict the subject matter jurisdiction of the Court and it does define the limits of the waiver of sovereign immunity that's applicable here.

Because the plaintiffs only sued the service, their claims state the limit of the case and they can't be in relief against the Bureau. And I think --

THE COURT: Unless they amend.

MR. MAYSONETT: Unless they amend.

Now, speaking to the motion to amend, Your Honor, I think the central point there, Your Honor, is we can't move forward simply assuming that such claims exist in the case. If the motion to amend --

THE COURT: What is your response to the argument that the bureau in effect has been a de facto party throughout this case? Your pleadings refer to the bureau as a defendant.

They've been actively participating in the litigation. They are the action agency. In effect for all practical purposes, aren't they here?

MR. MAYSONETT: Well, Your Honor, I think that would waive any issues about personal jurisdiction if those were issues. But I don't think it gets to the waiver of sovereign immunity or subject matter jurisdiction. And I think what you find if you look at the case law is that there really are no cases where someone sued the consulting agency, the service, and then obtained -- and did not sue the action agency and then obtained relief against the action agency.

What happens in most cases is that plaintiffs bring both APA claims against the Biological Opinion and ESA claims against the action agency itself. Here they chose not to. That was their decision. They chose to bring the ESA citizens' suit claims in the companion case, but their decision on how they presented their claims does define the limits of the Court's jurisdiction.

Now, of course, that just means that we don't think it's appropriate for the Court to go forward without allowing that amendment or, if it denies it, to not move forward and plaintiffs will have --

THE COURT: You know I'm not going to deny it.

MR. MAYSONETT: I understand, Your Honor. Beyond that, Your Honor, I think you've said several times that you

didn't believe that this would prejudice the Bureau's interest because it's been involved in the case, as you pointed out. I'm not sure I see an alternative to having the Bureau involved in these sorts of issues. We certainly --

THE COURT: I don't need to.

MR. MAYSONETT: -- don't want to decline to provide information to the Court on topics of interest to the Court.

That said, Your Honor, I think it does prejudice the Bureau's interest because if the motion to amend is granted, and what we're going to do is treat these proceedings essentially -- treat those claims as new claims and treat these proceedings as, for example, a preliminary injunction effectively. Then that may be appropriate.

If what we're going to do is amend the complaint and then assume that those claims have been adjudicated, that the plaintiffs have succeeded on the merits, that we're going to be denied the opportunity to present argument on those claims, that, we believe, does prejudice the interests of the bureau.

THE COURT: Well, I will ask Mr. Orr because I think that is a point that is valid. Under claims and issue of preclusion principles, if a party has not been formally named and included in the lawsuit, you have express authority that would make the rulings that the Court has made with that party not participating in the lawsuit in effect binding.

And I'm going to also ask you one question before I

have Mr. Orr respond. And that is what is the interrelationship between the Department of the Interior and the Bureau of Reclamation in the sense that the relief has been awarded against the Department of the Interior? Those findings have been made and why should that not be in effect binding on the Bureau?

MR. MAYSONETT: Your Honor, the relationship is when the bureau is part of the Department of Interior. It is not a stand alone agency. So -- but I think that issue is beside the point. The point is that the --

THE COURT: Beside the point?

MR. MAYSONETT: I think it is beside the point, Your Honor, and let me explain why. Or try to. I think the point is, Your Honor, that the plaintiffs' claims define the limit of the case. The plaintiffs' claims and the motions on summary judgment addressed the validity of the Biological Opinion. Now, that's what we have before the Court.

To the extent that we're moving beyond that to substantive Section 7 claims against the Bureau of Reclamation, that's a different issue. We presented, for example -- in a companion case, we presented independent arguments defending the bureau against those sorts of claims, even in light of the challenge to the Biological Opinion.

THE COURT: All right, Mr. Maysonett, thank you very much.

MR. MAYSONETT: Thank you, Your Honor.

THE COURT: Mr. Orr.

MR. ORR: Well, Your Honor, I think Mr. Maysonett may have answered the question in the earlier statements, which is that if this proceeding before the Court is basically in the notion -- in the form of an injunctive proceeding, which it is, there aren't -- I mean, it's just not true, as it's said in the pleadings, that suddenly we're going to need a new administrative record, we're going to need a new summary judgment hearing. No.

The claims that we're adding, that we thought the bureau had, by describing itself as a defendant and by participating so much in the case, exceeded the jurisdiction relief issues. That is, there are many cases which we've cited to the Court -- I could run through them, but they're in the briefs and I won't waste the Court's time with that -- that say that reliance by the action agency on a legally invalid Biological Opinion is improper and that an injunction needs to issue to prevent that. The Court has already found that there is an invalid -- in several substantial respects that the Biological Opinion is invalid.

So the question now before the Court is what to do about that. And as the Court has recognized, the bureau is an essential part of that determination. But we're not -- I don't know what these other Section 7 claims that we're

purportedly going to bring against the bureau that require a new record and require a new summary judgment are. The claim for the --

THE COURT: I don't know of any. The argument, as I understood it, was that with the limited waiver of sovereign immunity, the Bureau, which we now learn and I thank you for your candor, Mr. Maysonett, is a part --

MR. ORR: Yes.

THE COURT: -- of the Department of Interior, so in effect what legal result that accrues. You still have to name the agency head and the agency head, quite frankly, is always named in these cases. I've never seen them not named.

MR. ORR: Yeah. Well, and the true agency head of the bureau, Your Honor, it's yet another piece of this puzzle, is the Secretary of Interior who's been before the Court the whole time. So I don't want to -- I mean, I should probably stop at this point. But I think that the answer here is that the adjudication necessary to go forward with this remedy proceeding and decide what needs to be done has been made and the question before the Court now is in this interim period, what's needed to prevent jeopardy and to --

THE COURT: Let me state this very practically. Mr. Maysonett, on the issue of sovereign immunity. The Secretary of the Interior is before the Court. True?

MR. MAYSONETT: Yes, Your Honor.

THE COURT: And the Secretary of the Interior has jurisdiction authority and control over the Bureau of Reclamation; true?

MR. MAYSONETT: That's correct, Your Honor.

THE COURT: Therefore because the secretary, who is the ultimate agency head, is totally subject to the jurisdiction of the Court for the claims of violation of the ESA relating to the Biological Opinion and the effect that it has and the failure in the process, the ESA process, then whatever remedies that are necessary that will be ordered to apply to the Secretary of the Interior, I can direct because I have complete jurisdiction over that secretary. Whatever subagencies, or the Bureau, or any other personnel to see that the -- whatever relief is ultimately pronounced is effectuated through the Secretary of the Interior to any subagency, individual or entity that has to be subject to the terms of the order for the relief to be effective. Do you agree?

MR. MAYSONETT: I don't, Your Honor.

THE COURT: All right. Why?

MR. MAYSONETT: Because, Your Honor, the -- again, the claims they brought were APA claims challenging the Biological Opinion. So you have jurisdiction over the Secretary of the Interior to that extent. And the appropriate relief for those is a remand.

If you look at the Supreme Court's decision in

Bennett V Spear, they make it very clear that there's a distinction between claims brought over the APA to challenge a Biological Opinion, that is for a maladministration of the Endangered Species Act and a subsequent claim brought under the citizen suit provisions of the ESA. They didn't bring the latter and that defines the limits of the relief that's appropriate. It limits the relief that's appropriate to remand the Biological Opinion and those related issues.

I think that's important, it's significant because if the Court holds that plaintiffs only bring an APA claim against the service to obtain injunctive relief against Reclamation, because Reclamation is also part of the Department of the Interior, that means that from now on, plaintiffs won't have to provide the 60-day notice that would otherwise be required under the Endangered Species Act to get an injunction against the action agency.

Right now, plaintiffs can -- as you know, Your Honor, plaintiffs can bring an APA challenge to Biological Opinion without providing 60-day notice. The ESA citizens' suit provisions, which are usually what are used to sue the action agency, require you to provide that notice. If they don't need to bring both sets of claims, that means that the 60-day notice provisions of the Endangered Species Act are effectively being run out of statute, at least to the extent to which the action agency and the consulting agency happen to

both be under the same, you know, both within the Secretary of Interior or the Department of Commerce.

THE COURT: All right. That is a separate argument. But you acknowledge that the Court's authority over the Secretary of the Interior subsumes any subagencies, officers, employees who act for and on behalf of the Secretary of the Interior through the governmental, if you will, infrastructure that those agencies represent?

MR. MAYSONETT: Yes, Your Honor.

THE COURT: Thank you. All right. Is the matter submitted?

MR. ORR: Yes, Your Honor.

MR. HITCHINGS: Your Honor.

THE COURT: Yes.

MR. HITCHINGS: Andrew Hitchings for intervenors Glenn-Colusa Irrigation District et al. I have a couple of points in particular to the long-term water contract renewal claims that the Court did not address in its tentative decision, I think it's important to raise here, if I may.

THE COURT: I think where it's important to raise is in a 12(b) motion relative to the argument, as I understand it, the plaintiffs allege that the renewal of long-term water service contracts was premised on the Biological Opinion, that it was in effect a necessary condition, that in the review and, as I understand it -- was there both a NEPA and an ESA

review to renew the contracts?

MR. HITCHINGS: For the various types of contracts that were renewed, that is the case. There was a separate environmental review as well as separate ESA consultations on each batch of contracts.

THE COURT: And the biological opinions were an integral part of that, as I understand it, and had to be considered. And so from the standpoint of can they make the claim if the Biological Opinion is illegal and invalidated? We haven't gotten to in effect deciding if it's a matter of law. But it's a remedy that is being sought. It's relief that's being sought in the context of the APA case.

However, can they file a new ESA claim, which I'm just about to say that they can, would that be an appropriate remedy? If it's not, you can argue and you can move under Rule 12(b)(6) that it either fails to state a claim or that there's an absence of subject matter jurisdiction or that any other basis for which that claim could not be assertable. But it doesn't prevent this complaint from being supplemented because there are ESA claims that can be advanced. We've already just gone through that.

And so relative to the relief that is sought, if you want to say it's futile legally or it fails to state a claim, we'll take it up in a 12(b)(6) motion, but it's not going to prevent the complaint from being supplemented.

So I don't think it's a productive use of time now when we're going to talk about it in remedial phase, which is what we're here to take evidence on. That's when we can talk about it.

MR. HITCHINGS: Well, Your Honor, the question is, if the Court grants leave to file supplemental complaint, Rule 15(d) talks about doing so on terms that are just. And as to the water contract renewals, that is precisely the type of claim that does have an issue with whether the record needs to be augmented. There, the Biological Opinion is but one part of the record that the bureau relies upon to decide its decision as an action agency and whether it complies with the ESA.

And in this case, there are innumerable events, documentation, occurrences through the various consultations that occurred on each of the batch of water contracts. And none of that information is in this record. And right now, the plaintiffs are asking for contract rescission as part of this interim remedies proceeding now. And it doesn't allow time for a 12(b)(6) resolution of the issues.

THE COURT: I'm very well aware of that. Relative to the issues of joinder of claims and joinder of parties, the Court's understanding is the alternative is we're going to see another lawsuit, so we're going to have the proliferation of a brand new lawsuit. We've already got all the Endangered

Species Act here. We've already spent hundreds of hours working on this case.

These contracts are just another incident, they are another facet of the impact, quite frankly, to the operation of the projects, the Biological Opinion and the interplay between the species and the overall effects that it has on every aspect of operations of the projects.

And so do I think it's appropriate that we start yet another lawsuit and go through all the -- we're going to have jockeying for venue, we're going to have the preliminary motion, the answer is no. You make a lot of valid points. I'm going to address those at the time. I don't find that that is either prejudiced or inappropriate legally or jurisdictionally for these claims to now be asserted by way of supplement.

As to the absence of a record and what evidence is going to be required to address those issues, again, you make very valid points. But that doesn't prevent the complaint from being supplemented. Those are all issues that are going to be raised by appropriate motion at appropriate times when we get there.

MR. HITCHINGS: I understand, Your Honor. The point -- the point I want to make is that in any order granting the motion for leave to supplement, it should include those terms that are just with regard to that order. And that

would include, with regard at least to the contract renewal claims that have been newly pled, that there be time for augmentation of the record for any and all record evidence associated with the Bureau's decision, that there be full briefing and a hearing on that particular issue and that there be a decision on the merits before the Court goes ahead and considers remedies on that particular challenge to the contracts.

THE COURT: Mr. Orr?

MR. ORR: If I may, Your Honor. I mean, it's our position that because these actions tiered off of the Biological Opinion that Your Honor has found invalid, that they are also arbitrary and capricious actions.

However, it is also our view that the really important matter that we want to get to at this hearing this week is the interim remedy proposal. And so we are willing to put that aside or move it off rather than have that be a part of this -- I mean, it's the last thing, I suppose, I would say you should get to at this time. It may be that the Court --

THE COURT: The underlying contracts, the rescission --

MR. ORR: Yeah, because what we are most interested in here obviously is getting in place an interim remedy that ensures that the fish is neither further jeopardized from the state of jeopardy it's already in and its habitat not further

adversely modified. And the contracts are an incident of the overall relief we're seeking, but they aren't a part of that.

And so I would just say that to the extent the Court finds itself not able to decide those things and wants to think more about what additional evidence may or may not be needed, we are not -- that's not anywhere near the top of our list of things we would like to see addressed.

THE COURT: All right. Let me say this. Under the authority of Federal Rules of Civil Procedures 17, 18, 19 and 21 respecting the joinder of claims and parties, the Court sees absolutely no basis to have a new stand alone lawsuit to address these the Court believes are derivative claims that are raised by the overall issue of the OCAP operation, the project operations and the effect on the environment.

The provisions of Rule 15(d) do provide that upon such terms as are just, that a supplement can be permitted. And the Court would expect to see those, in effect, raised in a scheduling conference. But we've had no evidence about the contracts or their effects. We've had no evidence about how they were, in effect, renegotiated or how they were negotiated, how they came into effect and being.

And so that, although that is a suggestion as a remedy and maybe it's an ultimate remedy, Mr. Orr has just stated they're not going to pursue that certainly in this hearing and any interim relief that the Court is now going to

order by way of remedies. And I think they recognize, as lawyers, as every one of you should, that we can hardly start issuing relief where we don't have evidence and we don't have a foundation to do it. And so you need not be concerned that the Court is going to be simply skipping ahead and making decisions without a proper legal and factual foundation.

Is the matter submitted?

MR. ORR: It is, Your Honor.

THE COURT: All right. The Court is going to grant the motion to supplement upon terms and conditions to be specified in a written order that will follow. I intend the reasons that I've stated here orally to be a partial statement of decision and I will -- in support of my ruling granting the motion to supplement of the plaintiffs, and I will amplify in a written decision those additional issues.

Now, let's go immediately and see if we can get through this quickly. The State Water Contractors have objected to -- I should say they've opposed evidentiary objections and what -- that directly concern the scope of the remedies hearing.

The plaintiffs have objected to evidence that would concern -- I'm going to call it purely economic consequences. Because I think we need to distinguish here. I think that the State Water Contractors make a very valid point. And I think it's implicit in what the plaintiffs have already suggested in

their proposal of remedies.

It is true that there appear to be different standards under APA injunctive relief and ESA injunctive relief. And the Washington Toxics case, which is the leading authority under which -- and the law is that for an ESA violation, the traditional balancing of hardships doesn't apply. That because of Congress' intent to protect the species and to in effect prioritize and to elevate the species in terms of its interest over and above all other considerations, that we don't balance the hardships. And the species is given that preferential status.

However, I believe that there is an ultimate and it's recognized, I think, very responsibly by the plaintiffs, that health and human safety has got to figure in to the equation somewhere. And when we're talking about stopping emergency services, hospitals, fire departments, other emergency water that's needed to operate communities and to provide for human health and safety, the Court can't ignore such concerns. And so although if this were strictly an ESA case, that Washington Toxics standard is what applies.

There is also -- this is an unpublished case, but in California Native Plant Society versus EPA, it's 2007 Westlaw 201 -- I'm sorry, 2021796. Judge Jenkins, that was a NEPA case, recognized that the APA standard for an injunction is the traditional test, the burden isn't on the agency.

If the injunction is an ESA injunction under Washington Toxics and its progeny and Sierra Club versus Marsh, which is an earlier case in this circuit, then the burden is on the agency and the balance of hardships, that traditional test isn't applied.

And so I'm not going to exclude in this proceeding very focused and very well presented evidence about risk to human health and safety that the proposed remedies that the plaintiff seek will be. But in terms of the economic harm, and, if you will, pure economic harm and dislocations to the agricultural industry and the like, to the extent that that -- and you'll have to explain how that impacts health and human safety, Mr. Wilkinson, which I'm going to give you an opportunity to do.

I'm going to in effect sustain the objection in part, but I'm not going to prevent evidence, because I even called for some of it in my directions to you as to what subjects I wanted covered, what effects the operations proposed would have on human health and safety. So that objection is sustained in part.

Does anybody want to be heard on that evidentiary issue.

MR. WILKINSON: Yes, Your Honor, I would like to be heard.

THE COURT: Mr. Wilkinson.

MR. WILKINSON: Part of the problem we have, Your Honor, lies in the nature of the proceeding that we have here. We have one witness. The Court has allotted two witnesses to all of the defendant intervenors. And our witness is Dr. Hanson, who is a biologist. If this were an ordinary trial, we would have had the opportunity to conduct discovery and to choose the witnesses that we wanted to choose. This is not an ordinary trial. What it really is --

THE COURT: No, this is an interim remedy proceeding.

MR. WILKINSON: Exactly right.

THE COURT: That is called for both under the ESA and the APA.

MR. WILKINSON: Right. And it's in effect an extension of the Rule 56 summary judgment motion.

THE COURT: That's correct.

MR. WILKINSON: We're moving from that. And Rule 56 motions are usually decided on the basis of declarations. So there have been a number of declarations presented to the Court relating to the kind of issues that Your Honor is worried about, the issues of impact to human health and safety kind of considerations.

The other factor that I think is apparent here is that there are, if you will, competing proposals before the Court and there is plenty of testimony through declarations that these competing proposals do not jeopardize the continued

existence of the smelt. In those circumstances --

THE COURT: That's why we're here.

MR. WILKINSON: That's right.

THE COURT: Because of the competing science, quite frankly.

MR. WILKINSON: That's right. And in deciding those questions, if there are competing witnesses who suggest that the proposals that they are advancing do not jeopardize, the Ninth Circuit has made it very clear that the agencies, and we believe, by extension the Court has the opportunity to choose among those proposals based upon the impacts that may be caused. Economic, political and otherwise, social and so forth. That's the --

THE COURT: Subject to disqualification that pertains in every one of these cases, that the Court is not going to usurp the function of the executive to run these projects. The Court has no expertise. It has no training or background. It is not a hydraulic or a fluid mechanic engineer and essentially the Bureau and the Secretary of the Interior are going to continue to run these projects. All they have to do is run them lawfully so that they don't make the species extinct.

MR. WILKINSON: And that's exactly right, Your Honor. That is the test. And we believe that in the circumstances that Your Honor --

THE COURT: Let's be clear on the test because the plaintiffs did raise this.

MR. WILKINSON: I understand.

THE COURT: -- that you can also threaten or jeopardize, without having to go to extinction. And that was part of my ruling, but not all of my ruling. And I do recognize that there can be a lesser showing. We don't have to go to complete obliteration of the species.

MR. WILKINSON: Well, that may be. But we're also dealing with a very brief period of time here, until there is a reconsultation.

THE COURT: It's a year --

MR. WILKINSON: It's a year.

THE COURT: -- that we're talking about. It's not a new Biological Opinion that we're dealing with where the test certainly would be non-jeopardy. This is not that kind of a proceeding either.

The point here is that where there are competing proposals before you and those competing proposals each indicate that they are not going to jeopardize the continued existence of the species, there is an opportunity to show that one proposal may be more narrowly tailored than another proposal.

There is an opportunity to show to the Court, we believe, that some proposals may be more impacting to other

competing needs than other proposals. And we believe it's very important in those circumstances to have the Court be able to rely on the kinds of declarations, the kinds of testimony that we've had previously submitted from a variety of these water resource district managers.

THE COURT: What you've done is you've summarized those and presented them at least in the remedies briefs very succinctly. And I think that's all that needs to be done.

MR. WILKINSON: All right.

THE COURT: In other words, we're not going to hear a witness on that subject unless it relates to health -- human health and safety in the environment.

MR. WILKINSON: That's understood. But the plaintiffs are asking that all of those declarations that we did present be struck, that they not be -- that there be objections to those sustained, that they are inadmissible. And that's the concern we have. Because we have one witness that we can present, we may not be able to get into the kinds of issues that are raised in those declarations and without them, we're in a catch 22 situation. We've got one witness we have to talk about biology. We don't have other witnesses who can talk about some of these other issues. Those are in the declarations and those are before you.

THE COURT: All right. Well, when we get there, you can make an offer of proof and I will determine whether

there's anything that needs to be admitted and I will specifically rule on the objection at that time.

MR. WILKINSON: That's fine, Your Honor. I mean, the alternative for us really is to call all of those people --

THE COURT: Well, you're not going to do that.

MR. WILKINSON: We don't have that opportunity.

THE COURT: That's right. You do not. Mr. Lee?

MR. LEE: Your Honor, Clifford Lee with the Department of -- representing the Department of Water Resources. We would want to share Mr. Wilkinson's concern and note that there are at least two declarations from the State of California that are objected here by John Leahigh. These declarations, we believe, go both to the follow on questions that you have dealt with relating to human health and safety and also the economic question issues that are in the declaration Mr. Wilkinson talked about.

Mr. Leahigh's declarations, he is an engineer with the Department of Water Resources and they go to the actual water costs in terms of reduced deliveries, at least to the individual projects. Obviously we cannot determine whether there are any health and safety, human safety or economic or other consequences of these actions unless you know exactly how much water will be lost. The plaintiffs would have those declarations struck.

Now, we too are subject to limitations on witnesses

and we --

THE COURT: I didn't intend that that evidence be omitted because the net effect of the absence of water south of the Delta and what results from that is something that has the potential to impact on human health and safety. And I said that I would hear that.

MR. LEE: All right. So as to documents 398 and documents 428, which are those two declarations we would assume then, that any rulings on this motion will --

THE COURT: I'll rule on the objections in seriatim as they are presented during the evidentiary hearing to exactly what you refer me to. We're going to put evidence, just like at a trial in, exhibit by exhibit, through the testimony. And if you have a legal objection at the time, make it, I'll rule on it.

MR. LEE: Thank you, Your Honor.

THE COURT: All right.

MR. MAYSONETT: Your Honor, just briefly. I share some of the concerns already voiced here today. We've already discussed -- and would just point out that the water cost issues also go beyond the public health and safety and economic issues, but may also bear on effects on other listed endangered threatened species. And also on how the system is managed from year to year. It may be that using more water this year may jeopardize the amount of water we have next

year, issues like that that may themselves bear on the species.

THE COURT: That is inherently part of the proceeding and I would not expect to see such evidence excluded. In other words, if you draw down water so that the storage capacity is such that you're going to have to have extra time to refill and to recharge the reservoirs or if the pumps go down and the time that the pumps are down is such that the pumps then have got to be rewired and they're out of service for a year, that's something that we need to know about. And I don't think the plaintiffs will be objecting.

All right. Are we ready to start the evidence?

MR. WALL: The plaintiffs are ready, Your Honor.

THE COURT: All right. You may call your first witness.

MR. WALL: Your Honor, may I have an opportunity to make a brief opening?

THE COURT: You may. Given the volume of papers that I have received, I wasn't sure that you were going to make opening statements. But anybody who wants to make one, now is the time.

MR. WALL: Thank you, Your Honor. Once again, Michael Wall on behalf of NRDC and, in this proceeding, all of the plaintiffs.

I'd like to, in this brief statement, preview the

evidence that the Court will hear from the plaintiffs and offer a lens through which the Court might view that evidence, and view that evidence in relation to the questions that the Court has posed.

Our witnesses are biologists, they're fisheries biologists and their testimony will be presented in the structure of the fishes' biology, which relates to but doesn't precisely parallel the questions the Court has posed; but in the course of the testimony, they will answer all of the biological questions this court has raised.

There's one other preliminary matter that we hope the Court will have an opportunity to address. There are, I believe, six separately represented groups of defendants and we do have a concern if all six are going to cross-examine our witnesses that it will become quite extended and prejudicial to the defendants.

THE COURT: I think that is a very helpful suggestion. Let me ask the intervenors. How many attorneys -- I recognize there are separate parties, but how many effectively do we need to cross-examine? Because I don't want duplication. I'm going to permit -- it will be -- it will be one attorney per witness, same attorney handles the direct and the cross, only one attorney makes objections for a party.

And so I'm -- the federal defendants are going to

cross and have the right to treat a witness, the state does. Now, as between all the intervenors, if there are truly such differences that it would in effect require a separate perspective and a separate attorney questioning, otherwise my sense is that if we have one or two at the most. You can hand questions, I'll give you time to consult with each other for the asking of questions. But I don't think we need four or five lawyers questioning for the intervenors.

MR. O'HANLON: Your Honor, Daniel O'Hanlon. I would agree with the Court. I think there is -- there are some differences among the intervenors and those will come out during the scope of this trial. I suspect that Mr. Buckley and my positions are very close. That may not be the case with respect to --

THE COURT: I think Mr. Wilkinson's interests are probably different from yours.

MR. O'HANLON: Yes, they are, Your Honor. Because I anticipate --

THE COURT: You're competing for the water.

MR. O'HANLON: And there are other issues -- there are other different ways we view the evidence and the issues in the case. So I expect that either Mr. Buckley or me at least will be examining in addition to Mr. Wilkinson. Although we will make every effort to avoid duplication. And as the Court is aware, we do try to do that and avoid

duplication in arguments. And a number of counsel here have worked previously together on various cases and we will endeavor to avoid duplication.

THE COURT: All right. So for the purposes --

MR. HITCHINGS: Your Honor.

THE COURT: Yes.

MR. HITCHINGS: Andrew Hitchings. Given the Court's prior statements and Mr. Orr's assurances during a prior proceeding, I don't see any need for Glenn-Colusa Irrigation District to cross-examine.

THE COURT: Thank you.

MR. HITCHINGS: Thank you.

THE COURT: Let's have one attorney questioning for Westlands, the Farm Bureau and Glenn-Colusa. I'm going to let the State Water Contractors, because their interests are so different, question separately. So that will mean, in effect, we've got five sides. There will be no more than four attorneys questioning on the opposite side from you, Mr. Wall.

MR. WALL: Your Honor, if they really have different questions, we can't object.

THE COURT: That's right. We're not going to hear duplicative questions. And if -- even though it's a different party asking the question, if it's the same question, you can object that it's been asked and answered and I'll sustain the objection.

MR. WALL: Thank you, Your Honor.

Your Honor, this case may decide whether one of the species placed on this earth survives or disappears forever. The delta smelt is a short lived fish. And through no fault of its own, it exists in only one small location on this earth, some of the habitat within the Bay Delta Estuary.

As a result, the delta smelt lies in the cross hairs of the massive federal and state water projects that regulate much of the hydrology in the State of California.

By every reliable scientific indicator, the abundance of the delta smelt has crashed. The indices which the federal and state indices use to measure these populations are at record lows. In some areas, where delta smelt were once abundant, they are now hard or almost impossible to find.

We will present testimony from two witnesses. Professor Peter Moyle is the world's leading authority on California native fishes. As the Fish & Wildlife Service, the defendant, itself said in its Biological Opinion, Professor Moyle is the foremost expert on delta smelt. Professor Moyle's respected both for the rigor and for the integrity of his opinions ranging from his work, his lifetime research on the native fishes of the central valley, to his work on the panel of the National Academy of Sciences that consider the decline of salmon on the Klamath River.

Dr. Christina Swanson has been studying fish biology

for more than 20 years. During more than half of that time, she was a visiting post doctoral investigator at the University of California Davis where a substantial part of her research focused specifically on delta smelt. Among her many peer review publications are eight that deal in whole or in part with the biology of the delta smelt, which may be more peer review publications on this fish than any other researcher in California.

In recent years, as a senior scientist with the bay institute, she has continued her research on delta smelt and published several publications on the fish. And she's also been deeply involved in Bay Delta management and fish restoration efforts, participating in several governmental teams and agencies that work on these issues.

Professor Moyle and Dr. Swanson will testify that the delta smelt is on the threshold of extinction. There is, candidly, much that science does not know about this fish. Science doesn't know with certainty all of the reasons for the Delta smelt's decline. Nor does it know the precise relative importance of those causes that have been identified. Despite a huge amount of research, particularly in the last several years, many questions remain unanswered.

There are certain things science does know, however. We know that delta smelt have reached record lows by every reliable indicator. We know that much of that decline has

occurred at a time when the state and federal water projects have increased exports and changed the timing of those exports.

We know that reduced inflows of fresh water to the Delta, which are caused both by operation of pumping facilities, but also by other operations of the state and federal projects with only water that would otherwise be flowed to the Delta.

We know that those reduced inflows have reduced the quality of the Delta smelt's habitat, its critical habitat. And we know that the operations of these projects have made part of the critical habitat of the delta smelt almost entirely inhospitable for this fish.

Thousands of delta smelt are being salvaged in CVP and State Water Project holding tanks in pumping facilities where they die. We also know that these salvaged fish represent only a fraction of the total number of fish that are directly killed by entrainment at pumping facilities, since most of the fish that are entrained are never even counted. And we know that the operation of these projects cumulatively with other powerful forces affecting delta smelt are battering the species towards extinction.

As this court recognized this morning, until the defendants prepare a valid Biological Opinion, the court may not prevent defendants' proposed operations to proceed unless

the defendants carry a burden of proof. It is a heavy burden. They must prove, in the face of scientific uncertainty, that their proposed operations will neither jeopardize the delta smelt nor reduce the value of its critical habitat for the species' survival or recovery.

The last part of the standard is important because, although the limit of the Court's and parties' attention has been focused on entrainment at the pumping facilities, the federal and state water projects have much broader affects on the Delta smelt's critical habitat. Substantial portions of that habitat around and upstream of the water projects have become all but lethal to the delta smelt when the pumps are operating at a moderate to high capacity.

The operations of both these pumps and of the projects reservoirs, as I've mentioned, reduce inflow to the Delta which makes that habitat less valuable to the species. While scientific uncertainty remains as to the precise extent of these effects, the projects effects on delta smelt critical habitat are not benign and defendants will not prove otherwise.

Now, the defense will present testimony, or we expect they will, that the delta smelt numbers in the hundreds of thousands. And the implication from that -- or perhaps the millions. And the implication from that is that we're not supposed to be concerned.

There are three things that the evidence will show about that testimony. The first is that the method by which those population counts were made is unreliable. It rests on a series of assumptions that the peer review literature have recognized are known to be incorrect.

The second, those population estimates are for larval and juvenile delta smelt. Now, that's important because it -- the population of the smelt depends a lot on when you count it. A single spawning female may have a thousand or even perhaps 2,000 eggs which hatch into larvae. But if the population were stable, only two of those thousand or 2000 eggs would actually survive to reproduce.

So what this means is that at the beginning of the life cycle of the delta smelt, you have many, many, many orders -- many, many more fish and have orders of magnitude more fish than you have at reproductive age. And what the defendants' experts are doing is counting the fish at an early lifestage.

What our experts will testify to, Dr. Moyle and Dr. Swanson, is that even if these unreliable population counts were accurate, that would not change the jeopardy in which the delta smelt finds itself.

The defense may also present testimony that the lack of food is the principle cause of the Delta smelt's decline. The statistical analysis and assumptions underlying that

testimony, which we believe will be presented by a non-biologist, are not supported.

There is some evidence that limitations on food abundance have played a role in the Delta smelt's difficulty in rebounding to its historic levels of abundance. But there is no reliable evidence that lack of food is the cause, the sole cause, the principle cause of the smelt's decline. And, in fact, actual empirical observations of these fish by individuals who are working with them found that most are healthy and well fed, with their bellies full.

At the conclusion of this evidentiary proceeding, the Court must determine whether the defendants have proven that the remedies they proposed will fully address the water projects' contribution to the jeopardy of the delta smelt and the adverse modification of its critical habitat. The defendants' remedies do not succeed in this goal and we will draw a number of problems with their proposed remedies.

But let me just highlight three themes that the Court will see.

The first is that these actions are almost entirely focused on entrainment at the pumps. As I've indicated, the effects of the water project go far beyond entrainment at the pumps, they go to the effects on the Delta smelt's much broader critical habitat. None of the defendants' proposals directly address that concern, that -- we're the only one who

have put forward a remedy that would provide higher quality habitat during the critical rearing months for the species.

Second, many of the actions that the defendants propose would be triggered by a finding of delta smelt near or in the vicinity of the pumping plants. Unfortunately, delta smelt populations are so low that sometimes the surveys that are looking for them cannot find them even when they are present. In addition, the surveys and salvage counts, which the defendant agencies use, do not even look for smelt below 20 millimeters. They're not looking for larval smelt or young juvenile smelt. And that means if they're triggering their actions off of finding smelt that they're not even looking for, their actions will not be protecting those fish.

This is why we have proposed, as part of our remedy, enhanced monitoring so that we all have better information about when the smelt are present.

Third, when proposing flow conditions to keep delta smelt away from the pumps, in the face of uncertainty, the defendants' proposals consistently err on the side of less protection for the fish. The law, however, requires that until the Fish & Wildlife Service issues a valid Biological Opinion, uncertainty must be resolved in favor of the delta smelt.

Plaintiffs' experts, Professor Moyle and Dr. Swanson, will present a more robust remedy that acknowledges the

precipitous decline of the fish species; acknowledges the CVP's and the State Water Project's impacts beyond entrainment; acknowledges that the present surveys are incapable of reliably detecting delta smelt even when they are present; and that uses a conservative approach to set flow targets based on the best available science. We will ask the Court to adopt that remedy.

This Court is being asked to craft a remedy that may last only one year. We hope that the Fish & Wildlife Service will complete its consultation with the bureau expeditiously.

Had the service prepared an adequate legally valid Biological Opinion in the first place, the Court would not be asked to craft a remedy at all. But it must do so and do so unfortunately, from the Court's perspective, in the face of some scientific uncertainty.

The delta smelt cannot take risks. Its population is at the lowest point ever recorded. It lives only one year. If the remedy this Court adopts proves inadequate during the next year, the delta smelt might in that year cross the tipping point toward extinction. This is a result that the Endangered Species Act does not count.

Thank you. I would like to call Professor Peter Moyle.

THE COURT: Before that, let me ask. Does any other party wish to make an opening statement?

MR. WILKINSON: Your Honor, for the State Water Contractors, we'd like to reserve that opportunity for when we call our witness.

THE COURT: Yes, you may.

MR. O'HANLON: Your Honor, Daniel O'Hanlon for San Luis Delta-Mendota Water Authority. I would like to make a brief opening statement at this time.

THE COURT: Mr. Lee, you're up.

MR. LEE: Your Honor, Clifford Lee for the Department of Water Resources. We would like to reserve our opening statement until we call our witness.

THE COURT: You may.

MR. MAYSONETT: Your Honor, James Maysonett, I think it would probably make sense to reserve ours until just before our witnesses.

THE COURT: Thank you very much. All right. Mr. O'Hanlon. Yes, Mr. Buckley.

MR. BUCKLEY: I was going to say Farm Bureau would like to make an opening statement at this time perhaps following Mr. O'Hanlon.

THE COURT: All right. As long as it is not duplicative.

MR. BUCKLEY: Yes, Your Honor, I'll try to avoid this.

THE COURT: So listen carefully. If your points are

covered, please don't repeat it.

MR. BUCKLEY: All right. Thank you.

MR. O'HANLON: Thank you, Your Honor. Good morning. And Daniel O'Hanlon on behalf of defendant intervenors and San Luis & Delta-Mendota Water Authority and Westlands Water District.

This case is about a paradigm. A paradigm that has been in existence for a long time. A paradigm that says that the Central Valley Project and the State Water Project are the major cause of the decline of Delta fishes, including the delta smelt. As more information has become available about Delta fishes, including the delta smelt, this has changed somewhat and is now evolved to there are multiple factors affecting the delta smelt, of which the projects are one.

But somehow, when it comes time to do something to protect the delta smelt or other fishes, all the solutions are directed at the projects. Changing the project operations. Not much effort, not many measures are devoted to the other factors affecting the delta smelt. So the paradigm lives on.

Most of the evidence you are going to hear in this hearing rests on this outdated paradigm. Certainly from the plaintiffs, who insist that changing project operations is the key to the survival and the recovery of the delta smelt.

This is not simply a question of what is the status of the delta smelt. The question here is what effect do the

projects have on the survival and the recovery of the delta smelt. And those are two different questions. Their measures presume, with precious little evidence to support them, that project operations have major population level effects on the delta smelt so that changing project operations will then produce population level benefits.

To some degree, the proposals by the other parties that have made before the Court by Fish & Wildlife Service, by the Department of Water Resources and the State Water Contractors make the same assumptions.

We reject that paradigm. We don't believe the data support this paradigm. And we will be presenting a very different picture for the Court.

As counsel indicated in his opening statement, there is a lot that is not known about the delta smelt. There are many uncertainties about the delta smelt. But there is a lot of data that has been gathered over the years. We have years of surveys going back to the 1960s. There's a lot of data about project operations and about flows and the level of export and the level of salvage of delta smelt at the pumps.

That data can be analyzed using statistical methods to help answer questions about what is causing the decline of these fishes, including the delta smelt and ask the questions using tools that are objective and don't rest on presumptions and biases. But instead look at and use the data and the

Endangered Species Act says that is what you must do, you must look at the data. And what does the data tell you? Not presumptions and assumptions.

We will be presenting the testimony of Dr. William Miller. He, with the assistance of others, has exhaustively analyzed this body of data, including particularly with the assistance of Dr. Bryan Manly, one of the foremost statistical ecologists. He has found a statistically significant relationship between project operations and the abundance of the smelt.

Statistically significant, yes; but major, no. It's a minor effect. On the degree of a few percent. There's an effect from the projects? Yes. Is it a large effect? No. Is it the difference between survival or not in the delta smelt? No. Changing project operations is dealing on the margins of the problem for the delta smelt.

Dr. Miller will testify in addition that he has found both a statistically significant and a very large effect between the abundance of delta smelt and their primary food, particularly in the month of April, that explains very well the decline of the delta smelt.

That is where the focus of the solution to pump or don't pump should be. Not on making yet further changes to project operations that we believe are not going to do much good, if any, for the delta smelt and yet will have many, many

serious collateral consequences.

Finally, Dr. Miller will address the Court's questions concerning population estimates. He will testify that while initially there was some resistance to the estimating population of delta smelt, it is now accepted by a number of researchers that estimates can be done and do provide useful information. And he'll put into perspective, for example, the level of salvage at the project pumps, which in relation to overall population is minor, small.

In sum, we believe that the evidence will show that while measures can be taken to benefit individual delta smelt, for example, by limiting entrainment at the project pumps, there is no population level benefit to these measures. And so those measures aren't essential to comply with the mandates of Section 7(a)(2).

Old beliefs, old paradigms do not change easily. People do not let go of old presumptions easily. But if the decisions are based on what the data show as the ESA requires, then that old paradigm must give way with respect to the project operations.

We will ask the Court to remand the Biological Opinion without vacatur. Thank you, Your Honor.

THE COURT: Thank you, Mr. O'Hanlon.

Mr. Buckley, anything left to say.

MR. BUCKLEY: Nothing left to say, Your Honor. I

agree with Mr. O'Hanlon.

THE COURT: Thank you very much. You may call your first witness.

PETER B. MOYLE,

called as a witness on behalf of the Plaintiff, having been first duly sworn, testified as follows:

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

THE WITNESS: I am Peter B. Moyle, M-O-Y-L-E.

THE COURT: You may proceed.

MR. WALL: Can the Court hear Professor Moyle?

THE COURT: If you can pull the mike. You've got it there. If you can speak onto it.

THE CLERK: Doesn't seem to be on.

THE COURT: Will you tap it again? Still off. There we go. Good to go.

MR. WALL: Thank you, Your Honor.

DIRECT EXAMINATION

BY MR. WALL:

Q. Professor Moyle, could you please introduce yourself to the Court?

A. I'm Peter Moyle. I'm a professor of fisheries at the University of California at Davis where I've been since 1972. Prior to that I was at Fresno State University for three years. And prior to that I was in graduate school at

University of Minnesota where I obtained my Ph.D. in aquatic ecology.

Q. Could you describe your research?

A. I have been working on native fishes of California ever since I arrived here in 1969. And I've been working on Delta fishes ever since I arrived at Davis in 1972. As a matter of fact, the delta smelt initially attracted as a research subject because, as an assistant professor, I need something easy to work on that would result in papers and the delta smelt was abundant and easy to obtain.

I also, in 1979, I began annual research -- a study in which I sampled the fishes of Suisun Marsh, which is part of the estuary, monthly since January of 1979. And that's regarding -- that's one of the ongoing monitoring programs in the San Francisco Estuary. The advantage of that, having that program under my supervision, is that I'm in continuous contact with the Delta fishes, so to speak. Every month I know really what they're doing at least in one part of the system.

Q. Professor Moyle, have you had occasion to publish research on California native fish?

A. I have published roughly 180 papers, probably 75 or 80 percent of them are on native fishes, or California fishes one way or another. I'm author of the book Inland Fishes of California published by University of California Press, which

is largely widely regarded as the standard reference work on the fishes.

As a matter of fact, I've always felt that was one of my jobs as a university professor was to share as much of the information of California fishes as broadly as I could. And that book was published in 2002, at least the most recent edition was, and is on most fisheries biologists in the state bookshelves.

Q. Professor Moyle, you're a fellow of the California Academy of Sciences?

A. Yes, I am.

Q. And you were acquainted by the Fish & Wildlife Service to head the Delta Native Fishes Recovery Team?

A. Yes, I was. We completed that document in a year. It came out in 1996.

Q. And you served on a National Academy of Sciences panel to consider the decline of native fishes on the Klamath River?

A. Yes, I did.

Q. When was that?

A. This that was two years, three years ago.

Q. You were --

A. For -- sorry.

Q. You were a co-author of the National Academy --

A. Yes. They had a book come out on describing the findings and I'm one of the co authors.

Q. Have you ever previously testified at trial?
A. Yes, I have.
Q. And have you been qualified as an expert witness on fisheries biology?
A. Yes, I have.
MR. WALL: Your Honor, I'd like to move that Professor Moyle be qualified as an expert for this proceeding in fisheries biology.
THE COURT: Is there any objection?
All right. The Court accepts the tender of Dr. Moyle as having sufficient background, expertise, knowledge and training to offer opinions on the subject of fishery biology as it relates to this case and the delta smelt. You may proceed.
BY MR. WALL:
Q. Professor Moyle, just one last preliminary question this morning. Are you being paid for your testimony here today?
A. No, I am not.
Q. Could you please tell us about the life history of the delta smelt.
A. The delta smelt is a unique fish in that it has just one-year life cycle. Basically it starts off by -- as an egg that's been spawned up in the upper part of the Delta, usually depending on the year, but they're widely distributed in the Delta. The eggs hatch, the larvae move into the water column

where they're carried by the rivers and by the tides down in to Suisun Bay, which is their optimal habitat. That's essentially a brackish tidal water area where they move up and down in the water column which enables them to stay essentially in place and find areas where food supplies are high and feed and grow.

They spend roughly six to nine months in that habitat in Suisun Bay, when they begin gradually moving upstream again to spawn. And again, they're very good about finding the places where they can capture the tides to get a free ride up. And they move in to areas where they can spawn. At the same time it's not a directed rapid migration, it's relatively slow. So while they're moving up, they're also feeding.

Q. And is the speed of their migration or attempted migration affected by their swimming ability?

A. Yes. These are a fish which are not great swimmers. But it's -- they have a method of swimming which is perfectly adapted for the historic conditions of the Delta. Essentially they take a burst of swimming, then they rest, they glide essentially. A burst and they glide.

So this is a type of swimming which allows them to take advantage of the tides because when they're gliding, they allow the water to carry them forwards or backwards depending on where they are. It's also worth noting that because -- partly in relation to this behavior, that they are

not a schooling fish as such. We tend to envision these plankton feeding fishes as being in dense schools, but they tend to be in aggregations related to favorable habitat, but they're fairly dispersed in the water column, at least in the surface waters of wherever they're found.

Q. Could you elaborate on the preferred habitat of the delta smelt?

A. Well, the preferred habitat depends on lifestage. When they're spawning, it's in fresh water. They're apparently seeking out areas with hard substrates they can aggregate over and deposit the eggs where the males fertilize them. The best -- it's thought now that they're looking for areas of sand and gravel because that's what related species find. Prefer.

The larvae then, once they hatch, move down as fast as they can really to get into Suisun Bay where survival rates seem to be highest in areas where you have moderate salinities.

And these areas of moderate salinities where fresh water and salt water mix and that's, again, where -- because it's mixing there, it's also the area where you have the highest densities of food, which these small smelt feed on.

And the almost -- they're -- they feed almost exclusively on copepods, which is a small crustacean that lives out in the estuary and they feed on all different life history stages of these animals.

They like temperatures that are fairly cool. They can tolerate temperatures given appropriate conditions up to 28 degrees centigrade. But really they prefer to be in water that's less than 20 degrees. Which is characteristic of Suisun Bay.

Under those conditions, they grow reaching 60 to 70 millimeters in nine months or eight, nine months or so and then they migrate upstream again into fresh water.

Q. You mentioned that their preferred habitat during the rearing stages is in this low salinity zone. Does the location and size of that low salinity zone vary with hydrologic conditions?

A. Yes, it does. During periods of low inflow, as we've noted from severe droughts, especially it tends to be very small and concentrated in the upper parts of Suisun Bay or even in lower parts of the Delta, in the Delta channels where -- which means it's a much smaller area available for smelt to rear in.

Under really high flow conditions, they can be out in -- even in San Francisco Bay. That doesn't happen very often. But more typically, under more usual or under naturally high outflow conditions, it would be down in lower Suisun Bay somewhere. Again, differences of 50 to 60 kilometers or more of space for the smelt.

Q. And does the location of that preferred habitat zone

affect the quality of the habitat for these fish?
A. Yes. Because what the smelt like, again, is this relatively low salinity water at the appropriate temperatures and also of -- not where the water clarity is not too great because they have to see their prey against the background.

And they also seem to do best where the water is fairly shallow and the currents are not too strong. In other words, they can stay in the tidal currents and find their -- the food supplies that they need. They're typically in water that's less than five meters deep.
Q. And from this perspective, is there a difference in quality of the habitat between, say, Suisun Bay and the upper reaches -- I guess I want to say -- I'm not sure I want to say "upper," the reaches of the habitat where they would be found if there was less fresh water inflow?
A. Yes. When -- during drought periods in recent past, when there were some signs of decline, they were concentrated in the lower Sacramento River. Which is fairly deep. And it didn't have the food supplies that you would expect that they would really need to really thrive, at least for a large population to thrive. So the more they're down in Suisun Bay, the better off they are.
Q. Could you describe the reproductive strategy of this fish and its fecundity?
A. Well, the delta smelt is a group spawner. It moves up

into -- it selects its spawning areas and then they spawn in batches. They have external fertilization. Each female produces anywhere from -- depending on the size of the female, 1,000 to maybe as many as 3,000 or 3500 eggs, but usually when you're doing population estimates, you say it's around 2,000 eggs depending on the size of the fish.

So you -- so it has a relatively low fecundity for a plankton feeding fish. Normally with fish of this nature, you'd expect a much higher -- much higher number of eggs per female. That's one of the many remarkable aspects of its biology, its actual number of eggs a female produces is so low.

Q. You used the word "fecundity." Could you explain what that means?

A. Fecundity simply means the number of eggs per female.

Q. Professor Moyle, in the course of your research, have you reached any conclusions about the Delta smelt's present risk of extinction?

A. Yes. I think that the smelt is on the verge of extinction. That it needs to be listed -- it should be listed as an endangered species. If you look at it in a clearly -- in a rational way, in terms of looking at all the things that are going on with the delta smelt, they should be on the endangered species not as a threatened species, but as an endangered species, which essentially says the threat of

extinction is imminent.
Q. And what are the factors you would consider in making that -- or reaching that conclusion?
A. Well, it's -- it's unfortunate, but you can never find just one cause. There are multiple causes out there. And the causes are -- they have -- I should say, they have variable amounts of information in terms of how important they are. But the things that have been pointed to have been pesticides in the system, toxic materials in the system, the -- another thing that's been pointed to is food supply, declining food supply. A third factor has been the decline in the amount of habitat in Suisun Bay. Covers a variety of things. And another factor has been the entrainment in pumping plants, in pumps everywhere from the small diversions of the Delta up to the bigger -- the pumps in the State Water Project and the Central Valley Project.
Q. I'd like to come back to those multiple potential causes in a moment.
But first I'd like to focus your attention on not the causes of concern for the species, but the indications that the species, as I believe you testified, is on the verge of extinction.
A. Well, we are -- we are blessed in this estuary with some really good monitoring programs, even though the long term ones were set up initially for striped bass, they also have

been good programs for delta smelt because striped bass -- juvenile stripe bass and delta smelt occur pretty much in the same areas. We have sampling programs that go back to the late 1960s, the Fall Midwater Trawl Surveys and a number of surveys since then.

So it's a well monitored estuary. That includes, by the way, my own Suisun Marsh monitoring program which goes back, monthly cycling starting in 1979.

THE COURT: Actually, excuse me for interrupting. But this is a subject that's very well known to you, but our court reporter is trying to make a record. And the pace at which you're speaking is, I'm sure, she's been going for an hour and 45 minutes, is exceeding her present capability. So let's take the morning recess at this time, ladies and gentlemen. We'll stand in recess until 11 a.m.

THE WITNESS: And I will try to slow down.

THE COURT: Thank you.

MR. ORR: Thank you, Your Honor.

(Recess.)

THE COURT: We're back on the record in NRDC versus Kempthorne. Mr. Wall, you may proceed.

MR. WALL: Thank you, Your Honor.

Q. Professor Moyle, I'd like to just touch on one other aspect of the Delta smelt's life history that I may have neglected to raise with you. What's the life span of this

fish?
A. Well, 99 percent of the fish live just one year. There is a tiny fraction that live two years. And Bill Bennett and I, who's one of the persons whose written the most recent monograph on smelt have gone around about this, had lengthy discussions. We -- and he's pretty much figured out that the two-year old fish don't contribute much to the population. At one time we hoped they would be a savior for the fish, but they don't appear to be.
Q. Dr. Moyle, prior to our break, you testified that you've -- in your view, the delta smelt is on the brink of extinction. And I wanted to ask you to elaborate on what are the factors that led you to that conclusion?
A. Well, the first factor I mentioned was toxic materials, pesticides, that's always something in the background. When you're working in the Delta or in the San Francisco Estuary, you always have to be thinking about pesticides because it's an agricultural region. There's lots of materials coming out of the fields.

There's also -- it's also in urban areas, so both cities, Stockton and Sacramento and so forth, have storm drains that periodically release toxic materials into the system. These -- the presence of toxic materials actually pesticides is fairly episodic.

The problem with using them as a major cause of smelt

declines is that, first of all, they have pretty much been around one way or another throughout the whole period of decline and before. Although there are some new pesticides out there, that may have increased the problem. But also there's a lack of any direct evidence of toxic materials causing kills of delta smelt or causing the direct appearance. I -- disappearance, rather.

I don't doubt that there are times that they are causing stress to the smelt. Some of the physiological evidence will even suggest that. But there's really no evidence that toxic materials by themselves are the cause of the decline.

Another factor that is mentioned fairly often --

THE COURT: Let me ask you a question, doctor.

THE WITNESS: Yes.

THE COURT: You say that there is a lack of direct evidence that toxic materials are killing the smelt.

THE WITNESS: Yes.

THE COURT: They're stressing them, but there's no direct evidence that this is in effect reducing the species.

THE WITNESS: Yes. What you have is some of the studies that have done of the tissue of the smelt occasionally show fish that have lesions that you might attribute to exposure to toxic materials. But again, that's indirect evidence. They may be caused by a number of things.

There's occasional records of -- most recently of the water in which delta smelt had been found being toxic to laboratory animals, mainly Dafnia, which is a small crustacean. Again, it's -- doesn't -- doesn't prove that -- doesn't -- you can't really say that's a cause of delta smelt death. In other words, there's some indirect things going on out there --

THE COURT: For instance, the tissue of fishes that are recovered doesn't show toxicity that would be related to what's in the water?

THE WITNESS: No. In fact, there's -- one of the more remarkable things, when you think of everything that's going on out there, is some of the recent studies by Swee Te at the University of California Davis and also Dr. William Bennett find a surprisingly healthy population of smelt in terms of they look at the body condition and they find smelt that have plenty of fluid that seem to be -- don't seem to demonstrate major exposures to pesticides. Which is in remarkable contrast to striped bass, which have lots of problems.

THE COURT: And if you water sample and then test the water by analysis for content, there aren't recognized chemicals that produce fatal effects in this species?

THE WITNESS: There are chemicals out there that can be fatal, but the direct tests, as far as I know, have not

been done. It's all by inference.

THE COURT: But those could be done, those kind of tests.

THE WITNESS: They could be. But the exposure would be very short. These things are episodic. They appear in the water and they get washed downstream. They may flush back and forth in the tides, but by and large, the exposure to this fish is going to be short. Which doesn't mean that it couldn't be a problem at times. But you have to keep in mind that pesticides of one sort or another and various other kinds of pollutants have been out in that system ever since humans have been settled around there and in large quantities.

THE COURT: Thank you. You may continue.

BY MR. WALL:

Q. And Professor Moyle, with respect to pesticide concentrations in the water, would the addition of fresh water from behind the CVP and State Water Project dams to the Delta have a tendency to affect those concentrations?

A. Yes. That's always the kind of thing you -- as a biologist, I don't like saying, but, in fact, the dilution is one of the solutions to pollution, as they say, that you have -- you can dilute the effects of pesticides by putting more water in the system. It's a terrible way to do business, but, in fact, it works.

Q. Professor Moyle, you were addressing other potential

causes of the Delta smelt's decline.
A. Yes. The -- another aspect is the decline in the amount of habitat available for rearing, specifically in the Suisun Bay, the low salinity zone in Suisun Bay. There's a recent paper that came out by a group of scientists from the Department of Water Resources that shows that you can relate smelt numbers in part to the abundance -- to water quality index which they have developed. And that water quality index is essentially a measure of combining the measure of salinity, water clarity and temperature to try to say here are three factors that together create the habitat that smelt -- that are characteristic of smelt. And what they find is that when you use their water quality index and relate smelt numbers, that their numbers are related to the amount of habitat essentially there is with the appropriate water quality.
Q. And you mentioned three factors in this water quality index. Were they all of equal importance?
A. No. They found temperatures seem to be the least important. They really thought -- appeared that salinity, the low salinity in probably the one to two parts per thousand range, where sea water is about 36 parts per thousand. So low salinity and some -- and modest water clarity. In other words, you don't want the water to clear, you don't want it to turbid. You want it somewhere in between because the smelt have to apparently see their prey against some kind of a

background.

So what it means is that the delta smelt had very specific water quality requirements that have to be created in the rearing habitat. And especially in the fall months, that seems to be very important.

Q. Is the quantity of habitat that has the appropriate salinity conditions affected by fresh water flow through the Delta?

A. Yes, it is. The amount of water that comes down the Sacramento River and historically the San Joaquin River were very important for maintaining that low salinity zone in Suisun Bay, which is the broad flat shallow bay that historically has been the optimal place for smelt rearing.

Q. And is turbidity or clarity of the water also affected by fresh water flow through the Delta?

A. Generally when you have more fresh water flow coming down the system, the fresh water mobilizes materials that create more turbid conditions that the smelt seem to like.

Q. During what period of the year was this research by the Department of Water Resources scientists conducted?

A. That was just published in 2007. Just came out in a peer view journal. The years, I think, were two years for -- I think they used a long term data set for smelt, but I think it was -- again, I'm sorry, I don't remember the exact dates it ended, but I think it was two years before the paper came out,

through 2005. But I could be wrong in that.
Q. Let me ask the question slightly differently. Did they look at the effects of habitat quality on -- for the entirety of the calendar year or did they look at it for a part of the calendar year?
A. They were -- they were trying to look at it primarily for the -- the fall months, as I recall, for the period of time when the smelt would be rearing out there.
Q. What other factors, in addition to pesticides, habitat quality, salinity, have been suggested as possible causes of the smelt's decline?
A. Well, a major cause that's been put out there has been diversions. And usually divided up into two kinds of diversions, the small diversions and the really big ones in the south Delta.

Let me deal with the smaller ones first. Those are the 2200 or so diversions, small pumps that are in the Delta used for -- to divert water for Delta farming. Collectively they divert quite a large amount of water. But they're all small. And I did an analysis of this that was published a couple of years ago. And as suggested that most of these smaller diversions don't really have much of an impact in fish populations because the smelt in particular are out more in the middle of the channel and don't get sucked up by the small diversions. Many of the diversions are turned down at periods

of time when smelt are not present.

So it looks like the smaller diversions in the system most likely not having much of an impact. It doesn't mean that occasionally they don't take some delta smelt, but it does look like they are not the problem.

In contrast, we do have the large pumping facilities at the State Water Project and the Central Valley Project, which take a large volume of water. And which, as a consequence, also are taking large numbers of smelt.

Now, there are a number of different ways that the water projects can affect smelt populations. First off, you know, is by direct entrainment. Just the numbers of fish that are taken directly by the pumps. Now, the numbers appear to be low when you look at the actual numbers that people often cite. But one of the reasons that Dr. Swanson has developed the idea that -- which I fully agree with, that we needed to have for a long time. That we need more monitoring is that, in fact, we don't know really how many smelt are being killed by the pumps.

My professional judgment is that early in the season, when -- especially, but when the smelt are up in the vicinity of the pumps -- when the larvae, the juveniles are up in the vicinity of the pumps, that is fish less than 20 millimeters long. Those pumping plants can be taking large numbers of fish, enough to be affecting populations, especially when

smelt numbers are low.

The other -- another potential way the pumps can be affecting smelt populations is through a hypothesis that Dr. Bennett has developed. Unfortunately he's not published it yet, but he has presented it in a number of public forums. That makes a great deal of sense to me. Which is what sometimes called the Big Mama hypothesis, which is that the largest females which produce the most eggs and produce the healthiest young and which spawn earliest in the year are the ones whose progeny are being most affected by the pumps because what's happened recent -- in recent years, we increase the amount of pumping, but especially the amount of pumping early in the season. And that early pumping may be taking the progeny of these smelt.

Now, the reason he thinks this is that he's been looking at the ear stones of the small juvenile delta smelt, which are like the black box of an airplane. They can tell you when the smelt was born, because they have daily growth rings on them and they can roughly tell you where that smelt was born, where it was hatched because of the chemistry of the first middle part of that ear stone.

And in the two years that he was looking for -- looking at the ages and origins of these juvenile smelt, he was struck by the fact that the smelt that would have been produced early in the season, when we knew smelt

were up there spawning, were absent from his samples. In other words, he was not finding smelt that had been spawned by those big early females, by the big mamas. So that suggests that here's another mechanism by which the pumps could significantly affect populations.

A third way that the pumps can affect populations is simply that they change the hydrodynamics of the whole Delta system. They reduce the amount of water that's moving downward into Suisun Bay at different times of the year. Because what you want in an estuary is for the net tidal movement, the net movement of water to be downstream. The smelt are very good at finding the places where you can get up in the water column to be taken downstream.

But when you have reverse flows, water going towards the pumps rather than downstream, they get confused and they wind up -- they can wind up in the wrong places or they can wind up in the central Delta, for example, which is not a favorable place for the smelt. So there are a number of different ways that the big pumps in the south Delta can affect smelt populations.

Q. Professor Moyle, let me go back and ask you a couple of specific questions about the material you've just discussed with the Court.

You indicated that we don't know how many fish are taken through entrainment at the pumping facilities; is that

correct?
A. Yes.
Q. Could you explain why that is?
A. Well, it's basically nobody counts fish less than 20 millimeters long. And it's these small fish that are -- you know, the ones that have to grow up to be the bigger smelt. Now, fortunately for us and for the smelt, there's naturally really high mortality at those early stages. A lot of those small larvae die, which is why the tendency is to say, well, you can kill half a million smelt, larval smelt in the pumps and it doesn't make any difference. But the fact is the smelt are now at critically low population levels. We're at a point where we need every small smelt out there we can get to contribute to the survival of the species.
Q. And you indicated that the small smelt, these sub 20 millimeter smelt that are entrained at the pumps are not counted.
A. Yes.
Q. Are all of the larger smelt entrained by the pumps counted?
A. They're sampled. It's a sampling estimate in which I think it's about 10 to 12 percent of the buckets essentially that contain the fish that are rescued from the facility, something like 10 to 12 percent of those are sampled and the fish are counted in them.

You can question that that is actually -- that's enough of a sample to really get a handle on the smelt, especially when smelt numbers are so low. Because essentially you could have missed one bucket that has a huge number of smelt in it or -- and get a miscount. So one of the things that should be done is to increase the frequency of sampling of the larger smelt as well that are being entrained in these pumps.

Q. Just to clarify. Are they, the larger fish that are being sampled, are those -- where are they being sampled from?

A. They're being sampled from the water that's sucked into the pumps. It's basically a procedure where there's louvers that are essentially gates that are across the intake, the water intakes for these big pumps. Those louvers are designed to send the fish into a capture facility where in the state project, for example, those fish then, they're essentially herded into large buckets, which are lifted up and then the fish and the water is put into trucks and the trucks are sent down to the Delta where the fish are released.

Most of the smelt, to the best of our knowledge, don't survive that experience. So the smelt essentially entrained in this -- in the project facilities are dead.

Q. And Professor Moyle, are all of the larger fish that are pulled towards these louvers diverted into these buckets or holding facilities?

A. No. Especially the smaller they are, the less likely they are to be diverted. This -- the louvers depend on essentially a behavioral response of the smelt to seeing these series of bars across the intake. So they come up to it and, you know, a high percentage of them seem to, you know, make a turn. They don't want to go through -- don't want to go between the bars, so they swim off and get captured in the rescue facility. Of course, some do go through because they -- they're big enough so they can slide through. It's not a screen.

And so if you're really small, especially if you're a larval fish, the louvers don't present any kind of a barrier at all, you can go right through them.

Q. Does anyone count the fish that go through the louvers?

A. No. They don't.

Q. And what happens to those fish?

A. They are sucked up into the pumps of the two projects and get sent south.

Q. And would those fish survive?

A. That's a good question. I don't really know. They certainly don't contribute anything to the population. Because there are rumors that you occasionally get smelt in the San Luis Reservoir, which is one place pumps -- the water is pumped into. But no, I think you can say for all intents and purposes, they're lost.

Q. Does anybody know how many of those fish are lost?
A. No, they don't.
Q. So the numbers of fish counted in the salvage tanks, do those represent the entire number of larger fish that are entrained at the pump?
A. No. They only represent fish that are 20 millimeters and larger.
Q. Professor Moyle, you mentioned this Big Mama hypothesis. And I'm going to ask you, if you could, to expand on that a little bit.

I believe you testified that Dr. Bennett was not finding smelt with ear stones from the early life history of the smelt. Could you explain what the spawning period is and when he was finding fish from?
A. Well, again, I -- these fish were ones that were spawned early in the season. The exact dates I really don't remember. But it was during the period of time -- gosh, I should know this, it's probably fish that are coming up in March to spawn. I'd have to check on that for sure. But these were the earliest fish to spawn.

So they are coming up and spawning. And you can -- and then -- by the way, the smelt die after spawning. So they spawn and they die. The young then are released into the environment where they become vulnerable to entrainment. And so they -- you can tell the age of these fish because they

do have rings just like a tree does on the ear stones, daily growth rings. So you can tell how old fish are when you catch them.

And the fact that Dr. Bennett was not finding any fish of the appropriate age was suggesting that these early spawners were not producing any young.

Q. Not producing any --

A. I'm sorry. Not producing young that were -- they were undoubtedly spawning, but they were not producing young that were surviving.

Q. Professor Moyle, I believe you also testified that the operations of the state/federal projects were changing the hydrodynamics of the Delta so that delta smelt might be confused about where they should be; is that correct?

A. Yes.

Q. Would those changes in the hydrodynamics reduce the value of the smelt's habitat for their survival?

A. Yes. Because, among other things, much of the south Delta now is no longer really available as smelt habitat, even for spawning. Although some years they do get up there.

Increasingly, in recent years, it appears that the smelt that are spawning successfully are spawning up in the north Delta, specifically over in the region around Cache Slough. And that's a shift. Historically they spawn over the entire Delta, which is what you want in a fish. You don't

want to have all your fish spawning in one place because then they're much more vulnerable to things like a pesticide spill, for example.

So there's a lot of habitat that has been -- that's no longer available to the smelt because of the hydrodynamics of the system. Because they simply can't -- they can go up there perhaps but they can't find their way out or the young can't find their way out or the water quality conditions are such that they avoid it increasingly, so you just don't -- unless it's a wet year, you just don't find the smelt scattered around the system like you used to.

MR. WALL: Your Honor, I have with me a map that we'd like to present as an exhibit. I believe I've shown it to counsel.

THE COURT: Any objection?

MR. O'HANLON: No objection.

MR. WALL: Let me show the government's counsel. I showed it to the intervenors.

THE COURT: All right. Is it marked for identification?

MR. WALL: It will be momentarily.

THE COURT: Thank you.

MR. MAYSONETT: Your Honor, we have no objection.

MR. LEE: State of California has no objection.

THE COURT: Thank you.

MR. WALL: This will be marked as Plaintiff's Exhibit 1.

THE COURT: This is Plaintiff's 1 for identification. And what is the caption?

MR. WALL: Delta smelt critical habitat.

THE COURT: Thank you.

(Plaintiffs' Exhibit 1 was marked for identification.)

MR. WALL: May I approach?

THE COURT: You may.

BY MR. WALL:

Q. Professor Moyle, I'm going to show you what I think we can all see is a map. Could you describe that map for us?

A. It's a very simple map of the Delta and Suisun Bay as well as Suisun Marsh. It essentially shows the legal Delta plus the areas around Suisun Marsh that were designated by the Fish & Wildlife Service as designated critical habitat for the delta smelt.

THE COURT: And that designation was made when?

THE WITNESS: It was probably 1997. It was after our recovery plan came out. So I'm assuming it's roughly in that period. I don't know for sure.

THE COURT: Was it designated pursuant to specific study or an action by the agency?

THE WITNESS: I -- I don't know. I guess I don't

have an answer for that question. I assume it was done probably in response to our recovery plan, but I may be -- this is something I don't know about.

MR. WALL: Your Honor, we'd be happy to provide authority on that. It was done pursuant to the Endangered Species Act provisions for designation of critical habitat in the federal register. If Ms. Goude is going to be a witness, she might be able to explain.

THE COURT: All right. Thank you.

BY MR. WALL:

Q. Professor Moyle, are you familiar with the Delta smelt's habitat range?

A. Yes, I am.

Q. And could you describe that range?

A. Well, it coincides with the purple area on the map and during really wet years we need to move it downstream. Essentially this is a fish that likes to be in tidal areas where there is tides moving back and forth.

And the legal Delta and the critical habitat for the delta smelt is essentially the area where you have tides, where you have salt water mixing with fresh water or even, in the upper parts of the Delta, the tidal movement of water. Because they are fish specifically adapted to moving with the tides and using the tides to move them around.

Q. Professor Moyle, you were involved in the development of a

recovery plan for the delta smelt, is that correct?
A. That's right.
Q. On behalf of the Fish and Wildlife Service.
A. Yes.
Q. And are you familiar with the location of the critical -- designated critical habitat for the smelt?
A. Yes.
Q. Does this map accurately reflect that designated critical habitat?
A. Yes.

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

THE COURT: Any objection?

Exhibit 1 is received in evidence.

(Plaintiffs' Exhibit 1 was received.)

BY MR. WALL:
Q. Professor Moyle, I'm not sure if you might need to stand down from the witness box with the Court's permission, but I'd just ask you to point out on the map first the general location of the state and federal water projects.

THE COURT: Yes, you may.

THE WITNESS: Actually, I think I can do it from up here. They're down here in the south Delta where it says Banks Pumping Plant and Tracy Pumping Plant with the big most noticeable thing is the Clifton Court Forebay, which leads

into the state pumping plant.

MR. WALL: Are we going too fast for the court reporter?

THE REPORTER: Not right then.

MR. WALL: Feel free to let us know if we are.

Q. And Professor Moyle, I believe you testified that a portion of the Delta smelt's habitat, critical habitat had become inhospitable for that species. Could you describe that with relation to the map?

A. Well, it does vary from year to year, but let me go to the map for a second. The area that's most important to the smelt these days is this region right up here. This is the Sacramento River. And this is Cache Slough, even the Stockton -- sorry, the Sacramento ship channel right up here. This whole slough area here, this appears to be the critical area for smelt spawning, which is one of the limiting areas these days.

THE COURT: For the record, you're in the upper half, approximately the center of Exhibit 1.

THE WITNESS: Yeah, it's called -- the north Delta would be a good way to designate that general area. And south Delta is the region by the pumps. Much of this region in the south Delta today is really not available to the smelt. They do get up there in small numbers at various times. Historically this entire region was used by the smelt. They

would move up with the tides and with -- in response to outflows and spawn widely over this entire system. To the best of our knowledge.

THE COURT: And what has changed to cause that difference where the smelt are not in this -- I'm just going to call it the southern part of the area?

THE WITNESS: I think the main thing that has changed in this area is the way the water moves around. Obviously there's urbanization and agriculture and other things too. But the -- one of the real problems here is this -- in the region of the pumps, especially the areas called -- the Old River, New and Old River areas for the San Joaquin channel, you have negative flows.

You have water that's moving essentially in the wrong direction because it's moving towards the pumps. Because the pumps are basically -- they change the hydraulics of the system because what they are doing is drawing Sacramento River water out of this -- rather than putting into the Sacramento River, they're drawing it essentially across the Delta and towards the pumps. It makes it -- the hydraulics, in fact, very complicated and I would not want to be pressed too closely on trying to describe them. But the fundamental idea is that water that would normally be going downstream gets drawn into the pumps. And from the San Joaquin side, high percentage of the water that would be flowing out of the San

Joaquin River really winds up in the pumps. So it makes it very difficult for these fish to find their way into the south Delta or into the other parts of the Delta as well.

BY MR. WALL:

Q. Is that problem -- the extent of that problem dependent upon the extent of negative flows?

A. Yes. To a large part it is. If we had positive flows at the right times of year going down the San Joaquin River, you would see -- and especially up in the upper parts of the San Joaquin, places that are called Old and Middle Rivers, you would see much more attractive habitat for smelt.

THE COURT: Do they have enough area in the north to spawn and do whatever else they do up there?

THE WITNESS: Well, you could argue they do now because delta smelt population is so small. The big worry about these smelt being concentrated in the north Delta area is that it appears where they're spawning is a very tiny area compared to what it was historically. That means they are really vulnerable to anything else that happens out there. Anything that might kill the smelt. If you're concentrated in one place, you have no backup, you have no insurance policy. And historically, that was obviously part of the strategy given, you know, a one-year fish. You can't just have one population or you're going to a natural situation to probably go extinct.

BY MR. WALL:
Q. And does the effects you've described in the southern part of the Delta affect the Delta smelt's prospects for recovery?
A. Yes, it does, because they -- it is a large chunk of habitat that's simply no longer available to them. And also, you have this problem, as you take water from the pumps, they can actually move water across the Delta bringing smelt that is spawned in the north Delta into the central Delta. And perhaps even in the purview of the pumps.

This past year, for example, there's some evidence that the smelt that's spawned up in Cache Slough is spawned successfully, the young were moving down and then the pumps got turned on and they got sucked up or moved up through 12 Mile Slough, which is in the -- roughly in this area right here. Then they got --

THE COURT: Indicating the center of the diagram and what is that with --

THE WITNESS: It's really right off the middle of the Sacramento River part of the Delta. They essentially got entrained into or moved into 12 Mile Slough and wound up in the central Delta where not only were they more vulnerable to being taken by the pumps directly, but they're more likely to be put in a habitat that would be unfavorable to them, that is warmer and not saline enough.

THE COURT: Did you say not saline enough?

THE WITNESS: Yeah. Basically when they're rearing, the smelt don't want to be in pure fresh water, they want to be in salt water that's -- well, it's variable, but optimal habitat seems to be around one to two parts per thousand salinity, which is -- 36 is sea water.

MR. WALL: Excuse me, Your Honor, I spilled my water. So trying to protect the Court's furniture.

THE COURT: All right. Thank you very much. GSA will especially appreciate that. They are washing our windows. Those of you who were at the building naming may have been aware that was an issue.

MR. WALL: Thank you, Professor Moyle.

Q. I believe you've described several of the possible suggested causes for the smelt's decline, including pesticides, habitat quality, the effects of entrainment at the pumps and hydrodynamic changes.

Are you aware of other significant causes that have been suggested?

A. I think I've covered the major ones, but I'm sorry, my mind is going blank right now. There are so many different things going on out there.

Actually, I'm sorry, there is one other thing that's frequently mentioned and that is invasive species as related to food supply. There's an interesting dynamic out there with the invasion specifically of the clam from Asia that's called

the overbite clam. This clam invaded in roughly 1987, '88, where it became very abundant in Suisun Bay and commandeered a good part of the food sources out there. That is, clams are filter feeders, they suck up algae, they'll suck up the early life history stages of various kind of animals that the smelt and other fish like to eat, so they reduce the food supplies. And this has been construed as being a major cause of smelt decline.

And actually, I won't dispute the fact that the reduced food supply has not been good for the smelt and may have caused their populations to decline to a lower level in recent years and is going to make it much harder for populations to recover with anything approaching historic numbers.

Yet, at the same time, it's too simplistic an explanation by itself. Because there are so many other things going on out there. And specifically, the food supplies are not -- the clam and the food supplies are not uniformly distributed out there. There are patches of food that the smelt seem to be able to find. There's studies that have shown that, for example, if you're in northern -- the northern parts of Suisun Bay and you're a smelt, your chances of finding appropriate food are quite good.

And the fact that both Dr. Bennett and Swee Te, the scientist at Davis, have found healthy smelt in their samples,

you know, a high percentage of the smelt that they find are healthy smelt meaning that they don't have signs of pesticide abuse or use affecting their systems, they don't have deformed livers that suggest they're starving. So the smelt -- a lot of smelt are clearly finding the food they need.

The smelt that create the Big Mama, so to speak, are actually normal size smelt. The ones, the size the smelt used to be historically. And indeed one of the -- the base right now is our -- the fact that the average size of the smelt is smaller, is that the result of these big smelt not being able to reproduce and not being able to recreate themselves essentially or is it the result of slow growth on the part of the existing smelt or some combination of the two.

THE COURT: Is there any other cause that you're aware of besides the overbite clam that's impacting the food supply?

THE WITNESS: Well, unfortunately, the estuary is constantly being invaded by new species and the food that the delta smelt feeds on has been changing. The kind of organisms they feed on, it appears to be a direct change. They switched from one species of copepod to another one. And the best evidence suggests that they're perfectly okay with that. But we have this constant change in the food supplies out there. We also have other species which have invaded the system. The inland silverside, for example, came in in the 19 -- late

1970s, around the time the smelt were declining. The inland silverside is a small fish that has feeding habits very similar, but not identical to that of the smelt. You could argue that that contributed to the decline. But again, they've been out there now for a long time and are probably not responsible for the present situation with the smelt.

THE COURT: But they compete for the same food supply?

THE WITNESS: Well, they eat the same things. And that's different from saying they compete. Because the food -- in order for competition to occur, the food has to be -- has to demonstrate it's actually in short supply. And I -- I guess you can argue that, I'm not entirely convinced that's the case because the food -- if you think of the food supply as being on the average lower, that's true.

But if you look at food as not being distributed evenly, but in patches, the smelt seem to be able to find patches where the food is in the appropriate abundance for them to feed and grow. The problem is the population of smelt today are much smaller than they were historically, so really it doesn't take as much food to support those populations as it did historically.

THE COURT: If you had to give us an opinion, and I'm not trying to box you in, but would you say that the absence or reduction of food supply is a cause of the decline of the

smelt?

THE WITNESS: I would say yes. That is one of the causes of smelt decline. Again, we're looking at the smelt -- a species which has been declining since the late 1970s. And it's likely that at different times, different things have been hit on the smelt. When the clam invaded in the late 1980s, it makes sense that if it reduced food supply, it would have reduced the smelt populations in that period of time. But now the clam has been doing its thing now for 15 years and so you think the main damage it would have done would be over with and the smelt populations would have adjusted to it.

THE COURT: And has the decline been constant or has it been interrupted?

THE WITNESS: The decline has not been constant. There seems to have been sort of step changes in the declines. We had the drought in the 1980s and other conditions in the -- not just the drought, but the 1980s were a period of time in which the smelt population seemed to have dropped considerably. Then they started to come back up again.

But if you look at the actual data, what you see is a wide fluctuations in their numbers, which is, again, what smelt have always seem to have done. They seem to be recovering or going back to a slightly higher numbers in the 1990s, suggesting they had adjusted to the clam. And then in

the last four or five years, they've suffered this major decline again.

And this is what the agencies have been very concerned about. That's part of this Pelagic Organism Decline or POD that the state and federal agencies are putting a lot of money into trying to figure out -- figuring out what's happened. Because the smelt is just one of four plankton feeding fish that have suffered very severe declines in the last four years, four or five years.

THE COURT: And the causes are all as you've described them, that's causing the pelagic organism decline?

THE WITNESS: Well, there's still a -- the people working on it don't want to commit themselves yet to saying what they think the cause is. But it's clearly related to multiple factors acting together, of which the pumping plants in the south Delta are certainly a contributing factor.

THE COURT: All right. And have you -- in your own individual analysis and opinion, have you been able to quantify the relative contribution from the factors you've identified to cause the decline?

THE WITNESS: No. I've not been able to quantify that. It's many -- because I'm not working directly on delta smelt myself anymore except through my own sampling programs. I'm -- my acquaintance with what's going on with the smelt is mainly through the peer review literature and now through

constant conversations with people like Dr. Bennett, who's a former graduate student of mine.

THE COURT: Thank you. You may continue.

BY MR. WALL:

Q. Professor Moyle, I'd like to ask one clarifying question. You mentioned that there have been a renewed decline in the delta smelt population in recent years. Do you attribute that renewed decline to the invasion and establishment of the overbite clam in, I believe you testified, the late 1980s?

A. No. Renewed decline is, to me, clearly due to some other factor. And it's -- and certainly the way the water is managed in the system, the way the pumps are managed, seem like one of the things to point to.

THE COURT: And what else? If it's one of the things.

THE WITNESS: Well, you can't dismiss -- unfortunately, you can't dismiss pesticides as one of the things that's acting on the smelt. And nobody seems to want to deal with that particular issue because it requires telling people to change their behavior.

But as I mentioned, but for the pesticides, you can't rule them out. We have no direct evidence that they're an impact. But the fact is they're out there.

There's a new pesticide pyrethroids that are out there that are more toxic to fish than some of the previous

pesticides. I would not want to dismiss them as potential cause.

THE COURT: And if you could, just for the record, could you spell the word -- I don't know if I would pronounce it. It ended with "roids," I think.

THE WITNESS: Pyrethroids, this is the pesticide derived from marigolds, so they're supposed to be organic. But it's P-Y-R-E-T-H-R-O-I-D-S. That sound correct?

THE COURT: Thank you. It does. You may continue.

BY MR. WALL:

Q. Professor Moyle, I'd like to -- you've discussed the decline in delta smelt population. What are the -- how do we measure or how would you measure that decline? What would you look to?

A. Well, as I mentioned earlier, we have these really good data sets that have been tracking fish really since the late 1960s in the system. And now we have some surveys that are specifically designed for delta smelt, the 20 millimeter survey specifically. So we have a variety of means to track the populations. And the nice thing about them is that we have these independent surveys that advise for different purposes and they all show the same general trend, which is smelt populations have collapsed.

In Suisun Marsh, for example, in my own surveys, which is not the best habitat in the world for smelt, but is

sort of on the edges of their habitat. I used to get dozens of fish per year in my samples, in the first years I got hundreds actually. This year I failed to get any of the samples; last year we got two, the year before we got zero. So that's typical of all these various sampling programs. They all show a rapid decline in smelt numbers in the last four or five years.

Q. Do these various sampling programs allow us to draw reliable conclusions of total number of delta smelt that exist in the system?

A. No, they don't. Because they all are based on sampling portions of the populations and the agencies, for a long time, were very careful not to say that these were population estimates, but that they were only indices of the populations. That is, they were a number which you could track how the populations were doing in the sense of whether they were going up or down. But you couldn't really use them to give population numbers.

With the advent of the listing of the smelt and of the demand for numbers, everybody wants to know how many smelt are out there. We got to know how many smelt are out there. Various people have tried to make estimations of smelt numbers based on these sampling programs. And the estimates are always going to be flawed because in order to expand the numbers from, say, a trawl which is going through a fixed

amount of water, you have to make assumptions about how the smelt are distributed, how efficient the gear is, a whole variety of things.

And all of those assumptions that you make when you try to expand from your index from the number of fish caught in a net to the actual number of fish that are out there in the system, those estimates are going to be fraught with problems.

And the only person who has really taken this head on and provided not only estimates, but also what are called confidence intervals around his estimates, he says -- frankly says -- it's Dr. William Bennett in his monograph on the smelt. And he essentially says, these are really terrible estimates in there because of all the assumptions, but here they are. And they are -- if I estimate 60,000 smelt, adult smelt are out there, it's going to be anywhere from 10,000 to -- I don't remember the exact numbers, but anyway, from 10,000 to 120,000 smelt.

In other words, a large -- he's not very confident of his central estimate of -- but he used the central number as your estimate, but it could just as easily be at the low end or at the high end. So -- but most people, when they give estimates of smelt numbers, you do one number. And they don't tell you how good that number is.

Q. Is the number of delta smelt dependent on the lifestage of

that smelt?

A. Yes. They're a good fish, classic pelagic, midwater type of fish that has very high rates of death among the young. The earlier you are in the lifestage, the lower your probability of surviving is.

So that, for example, Dr. Bennett's population models suggest that less than one-tenth of one percent of the delta smelt in most years survive -- go from egg to adult and that's within the estimates you see for things like herring and other kind of similar fishes. So the early lifestages are always going to be much more abundant than the later lifestages.

They have to be if you're going to suffer 99.9 percent loss of the fish, just by natural causes, not even taking into account human accelerated causes, if you're naturally going to lose that percentage of the population, you're going to have -- it means that you have very high mortality rates at the early lifestages.

Q. And higher population numbers in the early --

A. And higher population numbers, that's right.

Q. Have you reviewed a declaration or declarations prepared by Dr. Charles Hanson in this case?

A. Yes, I have.

Q. And are you aware that Dr. Hanson estimates the population of delta smelt based on some survey data?

A. Yes. Yes, I am.

Q. Would you -- do you recall the population estimate or estimates that he gives?
A. Well, I believe that in his -- in one point he estimates from the 20 millimeter surveys for over a one week period, I think, there were 1.8 million smelt. And I think from -- I don't remember which survey it was, there's another number he gives, which is 600,000 smelt at a slightly later life history stage at the same time. Again, those numbers are for early life history stages in which you have very -- you could expect very few to survive to adulthood.
Q. Are you familiar with Dr. Hanson's methodology for developing these estimates?
A. Yes. He uses the methods that are similar to what Bill Bennett and others use, because it's really the only way you can do it. Which is to make assumptions that, for example, the -- your sampling program samples -- is an adequate sampling program of the entire population.

And it essentially takes a random sample of that population in that the entire population of the smelt is evenly distributed both by depth and by area. So that, you know, you're actually dragging the net through the water and capturing smelt in exact proportion to their abundance out there.

And he has some other assumptions as well I think I've forgotten. But the basic idea is you have to assume

-- make a lot of very unrealistic assumptions to get those -- to get those numbers.

Q. Is there evidence on the reliability of the assumption that the fish are evenly distributed throughout the depth?

A. No. And again, Dr. Hanson does not give any confidence intervals on his estimates. And as I mentioned, Dr. Bennett uses the same general methods and you can tell he really is not liking to do this because he mentions specifically the unreliability of these numbers.

Q. Dr. Moyle, are delta smelt evenly distributed through their -- the depth of the water column?

A. No, as a matter of fact, again, they behave like all organisms. They aggregate where there's the most food. They do tend to be attracted to each other when they're spawning, of course.

Under normal circumstances, they tend to be in the middle of the channels or middle of the water and at fairly -- not at the surface, but somewhat below the surface. They are not very -- tend to be less abundant as you get toward the bottom and towards the edges of the channels. So -- and there's also this basic problem that the fish are -- move with the tides. And remember, these sampling programs take place over a period of days.

So you could literally be sampling the same bunch of smelt continuously for a couple of days if you aren't careful

about where you sample in relation to the tides. Because these fish could be moving upstream, you sample them up there. The next day your sample station is downstream, meanwhile they've moved downstream with the tide so you're sampling the same fish.

So that's another problem with the population estimates is they are assuming these fish really are not moving during the sampling period as well so you aren't actually sampling the entire population.

Q. In light of these issues, do you consider Dr. Hanson's population estimates to be reliable?

A. No.

Q. Do we know -- let me ask you to assume for a moment that Dr. Hanson's population estimates for these earlier lifestages in delta smelt were accurate. And in particular, I'll ask you to assume that there were 1.8 million -- is it 1.8 --

A. 1.8.

Q. 1.8 million larval or juvenile smelt in the first week of July, 2007. And in the next week of July, 2007, there were 680,000 juvenile smelt. Would you consider these to be high numbers?

A. Well, it's hard to say what the numbers are in terms of real numbers that are out there. But, you know, 1.8 million smelt, larvae, 20 millimeter larvae, if you figure that only -- generously, that four percent of them survive to

become spawning adults, that translates into, I forget the number, 60 to 80,000 fish as adults. And which is, again, probably a high number for what's actually out there. Again, I haven't done the math recently. But it suggests that, you know, a million fish, a couple of million fish does not translate into that many adults.

And indeed, Bill Bennett, in his population models where he's trying to determine what's the likelihood of fish going to extinction in this monograph, one of the numbers he used is about 80,000 smelt as the starting population. And he concludes that based on his models, that if you start with 80,000, you're going to be extinct in 25 to 40 years or have a high probability of extinction in that period of time. And then he -- but he regards that number as being high.

Q. When you say "he regards that number as being high," can you explain that?

A. Well, he essentially uses the modeling exercise where he starts with different numbers of fish to look at the probability of that fish -- of the population going extinct. And he uses 80,000, 8,000 and 800 adults as his starting point just because it is a model.

So he's trying to determine, based on what we know about the smelt, what's the likelihood of this fish going extinct. And he picked 80,000 as the high number because he thought that was probably the maximum number of fish you were

likely to have out there. You know, and I think it's much more likely that the number of fish, you would think the number of fish was less than that. But he was trying to put parameters on his model.

Q. Do you recall how he developed this 80,000 figure?

A. No, I don't specifically, I'm sorry.

Q. That's fine.

THE COURT: All right. Counsel, we are at the noon hour. Are you almost through or do you have --

MR. WALL: Let me ask a couple more questions. I'm sorry, Your Honor.

THE COURT: I beg your pardon?

MR. WALL: I'm sorry.

THE COURT: I asked you how much more you estimate you have for Dr. Moyle?

MR. WALL: I think it could be a solid half hour to 40 minutes.

THE COURT: All right. Let's do this. Let's take the noon recess at this time. Can everybody return at 1:15?

MR. WALL: Thank you, Your Honor.

THE COURT: We're in recess until 1:15. You may step down.

(Lunch recess.)

THE COURT: Good afternoon, ladies and gentlemen. Please be seated. We're going to resume the testimony of Dr.

Moyle. Mr. Wall, you may proceed.

MR. WALL: Thank you, Your Honor. Before we begin Doctor Moyle's testimony, Your Honor, I just wanted to address one issue that the Court had raised really quickly. The date of the critical habitat designation. It was in the Federal Register, so the Court can take judicial notice that it was published in December of 1994.

THE COURT: Any objection to my taking judicial notice of the date that the finding or at least the -- what would you call it?

MR. ORR: Designation.

THE COURT: The designation. Thank you. The designation of the critical habitat for the delta smelt was published in the federal register in December of 1994. And was that by the Fish & Wildlife Service?

MR. WALL: Yes, Your Honor.

THE COURT: Thank you.

MR. WILKINSON: No objection, Your Honor.

MR. O'HANLON: No objection.

THE COURT: Thanks. All right. While you're looking for your next question, let me ask a couple of questions of Dr. Moyle.

You have indicated that, based on all the information and data available in the different surveying methods, that there is not, at present, what the Court would call -- these

aren't your words, these are mine -- a finite population figure for this species, the delta smelt; is that accurate?

THE WITNESS: There is -- well, there are figures out there, Your Honor, but they're not very reliable, I think is the way I would characterize that. There seems to be this need for people to have a number. So they haven't provided -- just aren't reliable.

THE COURT: Well, this is where the question arises. And if you can shed any light on this, it would be appreciated. If we don't have a finite number, what is the point of reference and what is the foundation for the opinion that the species on -- is on the verge of extinction? Because if we don't know how many there are in the species, the population, in other words, then how are we able to say that the species is on the verge of extinction?

THE WITNESS: Well, it's because we do have all these surveys out here, which have indices. And the indices have been on a downward trajectory. Again, as I said earlier, it's not a steady decline, but it's partly at least due to some step changes. And at -- and we also know the smelt population show wide fluctuations in numbers in response to both natural and human caused conditions.

So I have to reach the conclusion that if we continue on this trend of shrinking indices for smelt, we're going to reach a point where they can't recover. You know, as the

hills and valleys of their -- or the hills and valleys, yes, of their populations get lower, at some point you're going to fluctuate into extinction if you keep doing that.

And all I can say is that looking at the numbers now, it makes me very concerned that we are reaching that point where the smelt simply can't recover. Now, we don't know what the exact numbers are of smelt, but we do know it's a very low number compared to what it was historically.

One of the things we don't know is what is the minimum population size for smelt? We don't really know that. But it looks like we're approaching that at the present time even if we don't have an exact number for it.

THE COURT: Is there an estimated number for it?

THE WITNESS: Well, the estimates are out there by, you know, Dr. Bennett and his monograph on the smelt, which is now already dated because it's in 2005, derives some numbers with population -- with confidence intervals around those numbers, which says that any number he gives is -- he frankly says "don't trust this very much."

For example, he creates a number through a variety of means that for 1994, which up to that time was the lowest -- the lowest index for smelt for the Fall Midwater Trawl. He thinks that -- the number he calculates is 86,000 smelt plus or minus. I don't remember what the interval was, but it's plus or minus most of the fish. So -- and again,

even 86,000 sounds like a large number, but it's not for a fish like this.

THE COURT: And what is the confidence factor, if it has been identified, would it be ten percent, 30 percent?

THE WITNESS: His confidence intervals, again, I'd have to look at the papers, they were 70, 80 percent, something like that, a very large number. In other words, the number was somewhere between 10,000 and, you know, 160,000, something like that.

THE COURT: Okay. Thank you very much.

BY MR. WALL:

Q. Professor Moyle, to followup on the Court's questions, if I might -- actually, I have this marked. I have a copy of Dr. Bennett's 2005 monograph here with me and perhaps it will help the Court if I showed you --

THE COURT: Thank you.

MR. WALL: -- the relevant portion of it.

THE COURT: That would be Exhibit 2 for identification.

MR. WALL: Yes, Your Honor.

THE COURT: That's the '05 Bennett monograph.

(Plaintiffs' Exhibit 2 was marked for identification.)

MR. WALL: May I approach?

THE COURT: You may. I'm going to have the courtroom

deputy mark it.
BY MR. WALL:
Q. Professor Moyle, if I could ask you first to turn to page 52. And read as much of it as you need to. But if you could -- and I think with the Court's indulgence, we'll just ask you to read for yourself the last paragraph on the bottom right. And then look at the chart with the figure on the next page and let us know when you're done with that. And then I'd like to ask you a couple of questions about it.
A. Okay, so --
THE COURT: Yes, you may read it to yourself, please.
THE WITNESS: Okay.
Okay. I'm ready.
BY MR. WALL:
Q. Professor Moyle, if you can also look at the figure on the next page.
A. Okay. I've done that.
Q. And there's one other page I'd like to ask you to quickly look at before we ask these questions. It would be figure 3 on page 8. And in particular, figure 3-C.
A. Okay.
Q. Having reviewed this, do you recall -- or could you tell us the population estimate that Dr. Bennett was using for his extinction, risk of extinction analysis?
A. Well, he used three different levels because he

was -- wanted to demonstrate -- explore the idea of an extinction -- extinction risk increases as population sonics goes down. So he used 80,000, 8,000 and 800 as his starting populations of spawning adults.

Q. And what was the calculated abundance level that he was using, assuming that it was present population of fish?

A. Well, he started this out using his -- he picked the lowest number he had at the time, which was 1994, which was 86,000 something fish. 86,203 fish. That was his calculation based on the lowest index for the Fall Midwater Trawl that he had at that time.

Q. And looking at figure 3-C on page 8, could you -- it may be hard to read from the diagram, but could you let us know if you can interpret his confidence interval for that population of 86,000 fish.

A. Yes. Those narrow lines that you show, that you see on there are his confidence intervals. Which means the interval, that you could pick any number in that interval and it could be the population. Because there's a 95 percent confidence that that could be the population.

So the number he uses, of course, is the median middle part of that whole interval. So if you look at 1994, which is the low point there. What you can see is that the low end of the confidence interval essentially is zero for this number, or very close to it. It's a tiny graph, so it's

hard to see. But then you can see the high end is twice essentially what the actual estimate is based on the trawl survey itself.

Q. Now, when Dr. Hanson provided population estimates using a similar methodology, did he provide confidence intervals?

A. No, he did not.

Q. Now, I believe you testified that Dr. Bennett calculated and assumed abundance level of 86,000 fish based on the 1994 Fall Midwater Trawl Survey; is that correct?

A. That is correct.

Q. And I think I'd like to -- I'm going to introduce an exhibit that I'd just like to make sure that counsel don't have objection to it first.

(Discussion among counsel, not reported.)

MR. WALL: Will there be any objection to introduction of this?

THE COURT: Perhaps you could describe the exhibit.

MR. WALL: Your Honor, this is a table showing the -- from Dr. Swanson's declaration. And if necessary, we can lay the foundation and have it admitted with her. But it shows the results of the different surveys.

THE COURT: Why don't we mark it for identification and then if there's an objection, we can deal with it.

MR. LEE: State of California has no objection.

MR. WILKINSON: No objection, Your Honor.

MR. O'HANLON: Your Honor, I have no objection to this exhibit.

MR. HITCHINGS: No objection, Your Honor.

MR. MAYSONETT: Your Honor, the federal defendants have no objection.

THE COURT: All right. Then let's move -- this will be Exhibit 3.

MR. WALL: And we move that it be admitted into evidence.

THE COURT: And it will be received as Exhibit 3 in evidence.

(Plaintiffs' Exhibit 3 was received.)

THE COURT: This is a compilation of Dr. Swanson of, what, abundance figures?

MR. WALL: Yes, Your Honor. And I believe I have an extra copy for the Court as well.

THE COURT: Thank you. Are you going to leave 2 as marked since you had him read from it? You're not moving that into evidence, Mr. Wall?

MR. WALL: Perhaps we should do so. If there's --

THE COURT: Any objection? To the segment of Exhibit 2, which was the Bennett monograph of 2005, which the witness relied on in describing the data on the chart, an abundance chart of reliability.

MR. WILKINSON: Your Honor, I think we would prefer

that the entire exhibit come in, the entire report.

THE COURT: All right. You have that right under the rules of evidence.

MR. LEE: Your Honor, the State of California would share that concern.

THE COURT: All right. Then we'll admit Exhibit 2 in its entirety. It's received in evidence.

(Plaintiffs' Exhibit 2 was received.)

BY MR. WALL:

Q. Professor Moyle, I've just handed you an exhibit that's been marked as Plaintiff's Exhibit 3 in evidence. And do you have an understanding of what it represents?

A. Yes. These are the indices from five different surveys that have been done to -- used to evaluate smelt abundance and it's the actual annual summary of the annual average of the index. So its number is often used to determine how the smelt was doing.

Q. And is one of these indices the one on which Dr. Bennett relied for his calculating an assumed population?

A. Yes. That's the FMWT, which is the Fall Midwater Trawl index. And he uses that because it's the one that tracks smelt that are moving into the Delta to spawn.

Q. And did you say that he used 1994 for his extinction?

A. Yes. He used 1994 because it was the lowest value available to him at the time for that index.

Q. What was the value in that year?
A. It was 102.
Q. Could you tell us what the value of the index has been in the last three years?
A. Well, in 2004, it was 74. 2005, it was 26. 2006, it was 41.
Q. Have there been any other years in which the Fall Midwater Trawl index was as low as in the past three years?
A. No, there has not been.
Q. In light of the difference between the Fall Midwater Trawl index in 1994 and the index figures for the past three years, do you believe that the risk of extinction has increased relative to what is portrayed in Dr. Bennett's work?
A. Almost certainly because this suggests that the numbers of smelt have dropped to less than half of what they were at the record low period before 1994.
Q. And Dr. Moyle, if you could turn to figure 34 on page 53 of the Bennett monograph.
A. Okay.
Q. Could you help us understand what the risks of extinction Dr. Bennett calculates are?
A. Well, these figures are -- unfortunately are not labeled the best in the world, but they are -- this is figures that are C through H. What they are, they are current studies generated to predict the risk of extinction from zero to 100

years.

THE COURT: Let me, if I could, just interrupt. My exhibit only has 52 pages. My Exhibit 2.

MR. WALL: Uh-ho. I am sorry, Your Honor, we can correct that.

THE COURT: Thank you.

BY MR. WALL:

Q. Professor Moyle, if you could help us understand what figure 34 means on page 53 in terms of extinction.

A. What it shows is that -- well, for example, if you look at -- various things going on here. Basically you've got figure G, which number labeled G there, which I believe is a curve based on 8,000 fish. Again, doesn't label these things very well. Which would suggest in 20 years, given the population in 1994, there is a 26 percent probability of extinction and a 55 -- and a 50 percent probability of extinction in 55 years.

But if you go down to a population of 800, then there's a 20 percent population -- which is in C, there's a 20 percent population -- 20 percent probability of extinction in 1.5 years and an 85 percent probability in 20 years.

Again, this is a modeling exercise and there are large error guards around each of those numbers. But it does give you a good indication of how much the starting numbers matter if you're projecting extinction.

Q. And you -- do you have an understanding of what those numbers would be like relative to Dr. Bennett's calculations based on the present midwater trawl index?
A. Well, they would presumably be somewhere between D and E. In other words, somewhere between 26 and 50 percent probability of extinction in the next 20 years. Again, you'd have to actually go through and use his equations to get the exact numbers. But if you figure roughly at half the abundance you were in 1994, then that accelerates the extinction rate that much.
Q. And the Fall Midwater Trawl index reflects calculated population of what age class of fish?
A. These are primarily one-year old fish. These are the fish that are getting ready to spawn.
Q. Is that a different age class than Dr. Hanson calculated his estimate based on?
A. Yes. Dr. Hanson's estimate was based on the 20 millimeter survey. And I think the second one was based on the townet survey. But I'd have to check to make sure.
Q. And what would happen to the population -- let me ask you to assume that Dr. Hanson's population estimates were calculated based on survey results from the first part of July. What would happen to the population of fish of the delta smelt between that first part of July and the fall time period when Dr. Bennett is calculating abundance?

A. Again, Dr. Bennett's estimates which are quite reasonable given the nature of this type of fish is that you would have about four percent survival between those two periods of the fish. And that's four percent, not taking into account potential mortality at the pumps or other factors. That's just four percent -- that's four percent specifically excluding the pumps as a source of mortality.

Q. Dr. Moyle, if I could ask you to calculate four percent of 1.8 million. Could you do that? Do you need a pen?

A. I don't. But it's -- it's roughly 80,000 fish. It's less, probably like 72,000 something like that. Or 75,000. It's in the -- you know, these numbers are so imprecise that saying it's 80,000 should be close enough.

Q. Let me actually offer you a pen so you can do the math and work it out for us rather than -- would that be okay?

A. Sure.

MR. WALL: May I approach the witness.

THE COURT: You may. I think it's 72,000. We can agree with that.

THE WITNESS: I'm up here under stress.

THE COURT: Unless my multiplication is in error.

THE WITNESS: Okay -- okay. I'm sorry, it was 1.8 and --

THE COURT: Four percent.

THE WITNESS: Four percent. My brain is not entirely

in order right now.

THE COURT: Hard to think on that stand.

THE WITNESS: Yeah. It's -- yeah, it would be 72,000. That's right.

BY MR. WALL:

Q. Professor Moyle, is -- are there factors you would look at, other than abundance, in determining the prospects of the delta smelt for survival or recovery?

A. Yes. I would use the same principle as we developed in; the Fisheries Recovery Plan, which was you base your recovery criteria on a combination of numbers of smelt or an estimate of the abundance of smelt and something about an index based on the area in which they occupy, how much of the Delta they're able to use for spawning and for rearing.

So numbers by themselves are not enough because you run this risk of concentrating the smelt in one place with a much higher susceptibility to natural disasters.

Q. And has there been evidence of that in recent years with respect to the smelt?

A. Well, certainly their distribution has become much more concentrated in recent years in the north Delta. And there are many fewer smelt moving up into the south Delta than there seem to have been historically. Again, probably even as late as 1970s, when I first started working on smelt, they were probably pretty widely distributed in the Delta when they were

spawning everywhere through the north Delta all the way over to the south Delta.

Q. And are they still that widely distributed?

A. No, they're concentrated in the north Delta. Again, you find fish spawning in other areas, especially in the south Delta. But really it's not an important part of the population.

Q. And what is the -- if, in fact, the smelt are not spawning in record numbers in the south part of the Delta, how does that affect their prospects for survival?

A. It means that most likely that many smelt that enter the south Delta is not going to make it. That would contribute to the population. And even the fish in the north Delta can get moved across -- as I testified earlier, can get moved across into the central or even the south Delta when the pumps are really turned on high early in the season.

Q. Are there factors other than abundance and distribution that you might consider in evaluating the risk of extinction to the species?

A. Those are the two main ones I would use. And certainly, the -- we do have to include their abundance and distribution in different habitats at different times of the year. So it's a -- in a way we're talking about a moving target here too.

Q. Is genetic diversity within the population a fact you might consider?

A. That's interesting. Yeah, that you bring that up. I have mixed feelings about that. Clearly as the population gets low, you run the risk of having -- having smelt reach such low numbers that their genetic diversity is low and that makes it much harder for them to adapt to changing conditions over a longer period of time.

At the present time, though, numbers are already pretty low and the genetic considerations, I would regard, as being minor although they're real compared to the risk of population extinction, the population is going extinct.

In other words, what's called the demographic factors, the population factors are so important right now, genetic considerations wind up being minor. They could be a big problem when you have recovery later on if you start with a very small population. But right now, I would regard them as being much less important than the other aspects.

Q. Earlier you testified regarding something you called the Big Mama hypothesis. Is there a relationship between that hypothesis or research and genetic diversity within the delta smelt population?

A. Well, we don't know that. That's an assumption that's often made, that fish that spawn at different times in different places, there may be a genetic basis for that. Certainly it's reasonable to think that fish that spawn earlier and grow faster, go to a larger size are -- there's a

genetic basis for that. We know that works in salmon, for example.

But the studies on the genetics of these fish have not really been done to demonstrate that. It's much more likely that in the case of the Big Mama hypothesis, that these are smelt that just get up and spawn earlier and that their progeny then have longer -- have a longer period of time to rear in the optimal habitat and Suisun Bay and then they return earlier so you've got a cycle going. That historically these fish would have been continuous with other populations or other -- other groups that were spawning. So the genetics would have been much less of an issue.

Q. Let's assume for a moment that Dr. Hanson's population estimates are correct. Do you believe that the operations of the Central Valley Project and the State Water Project appreciably increase the Delta smelt's risk of extinction in the foreseeable future?

A. Yes, I do. And the reason for this, I think I've mentioned, but real briefly, it's due to this -- effects on the early spawning smelt, the big mamas, it's due to the broad scale effects on the habitat within the Delta as well as due to the direct entrainment of fish in the pumps, again which we don't really have a good balance of how much -- percentage of the population is being entrained. We know it's probably a high number, but we don't know how many because we are not

monitoring the early lifestages. And it's also possible that the effects are a result of cumulative effects of killing smelt on a -- essentially on a weekly basis.

Q. Could you elaborate on that cumulative effect?

A. Well, basically, you could -- if you kill a -- the longer this fish are exposed to the pumps, the population is exposed to the pumps, the more fish cumulatively you're going to kill. You may kill a relatively small percentage of the population in any given week. But if they're exposed to these pumps for a long period of time, each week you're getting a higher -- you're getting more and more smelt. And cumulatively, that can be a high percentage of the population. And obviously one of the things we're doing now is pumping more often and at higher volumes, so will be --

Q. Professor Moyle, considering the various impacts which you've testified to the CVP and the State Water Project operations both at the pumps and elsewhere, if you were to assume that Dr. Hanson's population estimates for delta smelt were correct, would the project operations appreciably reduce the value of the Delta smelt's critical habitat for its recovery?

A. Yes. Because they are -- the pumps affect the entire south Delta region. And they can -- as I think I mentioned, they can even -- when they're really turned on high, they can even draw smelt in from Sacramento River when they're on their

way downstream to try to find -- get into Suisun Bay. So yes, there's a zone of information from those pumps that can encompass a good chunk of the Delta.

Q. Have you reviewed the declarations filed in this case by Dr. Christina Swanson?

A. Yes, I have.

Q. And have you reviewed the protective measures that Dr. Swanson has proposed with respect to the delta smelt pending the preparation of the new Biological Opinion?

A. Yes, I have.

Q. Do you believe that those measures would address adverse impacts of the project operations on the Delta smelt's prospects for survival or recovery?

A. Yes, I do. I think they go a long way to addressing the problems.

Q. Could you -- we'll have Dr. Swanson here a bit later for the judge, but could you give us a general outline of your understanding of the protective measures? And if you'd like to refer to her declaration, I can get it to you.

A. As long as I don't have to get into chapter and verse, I can get to -- which I'd much rather have Dr. Swanson do because she's the one that generated them. I can give you a general idea of what they are.

First off, it's improved monitoring. That's absolutely crucial. And essentially the monitoring of the

larval smelt moving in to the pumps. That's the big question mark that we need to get answered the sooner the better.

A second aspect of them -- of her recommendations is to reduce the negative flows in the San Joaquin River, that is at Old and Middle River, which are a way of essentially saying that the more negative those flows are, the more you're likely to draw fish into the pumps. And so the recommendations are to find ways to reduce those negative flows.

The third aspect of these, of the recommendations is to move -- to have the VAMP flows, the Vernalis Adaptive Management Project flows, have those flows, which are designed for salmon actually, to do some testing for salmon -- well, anyway, won't get into that.

But basically extend those for a month earlier because Dr. Bennett's work suggesting it's those early outflows that are really important to smelt. If you move the VAMP flows earlier in the season, you're essentially providing more outflow down the San Joaquin River.

And the fourth one is to increase the amount of habitat in the fall months through changing water project operations; that is, allowing more water to move down the Sacramento River, essentially push the low salinity zone further out into Suisun Bay.

Q. Let me ask you a couple of questions about this. You mentioned the San Joaquin River and the Old and Middle Rivers.

What's your understanding -- how are you using the San Joaquin River in that?

A. Well, these are -- this is a historic channel of the San Joaquin River essentially. They're currently managed with barriers to -- and a good part to get the -- to improve flows in order to get salmon through the system a little bit easier. So you construct barriers on Old and Middle River. And that changes the hydrodynamics of the system in such ways that it creates negative flows in parts of those rivers, in the lower part of those rivers will draw the smelt up. The salmon are going around, but the smelt are coming up. And that results in a bad situation for the smelt.

So it's a matter of partly of increasing flows down the San Joaquin River, partly of managing barriers that currently change the hydrodynamics of the San Joaquin River area.

Q. When you say -- just to clarify. Are you referring to the Old and Middle Rivers as part of the historic channel of the San Joaquin River?

A. Yes.

Q. So when you talk about negative flows on the San Joaquin River, you're referring to Old and Middle River flows?

A. Yes. Those were the ones that were measured.

Q. And which -- which type of salmon are the salmon that are by the barriers to which you refer to?

A. Those are -- the fall run Chinook salmon from the San Joaquin tributaries.
Q. Do you know if those salmon are protected under the Endangered Species Act?
A. No, they're the one run which is in reasonably good shape and partly because there are hatcheries.
Q. Professor Moyle, you also mentioned an aspect of Dr. Swanson's proposed protective measures that, as I understood your testimony, would allow the VAMP flows to be recreated early; is that correct?
A. Yes.
Q. And you mentioned that there's a relationship between that and Dr. Bennett's research. Could you elucidate that relationship?
A. It's basically getting back to the Big Mama hypothesis. Again, that it appears that those -- that that -- if you want to have success in those early spawning fish, you've got to have increased flows in the San Joaquin River. You've got to change the negative flows in the San Joaquin River.

And Dr. Bennett noticed that when he had -- when you had smelt larvae that were surviving from the San Joaquin side, it tended to be either before or after VAMP flows were initiated.

So this essentially is a proposal to have the VAMP flows available for another month at a time when these -- when

the most of these bigger smelt are up there and for spawning. So it's to increase the survival rates of what we perceive to be the most valuable smelt in the system.

Q. And do you believe that that would contribute to the survival of the recovery of the species?

A. Yes, I do. I think almost as much as anything that would.

Q. Professor Moyle, you also referred to the aspect of Dr. Swanson's proposed protective measures that would provide for fall flow through the Delta; is that correct?

A. Yes.

Q. And could you elaborate on how that would be beneficial to the smelt?

A. Well, this is based in part on the recent work of the team of DWR, Department of Water Resources, biologists who have shown that as you increase the flows down the river, you improve the habitat for delta smelt and other species by decreasing some of the decreasing turbidity and the changing temperatures.

Q. And do you believe that this would be helpful in addressing impacts of the federal and state water projects?

A. Yes, I think that because that kind of habitat for rearing appears to be in short supply right now. If you want to produce a lot of delta smelt, you've got to provide the pastures for them to feed in. And that's exactly what you're doing, you're increasing the volume of the area, the amount of

the area these fish that are rearing have to rear in, so you decrease the probability of starvation, you increase the area they could find food, et cetera.

Q. Is there any certainty about the success of these measures?

A. There's always uncertainty in part because the smelt populations are already so low that it's going to be difficult to get a very rapid response from them. And we know this in general because with the relatively low number of eggs these smelt produce, they have a limited capacity to respond to major changes in the environment. So unfortunately, you can't just magically turn on the water and next year have a zillion smelt. It's going to take time.

Q. Professor Moyle, are you familiar with the -- let me ask it a different way.

Have you had an opportunity to review the Action Matrix proposed by the Fish & Wildlife Service and attached to the declaration of Ms. Goude?

A. I have, but I must admit I haven't looked at it too closely.

Q. If I were to represent to you that some of the actions in that matrix would be triggered by detection of smelt in or around the pumping facilities, would you have an opinion on whether that's an adequate trigger?

A. Yes. My feeling is, given the low numbers of smelt and

the probability of detection when they first appear, and the fact that we don't have adequate monitoring for these fish. In other words, you couldn't even detect the larval smelt.

It suggests that using the presence of smelt as a trigger for protective actions means you're probably already too late or you may never take the actions because you aren't looking for the fish.

Q. Are you familiar -- did you have an opportunity to review the declarations of Dr. Charles Hanson in the public remedies stage in this case?

A. Yes, I did. Again, not as closely as I would have liked to.

Q. And how familiar -- are you familiar with his remedy proposal?

A. His three tiers of protection? Yeah, I have some familiarity with them, yes.

Q. Maybe it will be helpful if I showed you a copy of his declaration and then we can refer to it that way.

A. You can do that. I can probably respond to questions fairly well without it at least initially as long as they're not in too much detail.

Q. Okay. Why don't we try that and then if we need to look at it, just let me know.

A. Yeah.

Q. It would be helpful for me to look at it, so I'm going to

get it.

Dr. Hanson's -- I'll just represent to you that Dr. Hanson's tier one measure would provide for net positive or net westerly flows throughout the winter and spring on the San Joaquin River. And let's assume for present purposes he means the San Joaquin River main channel rather than the Old or Middle River.

Do you have a view on whether that would be adequately protective of the delta smelt?

A. I don't think it would be. I gather he's referring there to the Q west measurement, which is one of these -- I don't want to say nebulous, but it's a tricky measurement that's made of flows in the lower San Joaquin River.

The problem with it, with that measure is that it doesn't seem to have much correlation with what's going on upstream, that is in the Old and Middle River, where it's most important to have negative flows. Also there's no relationship between fish populations and smelt populations in particular and the Q west flows. So it doesn't seem to be a very good protective measure because nothing seems to be really tied to it.

Q. Professor Moyle, I'm going to read you a sentence from paragraph 18 of Dr. Hanson's declaration. Which he says, "Results of these Particle Tracking Modeling exercises indicate that, by maintaining a positive net westerly flow of

water within the lower San Joaquin River through regulation of a combination of flow through the Delta Cross-channel, San Joaquin River flow, and State Water Project and CVP exports during the period extending from approximately December 1 through June 30th, the vulnerability of sub-adult, adult, larval and early juvenile lifestages of delta smelt to project exports effects can be substantially reduced or eliminated."

A. Again, I think for that one, one of the problems is using the Particle Tracking Models themselves. Smelt are not particles. They have behavior. They move up and down in the water column so they can regulate their position and choose places to go, which may or may not be the best places they should be. And again, what's really important is the Old and Middle River flows being reduced and not using smelt entrainment as your actual trigger for the action.

MR. WALL: Could I have one moment, Your Honor, to consult with counsel?

THE COURT: Yes, you may.

BY MR. WALL:

Q. Professor Moyle, I think we're almost done here. I have a few residual questions I'd like to try to address with you and then I think my colleagues may have a few questions to ask you as well. My -- counsel for the defendants.

I'm going to ask you, if you could, to clarify the timing -- let me back up for a second. As I understood your

testimony, Dr. Bennett has found that fish that are hatched in a certain window of time are not maturing to adulthood; is that correct?
A. The ones that --
Q. Please explain.
A. The ones that are spawned early in the season, he just doesn't find them. The progeny of the early spawning adults, he doesn't find in his samples where he looks at the ear stones for timing and chemistry. So it appears that the early spawning fish, the young don't survive.
Q. And what -- did you say the early spawning fish, what time period is that?
A. Again, I should look at his data, but it's presumably March, probably March, maybe early April fish, the first ones to come up to spawn in the spring.
Q. And how does -- and the ones after that period, he is finding --
A. Well, after the VAMP is -- well, while the VAMP is -- sorry. While the VAMP is going, he tends to find fish that are surviving. And then after that period of time, he tends to find either no fish or very few fish that are surviving, at least the ones that come from the south Delta.
Q. And before the VAMP period, what is he finding?
A. Again, if the -- before the VAMP, the same thing. The early spawning fish typically are coming in before the VAMP is

initiated, VAMP flows are initiated.
Q. And those are ones he's not finding?
A. Yes.
Q. And then during the VAMP period, the fish that are spawned during the VAMP period?
A. Yes, he tends to find -- they're -- you do tend to find more fish that survived as a -- during the VAMP period than either -- shoulders on either side.
Q. I think you testified that at present that delta smelt that may find a way into the southern part of the Delta are not an important part of the population; is that correct?
A. Well, they could be. But it appears that in event years, if you spawn -- if you're a delta smelt and you spawn in the south part of the Delta, there's a very good chance your progeny will not survive.

And increasingly, it appears that most of the smelt we see are over in the north Delta and away from the south Delta. Now, that could be a shift, the survivors have figured it out or resulted in changes of flows or we don't quite exactly what it is, but there are fewer smelt in the --
Q. So when you -- I'm sorry, are you done?
A. Than were historically. Yes.
Q. So when you're talking about an important part of the population, you're talking about an important part of the population that survives?

A. Yes. One that contributes to future generations.
Q. So delta smelt that spawn in the southern part of the Delta are not contributing importantly to the future generations?
A. To the best of our knowledge, yes, that's the case.
Q. And is that related to operations, the state and federal water projects?
A. That would seem to be the biggest single factor out there. Again, there's other things going on. But that's a consistent increasing factor is the operation of the pumps. And they seem to be -- and the operation does seem to be related to survival of the smelt.
Q. Are there any pumping facilities of the same magnitude in the northern part of the Delta?
A. No, there are not.

MR. WALL: One moment. I think we're probably done.

Thank you, Your Honor and Professor Moyle. I think we're done with the direct examination.

THE COURT: Thank you very much. Mr. Maysonett, do you wish to cross-examine?

MR. MAYSONETT: Yes, Your Honor.

THE COURT: You may proceed.

CROSS-EXAMINATION

BY MR. MAYSONETT:
Q. Good afternoon, Professor Moyle.

A. Good afternoon.
Q. I am James Maysonett. I'm the attorney for the federal defendants and I have just a few questions I'd like to ask you on cross-examination.
You have testified that we have really good monitoring programs and really good data sets about the delta smelt; is that correct?
A. That's correct.
Q. And what makes those data sets so useful?
A. The fact that they're long term. And the fact that we have multiple sampling programs that sample different parts of the system using different techniques. So that helps you overcome some of our sampling biases.
Q. So is it fair to say that one of the things that makes these data sets so useful is the fact that we have some of them for long periods of time, that is multiple years?
A. Yes.
Q. Professor Moyle, the plaintiffs have proposed a so-called fall action that would maintain certain minimum amount of flows from the Delta; is that correct?
A. Yes.
Q. And can you quantify how much of a benefit that action is likely to provide to the delta smelt in your opinion?
A. No, I can't. It's difficult to quantify that.
Q. Let me try to get at it a slightly different way. The

plaintiffs have also proposed that, for example, that certain flows -- certain negative flows in the Old and Middle Rivers be limited during winter pulse events; is that correct?

A. Yes.

Q. And if you were -- so Professor Moyle, for this question, assume that you were only able to implement one of those actions. That is a fall action or the limiting old and -- negative flows on the Old and Middle Rivers during winter pulse events.

In your opinion, which would provide greater benefit to the delta smelt?

A. You know, it's not a question I can give you a straight answer for because it would depend on the year, it would depend on so many different situations. That's why we propose them in tandem with one another. Because, one, they affect different life history stages of the smelt. So they really are not comparable actions that you can necessarily make that kind of choice. If you're really trying to protect the smelt through its entire life history.

Q. And did I understand you to say just now that one of the factors that might go into your consideration of which would provide greater benefits would be the specific hydrological conditions during that year?

A. Yes.

Q. You mentioned Dr. Bennett's Big Mama hypothesis several

times; isn't that correct?
A. Yes.
Q. That hypothesis hasn't been published or subjected to peer review yet; has it?
A. No, it has not.
Q. You have testified that state and federal officials are investigating pelagic organism decline in the Delta; is that correct?
A. Yes.
Q. And are you personally conducting any research as part of that investigation?
A. Just -- no. No. I'd have to say no.
Q. Professor Moyle, is it your opinion that a valid population estimate for the delta smelt is something that we need to reach conclusions about the status of the delta smelt?
A. No, I don't think you need to have a population estimate because we have all these indices which indicate the trends of the populations.

It would be wonderful if we could get a precise estimate because it makes -- it increases everybody's comfort zone enormously. But that is extraordinarily difficult with the delta smelt, which is part of the reason I think that we really should get along without the population estimate. Or at least recognize that the ones we have are very imprecise.
Q. Earlier, Professor Moyle, you testified that Particle

Tracking Models may have some limited usefulness because smelt have behavior, I think is the way you put it; is that right?
A. Yes.
Q. Would you concede that Particle Tracking Models do accurately predict the movements of larval and juvenile delta smelt?
A. No, even there I would not. You know, the smaller the lifestage, the more likely the particle tracking is to mimic their behavior. The early larvae are much more like a particle than after, they're drifting in the tidal flows. But even in these early stages, they can do remarkable things in terms of moving up and down in the water column, because it's essential that they do so in order to reach the habitats they need. They need to be able to move up or down in the water column in order to get to the flows that transport them to favorable conditions.

MR. MAYSONETT: Thank you, Dr. Moyle. That's all I have on cross.

THE COURT: Mr. Lee, do you wish to cross-examine?

MR. LEE: Yes, Your Honor.

THE COURT: You may proceed.

CROSS-EXAMINATION

BY MR. LEE:
Q. Good afternoon, Dr. Moyle, my name is Clifford Lee and I'm counsel for the California Department of Water Resources. I

have a few questions. I'd like to start with your discussion of Suisun Bay as being a habitat for the smelt. I believe your testimony was that in the 1987 and '88, there has been an invasion of a series of invasive species, including the overbite clam; is that correct?

A. That is correct. But principally overbite clam is the one that generates the most concern.

Q. And that the consequence of the overbite clam's presence in the species -- in the watershed is that it reduces food abundance; is that correct?

A. That is correct.

Q. And would then the post 1988 introduction of the overbite clam reduce the beneficial qualities of the Suisun Bay as habitat for the delta smelt?

A. Yes.

MR. WALL: Objection. I believe that mischaracterizes the date of the witness' testimony.

THE WITNESS: Oh, '87, '88.

BY MR. LEE:

Q. What dates did you say?

A. Well, it --

THE COURT: Let me rule on the objection first, Dr. Moyle, please. The objection is sustained to the form of the question if you were intending to characterize his prior testimony. If you want to ask the question, you may as long

as you don't attribute it to him or otherwise quote his testimony accurately.

BY MR. LEE:

Q. When was it, Dr. Moyle, that --

A. The invasion took place in 1987 or '88. These things don't happen instantly. They're there and then -- takes a year to build up a large population.

Q. I see. Would then generally the post 1988 period after the introduction of the overbite clam then result in a reduced beneficial habitat for the smelt in the Suisun Bay?

A. Yes.

Q. There is another clam -- excuse me. The overbite clam, is that a brackish water clam or a fresh water clam?

A. It's a brackish water clam.

Q. Are you familiar with a clam called the Corbicula?

A. Yes, I am.

Q. Is that a brackish water or a fresh water clam?

A. That is a fresh water clam.

Q. Would the Corbicula also produce the same or similar impacts on the food supply as an overbite clam would?

A. It has that potential, yes. Although that hasn't been fully demonstrated.

THE COURT: Do you have the swelling for Corbicula?

MR. LEE: I'm sorry, Your Honor, it would be --

THE COURT: Perhaps Dr. Moyle can --

THE WITNESS: Yeah, I can do it. C -- spelling quiz here. C-O-R-B-I-C-U-L-A.

BY MR. LEE:

Q. I believe, Dr. Moyle, you testified that project operations have the effect of changing the hydrodynamics in the south Delta thus affecting the Delta smelt's habitat; is that a correct characterization?

A. Yes.

Q. And could you explain how, in fact, those hydrodynamics again are changed by project operations?

A. Again, I'm not a hydrologist, so my explanations tend to be pretty simple minded. But basically what's going on is that there's a -- when the pumps are turned on, there's a general tendency of the water in the south Delta to -- and the San Joaquin River, to flow towards the pumps rather than flowing downstream into Suisun Bay.

Now, I realize it's a much more complex than that. But the general characterization -- that's why it's so bad for the smelt because when you turn on the pumps, you tend to increase their vulnerability to --

Q. Is this the concept of negative flow that we've been hearing up in Sacramento?

A. Negative flow -- in part, yes.

Q. All right. If the projects were, in fact, to reduce pumping and minimize or reduce the amount of negative flow in

the San Joaquin or Old and Middle River, would that have a beneficial effect on the smelt's habitat in the south Delta?
A. Yes. I think it would.
Q. Thank you. Now, I believe earlier in your testimony you said there were a multiple causes, I believe stressors, on the smelt. And I believe you identified toxics, food supply, I believe project operations and invasive species as some of the primary factors.
A. That's correct.
Q. All right. If my notes are correct, I believe you said, when asked "Have you been able to quantify the relative impact of these factors on the smelt?" I believe your testimony was that you would not be able to quantify the relative impact; is that correct?
A. That's correct.
Q. Now, when you say you haven't been able to quantify the relative impacts, are you in effect saying you can't tell whether the toxic impact is more important or less important than the food supply impact or that the food supply impact is not more or less important than the project operation impact?
MR. WALL: Objection as to form.
MR. LEE: What do you mean when you say --
THE COURT: Let me rule on the objection.
MR. LEE: I'm sorry, Your Honor.
THE COURT: Objection is sustained. Question is

compound.
BY MR. LEE:
Q. What do you mean, Dr. Moyle, when you say you don't understand or aren't able to quantify the relative impacts of these four factors?
A. Well, part of it is we simply don't have the data on many of these issues. For example, the data on toxics is insufficient to say what kind of impact they're having on smelt. But little information we have, in terms of the episodes of toxicity, suggest that for the most part it's likely not to be a problem, but could be in some years at some times. That's the problem we're talking about a stochastic factor here.

And for food supply, it's similar kinds of things, you know, we know, for example, that the clam invaded in 1988, reduced the food supplies. But then the food supplies have probably not declined substantially since then. So they may have had an initial impact on the smelt population, but not necessarily one that would have contributed to the more recent decline.
Q. All right. Let's talk then briefly about toxics. Again, if my notes are correct, I believe you testified that you had some question whether the increase in use of pesticides can be -- can be linked to mortality of the smelt. Is that a fair characterization?

A. Yes. In the wild, by the way. Not necessarily in the laboratory.
Q. Have you looked at whether increase or changes in pesticides and toxics generally in the Delta would have an effect on the food supply for the smelt?
A. It potentially could, but I haven't seen any evidence that it's affected -- might have affected food supply except perhaps very locally. Most of the toxicity tests for the pesticides are on the kinds of invertebrates that smelt eat.
Q. I see.
A. But I don't think there's direct evidence that it significantly reduced food supply over a large area --
Q. And what is --
A. -- for an extended period of time.
Q. Excuse me. I didn't mean to interrupt you, sir. And as to the impacts on the invertebrates that are part of the food chain for the smelt, what does the preliminary evidence indicate in terms of the impact of toxics on invertebrates?
A. If you're talking mainly about the most recent additions to the toxics list, which are pyrethroids. They are especially toxic to aquatic invertebrates and to fish. But again, there's no direct evidence that they -- that the impact has been seen yet. I'm happy about the fact that they're out there, but it's hard to demonstrate a direct effect.
Q. All right. I'd like to talk a little bit about

monitoring, if I could. We spent some time talking about the issuing of monitoring. Excuse me for a second while I secure an exhibit.

Your Honor, I would like to mark and identify as plaintiff's -- excuse me, as Defendant DWR Exhibit 1 attachment --

THE COURT: Let's make it DWR A for identification.

MR. LEE: Attachment A to document 396-5 that has been filed with this court, which I believe is the Cay Goude declaration. If I can approach the witness and provide --

THE COURT: Yes, you may.

MR. LEE: Thank you. For clarification purposes, Your Honor, I believe the copy we circulated also has as attachment B to attachment A as well as the declaration.

THE COURT: It starts out 1624 in the upper right-hand corner, it has exhibit to attachment B.

MR. LEE: That's correct.

THE COURT: Yes. You want the whole thing together?

MR. LEE: I'm sorry?

THE COURT: You want both of these exhibits together?

MR. LEE: Yes, Your Honor. For the moment.

THE COURT: All right. So it's going to be marked as one exhibit.

MR. LEE: That's correct.

///

(Defendants' Exhibit DWR A was marked for identification.)

BY MR. LEE:

Q. You had indicated in your direct examination that you were -- had some familiarity with US Fish & Wildlife Service matrix. This document is attached to that matrix and I would like to ask you to read, if you could, Dr. Moyle, the first sentence on paragraph 2 on the first page. Could you read that for the record, sir.

A. Oh, okay. "The Delta Smelt Working Group will examine real time information on delta smelt and Delta environmental conditions to determine" -- sorry -- "what Old and Middle River flow would be adequate to protect delta smelt."

Q. Sir, I would like you to look at the number of the sources of real time information that were in paragraph two. And would like to ask you: Is the 20 millimeter survey mentioned in that?

A. Yes, it is.

Q. Are other sources of information mentioned as well as the 20 millimeter survey?

A. Yes, they are.

Q. Are sources of information derived from Delta water temperature mentioned?

A. Yes, it is.

Q. All right. My question for you is the Delta temperature

data as outlined here in attachment A a useful indicator of the onset of spawning adult smelt?
A. A useful indicator? You know, I can't answer that question right now. I really would have to look at my note or something. But I don't really -- can't give you a straight answer on that, I'm sorry.
Q. Would -- are smelt more likely to spawn at a certain temperature in the Delta?
A. They definitely move up when temperatures are cooler.
Q. And what would be --
A. I don't know how much of that it triggered by temperature and how much is triggered by flow and turbidity and other things.
Q. Okay. Would you know a temperature, roughly a temperature level in which spawning would likely occur?
A. Somewhere -- I can -- this is -- I'd be much more comfortable having something like my book in front of me to give you. But if we're talking about fall, late fall, I'm sorry, we're talking about spring temperatures in the system. So it's somewhere between 10 to 14 degrees, somewhere in that general neighborhood. But --
Q. After --
A. -- I don't want to be pressed on the wall to that.
Q. Assuming we fix a temperature level and spawning does occur, how long after spawning of the delta smelt would it

take for the smelt to hatch?
A. Again, having life in front of me would improve my answer. Hatching does depend on temperatures. It's normally -- actually, I would rather not give an answer when I don't have that information in front of me. I know it's in a period of a couple of weeks, but I just don't know exactly.
Q. So say between 10 and 20 days, if you wanted to give a range, sir?
A. That would sound reasonable, but -- yes.
Q. You had indicated that you were familiar with the plaintiffs' fish action measures that are in the Swanson declaration.
A. Yes.
Q. Were you aware that fish actions number three, number five, number eight and number nine rely on Delta water temperatures as triggers for their action?
A. No, I was not.
Q. Would you say that the temperature levels are reliable or unreliable triggers for fish actions for the spring measures?
A. Again, I would have to look at some data to really see. But spring temperatures are generally in the range that delta smelt don't have any problem with. So I don't know why, you know, what the correct responses would be.
Q. If you look at attachment A, it also points to the Spring Kodiak Trawl Survey; is that right?

A. That's right.
Q. Does data from the Kodiak survey serve as a useful indicator of the maturation stage of delta smelt or presence of, quote, spent smelt?
A. Yes, it's almost the only survey out there that's specifically looking for spawning smelt.
Q. And would this real time information be a useful indicator or predictor of the subsequent presence of larval smelt?
A. It could be, yes.
Q. All right. Were you aware that the plaintiffs' fish actions two, three, four, five, eight and nine expressly rely on the real time Kodiak survey data as action triggers?
A. I was not aware of that.
Q. Would you expect to see spawning adult smelt or spent smelt before you would see larvae smelt in the Delta?
A. Well, it's not quite a simple question because the smelt spawn for a fairly extended period of time. So there would be periods when you would find both spent smelt, ripe smelt and larvae in the system simultaneously.
Q. Upon the early detection of spent smelt by the Kodiak survey, would that be a reasonable predictor of the subsequent presence of larval smelt?
A. The first detection?
Q. Yes.
A. I would assume so, yes.

Q. Thank you. Were you aware that plaintiffs' action number two, three, four, five, eight and nine rely upon real time data from the 20 millimeter surveys? As triggers for their action?
A. Yes and no. Yes, I guess I was, but I haven't thought about it too much.
Q. Doesn't plaintiffs' action number one regarding monitoring expressly require or ask the Department of Fish and Game to continue the 20 millimeter survey?
A. Yes, it does.
Q. Has the Delta Smelt Working Group ever expressly recommended that there be new sampling for larval smelt near the Clifton Court Forebay or in the Clifton Court Forebay in the State Water Project?
A. I have not read all the notes from Delta Smelt Working Group so I don't have the answer to that question.
Q. Did the March 2007 Pelagic Fish Action Plan recommend the adoption of new sampling for larval smelt near the Clifton Court Forebay near the State Water Project pumps?
A. Again, I don't remember.
Q. In your testimony and also in your declaration, sir, you indicated you had reviewed the declarations of -- the declaration of Christina Swanson. I believe specifically the July 23rd, 2007 declaration of Christina Swanson. Is that correct?

A. That is correct.

MR. LEE: Your Honor, I'd like to provide the witness with a copy of that declaration and mark it.

THE COURT: Yes, you may.

MR. LEE: Oh, and Your Honor, before I move on, I'd like to move and have plaintiffs -- excuse me, the DWR Exhibit A, I believe --

THE COURT: Any objections?

MR. LEE: -- as moved into evidence.

THE COURT: DWR Exhibit A is received in evidence.

(Defendants' Exhibit DWR A was received.)

THE COURT: We'll mark as next exhibit the declaration of Dr. Swanson as DWR Exhibit B.

(Defendants' Exhibit DWR B was marked for identification.)

MR. LEE: May I approach the witness, Your Honor?

THE COURT: Yes, you may.

MR. LEE: The Department of Water Resources would like to mark and identify the July 23rd declaration of Christina Swanson.

THE COURT: You've done that. That's Exhibit B.

MR. LEE: All right. Exhibit B.

THE COURT: Yes.

BY MR. LEE:

Q. I would appreciate it if you could turn, Dr. Moyle, to

figure 8.

THE COURT: On page?

BY MR. LEE:

Q. On this declaration, which can be found --

A. Page 12.

Q. On page 12. Are you figure -- are you familiar, sir, with this regression analysis by Pete Smith of the US geological Survey?

A. Only from Dr. Swanson's declaration.

Q. I would like to read to you from the August 3rd, 2000 declaration of Stephen Ford. A declaration that is document 430. On paragraph 26 of the Ford declaration, Mr. Ford states that, "One concern about this analysis is that it calculated and displayed the relationship as though positive in Old and Middle River flows which occurred in 1997 and 1998 were of zero value."

Were you aware that Dr. Smith altered the 1997 and 1998 data points in figure 8 to reflect zero values when the actual data showed those data points with positive values?

A. I was actually aware of that, yes.

Q. All right. Is it an acceptable scientific practice in conducting regression analysis to alter data points?

A. Well, he didn't really alter the data points so much as -- as treating them all as zeros, positive values as zeros. But generally not. Yes. I would say no.

Q. Wouldn't the use of the actual data rather than the altered data better reflect the actual relationship between project salvage and Old and Middle River flows?
A. Yes and no. The reason I replied both ways is that one legitimate way you could do an analysis like this is to take out values that you think are not relevant to your analysis as long as you explain why you're doing it. And in this case, you could say, well, the -- I'm really concerned about what happens during negative flows.
Q. Did Dr. Swanson's declaration that you have before you explain why, the rationale for the alteration of the 1997 and 1998 data points?
A. No.
Q. I'd like you to consider, again, Plaintiffs Exhibit 2, which I understand to be the Bennett 2005 study. Considerable discussion occurred in your direct regarding the population evidence and the confidence levels of those estimates as described by Dr. Bennett.

However, as I understood your testimony, Dr. Bennett was assuming, based upon the Fall Midwater Trawl Survey, that there were roughly 80,000 adult smelt for purposes of making his extinction analysis; is that correct?
A. That's right. For one year.
Q. For one year.
A. Yeah.

Q. All right. Assuming that there are 80,000 adult smelt, under the Bennett 2005 study, what would be the probability of the extinction of the smelt in the next year?
A. For 80,000 -- from the 80,000 number, I'd have to look at his values here, but it's -- by his calculations, it would be less than -- less than ten percent.
Q. Roughly how much less? Closer to five or closer to ten?
A. I can't really tell from this graph. And remember that these have a huge confident intervals around them as well.
Q. I'd like to ask you a few more questions relating to the fall action. Are you familiar with the plaintiffs' proposed action ten, the fall action?
A. Yes.
Q. If, in the next twelve months, or until such time as it takes to complete the smelt BiOp, the Central Valley Project and the State Water Project do not conform their project operations to the X2 salinity requirements of the fall action, is it your opinion that project actions for this time period will significantly reduce the smelt population?
A. Yes, I guess I would say that even though there's a lot of uncertainty out here and the delta smelt populations are already very low. So they might affect the populations and we might not be able to detect that effect.
Q. Well, is it likely that the population will result in extinction within the next year or year and a half that it

will take to prepare the Biological Opinion if the fall actions and the fall actions alone are not adopted.

A. Again, the fall actions would have to -- are really part of a package, so it's really hard to answer that question because these things do -- you're talking about you need actions to protect all life history stages. So I guess I would say I don't know.

Q. All right. Well, if, for example, the US Fish & Wildlife Service matrix was adopted, which does not include a fall action. Now, fall action was not included, is it your testimony that the failure to adopt the fall action will likely result in the extinction of the species?

A. It would increase the probability of extinction in the species.

Q. By how much, sir?

A. That's something I don't know. But that's what we're talking about is probabilities.

Q. If, in the next twelve months, the State Water Project and the federal Central Valley Project do not conform their project operations to the X2 requirements set forth in the plaintiffs' fall action, is it your opinion that the failure starting this fall to adopt the fall action would effectively preclude or foreclose the US Fish & Wildlife Service from considering this option in developing the Biological Opinion?

MR. WALL: Objection as to form.

THE WITNESS: Yeah. I guess I don't really understand the question.

THE COURT: All right. Now, you have to let me rule on the objection --

THE WITNESS: Oh, sorry, sorry.

THE COURT: -- Dr. Moyle. Thank you. Do you understand the question?

THE WITNESS: I'm not sure I do. I'd have to --

THE COURT: The objection is sustained on the ground of ambiguity. You may rephrase the question.

MR. LEE: Yes, Your Honor.

Q. If, in the next twelve months or until such time as the smelt BiOp takes for completion, the Central Valley Project and the State Water Project do not conform their operations to the salinity requirement in the fall action, would that mean that the US Fish & Wildlife Service in its deliberations and development of measures in the smelt BiOp would be too late to consider this matter. Would the fish be so -- so far gone that this matter would no longer be relevant or --

MR. WALL: Objection as to form.

THE COURT: Actually, I think this is a substantive objection. It causes the witness to speculate on the operation of the collective minds of the agency. And therefore the objection is sustained. You may rephrase.

MR. LEE: All right.

Q. If the fall action is not considered and adopted this coming fall, would this foreclose the US Fish & Wildlife Service from considering the fall action as a measure in its Biological Opinion?
A. For all falls for the indefinite future?
Q. Yes.
A. I guess I don't understand -- I don't know why I would -- again, I don't know why I would understand what the Fish & Wildlife Service is likely to do. It's -- if I was them, I would include it. But I don't know -- I don't have any reason to know why or why not they would not.
Q. Well, then let's follow that question out. If, in the fall of 2008, the US Fish & Wildlife Service chose to adopt the fall action, would it remain an effective action for the protection of the smelt?
A. Assuming that delta smelt hasn't gone extinct by that time, yes.
Q. I'd like to provide one more -- one more exhibit, Your Honor, then we are through from the state defendants.
THE COURT: All right. You may do so. This will be DWR Exhibit C. Can you describe it for the record?
MR. LEE: Your Honor, the document is Exhibit A to Dr. Swanson's July 23rd, 2007 declaration. It's document 421-3. And it is a letter dated March 13th, 2007. The title of the letter is "Recommendations for actions to protect delta

smelt." And it is signed by Dr. Peter B. Moyle and Dr. Christina Swanson.

(Defendants' Exhibit DWR C was marked for identification.)

MR. LEE: May I approach?

THE COURT: You may. Any objection to this being admitted?

MR. WALL: No objection by plaintiffs.

THE COURT: All right. DWR Exhibit 3 is received in evidence. I'm sorry. It's C. C, not 3.

(Defendants' Exhibit DWR C was received.)

BY MR. LEE:

Q. In your -- can you please identify this document, sir?

A. This is a letter that Dr. Swanson and I wrote to the heads of the various agencies who have some responsibility for the Delta.

Q. In your March 13th, 2007 letter, you recommend as in your words, quote, "an immediate action," end of quote. In bullet point one on, I guess, it's page three of this document, quote, "Manage Sacramento and San Joaquin River inflows and Delta water exports to prevent negative flow conditions on Old and Middle Rivers during the late winter and spring, i.e., Old and Middle River flows negative zero cubic feet per second from February to January." Does the plaintiff --

THE COURT: That's actually --

MR. LEE: I'm sorry?

THE COURT: -- greater or equal.

MR. LEE: Greater or equal, I stand corrected.

MR. WALL: Objection. I think we can clarify it's February to June rather than January.

THE COURT: Yes.

MR. LEE: I'm sorry.

THE COURT: Maybe you can read it so it's --

MR. LEE: February to June. My apologies. I just got new bifocals, Your Honor, and my --

BY MR. LEE:

Q. February to June. All right. Does the plaintiff's remedy proposal submitted to this court adopt this specific recommendation?

A. This was a recommendation --

Q. Does --

A. No, actually, it does not specifically.

Q. Is it your opinion that a properly tailored remedy proposal no longer requires a zero flow requirement for Old and Middle Rivers between February and January?

MR. WALL: Objection as to the dates.

MR. LEE: February and June.

THE COURT: Don't look at it, just try to remember it. February to June.

MR. LEE: It's been a long afternoon, Your Honor. I

apologize.

THE WITNESS: You know --

THE COURT: Is there a question?

THE WITNESS: If I was in complete charge of the system, I would love to have it be zero because I think that's, in fact, the optimal condition for the smelt. But this is very difficult to achieve zero flows. So -- which is why the recommendations don't require that. We think we can get most of the smelt down to the appropriate conditions without necessarily having those -- having the positive flows be continuous.

BY MR. LEE:

Q. So it would be your testimony that a correctly or properly tailored remedy does not require zero negative flows in Old and Middle River?

A. Not at all times, no.

Q. I'd like you to take a look also at the -- I believe it's the sixth bullet point on page four of your March 13th letter. It says "Increase San Joaquin River flows and/or curtail water exports to maintain Old and Middle River flows no less than negative 5,000 cubic feet per second during the summer (July through September)."

Does the plaintiffs' remedy proposal adopt this immediate action as part of its proposal?

A. No, it does not.

Q. Is it your opinion, then, that a carefully tailored remedy proposal does not require this particular fish action?
A. This was one that we thought was highly desirable at the time. It's still a desirable action. I think we could get by without it, though. At least the smelt would be in such a situation that it would not go extinct, I guess.
Q. All right. Is that based on new information that --
THE COURT: Let me ask a question here, Mr. Lee.
MR. LEE: I'm sorry?
THE COURT: Interrupt you, please. How do you achieve negative 5,000 cubic feet per second of flows?
THE WITNESS: That's what regularly happens up there today. Under most of the time, that's what you have in Old and Middle River. And it's because --
THE COURT: They're going back toward the pumps?
THE WITNESS: Yes. Essentially. I would be much more comfortable if you got somebody who knew hydrodynamics to explain how that happens.
THE COURT: But what's the pumping volume, it's more than 5,000 cubic feet per second?
THE WITNESS: The pumping volume is more than 5,000 cubic feet per second.
THE COURT: I'm asking. Is it? To achieve a negative 5,000 cubic feet per second. Well, if you're trying to reverse the effect of the reverse flows.

THE WITNESS: I don't know, Your Honor.

THE COURT: You don't know.

THE WITNESS: Yeah. In terms of what the actual pumping takes.

MR. WALL: Your Honor, if I might, I don't think we put on Professor Moyle as an expert in the water project.

THE COURT: Oh, no. We were just asking him -- I shouldn't say we were. Mr. Lee was asking him to explain this recommendation and I was just trying to understand what you would do to achieve this. I understand that the purpose of it is to try to reverse the negative flow so that --

THE WITNESS: Reducing.

THE COURT: -- it doesn't go back toward the pump. But I'm asking, to do that, what action has to be taken at the pumps? And that -- he doesn't know and so we'll find that out from somebody else.

THE WITNESS: I can give you a general response.

THE COURT: All right.

THE WITNESS: Which is you have to curtail some of the pumping, reduce some of the pumping in order to -- and that amount of pumping -- what I don't know are the numbers. The amount of pumping would be proportional to how much you wanted to reduce negative flows. Or the alternative would be to release more water from one of the upstream reservoirs in the San Joaquin side.

THE COURT: All right.

MR. LEE: I have no more questions.

THE COURT: Thank you. Mr. Wilkinson.

MR. WILKINSON: Yes, Your Honor.

THE COURT: Do you wish to cross-examine?

MR. WILKINSON: Yes, I do.

CROSS-EXAMINATION

BY MR. WILKINSON:

Q. Good afternoon, Dr. Moyle. I'm Greg Wilkinson representing the State Water Contractors.

I'd like to ask you: You prepared a declaration in this case that was filed on July 23rd this year; is that right?

A. That is correct.

Q. Is that the only declaration you filed in this case?

A. Yes.

Q. And that declaration is a total of four pages in length; is that correct?

A. That is correct.

Q. And the only attachment that you had to your declaration was a one-page list of your publications on the Delta?

A. Yes.

Q. As I understand it, sir, the main purpose of your declaration was to support the more detailed declaration of Dr. Christine Swanson?

A. That is correct.
Q. In preparing your declaration, Dr. Moyle, did you undertake any analyses of your own?
A. You know, I've been involved in this continuously, but no. I would say no.
Q. In connection with the declaration of Dr. Swanson, did you prepare any analyses of your own?
A. No.
Q. Did you undertake any effort to verify any of the results of the analyses that was set forth in Dr. Swanson's declaration?
A. That's a hard one to answer with a straight yes or no because we're in continuous communication. So -- and a lot of these things that are in her declaration are things we talked about or I've done analysis on in the past or various things. But in terms of the actual time she was writing her declaration, no, it would be no.
Q. Can you tell me how much time you spent reviewing Dr. Swanson's declaration before you prepared your own?
A. I have no idea. Several hours.
Q. Several hours.
A. Yeah. Again, it's very familiar territory to me.
Q. Good. I'm glad to hear that. In your declaration, sir, you state that over 2600 delta smelt were taken by the state project and Central Valley Project pumps in 2007; is that

right?

THE COURT: Now, we don't have the jury here, but counsel are not supposed to comment on the answer of the witness.

MR. WILKINSON: I'm sorry?

THE COURT: We don't have a jury here.

MR. WILKINSON: All right.

THE COURT: But counsel, under our rules of this Court, are not to comment on the answer of the witness.

MR. WILKINSON: I appreciate that, Your Honor.

THE COURT: If you would, please.

MR. WILKINSON: Thank you.

THE COURT: You may rephrase your question.

MR. WILKINSON: I will do that.

BY MR. WILKINSON:

Q. Dr. Moyle, in your declaration, you state, do you not, that over 2600 delta smelt were taken by the state and federal project pumps in 2007?

A. I believe that is correct, yes.

Q. And you also state, do you not, that it is likely these fish -- and I'm quoting, "it is likely these fish represented a significant portion of the population"?

A. Yes.

Q. Did you actually write that sentence, Dr. Moyle?

A. I did.

Q. Over what period of the year were the 2600 delta smelt that are referred to in your declaration taken by the project?
A. The issue there is that these 2600 fish, perhaps I should have stated it more explicitly, are really the tip of the iceberg because one of the problems is we don't really know how much fish are being taken. So the assumption is that 2600 fish represents a significant portion of the population.
Q. That was not my question, though. Can you tell me when these fish were taken by the project pumps?
A. Oh, when the fish were taken by the project. That was -- that was -- I think that was ongoing at the time we were working on this declaration. So that would have been early -- I'm sorry, the date -- the exact date slips me. But it was in -- it would have been in May and June. But I'm afraid I have a hard time remembering the exact dates.
Q. Is it fair to say, then, that the 2600 smelt referred to in your declaration were juvenile smelt?
A. Yes.
Q. On your direct examination, sir, you were asked to calculate a survival rate of juvenile to adult delta smelt. Do you recall that?
A. Yes.
Q. And was it your testimony that the survival rate is approximately four percent?
A. Yes.

Q. If you were to take four percent of the 2600 juvenile smelt that are referred to in your declaration, would that give you an approximation of the survival rate of those 2600 fish?
A. Of those 2600 fish, yes.
Q. I'd like you to take your pencil out again, if you would.
A. That's not very difficult. It would be 104.
Q. About 104?
A. 104 fish, right.
Q. And if we assume that Dr. Hanson's estimate of abundance of 1.8 million fish is correct, was it your testimony that would result in 72,000 adult delta smelt in the fall?
A. I think -- could you repeat the question? I'm sorry.
Q. Yes, sure. Be happy to. I think you were asked to apply this survival rate of four percent to the 1.8 million fish that were assumed by Dr. Hanson to exist according to his calculations. Do you recall that?
A. Yes.
Q. And was it your testimony that the surviving number of fish would be 72,000?
A. Yes.
Q. If we take the 104 fish that you just told me were taken by the project pumps as a conversion, if you will, of the juvenile smelt, what percentage of 72,000 is 104?
A. It's a very small percentage.

Q. Would it be considerably less than one percent?
A. Yes.
Q. Would it be about one-tenth of one percent?
A. That sounds about right.
Q. And if Dr. Hanson were off on his estimate by, say, 50 percent and instead of having 1.8 million, we had 900,000, what would the four percent survival be then? Would that be 36,000 fish?
A. Yes.
Q. And what percent of 36,000, sir, would 104 fish be?
A. Again, approximately a tenth of one percent or something like that.
Q. Dr. Moyle, what was the size of the smelt population that you assumed when you said in your declaration "it is likely these fish represented a significant portion of the population"?
A. Again, that's why I said "proportion." I basically didn't know. The closest thing I had was what was in Dr. Bennett's monograph.
Q. And what was that population?
A. Well, that -- again, he had the lowest -- the lowest population he dealt with -- he estimated was around 86,000 smelt. Again, plus or minus a large number.
Q. And that's the -- that's the population of adult smelt; is that right?

A. That's the population of the adult smelt, yes.
Q. And that's the population that you used in writing the declaration; is that correct?
A. That's what I had in mind, yes.
Q. And if we divide 104 by 86,000 fish, what would the percentage be?
A. A very small number. Tenth of one percent, something.
Q. I believe it's your testimony that you believe the number of fish counted in the salvage does not represent the number of fish actually taken by the projects; is that right?
A. That's right.
Q. Do you have an idea of the number of fish that, in your opinion, are actually taken by the project?
A. No. We don't.
Q. Do you know what percentage the number of fish salvaged by the projects and recorded as salvaged is to the total number of fish taken by the project?
A. No.

THE COURT: All right. Let's take the afternoon recess at this time. We will stand in recess until 3:15 p.m.

(Recess.)

THE COURT: We're back on the record in NRDC versus Kempthorne. Please be seated. We'll continue the testimony of Dr. Moyle. Mr. Wilkinson.

MR. WILKINSON: Thank you, Your Honor.

Q. Dr. Moyle, when we broke for the afternoon break, we were talking about the fish that were collected by the -- salvaged by the projects and they were juvenile smelt. That was your testimony; is that correct?

A. I -- yes, if I remember where we were, yes.

Q. I'm trying to recall myself. Thank you. I'd like to show you, sir, a document that was -- this was a declaration that was submitted by -- Your Honor, may I --

THE COURT: You may.

MR. WILKINSON: I'm already halfway there, I apologize.

Q. That was prepared by a Mr. -- excuse me, Dr. Richard Sitts.

THE COURT: Are you going to mark this for identification?

MR. WILKINSON: Yes, Your Honor.

THE COURT: This will be State Water Contractors Exhibit A.

(Defendants' Exhibit SWC A was marked for identification.)

MR. WILKINSON: Your Honor, I will provide the entire declaration if you prefer that. Rather than the piece -- this is an exhibit from the declaration.

THE COURT: Depends on what you're going to use it for. Are you going to use it to refresh his recollection?

MR. WILKINSON: Why don't I provide the Court the full document, I think that would be better.

MR. WALL: So to clarify, will the entire document be Exhibit A?

MR. WILKINSON: Yes. The entire document is the declaration of Richard Sitts, Ph.D. filed here in August of this year.

Q. And Dr. Moyle, I'd like to refer you to Exhibit E attached to that declaration, if you would.

A. Yes.

Q. You have it in front of you?

A. Yes.

Q. Now, Exhibit E is entitled Collection Mortality Report. Have you seen this document before?

A. No, I have not.

Q. All right. Exhibit --

THE COURT: Is there a page reference for this --

MR. WILKINSON: Your Honor, it's page 26 --

THE COURT: -- Mr. Wilkinson? Thank you.

MR. WILKINSON: -- of the declaration. And it is entitled Exhibit E to the declaration.

THE COURT: Yes. I have it.

MR. WILKINSON: You have it?

THE COURT: Yes.

BY MR. WILKINSON:

Q. And Dr. Moyle, do you have it in front of you?
A. Yes, I do.
Q. Now, Dr. Moyle, this appears to be a report from a Bradd Baskerville-Bridges and Joan Lindberg. Do you know those individuals?
A. Yes, I do.
Q. Do they work with you at University of California at Davis?
A. No, they don't.
Q. They don't. How is it that you are aware of who those individuals are?
A. I was on Joan's -- Dr. Lindberg's dissertation committee. Dr. -- Mr. Baskerville-Bridges was an undergraduate. He was in my classes. I don't remember whether I was on his graduate committee or not.
Q. Now, the exhibit indicates that Mr. Baskerville-Bridges and Ms. Lindberg are employed at the Department of Biological & Agricultural Engineering. Is that a department that you have any connection with at UC Davis?
A. No.
Q. So you're not aware, then, of the work undertaken by those two individuals; is that right?
A. I am aware of the kind of things they do, but only generally.
Q. Are you aware, Dr. Moyle, that Mr. Baskerville-Bridges and

Ms. Lindberg had permission to collect delta smelt from the Delta?
A. I'm not surprised they do. They should given the things they do, yes.
Q. All right. And if we read down through this exhibit, it indicates that -- it describes the number of delta smelt collected. And it says, "delta smelt were collected during the first week of December using a Lampara net, a total of 2418 sub-adults were collected in 53 sets over the three sampling days." Do you see that?
A. Yes, I do.
Q. Can you tell me what a sub-adult delta smelt is?
A. It's a pre-spawning adult, essentially fish that have already moved up the river that are getting ready to spawn. I think this is their words. I'm not sure, they may have a different idea. But my impression is that by sub-adult, they mean spawn -- fish that are getting ready to spawn, but have not yet spawned.
Q. Are these fish, Dr. Moyle, the four percent of the juveniles that survive to adult smelt status?
A. I would assume so, yes.
Q. All right. So if Mr. Baskerville-Bridges and Ms. Lindberg took 2418 adult, sub-adult smelt, that would be a multiple of approximately what to convert that back to juvenile smelt?
A. I have to multi -- I don't know. I'd have to do the math.

But it would be a large number.
Q. Above 20?
A. Above 20?
Q. 20 times. In other words, one sub-adult is equivalent to approximately 25 juveniles?
A. That sounds reasonable, yeah.
Q. Well, am I correct, then, that this report indicates that two folks from UC Davis collected approximately 25 times the number of smelt salvaged at the state and federal pumps?
A. Yes. And must have been -- these are not my folks. And I would shout for that number myself.
Q. All right. Thank you.

Dr. Moyle, I think you testified -- and please correct me if I'm incorrect -- the delta smelt prefer salinities in the range of one part per thousand to two parts per thousand; is that right?
A. It appears that in this case, yes.
Q. Is the delta smelt a euryhaline species?
A. Yes, it is.
Q. Would you tell me what that means?
A. It means they can live under a fairly wide range of salinities. And I forget the extremes in which delta smelt have been collected, but they are regularly found at ten to 12 parts per thousand, roughly a third of the salinity of sea water.

Q. In your book Inland Fishes of California, do you describe the salinities in which delta smelt are most commonly found?
A. I'm sure I do.
Q. Do you recall what the numbers were, the range?
A. No, I don't. I'm sorry.
Q. Let me see if I can help you.

I'm reading from page 228 of your Inland Fishes of California, Dr. Moyle. Under life history, you say, "They are mostly found within the salinity range of two to seven parts per thousand, but they can be found at salinities ranging from zero to 18.4 parts per thousand and can tolerate salinities up to 19 parts per thousand." Do you recall that?
A. I guess I do, yes.
Q. All right. Dr. Moyle, if delta smelt are most commonly found at salinities ranging from two to seven parts per thousand, would it be your view that that's the preferred range of salinity for the fish?
A. If that was the case. But that's old information.
Q. Oh, it's old information. What was the date of publication on your book?
A. The date of publication was 2002 and it takes about two years for something like that to get to the press.
Q. I'm sorry. Have you finished?
A. Yes.
Q. So have you revised your view about the preferred salinity

range of the smelt?
A. Again, it's a complex issue. But yes, the preferred salinity ranges are at the lower end. It appears from the most recent data from Dr. Swanson's studies and others, that they really -- they -- they prefer to be at the low end of the salinity range when they're rearing.
Q. Well, the salinity range you provided here was two to seven. Based upon the later work, since apparently 2000, what do you believe the salinity range is currently?
A. Actually, the salinity range is the same. But except that there -- we come to appreciate the fact that they like -- also like to be at -- just slightly saline water, one to two parts per thousand. So they can actually live in that entire range. But apparently, given a choice, they'll choose the lower one.
Q. If smelt are subjected to a temperature of three parts per thousand rather than two parts per thousand --
THE COURT: You mean a salinity?
BY MR. WILKINSON:
Q. In salinity, yes. I said something else?
THE COURT: You said "temperature."
MR. WILKINSON: Ha. Thank you, Your Honor. Checking to see if you're listening.
THE COURT: Well, thank you for that.
BY MR. WILKINSON:
Q. Dr. Moyle, let me try that again. If delta smelt are

subjected to a salinity of three parts per thousand and live in a salinity three parts per thousand, rather than two parts per thousand, have you done any calculation of the change in abundance of the population that would occur?

A. No. Because I don't -- I think it really depends on where their food supply is found.

Q. So food supply is the critical factor?

A. It seems to be, that's what's driving their salinity choices as much as anything.

Q. Now, earlier, Dr. Moyle, you described a number of factors that you believe to be important to the delta smelt. I think you mentioned low salinity within Suisun Bay; that is right?

A. Yeah. Their habitat basically.

Q. And shallow habitat, I think, was another factor?

A. Shallow water, low salinity is the habitat in Suisun Bay.

Q. So it's the combination of these events. Low salinity and shallow water; is that right?

A. Yes.

Q. How about water velocities. Lower velocities are better than higher velocities?

A. Yes. They don't -- they are not great swimmers, so they need relatively low water column velocities, yes.

Q. Are these factors especially important to the fish during the spring time?

A. Well, during spring time, they're up in the Delta

spawning.
Q. Okay. In the late Delta -- in the late spring, they're still up in the upper part of the Delta, are they?
A. Yes. And they're -- so these factors are obviously still important, but salinity is much less of an issue because they're spawning in fresh water.
Q. Are you aware, sir, that the State Water Resources Control Board has already imposed an X2 requirement on the projects in the spring?
A. I'm aware of it, but I don't know what it is exactly.
Q. You don't though when it applies or where --
A. No.
Q. -- it requires X2 to be located; is that right?
A. No. I would be hard pressed to say that, yes.
Q. Do you recall where that requirement was imposed?
A. I'm sorry. Where?
Q. In what document.
A. No. I don't.
Q. You don't recall whether that's something that's part of water requisition 1641?
A. No, I don't.
Q. Dr. Moyle, are you aware that the state and federal projects are obligated by the water requisite I just mentioned, 1641, to meet certain water quality objectives in the fall?

A. I was aware of that, but I don't know specifically what they are.

Q. All right. Let me see if I can get a copy of that for you.

THE COURT: What are we doing with State Water Contractors A, do you want to leave it marked for identification?

MR. WILKINSON: Your Honor, I was going to ask a question. Do you prefer that I wait until the end of the examination?

THE COURT: No, I want you to do it when you present the evidence if you want it in evidence.

MR. WILKINSON: I want it.

THE COURT: You have the testimony in. But if you want the exhibit, is there any objection?

MR. WILKINSON: I'll go ahead and move the admission of Exhibit A.

MR. WALL: Is Exhibit A is the entirety of the Sitts declaration, we would object that he's a non-testifying expert and this is hearsay, Your Honor. We don't have an opportunity to cross-examine Mr. Sitts.

If the exhibit were just Exhibit E to the Sitts declaration, we would not object to that. Exhibit E is the subject of counsel's cross-examination.

THE COURT: Yes.

MR. WILKINSON: I'm happy make that change, Your Honor, if that would be permissible.

THE COURT: All right. Then what we're going to do is this: We'll leave this exhibit designated as SWK A, but.

I'm going to admit in evidence only -- is this one or two pages, this mortality report? Does it go over on to page 27, Dr. Moyle? I'm going to admit what is referred to by title as Exhibit E, Collection Mortality Report consisting of -- if it's two pages, I'll admit both. If it's one page -- looks like it's two pages, pages 26 and 27. And so those will be admitted as SWK A.1 and A.2 in evidence.

(Defendants' Exhibit SWC A.1 and A.2 were received.)

MR. WILKINSON: Your Honor, I wonder if I could approach the witness?

THE COURT: You may.

BY MR. WILKINSON:

Q. Dr. Moyle, I'd like to show you some excerpts from Water Right Decision 1641 as revised. And I'd like to have that marked as -- are we using SWK, Your Honor, SWC?

THE COURT: SW -- well, you know, I did K for contractors, let's make it C.

MR. WALL: Counsel, I haven't had an opportunity to see that. Do you have a copy?

MR. WILKINSON: Yes, of course.

THE COURT: All right. This will be SWC B.

(Defendants' Exhibit SWC B was marked for identification.)

MR. WILKINSON: Thank you, Your Honor.

Q. Dr. Moyle, why don't you familiarize yourself with that. Have you finished?

A. I've looked through it, yes.

Q. Okay. I'd like to refer your attention to table 1. Also it has page 181 at the bottom.

THE COURT: Do you have a copy for the Court, Mr. Wilkinson?

MR. WILKINSON: I'm sorry, Your Honor.

BY MR. WILKINSON:

Q. And Dr. Moyle, do you see on table 1, State Water Contractor Exhibit B, there's a reference to compliance location. And the third reference down is "Contra Costa Canal at Pumping Plant Number 1." Do you see that?

A. I do.

Q. And you see that, to the right of that, there is a parameter entitled "Chloride." Is that also a term for salt?

A. Yes.

Q. And to the right of that, you'll see that during the October through September period, it's like all year and all water year types, there's a value of 250 parts per million of chloride; is that correct?

A. I don't see the 250 -- the 150, you mean?

Q. 250.
A. I don't see that. But -- oh, yeah, I see it. I see where it is. The value of 250. Okay.
Q. Dr. Moyle, where in your understanding is the Contra Costa Canal at Pumping Plant Number One compliance point?
A. Well, I only know approximately. But it's over in the south central Delta.
Q. Could you point that out on the map that you have up here?
A. You know, I really don't know the precise location, but it's somewhere in that general region.
Q. It's to the -- slightly to the west of the central Delta; is it?
A. I think so. But I'd have to see it located on the map.
Q. Okay. And Dr. Moyle, I'd ask you to turn also to Table 3 and to the last page of Table 3. And you will see something called Delta outflow as a requirement. Do you see that?
A. Yes.
Q. And if you look to the right, you'll see there are a variety of water year types listed and they're alphabetical. W I believe is wet, AN is above normal and so forth. D is dry and C is critical. Is that your understanding?
A. I haven't -- I'm just looking at this. That seems logical.
Q. And you see, Dr. Moyle, in that right-hand column, there's a series of figures. And that appears to be values of outflow

and cfs; is that correct? Cubic feet per second.
A. Are we looking at -- oh, so this is page 184?
Q. This is page 184.
THE COURT: Yes. Far right column.
THE WITNESS: I'm sorry. I was looking on the previous page. Yes. Okay.
BY MR. WILKINSON:
Q. Do you have any reason to believe, Dr. Moyle, that the state or federal projects are failing to comply with these water quality objectives we've just discussed?
A. I don't know.
Q. If we assume that the projects are in compliance with these water quality objectives, can you give me your estimation of what the resulting water quality would be at Kilometer 80 in the fall if these objectives are satisfied?
A. I can't do that off the top of my head, no.
Q. You have no idea what the resulting salinity would be; is that right?
A. Not to any degree that would be meaningful, no.
MR. WILKINSON: Your Honor, I'm going to go ahead and move the admission then of SWC Exhibit B.
THE COURT: Any objection? SWC Exhibit B is received in evidence.
MR. WILKINSON: Thank you, Your Honor.
(Defendants' Exhibit SWC B was received.)

///

BY MR. WILKINSON:

Q. Dr. Moyle, during your direct examination, you identified a series of what I understood to be causes of smelt decline. One of those was toxic materials; is that right?

A. Yes.

Q. And I think you identified a couple of chemicals. I heard pyrethroids mentioned a couple of times. Do you remember that?

A. Yes.

Q. What are pyrethroids?

A. They're an -- well, they're an organic pesticide is the way you'd have to characterize them.

THE COURT: Inorganic or organic?

THE WITNESS: Organic.

THE COURT: Organic.

THE WITNESS: Yeah. They're regarded as an especially good pesticide to use on gardens and orchards and so forth because they have very low toxicity to birds and mammals.

BY MR. WILKINSON:

Q. Would the application of pyrethroids in the Delta area be dependent upon any operations at the state or federal pumps?

A. The application?

Q. Yes.

A. Not directly, no.
Q. And you mentioned organophosphates as well. What are those?
A. That's another class of pesticides. They're manufactured pesticides, they're very toxic at very low levels.
Q. They're very toxic to delta smelt, are they, at low levels?
A. Especially in conjunction with pyrethroids.
Q. And I'm assuming that, again, you're -- strike that.

Do you have any reason to believe that the application of organophosphates within the Delta area is dependent in any fashion on the operation of the projects?
A. No.
Q. I think in your testimony, Dr. Moyle, you indicated that delta smelt have -- I may be getting the wrong term here -- adjusted to these toxic materials; do you recall that?

MR. WALL: Objection. Misstates the witness' testimony.

BY MR. WILKINSON:
Q. Was that your testimony, Dr. Moyle?

THE COURT: You can rephrase the question.

MR. WILKINSON: I'll try to do that.

THE COURT: I'll sustain the objection.

BY MR. WILKINSON:
Q. Dr. Moyle, was it your testimony that delta smelt have

acclimated to the application of toxics such as pyrethroids and organophosphates?
A. No. I would never -- I would never say that.
Q. All right. So these materials, then, are materials that at very low levels are toxic to delta smelt and they do not acclimate to it; is that correct?
A. The assumption is they're toxic to delta smelt. They haven't really been directly tested on them. But the assumption is because they're toxic to fish, they'd be toxic to delta smelt, yes.
Q. I think you also identified a number of invasive species that are partially responsible for the delta smelt decline. Do you recall that?
A. Yes.
Q. I think you mentioned for Corbula.
A. Yes.
Q. That's the overbite clam.
A. Yes.
Q. That's the salt water critter?
A. Brackish water.
Q. Brackish water. And Corbicula, I think you mentioned that as well; is that right?
A. Yes.
Q. That's the fresh water clam?
A. Yes.

Q. Would striped bass be a predator of the delta smelt?
A. Surprisingly not.
Q. How about large mouth bass?
A. No evidence. Again, there's no evidence for it. I'm always surprised at that, but there's no evidence for it.
Q. Threadfin shad?
A. Not as a predator, no.
Q. So the only two predators in the Delta, then, are Corbicula and Corbula; is that right?
A. Those are predators on plankton in the sense that they're sucking up algae and the small lifestages of various species of crustaceans out there. So they aren't really -- well, you normally don't characterize them as predators, put it that way. I guess you could.
Q. The clams that we've described, Corbicula and Corbula, are competitors for the available food supply?
A. Yes.
Q. Are there predators of the delta smelt in the Delta?
A. You know, I -- but no. Actually, I have to say that. There's all -- but they're found in -- occasionally found in striped bass stomachs, for example, but by and large not. It's really quite remarkable.
Q. I think you mentioned also Delta diversions, in-Delta diversions. Do you recall that?
A. Yes.

Q. How many of them are there?
A. About 2200.
Q. Are they screened?
A. Most of them are not, no.
Q. Do you have any evidence that these in-Delta diversions do not take delta smelt?
A. The evidence -- yes, actually, there's some. It's very limited studies done by DWR that suggest that by and large the ones they've tested, which were right on the Sacramento River, so where smelt were likely to be exposed by them, had a very -- I don't remember if it was low or no catch of delta smelt. The studies that have been done of the fish response to small diversions like this really suggest that by and large small diversions in the Delta are not much of a problem for the fish.
Q. Is that because the fish generally reside in the middle of the channel in the Delta?
A. Delta smelt you're talking about?
Q. Yes. The delta smelt.
A. Yes. That's certainly a primary reason. Also a lot of the times these diversions are turned off when the smelt aren't present.
Q. Do you have any idea where Mr. Baskerville-Bridges and Ms. Lindberg caught their smelt?
A. I think they caught them in the Sacramento River near Rio

Vista as they're moving -- as the fish were moving up to spawn.

Q. Do you know whether the fish were taken in the shallow areas of the Sacramento River or in the middle of the river?

A. I don't know. Remember when spawning they do tend to -- and when they're migrating, they can be in shallower water. But I assume, since they used a Lampara net, it was probably fairly shallow water.

Q. Is it your belief, Dr. Moyle, that delta smelt had adjusted to the invasive species that we described?

A. Well, there are multiple invasive species out there. Adjusted to --

Q. The clams.

A. The clams.

Q. The fresh water clam and the salt water clam.

A. I don't know if "adjusted" is the right word, but their populations probably have because the take of -- you know, the -- sorry. The clam populations have not increased much since the initial invasion. They're widespread since they invaded and they have seasonal population fluctuations. So it doesn't appear that they have an increased effect on the plankton population. So once -- I assume, again from relatively limited evidence, that the smelt population declined initially in response to the invasion, but thereafter had ceased being much of a factor.

Q. I'm trying to understand how invasive species that are competing for the same food supply that the delta smelt uses is something that the delta smelt can adjust to. Would you explain that to me?

A. The delta smelt is a plankton feeder, as is the clam is taking the food that the plankton feeds on, that the smelt feeds on in turn. So they are competing for the same resource. But the food is always in patches -- excuse me, food is always in patches in the environment, it's not uniformly distributed. And the smelt seem to be very good at finding concentrations of food that are out there.

So we know basically that the smelt populations, when you look at individual smelt, they can have full guts, they can have indications that they are doing just fine. And even though we're in Suisun Bay, which is where the clams are existing.

So the clams that essentially have an equilibrium, in their populations they reached an equilibrium in terms of their effects on the plankton. So the smelt have essentially figured this out. They're at lower populations themselves, they can find the food that's remaining.

Q. Dr. Moyle, is it your understanding that the fresh water clam and the salt water clam have territories that overlap within the Delta?

A. There's a very small overlap between the two. By and

large they're in different places.
Q. Is it your understanding that if outflows were increased for the purpose of pushing westward the salt water clam Corbula, that the fresh water clam, Corbicula, would extend its range into the area that's been vacated?
A. No, we don't know that. Everything depends on how much the salinity fluctuates. How much it goes back and forth between different salinities. If you make it into a permanent fresh water environment, yes. But if you allow salinities to fluctuate, which it most certainly would in those areas, you might discourage both clams.
Q. Are you aware of any studies that have been undertaken to try to determine answers to my question?
A. Yeah. Janet Thompson of the USGS is looking at the clam biology very intensively.
Q. Dr. Moyle, in your direct examination, I believe you described the importance of a Cache Slough area for spawning purposes. Do you recall that?
A. Yes.
Q. That's in the northern Delta area; is that right?
A. That's right.
Q. And I'm trying to understand your concern. Is your concern that if the fish are in the Cache Slough area in the northern part of the Delta, that the project pumps could pull the fish down into the central Delta?

A. There's some evidence that they can pull -- the pumps can pull the larval smelt that come moving down the river from spawning in Cache Slough, can pull those pumps through 12 Mile Slough into the central valley.
Q. When you say 12 Mile Slough, do you mean Three Mile Slough, sir?
A. That is probably correct. I'm sorry. I'm getting foggy right now. Yes. But I'll take your word for it. Three Mile Slough. It's the one slough that comes off the Sacramento River about two-thirds of the way down.
Q. Can you show us on the map where Three Mile Slough is?
A. This is not the most accurate map in the world, but I assume it's this slough right here.
Q. This would be slightly above the middle near the word "Sacramento" on the map.
A. Yes. Yes.
Q. Is that correct?
A. I think so.
Q. I see near that "San Joaquin." Is that an indication where the San Joaquin River is?
A. Yes.
Q. And the flow is from right to left across the map; is that correct?
A. That is correct.
Q. Okay. Dr. Moyle, if a net positive downstream flow were

maintained in the lower Sacramento River as it nears -- I'm sorry, in the lower San Joaquin River as it nears the Sacramento River, would that not tend to alleviate your concern that delta smelt would be pulled towards the central Delta?

A. It might help. But you have to keep in mind that this is a very complex system and that direct -- that outflow, positive outflow in the lower San Joaquin River don't necessarily translate into positive flows in Old and Middle River, which is -- or even reduced negative flows in Old and Middle River, which is really a crucial point. Getting those fish out of the upper part of the San Joaquin.

Q. So are you saying, Dr. Moyle, that maintaining a net positive downstream flow in the lower San Joaquin River would not be sufficient to prevent delta smelt from being pulled into the central valley?

A. Not by itself. It depends on where the smelt are at the time. Remember, they have to make it -- you want them to get upstream to spawn initially and then to move down again.

Q. Well, let's suppose that the fish are in Cache Slough, which I believe you identified as an important area.

A. Yes.

Q. And under those circumstances, if a positive net downstream flow in the lower San Joaquin River were maintained, would that reduce your concern that smelt in Cache

Slough would be pulled into the central Delta?

MR. WALL: Objection. Asked and answered.

THE COURT: I'm not sure. I'm going to overrule the objection. You may answer.

THE WITNESS: I'm trying to understand the question, so what -- go ahead and you ask it to me again.

THE COURT: Let's read the question back.

(Record read as requested.)

THE WITNESS: I think I'd have to answer that it depends on what else is happening in the system at the same time, the time of year, where the smelt were, what the flows were at Old and Middle River. Again, it's nothing that's terribly simple out there. It sounds good, but there's so many that I would not want to commit myself to an answer until I really studied the issue.

BY MR. WILKINSON:

Q. And you have not done that; is that correct, Dr. Moyle?

A. I have not done that, made a study, no.

Q. Thank you. Dr. Moyle, you've referenced work by Dr. Bennett several times in your direct testimony. Is Dr. Bennett a colleague of yours at UC Davis?

A. Yes, he is.

Q. And you referred to his 2005 article. Do you recall?

A. Yes.

Q. Do you recall also that in his 2005 article, Dr. Bennett

did find a statistically significant relationship between his population abundance estimates and the Summer Townet Survey and Fall Midwater Trawl Survey?

A. Yes.

Q. And isn't it true, Dr. Moyle, that in her petition to upgrade the listing of the delta smelt from threatened to endangered, that Dr. Swanson relied upon the population estimates produced by Dr. Bennett in his article?

A. I don't recall that -- I don't recall that for sure.

Q. You don't know one way or the other; is that right?

A. Not that I remember anyway, no.

Q. You also mentioned several times, Dr. Moyle, something called the Big Mama theory of Dr. Bennett's.

A. Yes.

Q. Do you recall that?

Has that theory been published in any paper that's public?

A. No, it has not.

Q. Has it been peer reviewed by anyone?

A. He's presented at many meetings, so he's been open to a lot of criticism. But no.

Q. Has he made his -- has he presented that theory through some PowerPoint program or how has he done it?

A. Yes. As I recall, I've heard it at least twice. It's -- I believe it was a PowerPoint, yes.

Q. Do you know whether Dr. Bennett is releasing his PowerPoint to anyone for review?
A. I have not seen it except beyond this recent issue, so I don't know.
Q. Dr. Moyle, you were asked by Mr. Lee about a graph that appeared in Dr. Swanson's declaration that was filed on July 23rd, I believe it was figure 8 from page 12.
A. Yes.
Q. Do you have that in front of you?
A. I'm sure I do.
Q. This is from DWR Exhibit B. I believe you were asked by Mr. Lee -- do you have it in front of you, sir?
A. I'm -- so which -- it was --
Q. I'm sorry.
A. It was the attachment --
Q. It is DWR Exhibit B. It is the declaration of Christina Swanson.
A. Yes. What page of that?
Q. Page 12.
A. Page 12. Okay. Okay.
Q. And you were asked about the data points on that graph that appear --
A. Yes.
Q. -- for 1997 and 1998. And I believe it was your testimony, perhaps you can correct me if I'm wrong, that those

data points were not real data points; is that correct?
A. No. I didn't say they're not real data points. I said that you can make an argument for leaving them off your analysis.
Q. If those data points were left off the analysis, what would happen to the curve that's shown on figure 8?
A. To the line, you mean? It would be the regression. I don't know exactly, but it looks like -- I would guess the R squared value would decline, but the basic relationship would stay the same.
Q. Well, if those two data points, Dr. Moyle, were removed, wouldn't the line begin to shift upward at the left hand end?
A. I don't know that. I'd have to do the analysis.
Q. And you haven't done that; is that right?
A. I have not done that, no.
Q. Dr. Moyle, are you aware of any other analyses that have been developed that attempt to relate salvage of fish at the project pumps with combined Old and Middle River flows?
A. Not offhand.
Q. Are you aware of any such analysis conducted by a Sheila Greene at the Department of Water Resources?
A. No.
Q. Dr. Moyle, you recall that in the declaration of Dr. Swanson that you reviewed as part of the preparation of your declaration was filed in this case, that Dr. Swanson reports

that her measure ten, which is the fall X2 measure at kilometer 80 is similar to a measure that was considered in the Pelagic Fish Action Plan. Do you recall that?

A. I don't recall the measure in the Pelagic Fish Action Plan.

Q. Well, let me --

Dr. Moyle, let me hand you a copy of the Pelagic Fish Action Plan, which will be marked as State Water Contractor Exhibit C, I believe, Your Honor.

(Defendants' Exhibit SWC C was marked for identification.)

BY MR. WILKINSON:

Q. Have you seen this document before, Dr. Moyle?

A. I have.

Q. Were you part of the development of this document?

A. No, I was not.

Q. I'd like you to turn to page 40 of the document. And on that page, you will see Table 1 entitled: Potential Resources Agency actions for water year 2007 water project operations." Do you see that?

A. I do.

Q. And there are a number of actions which are shown on this table. I'd ask you to take a look at the very bottom one. And it says, "Timing: Summer/fall. Action: Maintain X2 west of Collinsville 80 kilometers during May through December."

A. Yes.
Q. All right. Now, that's not the same period of time that Dr. Swanson proposes her action; is it?
A. No. It's a little bit longer.
Q. Little bit longer. But otherwise the action is the same; correct?
A. Roughly, yes.
Q. Does the table also identify, in the very right-hand column, the scientific uncertainty associated with the measures that are presented?
A. Yes, it does.
Q. What does it say about the summer/fall action of maintaining X2 west of Collinsville during May through December?
A. It has a high scientific uncertainty.
Q. And if you were also to turn, Dr. Moyle, to page 48 of the Pelagic Fish Action Plan. I'm sorry. Let's go to page 47. I think that's where the description starts. And you'll see that the heading which appears about halfway down the page says "Maintain X2 west of Collinsville during May-December (summer/fall)."

Is that the same action that we just described on the table?
A. Yes.
Q. And if you turn to the next page, which is page 48, Dr.

Moyle, would you read the last paragraph for me that is entitled costs.

MR. WALL: Objection, Your Honor, this I believe goes directly to the objections we raised earlier in the case. This is a cost issue that is not related to biology.

THE COURT: All right. I'm going to overrule this specific objection as this does not talk about any economic cost, rather it refers to what water would be needed to address this action. You may answer.

BY MR. WILKINSON:

Q. Go ahead, Dr. Moyle.

A. It says "This action is estimated to cost up to 425,000 acre feet with most of the water costs occurring in September through November. In below normal water years, the water cost would exceed one million acre feet and such flows cannot be provided by storage releases without dramatic effects on storage levels and temperature conditions for fish upstream in the fall. Therefore, it is impractical to provide such flows in below normal and drier years."

Q. Dr. Moyle, is it your understanding that 2007 is a dry year?

A. I believe it is, yes.

Q. And can you tell me who the authors of the Pelagic Fish Action Plan were?

A. I could get the authors for you off the front. But it was

a group of agency biologists.
Q. Are they presented on the front page, sir, of the document?
A. They don't appear to be. But --
Q. You don't see the reference to the Resources Agency of California?
A. No. Well, there's resources agency, Department of Water Resources and Department of Fish & Game.
Q. Department of Fish & Game as a co-author of the Pelagic Fish Action Plan?
A. Yes.
Q. Dr. Moyle, do you recall the water supply impact estimated by plaintiffs' expert, Mr. Rosekrans, with respect to this fall X2 measure?
A. No.
Q. You don't recall whether Mr. Rosekrans' estimates were about the same, approximately the same as those set forth in the Pelagic Fish Action Plan?
MR. WALL: Your Honor, I'm going to object to this line of questioning. It goes well beyond the scope of professor Moyle's direct testimony. He is not put on as an expert on water costs or anything related to that. And he is --
THE COURT: I will sustain the objection on the ground that he is being asked to elicit an opinion that

appears to be beyond the scope of the subjects for which the Court has found him to be qualified. He says he's not a hydrologist. He's not a water engineer. And are you normally concerned about the operational steps that are taken relative to flow volumes and other quantities of water that are implemented by way of releases or the opposite in managing the projects?

THE WITNESS: Am I directly? I'm sorry. I'm sorry, am I directly working --

THE COURT: I didn't use the word directly. I said are those subjects that are within the field of your competence that you normal use in your day-to-day work?

THE WITNESS: Not really, because what I do is when I have questions about that, I find somebody who's a hydrologist or who really knows what they're talking about in those areas. So obviously the questions come up all the time.

MR. WILKINSON: I'll withdraw the question. Let's try one more, Dr. Moyle.

THE COURT: What do you want done, by the way, with Exhibit C, SWC --

MR. WILKINSON: I am, Your Honor, yes, and I will move the admission of Exhibit C, the Pelagic Fish Action Plan.

THE COURT: All right. Any objection?

MR. WALL: No objection, Your Honor.

THE COURT: All right. Exhibit SWC C is received in

evidence.

(Defendants' Exhibit SWC C was received.)

BY MR. WILKINSON:

Q. Dr. Moyle, can you give me an estimate the change of abundance in-delta smelt if X2 is maintained downstream of kilometer 80 as proposed by Dr. Swanson?

A. No, I cannot.

Q. Can you give me an estimate of the difference in abundance if X2 is maintained at the location it would exist at if the -- if the state and federal projects simply complied with the requirements of D 1641?

A. No, I cannot.

Q. If we assume, Dr. Moyle, that the water supply impact estimates in the Pelagic Fish Action Plan are correct, then is it your testimony, sir, that even though you cannot tell me the change in abundance, even though the scientific uncertainty associated with Dr. Swanson's measure ten is high, according to the Pelagic Fish Action Plan. And even though the Pelagic Fish Action Plan says don't implement measure ten or try to maintain X2 at Kilometer 80 in a dry year, that it's your view that the state project and the federal project should release hundreds of thousands of acre feet of water in a dry year in order to maintain X2 west of Kilometer 80?

MR. WALL: Objection. I have several different objections to that question. It's -- objection as to form.

There's an objection that goes beyond the scope of this witness' testimony or expertise. There's an objection that it's argumentative and there's an objection that misstates the Pelagic Fish Action Plan's statements.

MR. WILKINSON: The only assumption I asked Dr. Moyle to make, which I think was beyond his expertise, is that the pelagic fish plan is correct in terms of the water supply.

THE COURT: I'm going to sustain the objections in part and I'm going to limit the witness' answer to your understanding applying your science of the necessity. Don't worry about the costs of it. Don't worry about the volume about it. Assume that what is recommended is implemented in the period that it is implemented in and just tell us, in your opinion, what the effect on the species is.

THE WITNESS: I can do that. I agree actually that the -- this is an area with some risk or high risk of being hard to detect an effect. But nevertheless, it is one of these actions where we want to -- what we're trying to do is create the habitat the rearing smelt need for making it up and making it into the spawning sites so they can rear and grow successfully.

We're talking about a species that appears to be at a very low level in its population, where it's quite likely that almost every individual counts. So that, at least for a period of time, it seems reasonable to do everything we can to

try to bring the smelt back to some higher level of abundance.

MR. WILKINSON: So then Dr. Moyle --

THE COURT: Let's -- before you ask your question, let me ask mine. Is this maintenance of X2 at 80 kilometer, at that measure, is this to achieve the salinity level that you say is hospitable and conducive to the delta smelt?

THE WITNESS: Yes. It's to achieve water quality conditions upstream of that point that are favorable to smelt.

THE COURT: Now you may ask your question.

BY MR. WILKINSON:

Q. Dr. Moyle, do you have any understanding as to why the Department of Fish & Game recommended not attempting to locate X2 at Kilometer 80 in a dry year?

A. I can't speak for the Department of Fish & Game, but in general pretty risk averse.

Q. I'm sorry, sir?

A. They're fairly risk averse when it comes to using water.

Q. Do you recall whether the fish and game opposition to the measure that Dr. Swanson is proposing is related to the cold water pool that exists upstream at Shasta and the cold water pool that exists upstream at Oroville Reservoir?

MR. WALL: Objection. There has been no testimony the Department of Fish & Game opposes the proposal of Dr. Swanson. Dr. Swanson's proposal is different than the proposal of the Pelagic Fish Action Plan as counsel itself

elicited.

THE COURT: All right. The objection is made on the ground that it assumes a question of facts not in evidence. The objection is sustained.

BY MR. WILKINSON:

Q. Dr. Moyle, can you tell me the difference in the Pelagic Fish Action Plan X2 measure and that proposed by Dr. Swanson?

A. I would like -- I should -- I would look at it in greater detail to give you a firm answer. But basically Dr. Swanson's is for a shorter period of time.

Q. And you have no idea what the relative water costs of Dr. Swanson's proposal is versus the proposal in the Pelagic Fish Action Plan; is that right?

A. No, I've not looked at that.

Q. If the relative water costs were the same with Dr. Swanson's proposal and the proposal considered in the pelagic fish plan, would it be your understanding that fish and game -- strike that.

Dr. Moyle, is there a risk that if, between 500,000 and 900,000 acre feet of water are released from upstream reservoirs this year, that there could be insufficient cold water available in those reservoirs to provide for migrating salmon?

MR. WALL: Objection.

THE COURT: We haven't talked about salmon. Are

those in the fishes in which you have expertise?

THE WITNESS: I do have expertise on salmon from the work, yes.

THE COURT: All right. Do you know what the effects of the water temperatures in these reservoirs are? And more to the point, do you know whether there is any interrelationship that is the basis for an objection to the release of the volumes of water that are discussed because to serve one species, you're going to put another one in jeopardy?

THE WITNESS: What I don't know is what the condition is of those reservoirs are today and how much water they have available to release or even whether that's needed.

BY MR. WILKINSON:

Q. Have you reviewed the --

MR. WALL: Your Honor, if I might add an additional basis for the objection. And I was trying to avoid speaking it. But counsel's question did not identify which reservoirs this release would be as, I'm sure the Court is aware, that makes a difference in terms of the salmon involved.

THE COURT: All right. On the ground that the question is an incomplete hypothetical, it is sustained because it lacks foundation. You may identify the reservoirs if it will help the witness. I think he's telling us that it won't.

MR. WILKINSON: I will identify the reservoirs, Your Honor.

Q. Shasta and Oroville reservoirs, Dr. Moyle.

A. Again, it is very hypothetical because we're talking about, you know, I'm not intimately familiar with volumes of water and so forth.

THE COURT: What he said, counsel, was that he can't answer the question without knowing the capacity of the reservoir at the time, the temperature of the reservoir and when the actions are going to be implemented relative to the releases. And so it is still an incomplete hypothetical.

BY MR. WILKINSON:

Q. Dr. Moyle, have you read the declaration of Mr. Oppenheim from the National Marine Fisheries Service that was filed in this case?

A. No, I have not.

MR. WILKINSON: Thank you very much. That's all I have.

THE COURT: Redirect -- well, Mr. Buckley.

MR. BUCKLEY: No, Mr. O'Hanlon.

THE COURT: Mr. O'Hanlon.

MR. O'HANLON: Yes. Thank you, Your Honor.

THE COURT: Cross-examination.

MR. O'HANLON: Yes, please, Your Honor.

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CROSS-EXAMINATION

BY MR. O'HANLON:

Q. Good afternoon, Dr. Moyle.

A. Good afternoon.

Q. We've met before.

A. Yes.

Q. I have drawn the dreaded late afternoon time slot. And so I will try to keep my questions brief. Dr. Moyle, I'd like you to refer to the Pelagic Fish Action Plan which has been marked as --

THE COURT: In evidence as SWC C.

MR. O'HANLON: State Water Contractors Exhibit D. Do you have that in front of you.

THE WITNESS: Yes.

THE COURT: I don't have a D. It's C.

MR. O'HANLON: Is it C? I'm sorry. Exhibit C.

Q. And refer to page 40, please. That's -- there's a table there. Table 1. You testified about it briefly with respect to Mr. Wilkinson asking questions. He asked you about the -- an action in the summer and the fall. There are three other actions listed there. And I'd like to ask you about those. The first action in that table is in the winter and early spring. And it refers to minimizing net upstream flows in Old and Middle Rivers. Do you see that?

A. Yes, I do.
Q. Okay. And do you see in the far right-hand column labeled "scientific uncertainty" that the scientific uncertainty for that measure is high.
A. Yes.
Q. And, in fact, scientific uncertainty is defined for the purposes of this table in a footnote. Is that correct?
A. Yes.
Q. Could you please read that footnote for us.
A. "Scientific uncertainty indicates the confidence that the proposed action will have a demonstrable population benefit. A low degree of uncertainty reflects confidence in the scientific basis for the action."
Q. Thank you. The next action listed there in the timing column is in early and late spring. And it again refers to flows in Old and Middle Rivers. And this one specifies maintaining net downstream flows. Do you see that?
A. Yes.
Q. All right. And what is the scientific uncertainty associated with that measure?
A. Medium to high.
Q. You can put that aside. Thank you.
The next exhibit I'd like to ask you about is the Bennett paper, the Bennett 2005 paper, which I believe is Plaintiff's Exhibit Number 2.

A. Yes.
Q. Now, on direct examination, your testimony primarily related to the population by ability analysis in Dr. Bennett's paper; is that correct?
A. Yes.
Q. And Dr. Bennett calculated risk of extinction using various methods and you testified about that. However, Dr. Bennett does not say anywhere in this paper, does he, that the projects will cause such extinction; correct?
A. No, he does not.
Q. And, in fact, he cautions that the population level effects of the projects are not clear; isn't that correct?
A. That's correct.
Q. I'd ask you to refer to page 27 -- I'm sorry, page 57 of Plaintiff's Exhibit Number 2, which is Dr. Bennett's 2005 paper. And the right hand column there is headed "Water export operations." Could you please read the first two sentences.
A. "Actions to reduce the losses of delta smelt in water export operations are the most controversial. The export incidental take limits clearly provide benefits to individual delta smelt, yet there does not appear to be defensible biological basis for the levels chosen."
Q. Thank you. Could you please go a little further down into the same paragraph and read the sentence that begins, "For

delta smelt, however."
A. "For delta smelt, however, it has never been established that reducing water exports at the critical times has any benefit for the population."
Q. And finally, would you please refer to the next paragraph towards the bottom of the page, there's a sentence that begins, "Moreover, it currently -- it is currently unclear." Would you read that sentence, please?
A. "Moreover, it is currently unclear if losses to the water projects are a major impact on their abundance."
Q. Thank you. And he's referring there to the abundance of the delta smelt; correct?
A. Yes.
Q. Now, from your direct testimony, my sense was you had not made any comparison between what you thought the population level would be with the plaintiffs' proposed measures versus what the population level would be without the measures. Is my reading of that correct?
A. Yes.
Q. And you have not quantified the effect of the projects on the delta smelt population overall; is that correct?
A. That is correct.
Q. Let's explore that for a moment. Let's -- I'd ask you to assume the projects kill one percent of the total smelt population each year. So if the population is a million fish

and the projects were to kill one percent of that population, that would leave 990,000 delta smelt; correct?
A. What lifestage are we talking about?
Q. We can pick any lifestage you'd like. How about we'll pick the lifestage measured by the Fall Midwater Trawl.
A. That would be a very large number. Fall midwater. Go ahead.
Q. All right. The question is taking one percent of that number of fish wouldn't -- it would not appreciably diminish the likelihood of survival of the species; correct? Or recovery?
A. If you started with a million fish?
Q. That's correct.
A. Oh, yeah, that's -- historically populations were like that.
Q. What if you now assume a population of 100,000 fish. And the projects kill one percent. That leaves 99,000 fish; correct?
A. Yes. There are some assumptions there, but yes.
Q. All right. So you still wouldn't say, then, that the projects have appreciably diminished the likelihood of surviving or recovery; would you?
MR. WALL: Objection, vague.
THE COURT: Do you understand the question?
THE WITNESS: Yes.

THE COURT: Overruled.

THE WITNESS: I think I understand the question, but it's very speculative because -- okay, well, if it -- if truly the project impacts only one percent of the population, then that would not be a major impact. No. But we don't know that, of course.

THE COURT: You don't need to argue about the question. All you need to do is answer it and we'll figure out what the ramifications of that are.

THE WITNESS: Okay.

THE COURT: You're being asked to make assumptions. The assumptions underlying the question have to be proved. If they aren't proved, then the question is without meaning.

THE WITNESS: Thank you.

BY MR. O'HANLON:

Q. Now assume the population is 1,000 fish. If the projects only killed one percent, that leaves 990 fish; correct?

A. Yeah.

Q. And you still wouldn't say that that would appreciably diminish the likelihood of survival or recovery; would you?

MR. WALL: Objection. Vague.

THE WITNESS: Now we -- oh, sorry.

THE COURT: Do you understand the question?

THE WITNESS: I understand the question.

THE COURT: Overruled. You may answer.

THE WITNESS: Well, we're getting into thin ice here. Again, we're talking about fish that are about ready to spawn. And a thousand is a very low number of smelt. We don't even know if that's a viable population or not. It could easily be a number in which is the smelt right on the verge of extinction because 1,000 fish is some -- close to the minimum number to sustain the population. In that case, even ten fish might make a difference. Ten fish means 20,000 eggs.

BY MR. O'HANLON:

Q. But we don't know the minimal viable population of the delta smelt; is that correct?

A. No, we don't.

Q. And we don't know what portion of the population are taken by the projects; correct?

A. No, we don't, because we have inadequate monitoring.

Q. Dr. Moyle, were you one of the authors of a book Envisioning Futures for the Sacramento-San Joaquin Delta?

A. Yes, I am.

Q. That was published this year by the Public Policy Institute of California?

A. Yes.

MR. O'HANLON: Your Honor, I'd like to mark an exhibit.

THE COURT: Yes. This will be Westlands Exhibit -- let's make it Delta --

MR. O'HANLON: San Luis perhaps. San Luis A, Your Honor.

THE COURT: All right. SL A.

(Defendants' Exhibit SL A was marked for identification.)

BY MR. O'HANLON:

Q. Dr. Moyle, I have handed you what is an excerpt of the book. Including the title page and an appendix, Appendix A, which is titled "Paradigm Shifts in our Understanding of the San Francisco Estuary as an Ecosystem." Do you see that?

A. I do.

Q. All right. And as the footnote indicates, are you largely responsible for the material in this appendix?

A. Yes, I am.

Q. Now, is one of the points of this book that with more information, our understanding of and assumptions about the Delta have changed over time?

A. Yes.

Q. And that in looking for solutions to the problems of the Delta, California has to let go of some old ideas and assumptions about the Delta?

A. That's right.

Q. And you discuss some of those here in appendix A; is that right?

A. Yes, I do.

Q. And is one of the topics that you've referred to here Delta pumping?
A. Yes.
Q. Would you please turn to the last page of the exhibit titled "Delta pumping."
A. Let's see.
Q. Could you read for me, please, the old paradigm.
A. "The old paradigm is that the big State Water Project and Central Valley Project pumps in the southern Delta are the biggest cause of fish declines in the estuary."
Q. Can you please read for me the new paradigm?
A. "The new paradigm is that the big pumps in the southern Delta are one of several causes of fish declines and their effects depends on species, export volume and timing of water diversions."

MR. O'HANLON: Your Honor, I would move San Luis Exhibit A into evidence.

THE COURT: Any objection?

MR. WALL: Your Honor, this is an excerpt of the book. If I could reserve the right to -- I don't expect to, but I'd like to look at the book.

THE COURT: You may. Under rule 103, rule of completeness, if there's anything you need to add, you may. Exhibit SL-S A is received in evidence subject to that qualification.

(Defendants' Exhibit SL A was received.)

MR. O'HANLON: Your Honor, I --

THE COURT: But it would be up to you to do it.

MR. WALL: Yes, Your Honor.

MR. O'HANLON: Thank you, Dr. Moyle. I have nothing further.

THE COURT: All right. Redirect.

MR. WALL: Yes, Your Honor. Thank you.

THE COURT: My intention is to finish this witness today because I understand he's unavailable.

MR. WALL: Yes, Your Honor. I hope to be fairly quick. We'll try to move through it.

THE WITNESS: Thank you.

THE COURT: Those two seem to be mutually inconsistent, but --

MR. LEE: Your Honor, just a question. Going through my notes it was unclear to me whether, in my cross-examination, I did more than just mark, but in fact moved into evidence DWR Exhibit B, which is the Swanson declaration and Exhibit C, which is Exhibit A to the Swanson declaration. If I have not done so, I would like to do so.

THE CLERK: B is not admitted yet. C is admitted.

THE COURT: Any objection to DWR Exhibit B? It's received in evidence.

(Defendants' Exhibit DWR B was received.)

THE COURT: DWR Exhibit C is already in evidence.

MR. LEE: Thank you, Your Honor.

THE COURT: All right. And I didn't ask you, Mr. Buckley, if you had questions.

MR. BUCKLEY: No, Your Honor, I don't.

THE COURT: Appreciate that. All right. Redirect.

REDIRECT EXAMINATION

BY MR. WALL:

Q. Thank you. Professor Moyle, I believe getting it's late. Bear with me a few moments, please.

Professor Moyle, one of the counsel asked you about the toxicity of organophosphates. Do you recall that?

A. I do.

Q. Do you have an understanding of how long organophosphates had been used as a pesticide in California?

A. A long time. I don't know the exact period of time. But they are a post World War II pesticide.

Q. And is it your understanding that they were in use before the present decline in adult smelt populations occurred?

A. Yes, they were.

Q. Do you also recall that you were asked about pyrethroids on cross-examination?

A. Yes.

Q. Could you describe for us the solubility of pyrethroids in water. And maybe explain what that means.

A. Again, I'm not a -- a pesticide chemist, but my understanding is of pyrethroids, is that they have very low solubility in water, which means they don't dissolve in water. And, in fact, the main way they get into systems is through the sediments. They bind to clay and other materials like that. So they wash in on the surface of the soil. So they don't dissolve very readily in water.

Q. And I believe earlier today in response to a question from the Court, you stated --

THE COURT: Let me ask a followup question to that. If, however, they are present, whether in or on the soil, do they bind to the soil in such a way that they're not susceptible to being transported by some fluid or other mechanism to get into the water that would be in the waters of the bay?

THE WITNESS: That's actually a very astute question because the -- they're a pesticide which should not get into the water column the way they do. My colleagues at Davis, Dr. Inge Herner in particular, are somewhat baffled by why they appear in the water column as often as they do. And why they have this interaction with the organophosphates. So this is a very hot research question, trying to figure out why these pesticides that don't dissolve well in water seem to appear nevertheless.

THE COURT: An enigma?

THE WITNESS: They're an enigma for sure. Hopefully both an igma and enigma that will be resolved fairly soon. A lot of money being spent on the research.

THE COURT: You may proceed.

BY MR. WALL:

Q. Professor Moyle, is the -- as I understand your testimony, is the relative insolubility of pyrethroids one of the factors that relate to the degree of exposure delta smelt might have to that chemical?

A. That's right.

Q. And I believe, if I recall correctly, at an earlier point today you informed the Court that the expectation was that delta smelt exposure to these pesticides might be very brief; is that correct?

A. Yes. The anticipate -- I would expect it to be very brief and probably quite low, but you can never dismiss it as a possible factor.

Q. Professor Moyle, do you recall that counsel for the Department of Water Resources asked you some questions about the proposed protective measures put forth by Dr. Swanson?

A. Yes.

Q. And specifically asked you if you were aware that certain temperatures were used as the trigger for some of her actions?

A. Yes.

Q. I'd like to -- I believe counsel for DWR did not have

admitted the entirety of Dr. Swanson's declaration with the exhibits. And I would like to have that admitted now. I don't have -- what's the exhibit number? Do we know what the exhibit number is? 4? Is there any objection?

MR. O'HANLON: No.

THE COURT: All right. Well, I'm going to leave it to counsel to provide, this would be pursuant to Rule 103, the complete declaration with exhibits. And so what I will do is this. We will make this exhibit -- what's the first one, it is DWR --

MR. WALL: I believe it was DWR --

THE COURT: C as in cat?

MR. WALL: B as in boy.

MR. LEE: DWR Exhibit B, Your Honor.

THE COURT: All right. Well then we will leave marked as DWR B the initial exhibit that Mr. Lee proffered and we will mark this exhibit, which is the complete declaration of exhibits, as DWR Exhibit B.1 and then we'll go through however many pages there are and paginate it.

MR. WALL: Your Honor, I have to apologize. My co-counsel just alerted me that we're talking about different declarations of Dr. Swanson.

THE COURT: Then let's not do that.

MR. WALL: I apologize. This is the second -- I'm referring to, it turns out, is the second. So these actually

are different documents.

THE COURT: Yes.

MR. WALL: I apologize for that. So perhaps we can leave it as Plaintiff's 4.

THE COURT: This is Plaintiff's Exhibit 4 because this is a different declaration.

MR. WALL: Yes. This is the declaration they filed on August 13th.

THE COURT: All right. This will be Plaintiff's Exhibit 4 in evidence.

(Plaintiff's Exhibit 4 was received.)

BY MR. WALL:

Q. If I could ask you to turn to the appendix, which I believe if you look at the number, page numbers at the top, it's page 43 of the document.

A. Okay.

Q. And could you tell us what that is.

A. It's the revised recommended interim protection actions for delta smelt.

Q. And were you reviewing this -- did counsel hand this to you to look at when he was asking you about temperature triggers?

A. No.

Q. Could you look at action number three, please, which is on the second page.

A. Yes. I have it in front of me.
Q. And could you please read the trigger.
A. Well, there are alternate triggers. One is the Kodiak survey data based on maturation of the smelt, the presence of spent delta smelt. The second possible trigger is water temperatures greater than 12 degrees centigrade and a third possible trigger is the protection of larval delta smelt, the 20 millimeter survey. So temperature's one of three possible triggers.
Q. Right. If you could look at three, does it continue beyond "detection of larval smelt in the 20 millimeter survey"?
A. Yes.
Q. What does it say after that?
A. "Or at the Central Valley Project or State Water Project fish salvage facilities."
Q. Right. So presently is the Central Valley Project or State Water Project testing for larval smelt at those facilities?
A. No.
Q. Is that one of the recommendations that Dr. Swanson makes?
A. Yes, it is.
Q. So is it fair to characterize the trigger for this action as water temperature?
A. No. It's just one of the possible triggers.

Q. If I could ask you to turn to action five, which I believe counsel also asked you about.
A. Yes.
Q. If you could review the triggers there, please.
A. They're very similar to the triggers in the last action we talked about.
Q. There are multiple triggers.
A. Yes.
Q. Of which temperature is only one.
A. Temperature is only one.
Q. And detection of larval delta smelt at the State Water Contractors CVP facilities is another?
A. Yes. Thank you.
Q. And if you could turn to action 8, which is a few pages later, please.
A. Yes.
Q. And is this a similar situation with multiple triggers, not just the one that counsel referred you to during cross-examination?
A. Yes, it is.
Q. Including a trigger that looks for larval smelt at the pumps, which the projects are not presently looking for?
A. That's correct.
Q. And would your answer be the same if I asked you that question about action nine?

A. Yes, it would.
Q. You were asked some questions about a chart in Dr. Swanson's other declaration, the one admitted by DWR as Exhibit B. This is a chart based on data from the USGS which there was some discussion of the data points, I think it was '96 and '97.
MR. WILKINSON: Objection. That misstates the earlier testimony.
MR. WALL: Let me get it so I can state it correctly.
THE COURT: All right. Sustained.
BY MR. WALL:
Q. Do you have the declaration of Christina Swanson filed 7-23-2007?
A. Yes, I do.
Q. My copy seems to have only the old pages copied. Okay. I have a correct copy here.
Could you please look at Figure 7 on page 12.
A. Figure 7 or Figure 8?
Q. I believe it's -- yes, it's Figure 8. I apologize. Is this the figure that you were discussing with counsel during the cross-examination?
A. Yes.
Q. And I believe you testified that an argument could be made to leave 1997 and 1998 off depending on what the -- what question you were trying to answer; is that right?

A. That's right.
Q. What would that be? Why would it be potentially appropriate to leave those years off?
A. Well, because the question you're trying to answer is what's the effect of negative flows on fish salvage. And once you reach -- once you reach zero or a very low negative number, essentially the effects are all going to be the same regardless. Because it's, you know, basically a good condition you have very low salvage.

So I'm sure the reason that Pete Smith left them off or put them where he did was simply he wanted to have them on the graph. I'm just guessing, but he wanted to have them on the graph without leaving them off to recognize the data points existed.

Q. And in your view, would that be appropriate if you're trying to answer the question what's the effect of negative flows?
A. If you were really careful about justifying it, if you were going to publish this, if you stated why you were doing it and had the numbers available, usually you'd present the alternate analysis too. Yes. You can do it.
Q. Now, I believe counsel asked you to assume that 1997/1998 were not in this graph. Do you recall that?
A. Yes.
Q. And he asked you if that would mean that the left side of

that graph was higher.
A. Yes.
Q. And you stated that you couldn't -- you didn't know the answer to that without writing a regression; is that right?
A. That's right.
Q. I'm going to ask you to assume that the left side of the graph was higher. Would that reflect increased or decreased salvage of fish at the state and federal water projects?
A. It would be increased salvage.
Q. So if the premise of counsel's question was correct, that leaving '97 and '98 off would raise the left side of the graph, that would reflect increased salvage at the pumps?
A. That's right.
Q. Professor Moyle, do I recall correctly that you testified that the delta smelt prefer habitat in the -- when they're in the Suisun Marsh region, that in that lifestage they prefer habitat in the zero to one part salinity?
A. Generally, yes.
Q. And do they do better when they're in their preferred habitat?
A. Well, that's the assumption because that's -- that's where the food is. Though, in fact, I think that -- that there's studies that show that they're perfectly happy apparently in higher salinities as long as there's abundant food there. Generally where you have low salinities is where you have the

concentration of food.
Q. So would that lead you to conclude that in -- in all probability, they do better in that preferred habitat?
A. Yes.
Q. Now, counsel -- sorry, Professor Moyle, I think you are lucky not to be counsel. You were asked some questions about action ten, the fall action, in professor -- or rather Dr. Swanson's proposed set of protective measures; correct?
A. Yes.
Q. Did you testify that one of the bases for that action is an article that was published by Feyrer, et al.?
A. Yes.
Q. And do you know where Feyrer, et al. work?
A. They're all biologists for the Department of Water Resources.
Q. You were also asked about an action describing the Pelagic Fish Action Plan; correct?
A. That's correct.
Q. That's State Water Contractors Exhibit C. Correct?
A. Yes.
Q. And you were asked to read the stated probability of success of certain measures there.
A. Yes. Whether it's high or low.
Q. And those measures were not the same measures proposed by Dr. Swanson; were they?

A. No.
Q. Could you look at the front of the Pelagic Fish Action Plan and tell us its date?
A. The --
Q. The first page.
A. Yeah.
Q. This is SWC C.
A. Right. Okay.
Q. When was that published?
A. March 2007.

MR. WALL: Your Honor, I have an exhibit here, but unfortunately I wasn't expecting to introduce it, so I only have one copy. So what I'd like to do it to counsel and then to the Court and then show it to Professor Moyle. It will be quite quick.

THE COURT: All right.

MR. WALL: Let me just describe what it is. It's an article by Feyer, et al. that has been discussed during the testimony today that appeared in a fish -- or journal that appears to be the Canadian Journal of Fish and Aquatic Science.

THE COURT: All right. Proceed.

MR. WALL: This will be Plaintiff's 5 for identification.

THE COURT: It will be so marked.

(Plaintiffs' Exhibit 5 was marked for identification.)

MR. WALL: May I approach?

THE COURT: You may.

BY MR. WALL:

Q. Professor Moyle, do you recognize this document?

A. Yes, I do.

Q. Is this the Feyrer, et al. article which is one of the bases for Dr. Swanson's proposed action plan?

A. Yes, it is.

Q. What is the date of publication? I believe it appears at the bottom of the page.

A. It's 2007.

Q. Does it have a month there as well?

A. It was accepted in -- on February, 2007.

Q. Does it say when it was first published to the right of the --

A. Oh, yes, 11 May 2007.

Q. In May of 2007. So this article, Professor Moyle, was it published before or after the Pelagic Fish Action Plan?

A. It was after, yes.

Q. So this was new information that came to light after the Pelagic Fish Action Plan was written; correct?

A. Yes.

Q. If you could turn to the Pelagic Fish Action Plan,

paragraph 47. I mean page 47. Professor Moyle, you're not the only one getting tired.

And if you could look at the action entitled "Maintain X2 west of Collinsville."

A. Yes.

Q. Could you read the rationale that was given for that action.

A. "Higher Delta outflow in the summer and fall can increase the amount of habitat for delta smelt. If smelt use this habitat and their distribution is wider and shifted downstream, subsequent entrainment in the winter will be reduced."

Q. Is that rationale consistent with the findings of Feyrer, et al., in which Dr. Swanson's action plan was in part based?

A. Yes.

Q. Counsel asked you some questions about the uncertainties involved in action ten. Which I'd like to ask you a few followup questions on.

Is it necessary for the survival and the recovery of delta smelt that they have good habitat quality?

A. Yes.

Q. And would action ten contribute to good habitat quality for these fish?

A. Yes. And it contributes good habitat at the time of life where they really need to be growing rapidly.

Q. Is that definitely a sufficient condition for the delta smelt to survive and recovery?
A. You mean is it enough by itself? No. It's one of -- it has to be part of a package.
Q. And is that a cause for uncertainty associated with this action?
A. Yes. Because these different actions are all going to have different effects and will be -- have differential importance in different years.
Q. But in your judgment, what is the importance of action ten to the overall package proposed by Dr. Swanson?
A. The importance of the package is that it tries -- it proposed ways to protect the smelt at all stages of its life history.
Q. And how does action ten -- oh, I see. Nevermind. I'll withdraw the question.

If you could, please turn to the Bennett article. Bennett 2005 at page 57. You could look at the right hand column, the second sentence. This is the sentence that counsel asked you to read during cross-examination. Could you read that for the record again?
A. Sorry, which sentence is that? The first one?
Q. The right hand column, the second sentence.
A. "The export incidental 'take' limits clearly provide benefits to individual delta smelt, yet there does not appear

to be a defensible biological basis for the levels chosen."
Q. Are the take limits there -- is it your understanding that the take limits referred to there are the take limits that were set in the Biological Opinion that has been invalidated?
A. Yes.
Q. And is reinstituting those take limits part of Dr. Swanson's proposal?
A. I'm sorry. My mind is foggy. I think so. But --
Q. Let me ask this.
A. Yeah.
Q. Do you have an understanding what those take limits are?
A. Well, the take limits are the number of smelt that the water projects are allowed to take before they have to take action to prevent more take. But I don't know what the numbers are. At least not right now.
Q. And are those take limits among the ten actions in Dr. Swanson's proposal?
A. Not specifically. Sorry.
Q. Do you have an understanding of why Dr. Bennett says that there's no biological limit -- or basis for the take limit?
A. Oh, this would -- again, this was before he's done really quite a bit of more research. I doubt he would --
MR. WILKINSON: I'm going to object to that question.
THE WITNESS: -- write that same statement today.
MR. WILKINSON: Calling for speculation. He's asking

for why --

THE COURT: Objection is sustained.

MR. WALL: One moment, Your Honor.

Q. Professor Moyle, I believe, during cross-examination, counsel asked you whether food would be the primary factor and you said yes.

A. I said no. It's an important --

Q. Let me to ask you to clarify. Would food be the primary factor or the availability of food be the primary factor in either survival -- well, in survival of the delta smelt?

A. It's an important factor, but I'd say it's the primary factor would be really pushing things. So I would not say that.

THE COURT: Is there any primary factor that you've identified in the survival of the smelt?

THE WITNESS: No. Actually, that's part of the problem. The primary factors vary from year to year and from time to time, which is really why we have to deal with multiple issues. To really bring the smelt back.

BY MR. WALL:

Q. And is one of those issues we have to take -- or to deal with the effects of the operations of the Central Valley Project, the State Water Project?

A. That's right. Because that's very important for both the take of the smelt at the pumps and the effects it has on

habitat.
Q. Now, counsel asked you to do some math and calculate what four percent of 2000 or maybe it was 3000 fish were. Do you recall that?
A. I do.
Q. And you came up with a number, if I recall correctly, it was something like 104?
A. If you say so. That's what it must have been, yeah.
Q. I'm not saying that's what it was. But it was -- I'm just asking if you remember that.
A. Yeah. Vaguely.
Q. Now, the 2000 some fish that counsel asked about, does that represent the total take of fish as a result of operation of the state and federal pumps?
A. No, it does not. It's -- like I say, it represents the tip of the iceberg given that we don't really know how many smelt are being taken by the pumps, especially at the 20 millimeter and smaller size.
Q. But do we know that there -- that the 2000 some fish don't include any larval or juvenile fish less than 20 millimeters?
A. No. Those 2500 fish, or whatever the number was, are all fish 20 millimeters or larger.
Q. And those are the fish 20 millimeters or larger that were diverted into the salvage tanks and actually counted.
A. And actually counted, yes.

MR. WALL: One moment, Your Honor.

Professor Moyle, barring another round of cross-examination, I think you'll be able to leave quite shortly. I have nothing further. Thank you.

THE WITNESS: Thank you.

THE COURT: Thank you. Mr. Maysonett, any recross?

MR. MAYSONETT: No, Your Honor.

THE COURT: Mr. Lee, any recross?

MR. LEE: No, Your Honor.

THE COURT: Mr. Wilkinson, any recross?

MR. WILKINSON: Yes, Your Honor. Just a few. Beg the Court's indulgence. And Dr. Moyle, I beg yours. I know you've been up there a long time.

RECROSS-EXAMINATION

BY MR. WILKINSON:

Q. Dr. Moyle, you were asked about the Feyrer article on redirect.

A. Yes.

Q. Is it your understanding, sir, that the Feyrer article, in part, is the basis for Dr. Swanson's fall X2 measure?

A. Yes, it is.

Q. She attempts to use that as a management tool for the operations projects; is that right?

A. At least as an indicator of the value of that action.

Q. Do you have that article in front of you, Dr. Moyle?

THE COURT: There's only one copy of it, as I remember.

THE WITNESS: Yes, I do have it in front of me.

MR. WILKINSON: Great.

Q. Would you turn to the last page of the text, Dr. Moyle. I believe it's page 732. In the right-hand column, there's a sentence that begins with the word "however." Do you see that? About five lines down. Six lines down.

A. I'm sorry. In the right hand column?

Q. In the right hand column. Page 732.

A. Oh, "however," yes.

Q. Would you read that sentence, please.

A. "However, the degree to which the environmental quality could be used for management purposes remains unclear."

Q. And would you go to the last sentence in the same column just above the word "acknowledgments" and read that sentence, please.

A. "Moreover, for the water quality data to be most effective for species management, additional information is needed to better define the mechanisms for the effects of water quality variables on aquatic organisms."

Q. Based upon what you just read, Dr. Moyle, is it your understanding that Mr. Feyrer and his colleagues were recommending that their article be used for water quality -- for water management purposes at the project?

MR. WALL: Objection. Calls for speculation.

THE COURT: Sustained.

MR. WILKINSON: I'm asking for his understanding.

THE COURT: His understanding is irrelevant without foundation. He's going to be speculating unless you can lay the foundation. You didn't ask him if he had some basis for knowing.

BY MR. WILKINSON:

Q. Dr. Moyle -- I'll withdraw that question.

Dr. Moyle, would you turn to page 731, please, same article. Right hand column, about midway down the page, there's a sentence that starts with the words "this suggests."

A. "This suggests." Yes.

Q. Would you read that sentence.

A. "This suggests that recent patterns of fish recruitment and abundance are probably controlled by multiple interacting factors."

Q. And Dr. Moyle, is it your understanding from this article that Feyrer and his colleagues have concluded that with regard to delta smelt, that there was an overall decline in environmental quality with respect to the smelt?

MR. WALL: Objection.

THE COURT: The ground?

MR. WALL: Calls for speculation.

THE COURT: And the operation of the mind of Feyrer

and his colleagues. Sustained.

BY MR. WILKINSON:

Q. Dr. Moyle, I'd like you to turn to page 728.

A. 723?

Q. 728, sir.

A. 728.

Q. You'll see a heading in the left hand column entitled "Trends in EQ."

A. Yes.

Q. And is that sentence indicating -- the sentence begins, "Overall." I'll read it to you. "Overall, EQ values were highest for striped bass, intermediate for threadfin shad, and lowest for delta smelt." Is that right?

A. Yes.

Q. If you go to the very bottom of that column, there's a sentence there that begins with the word "There was." Do you see that?

A. "There was only one instance of a station exhibiting a statistically significant increase in EQ; it was near the confluence of the Sacramento and San Joaquin rivers for delta smelt."

Q. And can you point, sir, to the map where the confluence of the Sacramento and San Joaquin Rivers is?

A. It is approximately right here. It says "confluence" as a matter of fact.

Q. And is it your understanding that that is approximately the location of Kilometer 80?
A. I'm sorry? Location of?
Q. Kilometer 80.
A. I believe so. I -- yeah.
Q. Dr. Moyle, you were asked on redirect how long organophosphates had been around as chemicals. I don't recall your answer. Could you repeat it again?
THE COURT: World War II. Post World War II.
THE WITNESS: Post World War II, yeah.
BY MR. WILKINSON:
Q. And Dr. Moyle, approximately how long has the Central Valley Project been diverting from the Delta at Tracy?
A. Central Valley Project at Tracy?
Q. Yes.
A. Oh, Central Valley Project. Since -- I don't know exactly. 1950s sometime.
Q. Back to the 1950s?
A. Yes.
Q. And do you recall how long the State Water Project has been diverting from the Delta at Tracy?
A. The 1960s at some point.
MR. WILKINSON: Thank you. That's all I have.
MR. WALL: Your Honor, I have two very short questions.

THE COURT: Well, I haven't asked Mr. O'Hanlon whether he has any.

MR. WALL: I'm sorry. I apologize.

MR. O'HANLON: No, Your Honor.

THE COURT: Thank you very much. Do you want Exhibit 5 in evidence, Mr. Wall?

MR. WALL: Yes. I think there was no objection.

THE COURT: Any objection?

MR. WILKINSON: No objection here, Your Honor.

THE COURT: Exhibit 5 is received in evidence.

(Plaintiffs' Exhibit 5 was received.)

THE COURT: You say in re-redirect you have two questions. I'm going to count them. That's all you get.

THE WITNESS: Thank you, Your Honor.

THE COURT: You're welcome, Dr. Moyle. Mercy.

FURTHER REDIRECT EXAMINATION

BY MR. WALL:

Q. Professor Moyle, as a scientist, do you always want more information?

A. Yes. That's things that keep research programs going.

THE COURT: And the funding.

BY MR. WALL:

Q. Is there a -- that invites a third question.

THE COURT: You only have one more, Mr. Wall. This is it.

BY MR. WALL:
Q. Is there a material risk that the delta smelt will become extinct before all the questions about its decline are answered by science?
MR. WILKINSON: Objection. That's beyond the scope of the recross.
THE COURT: It's probably beyond the scope of the witness' knowledge and expertise. Do you have any basis to answer that question?
THE WITNESS: I can make some --
THE COURT: You don't have enough factors in the hypothetical.
THE WITNESS: That's the -- I can answer --
THE COURT: Do you know how many questions you have to ask and how long it will take to ask them?
THE WITNESS: Yeah.
THE COURT: Do you?
THE WITNESS: I'm sorry?
THE COURT: Do you know how many questions you have to ask and how long it will take to ask them to answer that hypothetical?
THE WITNESS: Yeah. If I was -- no, I don't.
THE COURT: Then that's the answer. It can't be answered. Objection's sustained.
MR. WALL: Thank you, Your Honor.

THE COURT: May Dr. Moyle be excused?

MR. WALL: Plaintiffs' side need nothing further from Dr. Moyle, Your Honor.

MR. MAYSONETT: We have no objection, Your Honor.

MR. LEE: Excusal is fine.

MR. WILKINSON: We have no objection to that, Your Honor.

MR. O'HANLON: Dan O'Hanlon. No objection, Your Honor.

THE COURT: Thank you. Dr. Moyle, you may step down. You're excused.

THE WITNESS: Thank you.

THE COURT: All right, ladies and gentlemen. That concludes today's proceedings. We're going to have Dr. Swanson tomorrow? And then that will be the last witness for the plaintiffs. Is that correct?

MR. ORR: That's right.

THE COURT: All right. Then let me get -- I know it's a guesstimate, can you give me a ballpark on the agency's witnesses and the intervenor's witnesses? You can at least give me the direct.

MR. MAYSONETT: Your Honor, we're presenting one witness by Court's order, Ms. Cay Goude, and I don't expect that her direct will take more than an hour, hour and a half.

MS. WORDHAM: Your Honor, we are presenting Mr. John

Leahigh and we've indicated we anticipate that his direct will not take more than an hour, hour and a half.

MR. WILKINSON: Your Honor, we're presenting Dr. Hanson. I would guess that his direct would take about the same length of time as Dr. Moyle's.

MR. O'HANLON: Your Honor, we'll be presenting Dr. William Miller. We expect that his direct testimony would last about three to four hours.

THE COURT: All right. Well, that should take us well into Thursday based on cross-examination. So unless there's anything further this evening --

MR. ORR: Your Honor, I don't know if you want to do this on the record. I've got information from Mr. Sherwood on the other case.

THE COURT: All right. Let's adjourn these proceedings. We'll stand in recess and you can tell us that and the courtroom deputy will get a date for the hearing.

MR. MAYSONETT: Your Honor, just to clarify before we adjourn. Do we have a sense of what the plaintiff's expectation is on how long the direct of Dr. Swanson will take just for the timing of our own witnesses.

THE COURT: Yes. What's the estimate?

MR. WALL: I expect it will take roughly the same amount of time as we had with Dr. Moyle.

THE COURT: All right. Thank you. Two to three

hours.

MR. MAYSONETT: Thank you, Your Honor.

THE COURT: All right. We are in recess until nine a.m. tomorrow.

(The proceedings were adjourned at 5:04 p.m.)

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