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SAN LUIS & DELTA-MENDOTA WATER  
11 AUTHORITY; WESTLANDS WATER DISTRICT

12  
13 UNITED STATES DISTRICT COURT  
14 EASTERN DISTRICT OF CALIFORNIA

15  
16 THE DELTA SMELT CASES  
17 SAN LUIS & DELTA-MENDOTA  
WATER AUTHORITY, et al. v.  
18 SALAZAR, et al. (Case No. 1:09-cv-407)

19 STATE WATER CONTRACTORS v.  
SALAZAR, et al. (Case No. 1:09-cv-422)

20 COALITION FOR A SUSTAINABLE  
21 DELTA, et al. v. UNITED STATES FISH  
AND WILDLIFE SERVICE, et al.  
22 (Case No. 1:09-cv-480)

23 METROPOLITAN WATER DISTRICT v.  
24 UNITED STATES FISH & WILDLIFE  
SERVICE, et al. (Case No. 1:09-cv-631)

25 STEWART & JASPER ORCHARDS,  
26 et al. v. UNITED STATES FISH AND  
WILDLIFE SERVICE, et al.  
27 Case No. 1:09-cv-892

CASE NO. 1:09-cv-407-OWW-DLB  
1:09-cv-422-OWW-DLB  
1:09-cv-631-OWW-DLB  
1:09-cv-892-OWW-GSA  
PARTIALLY CONSOLIDATED WITH:  
1:09-cv-480-OWW-GSA

**DECLARATION OF DR. BRYAN MANLY  
IN SUPPORT OF PLAINTIFFS' MOTION  
FOR INTERIM RELIEF/PRELIMINARY  
INJUNCTION**

**DATE:** March 17, 2010  
**TIME:** 9:00 a.m.  
**COURTROOM:** 3  
Hon. Oliver W. Wanger

1 I, Bryan F.J. Manly, declare as follows:

2 1. I am a consultant statistician working for Western EcoSystems Technology Inc.,  
3 2003 Central Avenue, Cheyenne, Wyoming. I have been employed by that company since 2000.  
4 Before that I was Professor of Statistics and the Director of the Center for Applications of  
5 Statistics and Mathematics at the University of Otago, in Dunedin, New Zealand. I have 40 years  
6 experience in the application of statistics in environmental and ecological areas. I hold a DSc  
7 degree from the City University in London, UK, am a Chartered Statistician of the Royal  
8 Statistical Society, and a Fellow of the Royal Society of New Zealand. A copy of my curriculum  
9 vitae is attached to this declaration as Exhibit A. I am the author of over 200 papers in refereed  
10 scientific journals, and seven books on applied statistics. A list of my publications is attached to  
11 this declaration as Exhibit B.

12 2. As explained in my previous declaration in this case filed November 13, 2009  
13 (Doc. # 397), I have reviewed the 2008 Delta Smelt Biological Opinion at issue in this case  
14 (“BiOp”) and certain articles and documents in the administrative record upon which the  
15 conclusions and statements in the BiOp rely. Also, I have reviewed several documents and  
16 declarations submitted to the Court in opposition to the preliminary injunction motion filed by the  
17 San Luis & Delta-Mendota Water Authority, including the Federal Defendants’ Opposition (Doc.  
18 #469) and the Declaration of Cay Collette Goude (Doc. #470).

19 **A. The Manly and Chotkowski (2006) Article**

20 3. Over the past several years, I have performed numerous statistical analyses of the  
21 available data relating to the abundance of delta smelt and variables that might influence that  
22 abundance. I have also reviewed many such analyses done by others. I am not aware of any such  
23 statistical analyses that have shown that entrainment at the Central Valley Project and State Water  
24 Project pumps has an important effect upon overall delta smelt population abundance. The  
25 authors of the BiOp appear to agree, given the statement at page 210 of the BiOp that “currently  
26 published analyses of long-term associations between delta smelt salvage and subsequent  
27 abundance do not support the hypothesis that entrainment is driving population dynamics year in  
28 and year out (Bennett 2005; Manly and Chotkowski 2006; Kimmerer 2008).”

1           4.       In paragraph 6 of her declaration, however, Ms. Goude disputes that no such  
2 relationship has been found. As support, she cites a paper that I co-authored, the same one cited  
3 in the BiOp, Manly and Chotkowski (2006). Ms. Goude's declaration states that "the 2006  
4 Manly and Chotkowski study found a statistically significant relationship between exports and  
5 Fall Midwater Trawl (FMWT) catches." (Goude Dec. ¶ 6.) This statement is incorrect. The  
6 main purpose of the article was to describe new methods for detecting regime changes in fish  
7 population numbers (times when the numbers increase or decrease considerably, or when an  
8 upwards or downwards trend changes abruptly). Delta smelt Fall Midwater Trawl (FMWT) data  
9 for 1967 to 2004 were used for examples of the methods proposed, but the focus of the article was  
10 not about the reasons for the recent decline in delta smelt numbers. Overall, the methods of  
11 analysis described in the Manly and Chotkowski (2006) paper indicate that there were abrupt  
12 changes in delta smelt numbers or trends in these numbers in the early 1980s and late 1990s that  
13 are not explained by the hydrological variables that have been analyzed. Some hydrological  
14 variables have statistically significant effects in the analysis, but these only account for a small  
15 part of the observed variation in delta smelt abundance. According to these analyses, the great  
16 majority of the variation in delta smelt numbers, and the decline since about 2000, is not  
17 accounted for by the hydrological variables.

18           5.       The Manly and Chotkowski (2006) paper did report a statistically significant  
19 relationship between "gross hydrology" and FMWT, but not between "exports" and the FMWT.  
20 The "gross hydrology" variable used was the average daily flow for the Sacramento and San  
21 Joaquin Rivers minus water exported through the state and federal facilities, for January to  
22 September each year. The gross hydrology variable is therefore related to exports but is not  
23 directly measuring export effects. Furthermore, based on that analysis, although the relationship  
24 was statistically significant, gross hydrology explained very little of the variation in the FMWT  
25 index. In other words, gross hydrology did not appear to have an important effect on delta smelt  
26 subsequent abundance. Instead, in this and other work I did preceding this 2006 article,  
27 predictions of delta smelt abundances from the models used were almost the same whether  
28 hydrological variables, including exports, were in the models or not.

1 **B. The 2007 IEP Report Cited by Ms. Goude Does Not Find That Entrainment Is**  
2 **Important To Delta Smelt Abundance**

3 6. In the same paragraph 6 of her declaration, as further support for her argument that  
4 the scientific community has found a relationship between entrainment and abundance, Ms.  
5 Goude states that the “Interagency Ecological Program’s 2007 Synthesis Report on the Pelagic  
6 Organism Decline Team stated ‘. . . entrainment of adults and larvae (top-down effects) are  
7 particularly important to the delta smelt population . . .’” (Goude Dec ¶ 6.) This is a partial and  
8 misleading quotation of that report. The 2007 IEP report actually said the following: “. . . Winter  
9 represents the main period of adult delta smelt migration and spawning. We hypothesize that  
10 entrainment of adults and larvae (top-down effects) are particularly important to the delta smelt  
11 population during this critical season . . .” (See AR 016957 (emphasis added).) As stated, this is  
12 a hypothesis about what might be true, not a finding based on scientific methods that in fact  
13 entrainment has a substantial or important effect on delta smelt population abundance from one  
14 year to the next.

15 7. According to the Wikipedia Encyclopedia (en.wikipedia.org/wiki/  
16 Scientific\_method): “The scientific method refers to a body of techniques for investigating  
17 phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. To be  
18 termed scientific, a method of inquiry must be based on gathering observable, empirical and  
19 measurable evidence subject to specific principles of reasoning. A scientific method consists of  
20 the collection of data through observation and experimentation, and the formulation and testing of  
21 hypotheses.” This is a definition that most scientists should find acceptable. If some testing  
22 supports a hypothesis, then it becomes more plausible. Before that testing, it is just an idea that  
23 may or may not be true. Ms. Goude’s statement and reliance upon the 2007 IEP report fails to  
24 distinguish between a hypothesis and a scientifically based conclusion.

25 **C. Ms. Goude’s Interpretation of Kimmerer 2008**

26 8. In my previous declaration (Doc. #397), I addressed the BiOp’s suggestion (at  
27 page 210) that entrainment is “sporadically” significant to delta smelt population abundance. As I  
28 explain there, the BiOp’s reliance on Dr. Kimmerer’s article, *Losses of Sacramento River*

1 *Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento – San*  
2 *Joaquin Delta* (2008) (“Kimmerer (2008)”) (AR 018854-018880) for this proposition is  
3 misplaced. Kimmerer concluded that observed effects of such entrainment are negligible in  
4 comparison to the effects of other factors, explaining that that conditions affecting survival in the  
5 summer-fall period (after the entrainment of delta smelt at the export pumps) appear to “dominate  
6 variability in abundance of delta smelt in fall.” (AR 018878; Kimmerer (2008) at p. 25.)  
7 Kimmerer also found that “despite substantial variability in export flow in years since 1982, no  
8 effect of export flow on subsequent midwater trawl abundance is evident.” (*Id.*) This is  
9 consistent with my understanding of the statistical analyses done to date, as described above.

10 9. In paragraph 8 of her declaration, Ms. Goude quotes select statements from  
11 Kimmerer (2008) as support for imposing a reasonable and prudent alternative in the BiOp to  
12 reduce entrainment. But while Dr. Kimmerer calculated that sometimes substantial percentages  
13 of the population could be entrained, he did not show that the entrainment he estimated was  
14 significant to subsequent abundance; instead other sources of mortality “dominate variability.”  
15 (*Id.*) Dr. Kimmerer’s suggestion at the conclusion of his article that export flow should be  
16 manipulated to reduce entrainment, because it can be manipulated while other factors cannot be  
17 easily manipulated (AR 018878), is not based on any scientific finding that entrainment has a  
18 significant or substantial effect on abundance.

19 10. In paragraph 8 of her declaration, Ms. Goude states that when preparing the BiOp,  
20 the Fish and Wildlife Service believed the effects of entrainment to be “episodic – significant in  
21 some years, while probably not in others.” Like the statement in the BiOp that the effects of  
22 entrainment are sporadic (BiOp at p. 210), the difficulty with episodically “significant” effects, as  
23 I noted in my previous declaration, is that what this means is not defined. (Doc. 397 at ¶ 7.) If  
24 this is intended to mean that entrainment has an important or considerable effect on subsequent  
25 abundance, that inference is not supported by any cited statistical analyses. Instead, as described  
26 above, the available statistical analyses do not show such an effect. The only study cited in the  
27 BiOp at page 210 is Kimmerer (2008), which expressly states that no such effect has been found  
28 because other factors appear to dominate.

1 11. Since the BiOp relies upon Kimmerer (2008), and the estimates of entrainment in  
2 that article to support the sporadically significant hypothesis, in my previous declaration I  
3 described various ways the Fish and Wildlife Service could have tested its hypothesis that the  
4 entrainment estimated by Kimmerer (2008) has had sporadically significant effects on delta smelt  
5 abundance. (Doc. 397 at ¶¶ 9-31.) Ms. Goude does not address these methods or the results, or  
6 explain any alternative analysis. As I indicated in my previous declaration, simply asserting an  
7 effect based on a hypothesis, without evaluating whether the available data support that  
8 hypothesis, is contrary to generally accepted scientific standards and methods. Claiming  
9 sporadically significant effects without providing any evidence of what these are and when they  
10 have occurred is not the scientific method according to the definition above. For this statement of  
11 sporadically significant effects to be science requires “observable, empirical and measurable  
12 evidence.”

13 **D. Statistics and the Inference of Causation**

14 11. Statistical correlations do not prove causation. An illustration of this that is often  
15 quoted in introductory statistics books and statistics classes is that there is apparently a strong  
16 correlation (a measure of the extent to which two variables are related with a maximum of 1.0) of  
17 0.7 between the number of nesting storks and the birth rate in Germany between 1950 and 1970.  
18 This is not because changes in one of these variables caused the changes in the other one.  
19 Instead, it is presumably a coincidental correlation that occurred because both of the variables  
20 declined over the period for unrelated reasons.

21 12. However, if there is a causal relationship between two variables, then we would  
22 normally also expect to see a correlation between the two variables. For example, if food  
23 limitation reduces the reproduction rate or survival of delta smelt, then we would expect to  
24 observe delta smelt numbers decline at the same time as a decline in some measure of the  
25 availability of food in the areas used by delta smelt.

26 13. If multiple factors are thought to influence the population dynamics of delta smelt,  
27 then it is crucial to have a population model for the species that attempts to use observed data to  
28 assess the relative importance of the different factors. Methods are available to do this (see, for

1 example, Deriso et al.'s (2008) paper *Incorporating Covariates into Fisheries Stock Assessment*  
 2 *Models with Application to Pacific Herring*, published in *Ecological Applications* 18: 1270-86,  
 3 and earlier papers referenced therein). This would clearly be "best available science," although it  
 4 still faces the problem of determining whether specific relationships are causal rather than  
 5 coincidental, as explained in above.

6 **E. Peer Review Does Not Assure That The Results In Articles Are Correct, Or That**  
 7 **They Represent The Best Available Science**

8 14. I have been involved in writing scientific papers and refereeing other people's  
 9 papers for more than 40 years. At present, I am actively involved as an Editorial Board Member  
 10 or Associate Editor for three statistics journals and two ecology journals, and was the Editor of  
 11 the American Statistical Association's *Journal of Agricultural, Biological and Environmental*  
 12 *Statistics* from 1999 to 2002. I am therefore very familiar with the refereeing process with  
 13 journals in statistics and ecology.

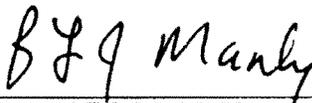
14 15. Ms. Goude's declaration and the related memorandum place great emphasis on  
 15 whether an analysis has been subject to peer review. It is sometimes assumed by those who are  
 16 not familiar with the refereeing process that this process somehow ensures that refereed published  
 17 papers provide the truth, and do not contain errors. Unfortunately, this is not true, as illustrated  
 18 by the attached paper *Exploring the Peer Review Process: What it is, Does it Work, and Can it be*  
 19 *Improved?* by D.R. Vries and others published this year in the journal *Fisheries*. (Exhibit C.) For  
 20 example, this paper describes a controlled study where eight errors were inserted into a previously  
 21 published paper, which was then sent out as a possible new publication for journals. The reviews  
 22 on average only detected two of the inserted errors, only 10% of the reviewers identified four or  
 23 more of the errors, and 16% of the reviewers did not identify any of the errors.

24 16. There are several reasons why the refereeing process is sometimes not very  
 25 effective. One problem that is becoming worse in journals of statistics and ecology is that  
 26 analyses are tending to become more complicated, and the basic data are not usually provided to  
 27 referees. This makes it virtually impossible to check whether the results of the analysis are  
 28 actually correct. This may not matter much if the results are not going to be used to make

1 important decisions, where a wrong decision may have very expensive consequences and affect  
2 many people. However, if the results are going to be used for important decisions, then it is not  
3 sufficient to accept that the results in a peer reviewed published paper are correct without having  
4 an independent expert redo all the steps of the analysis. A second problem, related to the first, is  
5 that referees for journals tend to be busy people, and usually they do not get paid for their  
6 services. This tends to lead to referees not spending a lot of time on the details of a paper, and  
7 possibly missing some problems that are not immediately obvious.

8 17. There are other well known potential problems as well, such as scientists with  
9 established reputations finding it easier to get their papers published than newcomers to the field,  
10 with referees being more critical of the newcomers' work. Also, as an Editor or Associate Editor  
11 of a journal, I have often known which potential referees will tend to favor a paper and who will  
12 tend to be critical because of the methods used. In sum, while peer review does sometimes catch  
13 errors in papers, it is no guarantee that the analysis and information in the peer reviewed paper is  
14 correct. In many instances, it is not.

15 I declare under penalty of perjury under the laws of the United States of America that the  
16 foregoing is true and correct. Executed this 11th day of January, 2010, at Dunedin, New Zealand.

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18 \_\_\_\_\_  
19 BRYAN F.J. MANLY

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**DECLARATION OF SERVICE**

I am a citizen of the United States and employed in Sacramento County, California. I am over the age of eighteen years and not a party to the within-entitled action. My business address is 400 Capitol Mall, 27th Floor, Sacramento, California 95814.

On January 12, 2010, I electronically filed

**DECLARATION OF DR. BRYAN MANLY IN SUPPORT OF PLAINTIFFS' MOTION FOR INTERIM RELIEF/PRELIMINARY INJUNCTION**

with the Clerk of the Court using the CM/ECF system, which will send notification of such to the attorneys of record in this matter.

I also sent the foregoing document by U.S. mail and electronic mail to:

Dr. Thomas Quinn  
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School of Aquatic and Fishery Sciences  
P.O. Box 355020  
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Dr. André Punt  
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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration was executed on January 12, 2010, at Sacramento, California.

  
\_\_\_\_\_  
Do Gentry