

# SCIENCE REVIEW OF TESTIMONY IN THE DELTA SMELT CASES

## Summary Report



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# SCIENCE REVIEW OF TESTIMONY IN THE DELTA SMELT CASES

## Summary Report

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## EXECUTIVE SUMMARY

Atkins, and its subcontractor and partner RESOLVE, were tasked with evaluating the scientific statements, and the professional behavior of two Department of Interior scientists following remarks made by a federal judge.

RESOLVE convened a panel of scientific experts who evaluated the testimony of Mr. F. Feyrer and Dr. J. Norris in several hearings, in light of subsequent criticism by Judge Wanger.

The panel feels that Mr. Fred Feyrer and Dr. Jennifer Norris may have demonstrated minor inconsistencies (Feyrer) or minor inadequacies in explanation (Norris) in the materials presented in written declarations and verbal testimonies, but these mistakes do not represent violations of scientific professional standards.

In the case of Mr. Feyrer, we find that he did change his opinion and testimony, but that this is consistent with good scientific practice.

In the case of Dr. Norris, we find that she did not change her opinion, and gave largely consistent testimony. This was consistent with her following standard scientific practice within application of the Endangered Species Act.

We find that both Mr. Feyrer and Dr. Norris, for the most part, made good faith efforts to engage in a cooperative scientific endeavor.

We are of the opinion that, in a complex situation, with ongoing litigation and competing scientific opinion, Mr. Feyrer and Dr. Norris have been constrained in explaining their positions.

There is no evidence that either scientist has failed to use 'best available science' appropriately. However it is not clear from the record exactly how the scientists reached the conclusions they did.

Our criticism of Mr. Feyrer and Dr. Norris is purely in the scientific realm, and should be seen as exhortatory (not castigatory) in tone: the explanations provided, as to how these two scientists reached their conclusions, could have been clearer and more forth-coming. We suspect that this failure to provide clear and convincing explanation, more than any other issue, may have led Judge Wanger to reach his conclusions alleging lack of candor and integrity

There is nothing in the record suggesting that either scientist deviated significantly from standard scientific conduct, as defined under the Department's definition of scientific malpractice. The panel members find that there is no evidence for either Mr. Feyrer or Dr. Norris operating outside the norms of behavior in the fields they operate in.

We find that in neither case is there evidence suggesting deliberate falsehood, interpolation of personal opinion into science, or other professional misconduct by either Mr. Feyrer or Dr. Norris. We do not believe that further investigation would be likely to produce evidence of such misconduct.

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## INTRODUCTION

Atkins, and its subcontractor and partner RESOLVE, were tasked with evaluating the scientific statements, and the professional behavior of two Department of Interior scientists following remarks made by a federal judge. As the evaluation proceeded, it was decided that most of the review would be carried out by external, independent scientists, under a process managed by RESOLVE.

RESOLVE is a non-profit that specializes in mediating and facilitating complex environment, health, and energy issues, and in helping individuals and organizations build their capacity to engage diverse interests in collaborative problem solving. In collaboration with Atkins, RESOLVE's science program focuses on the use of technical and scientific expertise in policy decisions. RESOLVE staff have an extensive background in the peer review of scientific materials. In particular, Dr. Courtney, Director of RESOLVE's Collaborative Science Program, has previously led teams investigating scientific disagreements, and forensic analysis where scientific malpractice was considered. He has also led teams that provided review of the Department of Interior's Science Ethics Policies.

The Atkins/RESOLVE team was contracted by the US Fish and Wildlife Service (USFWS) to coordinate an external science review of the declarations and testimonies of Mr. Frederick Feyrer (Bureau of Reclamation) and Dr. Jennifer Norris, PhD (USFWS) in the case of San Luis & Delta-Mendota Water Authority, et al vs. Kenneth Lee Salazar, et al. (the Delta Smelt cases). The basic charge of the review process was to 'determine if each scientist's statements were based in the best available science, and if any changes in their statements over time could be considered scientific malpractice.'

The terms of the contract are set in the contractual document. They include the following:

- Selecting the science reviewers;
- Administering, organizing, leading, and managing the science review;
- Facilitating clarification discussion between the review team and USFWS, as needed;
- Managing and producing a final report; and
- Maintaining an official record of the process.

## Review Process

### *1. Selection of Reviewers*

RESOLVE maintains strong contacts with a network of technical experts and scientists with expertise in this area of research. In selecting scientists for this science review process, we first approached scientists in our existing network with the required expertise. In selecting our reviewers, we had only two constraints: a reviewer could not be a USFWS employee and must have no conflicts of interest. Following the dictates of our contract, we sought reviewers who are respected in their field of expertise and are subject matter experts in the areas discussed in the testimonies and declarations related to the Delta Smelt cases, and during the selection

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process considered a group of reviewers with “expertise, diversity of science perspectives, independence, and ... no conflict of interest.”

The three selected science panelists were:

Dr. Scott McKinley, The University of British Columbia  
Dr. Bill Pine, University of Florida  
Dr. Don Weitkamp, Parametrix

These three scientists were the first choices for the panel, and no additional scientists were approached. It was felt that these three provided a solid team, well versed in the issues of fisheries science, statistics, modeling and (to a lesser extent) hydrology. Although we considered adding additional hydrological expertise, we ultimately decided that this was unnecessary.

All panelists were qualified to participate and brought diverse knowledge and expertise to the issue. All were interviewed by Dr. Courtney of RESOLVE on their abilities, expertise, and potential conflicts. No serious problems were identified. All three panelists completed a conflict of interest statement derived from that used by the National Academies of Sciences. RESOLVE was confident in the ability of all the reviewers to fairly and objectively evaluate the Delta Smelt cases testimony and declarations.

The specific areas of expertise of the three panelists are:

Dr. McKinley: Anadromous and other fish.  
Dr. Pine: Fish biology; statistics.  
Dr. Weitkamp: Anadromous and other fish; modeling; applied science; delta ecosystems.

In addition, Mr. Steven Quarles, Crowell & Moring LLP, Washington, D.C. was contracted to provide advice to the team on the legal context in which scientific information and analysis are employed in decisions reached under the Endangered Species Act. In his legal practice, Mr. Quarles specializes in federal wildlife laws, and is well-versed in the use of science in decision-making under those laws.

Originally, the review team had envisaged that the legal expert would serve as a co-equal with the scientists, as a fourth peer reviewer. However, after reviewing the charge to the review team and with the advice of Mr. Quarles, it became clear that the review was to be conducted on purely scientific issues and that it was not appropriate for a panel comprised mostly of scientists to reach any legal conclusions or to comment on legal issues. Moreover, it was not possible for Mr. Quarles to fairly evaluate the science the panel was discussing, as this is not within his expertise. Mr. Quarles’ role, therefore, was advisory only. He acquainted the panel with the science-related provisions of applicable law, including the Endangered Species Act, the Data Quality Act, and the Administrative Procedure Act, implementing regulations, and guidance of the Office of Management and Budget and Fish and Wildlife Service. He assisted the panel in parsing the similarities and differences in legal standards and procedures and professional standards and procedures for the process of assembling, considering, and drawing conclusions from scientific data, including addressing uncertainty, and for disclosure of how each step in the process is performed.

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## ***2. Evaluation of Materials***

The panelists were provided materials given to Atkins and RESOLVE by the Department of Interior, notably the transcripts of hearings presided over by Judge Wanger, plus many supporting and preceding documents. These were then read by the reviewers, and discussed among the group. Initially these discussions were limited to the scientific reviewers, with Mr. Quarles joining in later discussion.

Notes were taken of all discussions, and will be compiled and provided as part of the record, together with a list of materials evaluated.

The panel members were tasked with reading all of the materials provided by USFWS to Atkins and RESOLVE. The review then proceeded by directed discussions in which the panel examined the Judge's critiques and the record of statements by the scientists. Each of Judge Wenger's comments on the testimony of the scientists was tabulated from his statements (see Table), and then discussed in detail by the panel members.

The panel then elected to prepare notes on the testimony of each of the scientists, and to answer key questions, formulated by Dr. Courtney of RESOLVE, to address the applicability of Judge Wanger's criticisms. These questions were structured so as to focus on the available data and evidence, and to allow panelists to address issues of science and of scientific professional conduct (but not issues of law).

At one point, the panel sought additional information from DOI; this request was channeled through Dr. Courtney and brought a prompt response from DOI. This correspondence is also part of the record.

Although the panel operated using a discussion format, panelists were instructed that the purpose of the discussions were to help individual panelists reach their own conclusions. There was no requirement placed on panelists that there be a unanimous or consensus report. Instead the panelists were encouraged to discuss the issues freely, and then bring their individual conclusions forward. In the event, the panelists were essentially unanimous in their opinions, and therefore the team decided to write a single report, summarizing the group's conclusions. Nevertheless individual panelists were asked to document their agreement (or lack thereof) with the main conclusions of the report using questionnaires (which are appended).

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## ANALYSIS AND CONCLUSIONS

### 1. General finding: Did the two scientists violate scientific professional standards?

The panel feels that Mr. Fred Feyrer and Dr. Jennifer Norris may have demonstrated minor inconsistencies (Feyrer) or minor inadequacies in explanation (Norris) in the materials presented in written declarations and verbal testimonies, but these mistakes do not represent violations of scientific professional standards. Indeed, normal scientific procedures, which involve the careful weighing of new information, must always involve changing of opinion. Hence it is to be expected that scientific positions may often change, particularly when (as here) substantial new information was presented by plaintiffs. At the same time, science proceeds by the weight of evidence; it is therefore equally consistent with a scientific professional standard for a scientist not to change his or her position, because the scientist is unconvinced by the evidence at hand.

In the case of Mr. Feyrer, we find that he did change his opinion and testimony, but that this is consistent with good scientific practice.

In the case of Dr. Norris, we find that she did not change her opinion, and gave largely consistent testimony. This was consistent with her following standard scientific practice within application of the Endangered Species Act.

Under the Endangered Species Act, Data Quality Act, Administrative Procedures Act, and other applicable law, regulations, guidance, federal scientists have an obligation to use the best available science at the time that decisions are made. There is also an expectation that scientists will explain the positions they have taken, and they must avoid arbitrary and capricious decisions. We find that both Mr. Feyrer and Dr. Norris, for the most part, made good faith efforts to engage in a cooperative scientific endeavor. However the record before us does not fully document their reasoning and it is difficult to understand the basis for some of their evaluations and statements. We have no evidence before us that this was a deliberate effort on the part of either scientist to mislead, to withhold information or to be uncooperative. Rather we are of the opinion that, in a complex situation, with ongoing litigation and competing scientific opinion, Mr. Feyrer and Dr. Norris have been constrained in explaining their positions. It is not part of our charge to determine whether either scientist failed to adequately document his or her decisions under the legal standards set by ESA and APA. Rather, our task is to determine whether there has been scientific misconduct – again, we have no evidence for misconduct or breach of professional standards or ethics.

Our evaluation has highlighted professional and agency issues related to the presentation of uncertainty in data, statistical analyses, and in evaluating ecosystem responses to management actions in a courtroom setting. Natural resource scientists may find uncertainty a comfortable constant in managing natural resources and making decisions, and have developed tools (such as adaptive management) to respond to a shifting situation. We note from a legal perspective (when uncertainty is presented in court and interpreted by a judge) that this may appear as an

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attempt to confuse or mislead the court. However explicit treatment of uncertainties and unknowns is not unprofessional behavior – it is good science.

## **2. Finding: Did either scientist’s opinions change over time?**

The committee feels that the declarations and testimony of Mr. Feyrer and Dr. Norris should be assessed separately in this regard.

### **Mr. Feyrer**

Mr. Feyrer presented information that on the surface, and without very careful examination, could appear contradictory between written declarations and oral testimony in two key domains (1) whether or not a large area of potentially suitable delta smelt habitat would be available at or around a specific location of X2 and (2) questions related to statistical and population modeling analyses that Feyrer completed and included either in the BiOp, written declarations, oral testimony, or a combination of all.

**Domain 1 – Habitat availability.** In Feyrer’s July declaration (page 3, approximately line 18-24) Feyrer says “...where the habitat index changes dramatically corresponds to a geographic area that spans the confluence of the Sacramento and San Joaquin rivers, which is located at approximately 80-km...when X2 is located downstream of the confluence there is a larger area of suitable habitat because the low salinity zone encompasses the expansive Suisun and Grizzly bays, which results in a dramatic increase in the habitat index...in contrast when X2 is upstream of confluence, habitat is restricted to smaller river channels.”

The question of whether Feyrer contradicts himself in his declarations occurs between the information represented above from August and in his September declaration page 11, line 17 (also identified by Judge Wanger) “If X2 is set at 79 or 80 km most of the delta smelt population will not align with the shallow, biologically productive, turbid waters of Suisun Bay, Grizzly Bay, and Honker Bay. Thus position X2 at 79 or 80 km would provide far less habitat of sufficient quality and quantity than it would positioned at 74 km.”

What Feyrer has done between July and September is that he describes X2 as defining available suitable habitat in general terms in July, but when he makes a statement about a specific location of X2 in September he adopts much more precautionary language than he used in July. In September he states that most of the delta smelt population will not “align” with these shallow bay habitats at an X2 of 79 or 80 and an X2 at this location would “provide far less habitat ....than it would positioned at 74 km.”

**Domain 2 – Statistical analyses.** Lengthy, highly detailed critiques of the different statistical and population modeling approaches used by Fred Feyrer and his colleagues and co-authors to assess whether there is a relationship between the fall X2 location and the annual abundance index of delta smelt are available in the written declarations and oral testimony. All of these assessments are basically asking the question is there evidence that the location of X2 in the fall influences the abundance of smelt. Feyrer has previous provided published and unpublished information that shows a relationship between fall X2 location and the presence/absence of delta smelt. There are two lines of inference used by Feyrer in this type of assessment and both are question (1) a variety of regression type analyses which provide foundational information for the development of the BiOp. These approaches are very harshly criticized in the Plaintiff’s

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review of Feyrer’s work which includes criticism of what data sources are used or not used for different analyses and (2) extensive discussion on the use of different population modeling approaches which broadly are called “life cycle models” including a comparison and contrast of population dynamics model developed by the Plaintiff’s compared to other population modeling approaches used by Feyrer. Judge Wanger questions in his summary how Feyrer can provide declarations or testimony criticizing the approaches used by the Plaintiffs which appear to provide different results than Feyrer’s assessments, but, that Feyrer later provides testimony that these conclusions from the modeling approaches all generally agree. Basically these statistical and population models are all attempts describe in a transparent, mathematical way the population dynamics of the delta smelt and to attempt to ascertain what factors may be limiting delta smelt abundance and population recovery. These models are then used to inform decisions relate to the various RPA management actions such as how water is managed to influence the location of X2 in the fall and how these actions may enhance delta smelt population recovery.

In summary, we find that Mr. Feyrer’s opinions, and consequent testimony, evolved, as a part of normal scientific practice.

**Dr. Norris**

The declarations by Dr. Jennifer Norris appear to rely strongly, if not exclusively, on the 2008 BiOp, as evidenced by her frequent citations of the BiOp. The implication is that Dr. Norris believes that the 2008 BiOp relies on the best available science for implementing the RPA. Although Dr. Norris acknowledges that key agency biologists and academic scientists did participate in a Habitat Study Group that was charged with developing a scientific plan of study to support the adaptive management of the Fall Action, we have seen no explanation of how Dr. Norris has evaluated the information that has become available since the 2008 BiOp. Dr. Norris was certainly aware of the information provided by plaintiffs as evidenced by her statement “Plaintiffs did not propose any specific management alternative to the Fall Action, but rather, proposed studies and data analysis activities that, while potentially informative, would not provide any tangible benefits to the delta smelt during the Fall” (Norris declaration 07/01/11 p. 4:22-25) but, we do not see evidence that she relied upon this information. In her 09/07/11 declaration, Norris continues to cite the 2008 BiOp and information sources available prior to that date. However, she does cite Feyrer et al. (2011), but without explanation as to why this is the only additional information source she relies upon.

In summary, we find that Dr. Norris’s opinions, and consequent testimony, were consistent over time. This is compatible with normal scientific practice, if she is unconvinced of the need to change her opinions in the light of any new information.

**3. Finding: Did they have reason for their statements?**

Again the panelists feel that the declarations and testimony of Mr. Feyrer and Dr. Norris should be assessed separately in this regard.

**Mr. Feyrer**

Are Mr. Feyrer’s comments contradictory? Related to Domain 1 - Habitat Availability, on the surface yes, if a literal interpretation of Feyrer’s July comment related to “downstream of the

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confluence” is interpreted as a physical line drawn on a map immediately downstream of the confluence of these rivers. But Feyrer is a biologist and the committee feels that Feyrer is interpreting the position of X2 not as a line on a map as Judge Wanger appears to do, but instead, as Feyrer states in his July declaration (page 7, about line 24) “By definition, X2 describes the position of the low salinity zone in the estuary” and then about line 25 says “It is the low salinity zone, not specifically X2 that is delta smelt habitat”. The NAP panel states the agencies interpret X2 “not as a single line, but rather as an indicator of the spatial pattern of salinity in the delta and thus as indicative of the extent of habitat favorable for delta smelt.” (NAP panel 2000, page 5 of the document, page 20 of the pdf). Feyrer’s comments are consistent with this declaration

Related to Domain 2 Statistical analyses, the panel members feel that Feyrer is not contradictory in his analyses and what Judge Wanger interprets as Feyrer providing contradictory or misleading analyses is primarily a difference in interpreting biological and statistical uncertainty.

#### **Dr. Norris**

Dr. Norris does not conduct statistical analyses of the delta smelt issues; rather she relies on the works of others. Although she relies heavily on the work of Dr. Feyrer, she does not demonstrate obvious recognition of changes included in his most recent work. Again, Dr. Norris appears to be consistent in relying on the 2008 BiOp and information used to support that document. She continues to conclude throughout her declarations that the risk that the delta smelt will become extinct is real and that the population has remained at record low levels in recent years as indicated by the annual Fall midwater trawl index. However, we do not see analysis of other information more recent than the 2008 BiOp that she has brought forward to support her conclusions.

In summary, we find that Dr. Norris’s opinions, and consequent testimony, were consistent over time.

#### **4. Finding: Did they fully explain their statements?**

The panel members feel that the declarations and testimony of Mr. Feyrer and Dr. Norris should be assessed separately in this regard.

#### **Mr. Feyrer**

The committee feels that Mr. Feyrer does not fully explain why he adopts a more precautionary approach related to Domain 1 in describing whether or not X2 at 79 or 80 km will or will not make Suisun Bay, Grizzly Bay, Honker Bay and other areas of potential suitable habitat available during his September declarations. In the July declarations and testimony Feyrer uses more general language to describe expansion of suitable habitat when X2 is downstream of the confluence of the Sacramento and San Joaquin rivers. The committee feels that a large amount of confusion on this point would have been avoided if Feyrer had very explicitly stated at what river kilometer X2 would have to be located to make these habitats available or if this knowledge isn’t available (because of uncertainty in how the lower salinity areas are distributed in these bays due to wind, tide, and other uncontrollable factors), then this uncertainty should have been clearly articulated. In reading the statements of Judge Wanger

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and the testimony and written declarations of Feyrer it does appear that at times there are different interpretations of the definition of X2, either as a specific line on the map (Judge Wanger) or a more general broad area of suitable habitat (Feyrer). If the Federal defendants did interpret X2 more broadly than Judge Wanger, then they could have highlighted these differences in definition and Feyrer (and other defendants) could have reiterated their definition of X2 in all written declarations and in responding to all verbal questions.

Feyrer does do a very good job in responding to criticisms (made by the Plaintiffs and reiterated by Judge Wanger) on various aspects of the statistical and population analyses he and his colleagues conducted. Simple questions related to why data from different sampling stations were excluded from some analyses are explained in Feyrer's July declaration (pages 9 and 10, point 15) which describes excluding data from sampling stations based on "collective knowledge" such as stations being sampled inconsistently. Additionally, Feyrer states that inclusion of these additional data would not change the conclusions of the analyses and then presents the re-analyses including the previously excluded data to support this assertion. When questioned whether a life-cycle model Feyrer developed in a report in 2008 that was included in the BiOp but later excluded from the peer-reviewed manuscript published in 2011 and whether this model was excluded because it did not stand up to peer-review, Feyrer provides the draft submitted manuscript which did not contain this model and states that this model was removed to be included in a larger effort led by other USFWS scientists as part of the Adaptive Management Plan. Again, this is a reasonable response from Feyrer.

Overall much of the criticism of Feyrer's work by the Plaintiffs (which was reiterated by Judge Wanger) is related to the different modeling approaches that were taken by the Defendants or Plaintiffs to assess what factors affect delta smelt. Feyrer explains this well, as in a key point he makes (July declaration, page 13, line 14) in a response to questions related to the multiple modeling efforts that have been developed to assess factors affecting delta smelt (MacNally et al. 2010; Thomson et al. 2010; Maunder and Deriso 2011 [developed by Plaintiffs] states that "Although there were some areas of agreement, these efforts have generally come to different conclusions regarding the importance of factors affecting delta smelt. This may be due, in part, to the different tools (modeling frameworks) used in these efforts and the specific questions they attempted to answer." Further, in line 27-28 Feyrer is discussing the results of the different life history models and says "The result was that each of the three modeling approaches came to different conclusions about the relative importance of factors affecting delta smelt. The point I am making here is that it is clear that there is no one single factor that affects delta smelt abundance and there is no single paper, model, or analysis that is the final truth on the matter. There is substantial disagreement among scientists about the relative importance of various factors. Moreover, it is almost certain that the relative importance of factors differs both within and among years. Because there [is] so much disagreement, it is unrealistic to rely on or strive to identify a single static answer and expect it to be applicable all the time. Therefore, it is critical that resource managers rely upon the full body of available science to make well-informed decisions on how to best manage factors that can actually be manipulated." This is a very good explanation provided by Feyrer, and demonstrates that he is thinking synthetically about all of the analyses, not just those that he and his colleagues have completed, but also the additional analyses conducted by the highly qualified experts for the Plaintiffs. He is also clearly considering how to go about integrating these results in a framework to make decisions based on the best available science.

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**Dr. Norris**

Dr. Norris explains various aspects of the BiOp, the RPA, and several other ESA issues. However, we do not see an explanation of why she has not relied on more recent information provided by a variety of sources to address the uncertainty aspect of the proposed Fall Action. She does not offer an obvious explanation as to why she continues to rely specifically on information supporting the 2008 BiOp and not consider more recent information in forming her conclusions.

**5. Finding: Do the scientists use best available science in reaching their conclusions? Is this well documented?**

The panelists feel that the declarations and testimony of Mr. Feyrer and Dr. Norris can be assessed together in this regard.

As explained in the above comments, Mr. Feyrer changed his opinions and testimony in relation to new information provided by the plaintiffs and others. Dr. Norris did not substantively change her testimony. In both cases we have some evidence that the two scientists each made use of recent information, such as the Adaptive Management Plan (response to questions posed by this panel to USFWS, appended). On this information provided, and the record provided to us, we do not have strong evidence suggesting that either scientist failed to use best available information. Specifically, while Dr. Norris did not substantively change her opinion, we have no evidence that her stance was due to either ignorance or misconduct. Refusing to change position in the absence of convincing new evidence is as acceptable a professional scientific stance as is changing position when such evidence is provided.

However in neither case was it obvious to the panel how the scientists had considered and integrated recent information into their testimony. This was particularly true for Dr. Norris, who essentially limited her evaluation in testimony to the BioOp. Hence we do not feel that the available record documents well how the scientists reached their conclusions.

The term 'best available science' has both scientific and legal meaning. While there is an available literature defining or addressing these terms in both fields (science, and the law), there is relatively little integration across fields as to what standards are reasonable. It is not our task to develop such standards here. It must therefore be emphasized that our review is addressing the scientific understanding of the term. In that context, we find nothing in the record to show that either scientist is using substandard science in making their evaluations. We have nothing in the record to show that the scientists are using anything other than best available science to reach their conclusions.

However we also feel that all scientists have (through their commitment to the principles of integrity, transparency, etc.) an additional and higher responsibility, to explain their reasoning and their use of evidence. In essence that, in addition to 'best available science', there are also 'best possible scientific practices', such as clarity in how evaluations are made, willingness to address potential criticisms, a strong record, etc. In this regard, we feel that neither Mr. Feyrer nor Dr. Norris followed best possible scientific practices in documenting and explaining his or her position, showing how the conclusions were reached.

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We are cognizant that under the Administrative Procedures Act, government agencies must reach decisions that are well-supported by information, and that there must be an administrative record for how such decisions are made; also that such a record is important in demonstrating that the government's actions are neither arbitrary nor capricious. We emphasize that it is not part of our charge, nor is it part of any of our findings, as to whether Mr. Feyrer and Dr. Norris complied with APA requirements, and similarly we make no finding as to whether agency decisions comply with the dictates of APA, ESA or other law.

Our criticism of Mr. Feyrer and Dr. Norris is purely in the scientific realm, and should be seen as exhortatory (not castigatory) in tone: the explanations provided, as to how these two scientists reached their conclusions, could have been clearer and more forth-coming. We suspect that this failure to provide clear and convincing explanation, more than any other issue, may have led Judge Wanger to reach his conclusions alleging lack of candor and integrity.

## **6. Finding: Misconduct under the Department of Interior's Departmental Manual**

The Department's Manual states and defines as follows:

### **M. Scientific and Scholarly Misconduct.**

- (1) *Fabrication, falsification, or plagiarism in proposing, performing, or reviewing scientific and scholarly activities, or in the products or reporting of the results of these activities. (Federal Policy on Research Misconduct, 65 FR 76260-76264, December 6, 2000.) Misconduct also includes: (a) intentionally circumventing policy that ensures the integrity of science and scholarship, and (b) actions that compromise scientific and scholarly integrity. Scientific and scholarly misconduct does not include honest error or differences of opinion.*
- (2) *Fabrication, falsification, or plagiarism in the application of scientific and scholarly information to decision making, policy formulation, or preparation of materials for public information activities.*
- (3) *A finding of scientific and scholarly misconduct requires that:*
  - (a) *There be a significant departure from accepted practices of the relevant scientific and scholarly community.*
  - (b) *The misconduct be committed intentionally, knowingly, or recklessly*
  - (c) *The allegation be proven by a preponderance of evidence.*

This review panel is not empowered to make a formal evaluation of whether either Mr. Feyrer or Dr. Norris breached the Department's code of conduct. Any such an evaluation would presumably be made by the Department itself. We are able however to reach conclusions on the scientific evidence, and on whether or not there is a body of evidence suggesting 'a significant departure from accepted practices'. The panel unanimously concludes that there is **no** such deviation from accepted practice (response to 3a). The panelists recognize that, although there is no single universal code or single standard of acceptable scientific conduct, there are nevertheless well-established norms, for instance of honesty, that all credible scientists adhere to. The panel members find that there is no evidence for either Mr. Feyrer or Dr. Norris operating outside the norms of behavior in the fields they operate in.

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## **7. Finding: Is there a basis for further, more detailed investigations of the professional behavior of either Mr. Feyrer or Dr. Norris?**

We find that in neither case is there evidence suggesting deliberate falsehood, interpolation of personal opinion into science, or other professional misconduct by either Mr. Feyrer or Dr. Norris. We do not believe that further investigation would be likely to produce evidence of such misconduct.

### **Commentary**

It is not part of our charge to evaluate management of the Delta, or of Delta Smelt. However we offer this commentary, as an addendum to our formal findings above, as part of our evaluation of the factors leading to the disagreement between parties, and to Judge Wanger's evident frustration with some of the science.

The committee feels that the written and oral testimony of Feyrer and Norris represent two very different approaches to embracing uncertainty in making decisions. These differences may represent personal or agency culture differences in how uncertainty should be presented in legal proceedings and is a topic that might be addressed internally by DOI. Overall the committee found that, when taken as a whole, Feyrer is transparent in his expression of uncertainty in the results of the various analyses and assessments that have been carried out on factors that may affect delta smelt populations – these analyses all indicate that substantial uncertainty exists in how delta smelt populations will respond to a given flow treatment and no one factor likely controls delta smelt populations. While the Plaintiffs may assert that Feyrer's analyses violated a fundamental principle of statistical theory, in how uncertainty in inference from statistical models is expressed, uncertainty in inference is not uncommon in natural resource management - and this seems to be the point that Feyrer attempts to make in his July statements. Feyrer recognizes that no one factor likely controls delta smelt populations and population recovery, and Feyrer is a co-author on the draft adaptive management plan which is designed to embrace this uncertainty in designing future management experiments.

In contrast Norris adopts a very consistent, but prescriptive approach to managing delta smelt. This prescriptive approach does not readily recognize the inherent uncertainty in managing natural resources and is not flexible in describing alternative possible outcomes to management experiments. This is highlighted by her statements of increasing jeopardy for delta smelt populations unless a single prescriptive management action is followed.

We have a long history in natural resource management of trying to deal with uncertainty in our data, and how this uncertainty affects our ability to make decisions. Part of this history involves constructing statistical and mathematical models to evaluate different policy scenarios. These policy scenarios, such as what is the effect of different X2 locations on delta smelt population recovery, are descriptions of how the world works, and these descriptions can function as testable hypotheses. These hypotheses form the basis for all of the different models that have been built for delta smelt whether they are statistical models such as those critiqued by the Plaintiff's expert Dr. Burnham, Bayesian change point models of Thomson et al. 2010, multivariate autoregressive models of MacNally et al. 2010, or the life cycle model of Maunder and Deriso (2011), and many others. They are all descriptions of how the world might

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work and are all developed to test different hypotheses about what factors in the environment effect delta smelt. These hypotheses are then compared to the available data using a variety of mathematical and statistical approaches to see which policy (a hypothesis) best describes the data. These policies can be tested “passively” with the data that are available under “natural” conditions, such as water flows and the location of X2, which are not experimentally controlled or planned for. This is apparently the framework from which the delta has traditionally been managed and from which the available data are collected.

An alternative approach is to construct diagnostic management experiments in an adaptive management framework to test the hypotheses proposed, with the data from these experiments, to find the best policy. Adaptive management is a management approach to dealing with extreme uncertainty in how ecosystems respond to different policy choices, to achieve management objectives (recovery of delta smelt populations). In this framework, the uncertainty in how ecosystems function (the delta and delta smelt populations) and how they respond to management actions (water release manipulations and X2 location, which the Plaintiffs and Feyrer both acknowledge), is embraced, and the experiment is designed explicitly to explore this uncertainty. Norris asserts that she is following an adaptive process, but her prescriptive statements (of a single management action being required) are not consistent with an adaptive management program. In the adaptive management framework the different policy choices are treated as deliberate, large-scale experiments, not a single flow treatment. Including uncertainty in the planning of the experiment is the heart of adaptive management.

The committee has briefly reviewed the draft adaptive management plan provided, the peer-review of the draft adaptive management plan, and then the revised adaptive management plan. While we recognize that this plan is still in draft form, the working document appears to be well conceived and planned. The committee was impressed at how much the adaptive management plan (August version) improved from the earliest provided draft through the peer review (July) and the authors (including Feyrer) should be commended for their hard work to incorporate recommendations from the adaptive management peer-review.

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## JUDGE WANGER'S COMMENTS

### Verbatim comments from the Hon. Oliver W. Wanger regarding Mr. Fred Freyer's testimony

Page	Comment
19-20	<p>Now, we are going to start with the overview that at 79, which is now in Mr. Feyrer's declaration that there's going to be no benefit, there's going to be no expansion of the habitat, that the smelt are going to be imperiled, that they're going to be jeopardized because they won't have the range, the turbid water, meaning less clear, cloudy, that they won't have the water quality in terms of its lower salinity that they need.</p> <p>But every piece of evidence in Feyrer's testimony, before we get to this last declaration, is that either at 80 or 81 kilometers east of San Francisco Bay, that you're going to have an improvement in habitat, that you're going to access Cache Slough, the Ship Channel, the related areas. That you're going to have that expansion. And suddenly – Grizzly Bay, Honker Bay.</p> <p>And suddenly, we now have the opinion from Mr. Feyrer that, oh, no, if you're at 79, they're not going to have any -- access to any of those areas. They're not going to have that habitat.</p> <p>So this contradicts his sworn testimony that west of the confluence -- and the confluence of the Sacramento and San Joaquin Rivers is at 80 kilometers. 79 kilometers is west of that confluence. And he testified that when X2 is west of that confluence, that opens up the low salinity zone and delta smelt habitat to the broad shoals in Suisun Bay and other areas. And I'm quoting, "So there's just a lot more, a lot more suitable habitat for smelt."</p> <p>And he also testified that Grizzly and Suisun Bays would be available habitat and used by the delta smelt when X2 is at 79 kilometers or above the confluence of the Sacramento and San Joaquin Rivers. And there's a transcript reference on July 28th, starting at page 624, lines 12 to 21, page 716, lines 3 to 14. And so it simply -- this isn't an explainable inconsistency, this isn't a resolvable, if you will, conflict in the witness' own testimony. This is impossible. You can't have it both ways. It's as simple as that.</p> <p>And, in terms of deciding the credibility of the statement, when for the first time do we hear, "Oh, no, there's going to be no habitat?" After the Court has decided and ruled against the X2 standard. All of this testimony, all of the interpretations of the studies, all the "it will work at 80, it works west of the confluence," all of that was before, quite frankly, the Court made any decision.</p>
21-24	<p>The next subject is in his declaration now submitted, where he says "If X2 is set at 79 or 80 kilometers, most of the delta smelt population will not align with the shallow, biologically, productive turbid water of Suisun Bay, Grizzly Bay and Honker Bay. Thus, positioning X2 at 79 or 80 kilometers would provide far less of sufficient</p>

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quality or habitat."

And Mr. Feyrer's testimony during the hearing, at page 628, line 3 to 14, he testified under oath, "When the X2 is located downstream of approximately 80" -- he didn't have the kilometers -- "downstream of the confluence of the Sacramento-San Joaquin Rivers, X2 in low salinity zones are in those vast large shallow bays, those shoals of Suisun Bay, Grizzly Bay and Honker Bay, and so there's a lot of area there. That's why the habitat index is bigger. And when you move upstream, above 80 approximately, and up into river channels, those river channels obviously are a lot smaller, a lot less area."

And going on, at page 792, starting at line 10 to 15, page 794, lines 12 to 15, in response to the Court's question, Mr. Feyrer testified -- when the Court asked: "What if you were to use a less water intensive application of this X2 model? For instance, at 79 kilometers, where you would get areas that we discussed yesterday within the scope of the ultimate objective, but not require as much water to do it, would the same purposes be accomplished?"

Mr. Feyrer said: "With the above normal year standard 81, 81 is pretty much near the bottom of the ascending limb of that curve. And that's the minimum point where you get out of that lower tier of habitat conditions."

He was then asked, at page 695, starting at line 21, when Mr. Sims asked the question, "So when the -- what the data demonstrates then is that when X2 is below the confluence, that opens up Suisun and Grizzly, right?"

Mr. Feyrer said, "Yes. As depicted in those habitat maps."

And he was asked "If X2 was maintained at 79 kilometers, would Grizzly and Suisun Bays still be available habitat?"

He answer under oath: "Yes."

Next question: "If X2 is above 80 kilometers, smelt still use Suisun Bay; don't they?"

"Answer: Yes."

And in his pre-hearing declaration, Mr. Feyrer opined, taking his Feyrer 2011 study, "When X2 is located downstream of the confluence, there is a larger area of suitable habitat because the low salinity zone encompasses the expanse of Suisun and Grizzly Bays, which results in a dramatic increase in the habitat index. In contrast, when X2 is located upstream of the confluence, habitat is restricted to the smaller river channels."

And in the Adaptive Management Plan, Mr. Feyrer authored that plan and states at page 10 of the plan, "This range in X2 corresponds to a geographic area that straddles the confluence of the Sacramento and San Joaquin Rivers, which is located at

	<p>approximately 80 kilometers. When X2 is located downstream of the confluence there is a larger area of suitable habitat because of the" -- I'm sorry -- "because the low salinity zone encompasses the expansive Suisun and Grizzly Bays and Suisun Marsh, which results in a dramatic increase."</p> <p>And very simply, he was asked the questions. The Court asked the question. Counsel asked the question. And if it were true, and if the answers he gave weren't true, first of all, he never should have given the answers under oath. And secondly, he should have explained it.</p>
24	<p>And Dr. Burnham's analysis essentially is that when Mr. Feyrer testified that the delta smelt were -- and then there's a question of not or they were habitat limited, we have the two factors of salinity and water transparency which defined his habitat, meaning Feyrer's habitat index. Mr. Feyrer did not believe that the smelt were currently habitat limited.</p> <p>Mr. Nobriga, also a government expert, agreed the delta smelt are not currently habitat limited from a two variable perspective. But Mr. Feyrer's habitat only uses two abiotic habitat variables. It was his methodology that he chose. And so salinity and turbidity are what he used.</p> <p>And so, as pointed out, what's the scientific basis, then, if they're not habitat limited by salinity or turbidity, for him to say that the vast areas of salinity and turbidity conditions that he believes are necessary and important. It's simply unexplained.</p>
25	<p>And the Figure 2 discussion that was in the declaration now, the late surfacing declaration, saying that at 79 kilometers the habitat index is approximately 5600, that the habitat index values under the fall midwater trawl abundance indices in earlier years were at 899, 864, 756, those were in the years '95, '99 and 2000. And based on that, Dr. Burnham opines that there will not be a constraint on the habitat for delta smelt if X2 is located at 79.</p> <p>Then we go through the criticisms of the Court's decision by Mr. Feyrer. Starting with the extinction scenarios, where the Court found he was inconsistent concerning a flaw on his 2008 model which predicted, in almost all cases, negative smelt abundance. And the Court did not accept his testimony because of its apparent inconsistency.</p>
25-26	<p>And Dr. Deriso, now, in evaluating the latest declaration by Mr. Feyrer, opines that Mr. Feyrer definitely predicted negative smelt abundance as an extinction scenario where he was asked "When the model runs went into a negative abundance, that would be a potential extinction scenario?" He answered "Yes."</p> <p>But in his 2008 study, Feyrer rejected that negative abundance values were an extinction scenario. And rejected -- when it tested whether that was possibly the case, after the analysis, Feyrer said "no" in his 2008 study. Increasing the initial number of adult fish in the fall, even to 1,000, as opposed to 29, did not noticeably affect the probabilities.</p>
26-27	<p>The second issue was correlation of the fall midwater trawl to the habitat index. And here, we said you're loading comparable values on to the same axis and so you're</p>

	<p>going to have, in effect, built in bias and you're not going to get either a statistically reliable nor a scientifically reliable, using best available science, index and interpretive results from this modeling. Mr. Feyrer says that the Court's criticism isn't valid because the variables are constructed with different data. One abundance data, the other water quality.</p> <p>And the variables, as Dr. Burnham analyzes, are not constructed from two entirely separate and independent data sources as Mr. Feyrer now suggests. Rather, the habitat index, which is the X axis, uses a probability of occurrence calculation using the same abundance data that the fall midwater trawl abundance index uses on the Y axis. Therefore, they are using similar or identical data.</p> <p>And in his statement under oath, where Mr. Feyrer says the two axes are derived from different water quality and abundance data, the abundance data isn't different.</p>
27	<p>The next statement by Mr. Feyrer is that regardless of any criticisms of his plot, which was the graph of the fall midwater trawl index against the habitat index, there's no impact on reliability of the habitat index because this is just one of the input variables in the plot and doesn't depend on conclusions drawn from the plot. But Mr. Feyrer and the Service premised their claim about the habitat index, both as to its usefulness and its significance, to explain delta smelt abundance.</p> <p>And Dr. Burnham opines that finding this correlation between the habitat index and the fall midwater trawl abundance index inevitably results from an induced correlation derived from the data structure, which is essentially using the same data on both axes. And it impacts the reliability of the habitat index.</p>
28	<p>Next is that when the Court found that the critique of scientific impropriety in Mr. Feyrer taking and linking the results of multiple modeling without any statistical analysis of the margin of error introduced as each link is added.</p> <p>Mr. Feyrer says that he did in his 2011 study, and that he provided several figures and tables to explicitly demonstrate the statistical uncertainty associated with every analysis in his paper.</p> <p>Dr. Burnham opines that this is simply a false statement because there's no page reference. There's no data set. There is nothing that is either identified or referred to where an accounting for statistical uncertainty was performed. And the NRC report, which is cited when it helps but ignored when it doesn't, didn't find any uncertainty analysis by Mr. Feyrer because it concluded that the examination of uncertainty in the derivation of the details of this action lacks rigor. And that's at page 41.</p>
28-29	<p>Next, the turbidity index, the Court found that that didn't provide a basis for calculating the amount of variation in the delta smelt abundance index attributable to salinity as a stand alone variable.</p> <p>Mr. Feyrer says the Court's wrong because his 2007 and his 2011 studies did isolate salinity from turbidity and, quoting the GAM, concluded that salinity accounts for</p>

	<p>most of the -- for -- I don't know if he means variability. It prints out V-A-R-I-A-I-L-I-T-Y. I didn't have time to check a dictionary. And it's a word I don't recognize. Maybe there is such a word. But it's new to the Court. In the delta smelt catch rather than turbidity.</p> <p>Again, Dr. Burnham finds this misleading. Because although there is a separate analysis in the 2007 and 2011 Feyrer studies of the proportionate variation in absence or presence of delta smelt related to turbidity and salinity, the model that calculates the habitat index did no such separate analysis. And that it is simply incorrect to say that salinity accounts for most of the variability in the delta smelt catch rather than turbidity.</p> <p>Rather, 2011, in that study, before his declaration and testimony here, Feyrer states that the specific conductance, which is a salinity measure, and Secchi depth, which is the turbidity measure, accounted for roughly the same amount of variability, ergo include both the variables in the model. Neither accounted for the most, in quotes, "variability." Certainly it wasn't the salinity as being the dominant principal.</p>
29-30	<p>Now, use of core stations and tidal mixing. And we did go around with Mr. Feyrer on these issues. Where we have undeniable findings of smelt populations in Cache Slough, Liberty Island, the Sacramento Deep Water Ship Channel.</p> <p>And the Court found that, while he testified, that the map depicting the habitat index encompassed those areas, when he was questioned about it under oath at the hearing, the evidentiary hearing, he stated that the core stations he used to develop the habitat index were downstream of all those sites.</p> <p>And the Court said, "Well, that sure seems to be inconsistent. How can you say that you're using other core stations for your measurements rather than these areas which are not those core stations?"</p> <p>The Court found that it's, at the least, inconsistent, so it's inaccurate to state what the full extent of the habitat of the smelt was relative and relevant to the reliability of the justification to push X2 down to 74.</p> <p>And Dr. Burnham did some calculations and opines that if you had included those, if you will, separated populations in those areas, it would have a significant effect on the habitat index, the habitat variables related to smelt presence or absence -- and there, because those are in a predominantly fresh water area, there would be a much lower correlation between salinity and smelt presence.</p>
30-31	<p>And so the next issue is the tidal mixing justification where Feyrer opined that water quality measured at core sampling stations are accurate measurements of water quality at Cache Slough, Liberty Island and the Sacramento Deep Water Channel.</p> <p>Yet Mr. Feyrer testified -- he made no such definitive statements. He said that water quality measurements at the core stations were probably really similar to those areas. Obviously those areas hadn't been tested, they hadn't been observed and there</p>

	<p>was no basis for such a comparison. Now, Dr. Burnham refers to it as hypocrisy, I'm not going to use an editorial or even a pejorative potentially word like that in tolerating extreme imprecision for what it is. But what it is is testimonial inconsistency, it's contradictory testimony, it's opining without a basis. So the law calls that speculation. And it is unjustified.</p>
31-32	<p>Now, life cycle modeling. And Mr. Feyrer claimed that the Maunder and Deriso, the Thompson and MacNally, refers to 2008, Maunder and Deriso 2011, Thompson 2010, MacNally 2010.</p> <p>He comes back in his supplemental declaration, after the hearing, after the Court's decision and says, none of those studies contradict my papers, my studies, my opinions. But rather, they're entirely consistent. His words.</p> <p>And basically, what those studies, all of them found, contrary, diametrically contrary to his finding that there was a meaningful, significant and close relationship between the fall X2 and delta smelt abundance. Rather, all of those studies found no relationship that was scientifically significant between the location of X2 and the presence and abundance of the smelt.</p> <p>And what is the justification for the difference Mr. Feyrer offers is that, first of all, the models looked over the entire history of the data set going back, I believe it was 60 to 70 years, when only wet and above normal years should have been looked at.</p> <p>And yet, in his 2007 study, his 2008 study and his 2011 study, Mr. Feyrer used all the data sets. So he didn't limit them to the wet years that he now says discredit all the other experts' studies.</p>
33	<p>Next, Mr. Feyrer claims that his 2008 study is the only modeling effort that modeled the effects of implementing Action 4. Again, Dr. Deriso says this is false. 2008 does not model his Feyrer study, the effects of implementing Action 4. Rather, it evaluated four scenarios, none of which purported to analyze or effect Action 4.</p> <p>Further, it did not model the effect of implementing the action only during wet or above normal years, it did not model the projected effects of maintaining X2 at 74 kilometers or at 81 kilometers</p>
37-38	<p>Mr. Nobriga, the government scientist, based on three published life cycle models, describes 40 years of historical data as not supporting a correlation between the location of fall X2 and delta smelt abundance. His opinion, at page 902 on July 29th, 18 to 21; 905, 23 to 25; 906, line 17 to 907, line 2, was "I think in terms of the historical data" -- I'm quoting Dr. Nobriga -- "that the three models probably indicate that you're not going to find a correlation out of the historical data."</p> <p>And we have Mr. Feyrer, at page 628, starting at line 3 going over to line 14, about when X2 is downstream of 80 kilometers, X2 -- "the confluence of the Sacramento San Joaquin Rivers, X2 and the low salinity zones are in those vast large shallow bays, those shoals of Suisun Bay, Grizzly Bay, Honker Bay, and so there's a lot of area there. That's why the habitat index is bigger."</p>

	<p>He didn't say -- he never said, not once, he still hasn't said when it's west of 74 kilometers. He's never given these opinions that he gave over and over at the hearing under oath that this is what happens if X2 isn't at 74.</p>
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**Verbatim comments from the Hon. Oliver W. Wanger regarding Dr. Jennifer Norris's testimony**

<b>Page</b>	<b>Comment</b>
34	<p>And so although she never stated it in her testimony under oath in trial, now we have X2 at 79 extinguishing the species. In other words, now we have the opinion that, yes, if X2 is at 79, the species will be irreparably injured.</p> <p>Although what I had heard in other testimony was that this gave us a great opportunity in a wet water year to expand the range, to give the species a good and an optimistic opportunity to expand its abundance, to reproduce. Although there's no direct correlation or data that increasing the habitat in this time of the year will do that.</p>
35-36	<p>And we start with the threat to the extinction of the delta smelt. In the fall months, according to Dr. Hanson, the location of X2 during September and October, don't have any biological or scientific relation to productivity of the species, its abundance or the availability of its preferred food sources. When, at most, under the injunction as it is currently in effect, you can't go more than five kilometers east of the ideal, of the perfect standard at 74.</p> <p>And based on the daily tidal cycle, X2 moves several kilometers west and east in the natural ebb and flow that is caused by tidal cycles. And the shift would have been, in terms of the graphing and the charting of the data, evident. It was not.</p> <p>And I've already found that Mr. Leahigh has testified -- nobody disputes it -- that in September, there's going to be a zero effect on X2 under the current conditions. And there is, therefore, going into October, to mid October, and then you have 45 days that the action continues left until the end of November.</p> <p>The opinion is that a failure to limit will not appreciably reduce abundance or adversely modify its habitat. Well, we've already heard that opinion. That was the dispute that was before the Court. And its extinction rate or effect locating X2 at kilometer 79. If we go into October, there's no prediction where X2 is going to be. But it's not going to be far from kilometer 74, it won't be at kilometer 79 before October 15th. And at that point, we're talking about a maximum of six weeks, best case, drawing every inference in favor of the defendants.</p> <p>And the shift to the east of a three kilometer, if you will, range or a five kilometer range in that six-week period, there isn't one iota of evidence that has any credibility to it, other than conclusions and dire predictions of catastrophe that supports that there will be any injury to the species.</p>

36-37	<p>Mr. Feyrer was asked at -- this is on the 29th of July, at page 846, "Do you disagree with the authors of this plan" -- he's one of them, the Draft Adaptive Management Plan -- "that the expected effect of fall X2 at kilometer 81 is uncertain."</p> <p>He says, "No."</p> <p>He was then asked, "Can a biologist render a reliable opinion as to whether locating fall X2 this year at kilometer 81 will appreciably diminish delta smelt abundance in the fall?"</p> <p>His answer: "When all is said and done, I would say no."</p> <p>He and Dr. Norris apparently didn't communicate. Because they're not on the same page.</p>
38-39	<p>And to refute Dr. Norris' extinction scenario that we now have before the Court, the Revised Adaptive Management Plan that's filed with the Court August 10th, it's the most up-to-date analysis by the Service through its scientists and its experts. It states, at page 16, "The use of an 81 kilometer target for fall after above-normal years provides about 50 percent more of the abiotic habitat benefits than maintaining X2 at 86 kilometers, and at present represents a reasonable intermediate action to restore late post-reservoir period salinity conditions in the fall."</p> <p>Now, that came out after the hearing. But even if it was written before the hearing, it was only published after the hearing. That is in diametric opposition to both the prior testimony that we can't be one inch east of 74 and Dr. Norris telling us it's the end of the species, it's likely extinction if you go one inch east of 74.</p> <p>And the same study of August 10th at page 26 says, "Some key questions will be most efficiently answered by implementing the X2 action in very different ways within the boundaries of prudence in otherwise similar years and contrasting the results.</p> <p>"The best choice from a learning point of view would be an alternative in which the action is not taken at all with X2 instead managed so that it remains in the 84 to 86 kilometer range during the period in which the RPA targets would otherwise be in force."</p>
39-40	<p>Then, Dr. Norris came back to the National Research Council Report of 2010 and claimed that this supported her opinion about the necessity of implementing fall X2 at 74. And took the statement, "When the area of highly suitable habitat is defined by the indicators is low, either high or low FMT indices can occur. In other words, delta smelt can be successful even when habitat is restricted. More important, however, is that the lowest abundances all occurred when the habitat-area index was less than 6,000 Ha. This could mean that</p> <p>Then, Dr. Norris came back to the National Research Council Report of 2010 and claimed that this supported her opinion about the necessity of implementing fall X2 at 74. And took the statement, "When the area of highly suitable habitat is defined by the indicators is low, either high or low FMT indices can occur. In other words, delta smelt can be successful even when habitat is restricted. More important, however, is</p>

	<p>that the lowest abundances all occurred when the habitat-area index was less than 6,000 Ha. This could mean that reduced habitat area is a necessary condition for the worst population collapses, but it is not the only cause of the collapse. Thus, the relationship between the habitat and FMT indices is not strong or simple." That's at page 53.</p> <p>And that is a discussion of the scientific basis, if you will, for the fall X2 axis -- action, I should say, talking about can delta smelt survive when habitat is restricted. And they say habitat and abundance data, that relationship is not clear, it's not strong, it's not simple.</p> <p>And what Dr. Norris did not include was NRC's criticism of the fall X2 action in a number of respects.</p> <p>And in those respects, Dr. Norris simply was asked: "Do any of these criticisms change your opinion?"</p> <p>And her answer: "It did not change my opinion, no."</p>
40-42	<p>The next subject concerning what effect considering the Cache Slough areas, the three areas, the Ship Channel and the defendants call -- I'm sorry, the plaintiffs call it the complex. The BiOp refers to about 13,000 hectares, which is the equivalent of 30,000 acres of habitat in the preferred salinity range of delta smelt available at 74.</p> <p>And the Court's finding, based on Feyrer's testimony, was that adding habitat units to represent delta smelt habitat in the complex, the Cache Slough complex, would shift the curve. Well, that's already been discussed.</p> <p>But the Court noted that at that time, the exact impact of the shift had not been calculated by any party. And now Dr. Hanson has -- and he provides this figure, Figure 2 from Exhibit A to his current declaration on the relationship between X2 and habitat area.</p> <p>And it does shift the curve. And if the Cache Slough complex is considered, the 13,000 acres that were originally available, if you locate X2 at 74 kilometers, you still have it when X2 is located at 79 kilometers. And that's an independent analysis separate from the Court's.</p> <p>And instead of ignoring those areas of habitat, as the BiOp did, if you locate X2 at 79, which was the Court's location based on all the evidence before it, 79 is where the isohaline line is fixed.</p> <p>And so, then Dr. Norris' rationale, the defendants argue and the Court agrees, that she just reiterates what's already been provided in declaration or testimony by all the other experts. Nothing new. Nothing that changes any finding that the Court has made, nothing that contradicts or impeaches the evidence on which those findings are based.</p>

	<p>Dr. Norris says that recent scientific studies have found a statistical association between fall X2 and the production of young delta smelt during the following year. And there is one study, not recent scientific studies, plural, that's the Feyrer 2007.</p> <p>And her suggestion that the Service referenced multiple scientific studies is inaccurate. The Court's citation in detail in approval of Feyrer 2007, the Court will accept the partisan or an advocate's spin on what the Court said. But the Court's exact words were, "The reliance on Feyrer 2007 was not per se unreasonable, however, the use of that study to justify operational restrictions is more questionable."</p> <p>And, of course, there's no reference to any of the more recent findings.</p>
42	<p>And Dr. Norris, in her most recent declaration, states the fall X2 action is the only component of the RPA that expressly protects the delta smelt critical habitat. The defendants point out that the RPA Action 6 states its purpose as to improve habitat conditions for delta smelt.</p> <p>So obviously that statement is untrue. Whether it's intentionally untrue or whether it is simply negligently untrue, because she didn't bother to read the RPAs, the Court can't discern. But what the Court can know is that it's unreliable, it's testimony that simply cannot be accepted or credited.</p> <p>And she continued to insist that this is the only -- fall X2 is the only RPA action to benefit the species' critical habitat.</p>
42-44	<p>And then we get into her explanation of how 75 kilometers was initially picked based on a regression analysis relative to net Delta outflow.</p> <p>And the Court didn't accept that because the formula that was used didn't incorporate and had nothing to do with inputs that relate to the biology of the smelt and the impact of X2 on population dynamics. Nothing changes the Court's finding.</p> <p>Dr. Norris said there were three scientific reasons to locate X2 at 74. And those were that there was a 1994 biological assessment indicating reduced abundance of the species east of 74 kilometers. Variable, but increases in some years when it is west of 74 kilometers. And the Court considered and found unpersuasive those conclusions.</p> <p>The second reason that Dr. Norris claimed X2 should be at 74 was because it more closely approximates pre-POD fall X2 conditions to return ecological conditions of the estuary to that which occurred in the late 1990s during times of larger smelt populations.</p> <p>And also her observed -- what she refers to as a striking change in the position of fall low salinity zones in all water years during Pelagic Organism Decline years and her further assertion that X2 at 74 or less increases the expected abiotic habitat index above values that were present during POD years.</p> <p>And her third and final reason on historical X2 location was that there are inter-</p>

	<p>annual variabilities in fall outflow, and that the variability is necessary to maintain and recover the population. And that the projects eliminated that variability so that the location of X2 in every year resembles a dry year and favored the expansion of invasive species.</p> <p>As noted in the Court's findings, every one of those positions were addressed. They were analyzed. The time periods weren't long enough to assess trends. There was only one wet year after 2000. The Enright and Culberson 2009 study recommended evaluating variation in delta outflow salinity based on a 20 to 25 year time frame, not a 10 year time frame used by the defendants, to ensure that lower frequency changes and climate conditions be considered. A September through December four-month average was used and the RPA only operates three months. It doesn't operate in December.</p> <p>And the Norris opinion that 74 kilometer X2 requirement is based on a tandem use of 1641, that's the Water Board decision, X2 compliance locations for spring months. However, that's just it. That's the point. 74 and 81 kilometer points correspond to existing monitoring stations and those D-1641 compliance points in that time of the year has nothing to do with establishing that keeping X2 at those locations is necessary to the survival and recovery of the species.</p>
44-45	<p>And that is found where she actually referred to the Bennett, I believe it was Bennett 2008 study. I might be wrong. It's found at Bates 017060 and Bates 017036. Where Figure 19 describes Days X2 in Suisun Bay and it's talking all about spring.</p> <p>And then in looking at fresh water discharge to the estuary by managing in an environmentally friendly manner using the X2 standard to ensure maintaining the low salinity zone in Suisun Bay, again, during spring, quoting Kimmerer 2002, 2004. She was using this to justify the fall X2 action. I don't think that the fall is the spring.</p>

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## APPENDIX A: PANELIST QUESTIONNAIRES

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Panelist: Scott McKinley

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## Panelist: Bill Pine

Please indicate your agreement or disagreement with the following conclusions in the joint report. Provide commentary as you wish.

<b><u>Conclusion</u></b>	<b><u>Agree?</u></b>	<b><u>Commentary (optional)</u></b>
<b>Neither Mr. Feyrer nor Dr. Norris violated acceptable scientific professional standards</b>	Yes, agree	
<b>Neither scientist committed perjury regarding science</b>	Yes, agree	
<b>Mr. Feyrer's position changed over time</b>	Yes, agree	
<b>Dr. Norris' position did not appreciably change over time</b>	Yes, agree	
<b>Both stances (modifying or maintaining a consistent position) are plausible scientific stances when dealing with new information</b>	Yes, agree	
<b>Mr. Feyrer's evolving position is explained in his testimony</b>	Yes, agree	
<b>Dr. Norris's consistent position in regard to new information is not well explained</b>	Yes, agree	
<b>There is no evidence of a failure to use 'best available science'</b>	Yes, agree	
<b>The materials available to the panel do not provide a clear explanation and documentation of how the two scientists reached their conclusions</b>	Yes, agree	The materials provided are sufficient to answer the questions presented to the panel related to the testimony and written declarations in July and September 2011.
<b>There is no basis for further investigation into the work of either scientist</b>	Yes, agree	
<b>Uncertainty is a normal and pervasive aspect of science in resource management contexts</b>	Yes, agree	

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## Panelist: Don Weitkamp

Please indicate your agreement or disagreement with the following conclusions in the joint report.  
Provide commentary as you wish.

<b><u>Conclusion</u></b>	<b><u>Agree?</u></b>	<b><u>Commentary (optional)</u></b>
<b>Neither Mr. Feyrer nor Dr. Norris violated acceptable scientific professional standards</b>	X	It would have been preferable to provide greater explanation of why they selected their respective approaches.
<b>Neither scientist committed perjury regarding science</b>	X	
<b>Mr. Feyrer's position changed over time</b>	X	Appropriate
<b>Dr. Norris' position did not appreciably change over time</b>	X	Explanation of why this approach was taken would potentially have avoided some conflict.
<b>Both stances (modifying or maintaining a consistent position) are plausible scientific stances when dealing with new information</b>	X	
<b>Mr. Feyrer's evolving position is explained in his testimony</b>	X	At least in part.
<b>Dr. Norris's consistent position in regard to new information is not well explained</b>	X	
<b>There is no evidence of a failure to use 'best available science'</b>	X	Although Dr. Norris did not include scientific information available following the 2008 BiOp.
<b>The materials available to the panel do not provide a clear explanation and documentation of how the two scientists reached their conclusions</b>	X	Feyrer does provide some explanation, although it could be clearer. Dr. Norris did not provide a clear explanation.
<b>There is no basis for further investigation into the work of either scientist</b>	X	
<b>Uncertainty is a normal and pervasive aspect of science in resource management contexts</b>	X	

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## APPENDIX B: CURRICULA VITAE

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**R. SCOTT MCKINLEY**

**Professor and Director of Aquaculture and Environmental Research (CAER) – The University of British Columbia**

UBC  
4160 Marine Drive, West Vancouver  
British Columbia  
V7V 1N6  
[mckin@mail.ubc.ca](mailto:mckin@mail.ubc.ca)

**A. Executive and Administrative Achievements:**

- **Member - President's Senior Appointments Committee:** UBC – 2011 - present
- **Associate Vice-Principal Research (Strategic Development) and Professor (Biology) Queen's University – 2008 – 2009 (while on a one year leave from UBC)**
- **Member - High Level Expert Forum (How to feed the world in 2050) – FAO – UN (Food and Agricultural Organization of the United Nations) 2010 -**
- **Director – Fuel Cells Research Centre, Queen's University 2008 – 2009**
- **Director - Centre for Aquaculture and Environmental Research (CAER): A Partnership Between The University of British Columbia (UBC) and Fisheries & Oceans (DFO) – 2001 – present**
- **Member – Steering committee – IFOAM (International Federation of Organic Agricultural Movements) 2007 - 2009**
- **Director - Vancouver Aquarium Board of Directors - 2004 - Present**
- **Director – Pacific Ocean Shelf Tracking (POST) Management Board - 2004 – Present**
- **Member – Ocean Tracking Network (OTN) - International Steering Committee 2007- Present**
- **Chair – Scientific Management Board – POST - 2004 – Present**
- **Executive Scientific Director (CEO) - Canada Networks of Centres of Excellence AquaNet, 2003- 2006**
- **Theme Leader – Canada Networks of Centres of Excellence –1999 - 2003**
- **Chair, Research and Conservation Committee – Vancouver Aquarium 2003 – 2007**
- **Chair, Board of Technical Experts – Great Lakes Fishery Commission 2001- 2005**
- **Group Leader, Ontario Hydro Research Division- 1980 – 1993**

**B. Education**

- **Doctor of Philosophy** - University of Waterloo, Canada, 1993
- **Master's of Science** - York University, Canada, 1981
- **Bachelor of Science** - University of Guelph, Canada, 1975

**C. Academic Research Positions and Awards**

- **Professor** - The University of British Columbia- Animal Science, 01 - present
- **Research Chair in Sustainable Resources** – 2011- present
- **Canada Research Chair** -Tier 1, 02 - 10
- **Adjunct Professor** - Memorial University of Newfoundland - 01- 06

- **Adjunct Professor** - University of Waterloo - /Science, 01 - 05
- **Professor** - University of Waterloo – Science, 98 - 2001
- **NSERC Industrial Research Chair** - University of Waterloo, Science – 98 - 2003
- **Associate Professor** - University of Waterloo, Science – 93 - 1998
- **Research Scientist** - Ontario Hydro- Research Division, 85-1993

#### D. Graduate Student/PDF Supervision

**Number of HQP (1993 – 2011) = 53**

- Post Doctoral Fellows – 14
- Doctor of Philosophy – 12
- Master of Science – 26
- Master of Business Administration – 1

#### E. University Committees

- i) UBC Animal Care Committee – 2002-05
- ii) Faculty of Land and Food Systems, Chair – Annual Performance and Merit review – 2008 – 09
- iii) ATP committee – 2010 - present

#### F. Scholarly Record

##### (a) Referred Journals

164. Marshall, R., C. Pearce, R.S. McKinley, 2011. Effect of temperature on gonad development of the Pacific geoduck clam (*Panopea generosa*, Gould 1850), Aquaculture. (in press),
163. Jon C. Svendsen, Kim Aarestrup, Hans Malte, Uffe H. Thygesen, Henrik Baktoft, Anders Koed, Michael G. Deacon, K. Fiona Cubitt and R. Scott McKinley 2011 linking individual behaviour and migration success in *Salmo salar* smolts approaching a water withdrawal site: implications for management. . Aquat. Living Resour. 24, 201–209 (2011)
162. Dean, S., C. DiBacco and R.S. McKinley. 2011. Assessment of stable isotopic signatures as means to track the exchange of sea lice, *Lepeophtheirus salmonis*, between host fish populations. *Canadian Journal of Fisheries and Aquatic Sciences*, 2011, 68:(7) 1243-1251,
161. Azad, K., C. Pearce, R.S. McKinley. 2011. Affects of diet and temperature on ingestion, absorption, assimilation, gonad yield, and gonad quality of the purple sea urchin (*Strongylocentrotus purpuratus*) Aquaculture (in press).
160. Chittenden, C.M., Rikardsen, A.H. Skilbrei, O., Davidsen, J.G., Halttunen, E., and R.S. McKinley 2011. Dispersal behaviour and recapture rates of escaped adult farmed Atlantic salmon in northern Norway. *Aquaculture Environment Interactions*. Vol. 1: 215–224.
159. Plantalech Manel-la, N., Chittenden, C.M., Økland, F., Thorstad, E.B., Davidsen, J.G., Sivertsgård, R., McKinley, R.S., and Finstad, B. 2011. Does river of origin influence the migratory performance of Atlantic salmon post-smolts in fjords? *J. Fish Biol.* 78, 624-634

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158. Tveiten, H., Bjørn, P.A., Johnsen, H.K., Finstad, B. & McKinley, R.S. 2010. Effects of the sea louse *Lepeophtheirus salmonis* on temporal changes in cortisol, sex steroids, growth and reproductive investment in Arctic charr *Salvelinus alpinus*. J. Fish Biol. 76: 2318-2341.
  157. Carbonara, P., Corsi, I, Focardi, S., Lembo, G., Rochira, S., Scolamacchia, M., Spedicato, M. T. and McKinley, R.S. (2010) 'The effects of stress induced by cortisol administration on the repeatability of swimming performance tests in the European sea bass (*Dicentrarchus labrax* L.)', Marine and Freshwater Behaviour and Physiology, 43: 4, 283 — 296.
  156. Chittenden, C.M., Biagi, C., Davidsen, J.G., Davidsen, A., Kondo, H., McKnight, A., Pedersen, O.P., Raven, P., Rikardsen, A., Shrimpton, M., Zuehlke, B., McKinley, R.S., and Devlin, R.H. 2010. Genetic versus rearing-environment effects on phenotype: Hatchery and natural rearing effects on hatchery- and wild-born coho salmon. PLoS ONE. 5(8):e12261
  155. Chittenden, C.M., Jensen, J., Ewart, D., Anderson, S., Balfry, S., Downey, E., Saksida, S., Vincent, S., Welch, D.W., and McKinley, R.S. Recent salmon declines: a result of lost feeding opportunities due to bad timing? PLoS ONE 5(8):312423154.
  154. Skinner, L.A., P M Schulte, S E LaPatra, S K Balfry<sup>4</sup> and R S McKinley. 2010 Growth and performance of Atlantic salmon, *Salmo salar* L., following administration of a rhabdovirus DNA vaccine alone or concurrently with an oil-adjuvanted, polyvalent vaccine Journal of Fish Diseases. Vol 31 (9) 687-697
  153. Azad, AK, RS McKinley, CM Pearce. 2010. Factors influencing growth and survival of larval and juvenile echinoids. Rev Aquacult: (in press)
  152. Chittenden, C.M., M.C. Melnychuk, D.W. Welch and R. S. McKinley. 2010. An investigation into the poor survival of an endangered Coho salmon population. PLoS ONE 5(5): e10869.
  151. R. Marshall, R. S. McKinley and C. M. Pearce. 2010. Effects of nutrition on larval growth and survival in bivalves. Reviews in Aquaculture, 33–55.
  150. Skinner, L.A., S.E. LaPatra, A. Adams, K.D. Thompson, S.K. Balfry, R.S. McKinley, P.M. Schulte. 2010. Supra-physiological levels of cortisol suppress lysozyme but not the antibody response in Atlantic salmon, *Salmo salar* L., following vaccine injection. Aquaculture Vol. 300, 223-230.
  149. Skinner, L.A., McKinley, R.S., LaPatra, S.E., Adams, A., Thompson, K.D., Balfry, S.K., Schulte, P.M. (2009) Concurrent injection of a rhabdovirus-specific DNA vaccine with a polyvalent, oil-adjuvanted vaccine delays the specific antiviral immune response in Atlantic salmon, *Salmo Salar* L. Fish and Shellfish Immunology Vol. 28 (4), 579-586.
  148. Skinner, L.A., McKinley, R.S., Schulte, P.M., Balfry, S.K., LaPatra, S.E. (2009) The association between metabolic rate, immune parameters, and growth of rainbow trout, *Oncorhynchus mykiss* (Walbaum), following the injection of a DNA vaccine alone and concurrently with a polyvalent, oil-adjuvanted vaccine., Journal of Fish and Shellfish Immunology. Vol 28 (2), 387-393
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  142. Gollock, M.G., K. Hunter, D. A. Syme, M. Freeman, R. Scott McKinley, and A. Kurt Gamperl 2009. Potential methods for measuring the activity patterns and energy use of Atlantic cod (*Gadus morhua*). *Canadian Journal of Aquatic Sciences and Fisheries* (in press)
  141. Welch, D.W., Rechisky, E., Walters, C.J., Schreck, C., Clemens, B. and McKinley, R.S. "Survival of Migrating Salmon Smolts in Large Rivers With and Without Dams" (in press, *PLOS Biology*)
  140. Welch, D.W., Michael C. Melnychuk, Erin R. Rechisky, Aswea D. Porter, Melinda C. Jacobs, Adrian Ladouceur, R. Scott McKinley, George D. Jackson. 2008 Freshwater and marine migration pathways and survival of Cultus Lake sockeye salmon smolts determined using POST, a large-scale acoustic telemetry array. *Can. J. Fish. Aquat. Sci.* 66: 736–750 (2009)
  139. Chittenden, C. M., K. G. Butterworth, K. F. Cubitt, M. C. Jacobs, A. Ladouceur, D. W. Welch, and R. S. McKinley 2008. Maximum tag to body size ratios for an endangered coho salmon (*O. kisutch*) stock based on physiology and performance. *Environmental Biology of Fishes* 84: 129-140
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  129. Munroe, D. M., and R. S. McKinley. (2007) Effect of predator netting on recruitment and growth of Manila clams (*Venerupis philippinarum*\*) on soft substrate intertidal plots in British Columbia, Canada. *Journal of Shellfish Research*. 26(4): 1035-1044.
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  122. Ronquillo, J. and R.S. McKinley, 2006. Development stages and potential mariculture for coastal rehabilitation of endangered Pacific angelwing clam. *Pholas orientalis*. 2006. *Aquaculture*, Vol. 256, 180-191.
  121. Cubitt, K.F., Butterworth, K.G., Finstad, B., Huntingford, F.A., McKinley, R.S., 2006. Escaped Farmed Salmon: A Threat to BC's Wild Salmon. Fraser Alert, Risk Assessment Series. Fraser Institute, Vancouver, Canada.
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  119. Carbonara, P., Scolamacchia, M., Spedicato, M.T., Lembo, G., Zupa, W. and McKinley, R.S. 2006. Swimming performance as a well-being indicator of reared sea-bass: preliminary results. *Biol. Mar. Med.* 13(1): 488-491.

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  116. Thorstad, E.B., Okland, F., Finstad, B., Silvertsgard, R., Plantalech, N., Bjorn, P.A., , McKinley, R.S., 2007. Fjord migration and survival of wild and hatchery-reared Atlantic salmon and wild brown trout post smolts. *Hydrobiologia* 582:99-107
  115. Cottrill, R.A., Økland, F., Aarestrup, K., Jepsen, N., Koed, A., Hunter, K.J., and R.S. McKinley 2006 Evaluation of three different transmitter attachment methods for female silver-phase American Eels (*Anguilla rostrata* Lesueur). *Journal of Great Lakes Research*, in press.
  114. Økland, F., Thorstad, E.B., Finstad, B., Sivertsgard, R., Plantalech, N., Jespen, N., McKinley, R.S., 2006 Swimming speeds and orientation of wild Atlantic salmon post-smolts during the first stage of the marine migration. *Hydrobiologia* (In Press)
  113. Cubitt, K.F., Williams, H.T., Rowsell, D., McFarlane, W.J., Gosine, R.G., Butterworth, K.G., McKinley, R.S., 2008. Development of An Intelligent Reasoning System to Distinguish Hunger States in Rainbow Trout (*Oncorhynchus mykiss*). *Computers and Electronics in Agriculture* 62, 29-34.
  112. Ronquillo, J.D., Saisho, T., McKinley, R.S. 2006. Early developmental stages of green tiger prawn, *Penaeus seisculatus* de Hann, 1844 (Crustacea, Decapoda, Penaeidae). *Hydrobiologia*, 560:175-196.
  111. Finstad, B., Okland, F., Thorstad, E.B., Bjørn, P.A. & McKinley, R.S. 2005. Migration and salmon lice infestation of Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) postsmolts in a Norwegian fjord system. *J. Fish. Biol.*, 66, 86-96.
  110. Scruton, D.A., C.J. Pennell, M.J. Robertson, N.L.M. Ollerhead, K.D. Clarke, K. Alfredsen, A. Harby, and R.S. McKinley. 2005. Seasonal response of juvenile Atlantic salmon (*Salmo salar*) to experimental hydro peaking power generation on a Newfoundland, Canada river. *North American Journal of Fisheries Management* 25:964-974
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  108. Butterworth, K.G., Ronquillo, J.D., McKinley, R.S., 2005 Simplified Illustration Sea Lice Identification Guide for *Lepeophtheirus salmonis* and *Caligus clemensi* in British Columbia, Canada. ACC Spec. Publ. No.9 (2005)
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  104. Linton, E.D., Scuton, D.A., McKinley, R.S. 2005 Physiological effects of thermomechanical newsprint mill effluent on Atlantic salmon (*Salmo salar* L.). *Ecotoxicology and Environmental Safety* (2005) 62: 317-330.
  103. Dussault, E.B., Playle, R.C., Dixon, D.G. and McKinley, R.S. 2004 Effects of chronic aluminum exposure on swimming and cardiac performance in rainbow trout, *Oncorhynchus mykiss*. *Fish Physiology and Biochemistry* (2004) 30:137-148
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2. G.T.O. LeBreton, F.W.H. Beamish and R.S. McKinley (2004) Sturgeons and Paddlefish of North America, IN: Distrubution, Habitat and Movements. Kluwer Academic Publishers, pp.40-69.
3. Butterworth, K. G., F.K Cubitt and R. S. McKinley, Aquaculture in British Columbia (2007) In: K. Culver and D. Castle, [eds]. *Aquaculture, Innovation and Social Transformation\_ in the International Library of Ethics and Agriculture*, Springer publishing, 2007.
4. D. Pincock, D. Welch, R.S. McKinley, George Jackson. 2010. Chapter 6.—Acoustic Telemetry for Studying Migration Movements of Small Fish in Rivers and the Ocean — Current Capabilities and Future Possibilities. PNAMP Special Publication: Tagging, Telemetry, and Marking Measures for Monitoring Fish Populations. pp. 107-120.
5. Payne, J.C., K. Andrews, C. Chittenden, G. Crossin, F. Goetz, S. Hinch, P. Levin, S. Lindley, S. McKinley, M. Melnychuk, T. Nelson, E. Rechisky, and D. Welch. 2010. Tracking fish movements and survival on the Northeast Pacific Shelf. Chapter 14 (pp. 267 – 290) in *Life in the World’s Oceans*, Alasdair McIntyre, ed. Wiley-Blackwell, Oxford, U.K.

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***(c) Scientific Expeditions***

1. Galathea 3 (2007) – Invited to join the largest Danish research expedition for more than 50 years. The circum-navigation of the globe took place from August 2006 to April 2007 and was supported by the Danish Expedition Foundation. The purpose of the expedition was to strengthen international research collaboration and to promote and stimulate interest in natural science to the next generation of researchers.

**G. Patents**

- Integration of Telemetry and Sonar Technologies - EP 0662617 A2
- Micro bead bio-filter for water quality – patent pending (co-inventor)
- Development of green feed from microalgae - patent pending (co-inventor)
- Molecular procedure to rupture micro algae cell walls – patent pending (co-inventor)

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William E. Pine, III

**Associate Professor, University of Florida**  
**Department of Wildlife Ecology and Conservation and**  
**Fisheries and Aquatic Sciences Program**  
**110 Newins-Ziegler Hall, Box 1104300**  
**Gainesville, Florida 32611-0430**  
**email: [billpine@ufl.edu](mailto:billpine@ufl.edu)**  
**<http://www.floridarivers.ifas.ufl.edu>**

**ACADEMIC PREPARATION**

- PhD North Carolina State University, Raleigh, North Carolina  
Department of Zoology, Supervisors Drs. Jim Rice and Tom Kwak  
December 2003, Major: Zoology
- MS University of Florida, Gainesville, Florida  
Department of Fisheries and Aquatic Sciences, Supervisor Dr. Mike Allen  
December 1999, Major: Fisheries Science
- BS Auburn University, Auburn, Alabama  
Department of Fisheries and Allied Aquacultures, Supervisor Dr. Dennis DeVries  
August 1997, Major: Fisheries Management

**PROFESSIONAL EXPERIENCE**

*University of Florida, Gainesville, Florida*

Associate Professor (July 2011-Present)

- 60% research and 40% teaching appointment (February 2010 – June 2011)  
Department of Wildlife Ecology and Conservation

Primary research responsibilities are related to evaluating how animal populations respond to management actions including modifications to habitat, harvest, and species introductions. Additional areas of research include developing new estimation techniques for evaluating trends in animal populations and estimating population vital rates.

Current teaching responsibilities include graduate courses Stream Fish Biology (4 credits) and Ecological Statistics and Design (co-taught with Departments of Statistics and School of Forest Resources 4 credits) and undergraduate courses Quantitative Wildlife Techniques (3 credits) and Field Ecology of Aquatic Organisms (joint undergraduate/graduate, co-taught 4 credits).

Assistant Professor (June 2005-June 2011)

- 60% research and 40% teaching (February 2010 – June 2011) Department of Wildlife Ecology and Conservation
- 80% research and 20% teaching (February 2009 – February 2010) Department of Wildlife Ecology and Conservation

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- 80% research and 20% teaching appointment (June 2005 – February 2009) Fisheries and Aquatic Sciences Program

*Mote Marine Laboratory, Sarasota, Florida*

Assistant Program Manager, Post-doctoral scientist (December 2003-June 2005)

Fisheries Assessment and Ecosystem Management

Supervisor: Dr. Carl Walters, University of British Columbia

- Development of statistical models and spatial receiver designs for using acoustic tags to study distribution, movement, and mortality rates of Florida coastal fishes.
- Evaluation of sampling methodologies and estimation of population trends for endangered fishes in Grand Canyon reach of the Colorado River.

**STUDENT MENTORSHIP**

Graduate Students Currently Supervised at the University of Florida

(Anticipated graduation term)

[Redacted text]

Post-doctoral Scientists

[Redacted text]

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Undergraduate Students

(Mentorship location, Current position)

**RESEARCH EXPERIENCE**

Graduate Research Assistant, Ph.D.

North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University

- Examined population ecology of the introduced flathead catfish in coastal North Carolina rivers through the use of ecosystem models to simulate species introduction, ecosystem response, and management options.
- Evaluated joint active and passive tagging programs to estimate population size, survival, and movement of animal populations.

Graduate Research Assistant, M.S.

Department of Fisheries and Aquatic Sciences, University of Florida

- Evaluated recruitment dynamics of juvenile freshwater fish.
- Conducted population assessments of the threatened Gulf of Mexico sturgeon using age-structured and capture-recapture models.

Undergraduate Research Technician

Department of Fisheries and Allied Aquacultures, Auburn University

- Documented relationship between birth date and survival of age-0 largemouth bass.

**HONORS AND AWARDS**

Recognition from USGS-Grand Canyon Monitoring and Research Center for outstanding service providing scientific guidance (2008)

Best Professional Paper Award, Florida Chapter American Fisheries Society (2005)

John F. Dequine Honorary Scholarship, Southern Division of the American Fisheries Society (2003)

Jimmie Pigg Outstanding Student Achievement Award, Warmwater Streams Committee, American

Fisheries Society (2002)

Finalist, Best Paper Award, 2000 Volume, North American Journal of Fisheries Management

American Fisheries Society Skinner Memorial Travel Award (2001)

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Most Outstanding Graduate Student Award, Department of Fisheries and Aquatic Sciences,  
University of Florida, Gainesville, Florida (1999)

Honorable Mention, American Fisheries Society Skinner Memorial Travel Award (1999)

Best Student Paper Award, Florida Chapter American Fisheries Society (1999)

## **PROFESSIONAL SERVICE**

### Invited Service

- Continuing, invited service to multiple State and Federal research and management agencies related to assessing risks and status of native fishes in the Grand Canyon reach of the Colorado River – a United Nations Educational, Scientific, and Cultural Organization [UNESCO] World Heritage Site (November 2003-Present)
- Panel lead, Development of Cropping Recommendations to Support Translocations and other Conservation Measures for Little Colorado River Young-of-year Humpback Chub – Provided technical assistance and modeling support to assess management options to aid in recovery of humpback chub to Department of Interior Cooperators (July 2011)
- Panel Review of the Restoration Analysis and Recommendations for the San Acacia Reach of the Middle Rio Grande, New Mexico. Sustainable Ecosystem Institute, Peer Review Group, National Center for Ecological Analysis and Synthesis [NCEAS] (December 2009) – Served on review panel and assisted with writing outside review of restoration program for San Acacia reach of the Rio Grande river.
- University of Florida Water Institute Symposium, Sustain Water Resources, Florida Challenges, Global Solutions (February 2008) – Panel member and invited speaker, Florida Water Availability and Water needs in 2020, 2060. Gainesville, Florida.
- Apex Predators Working Group, National Marine Fisheries Service, University of Hawaii, Honolulu, Hawaii (January 2008) – Participated in an NSF funded workshop (NSF grant to J. Kitchell, University of Wisconsin-Madison) composed of personnel from the National Marine Fisheries Service, University of British Columbia, and University of Wisconsin-Madison evaluating ongoing capture-tag-release programs to provide estimates of exploitation and release survival for billfishes.
- Grand Canyon Monitoring and Research Center Nonnative Fish Workshop, Flagstaff, Arizona (October 2007) – Participated in panel service and discussion with cooperators from multiple Federal and State agencies related to sampling design and potential impact of nonnative fish on Colorado River native fish populations.
- Atlantic States Marine Fisheries Commission Terms of Reference Stock Assessment Review Committee for American Shad, Washington, D.C. (July 2007) – Participated in peer review of the American shad stock assessment by providing critique of current sampling programs, assessment approach, and providing guidance for future research.
- Experimental Sampling Protocols for Nonnative Invasive Species in the Lower Colorado River, Grand Canyon Monitoring Research Center, Flagstaff, Arizona (February 2007) – Served on advisory panel to develop experimental sampling program for sampling nonnative catfishes in the Colorado River during summer 2007.
- Apex Predators Working Group, National Marine Fisheries Service, University of Hawaii, Honolulu, Hawaii (January 2007) – Participated in an NSF funded workshop (NSF grant to J. Kitchell, University of Wisconsin-Madison) composed of personnel from the National Marine Fisheries Service, University of British Columbia, and University of Wisconsin-Madison evaluating ecosystem effects of direct and indirect harvest of apex

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predators in large ocean ecosystems. 2007 efforts focused on evaluating catch-and-release policies as a conservation tool to protect billfishes (family Istiophoridae).

- A Review of the Missouri River Catfish Harvest Evaluation Plan, Missouri Department of Conservation, St. Joseph, Missouri (September 2006) – Served on advisory panel and co-authored review document evaluating potential impact to catfish population structure of legalizing hand fishing for catfish in Missouri rivers.
- Assessing the Potential Threat of Warmwater Invasive Species in the Lower Colorado River Ecosystem, Grand Canyon Monitoring Research Center, Flagstaff, Arizona (December 2005) – Served on advisory panel and provided guidance on developing sampling protocols for evaluating warmwater invasive species in Grand Canyon.
- The State of the Colorado River Ecosystem in Grand Canyon, Colorado River Science Symposium, Tempe, Arizona (October 2005) – Presented stock assessment and met with cooperating agencies to discuss the status of humpback chub populations in Grand Canyon.
- An Independent Review of Ongoing and Proposed Scientific Methods to Assess the Status and Trends of the Grand Canyon Population of the Humpback Chub (*Gila cypha*), National Center for Ecological Analysis and Synthesis [NCEAS], Santa Barbara, California (November 2003) – Served on review panel and assisted with writing outside review of sampling programs for humpback chub in the upper and lower Colorado River basin.

#### International Service

- Design and analyses assistance for assessing the relationships between hydrologic regimes and fish spawning patterns in the Amazonian headwaters (Spring 2005 – Present)
- Provide design assistance and equipment for development of a tagging program to estimate movement and exploitation of giant mahseer (Family: Cyprinidae) in the Cauvery (Kaveri) River in cooperation with the Wildlife Association of South India and the Ashoka Trust for Research in Ecology and the Environment. (Fall 2007-Present)
- Guidance on tagging programs to estimate abundance and exploitation patterns for large river fishes. Department of Primary Industries, Brisbane, Queensland, Australia (October 2006)

#### Professional Society Service

- American Fisheries Society Education Section, Book Co-editor and chapter author *AFS Guide to Fisheries Employment* (2006)
- American Fisheries Society, President of the North Carolina State Student Fisheries Society (2002), Executive Committee member North Carolina Chapter American Fisheries Society (2002), organizer and instructor continuing education technical workshop (2003), Publication Awards Committee Member (2001), contributed session moderator at regional (2002) and national (2001) meetings

#### Departmental Service

- Department of Wildlife Ecology and Conservation and Florida Fish and Wildlife Commission research coordination working group (August 2009-Present) – Purpose is to facilitate collaborative research between faculty and state agency personnel through collaborative research projects and research planning activities
- Department of Wildlife Ecology and Conservation – Graduate Programs Committee (September 2011-Present)
- Department of Wildlife Ecology and Conservation – Space and Safety Committee (Chair, June 2009-Present)

- Department of Wildlife Ecology and Conservation – Climate Change Ecologist Search Committee (January 2010)
- Department of Wildlife Ecology and Conservation – Seminar Co-coordinator (2009)
- Department of Fisheries and Aquatic Sciences Space Committee (January 2006-July 2008)
- Program in Fisheries and Aquatic Science Distance Learning and IT Coordinator (August 2007-July 2008) – I maintained and serviced the IT components of the Fisheries and Aquatic Science distance learning equipment and the mobile teaching computer lab
- Department of Fisheries and Aquatic Sciences Seminar Coordinator (2005)

#### University Service

- UF Water Institute Advisory Board - ITEST: Innovative Experiences for Students and Teachers. An NSF project to develop curricula, tools, and teacher training to teach about water, environmental science, uncertainty, social sciences using water conflicts using the Apalachicola-Chattahoochee-Flint river basin as a case study (under review).
- Actively involved in development of the Program for Environmental Statistics (PES) – Co-teach one course, teach workshops, and assist with program development

### **TEACHING**

#### Graduate Courses

##### Current:

Instructor, Spring semester even years, Stream Fish Biology, University of Florida, Fisheries and Aquatic Sciences Program, Four credit hour graduate level lecture and lab course

Co-Instructor, Summer semester odd years, Ecological Statistics and Design, University of Florida, Program for Environmental Statistics, Three credit hour graduate level lecture and lab course

##### Previous:

Co-Instructor, Fall semester even years, Fisheries Ecology and Management I, University of Florida, Fisheries and Aquatic Sciences Program, Four credit hour graduate level lecture course and lab

Co-Instructor, Fall semester odd years, Fisheries Ecology and Management II, University of Florida, Fisheries and Aquatic Sciences Program, Four credit hour graduate level lecture course and lab

Co-Instructor, Fall semester even years, Ecological Statistics and Design, University of Florida, Program for Environmental Statistics, Three credit hour graduate level lecture and lab course

#### Undergraduate Courses

##### Current:

Instructor, Spring 2011 and Fall each year, Quantitative Wildlife Ecology, Wildlife Ecology and Conservation Department, Three credit hour undergraduate lecture and lab course

Instructor, Summer semester odd years, Field Ecology of Aquatic Organisms, Program in Fisheries and Aquatic Sciences, Four credit hour undergraduate/graduate co-listed lecture and lab course

##### Previous:

Instructor, January – May 2003, Department of Forestry, North Carolina State University, FW/FOR

221 Introduction to Conservation of Natural Resources, Three hour undergraduate course

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Invited Lecturer in various undergraduate and graduate level courses and labs at North Carolina State University and the University of Florida including Introduction to Fisheries Science, Biology of Fishes, Natural Resources Sampling and Quantitative Fisheries Management

### Workshops

- Facilitator, November 2009, G-DAR, Gulf sturgeon Data, Assessment, and Review. Stock assessment review and sampling program development and evaluation meeting. Cedar Key, Florida
- Co-Instructor, December 2008, Ecosystem Modeling with Ecopath Software, University of Florida, Cedar Key, Florida.
- Instructor, September 2008, G-DAR: Gulf sturgeon Data, Assessment, and Review. Data workshop and policy evaluation exercise using population models. Gulf Coast Research Laboratory, Ocean Springs, Mississippi.
- Co-Instructor, October 2007, Ecosystem Modeling with Ecopath Software, USGS Grand Canyon Monitoring and Research Center, Flagstaff, Arizona.
- Co-Instructor, May 2007, Basic Fish Population Dynamics, University of Florida, Department of Fisheries and Aquatic Sciences and the Program for Environmental Statistics, Gainesville, Florida.
- Instructor, January 2005, Using Tagging Data to Assess Survival Patterns in Atlantic Bottlenose Dolphin Populations, Mote Marine Laboratory, Sarasota, Florida.
- Instructor, July – August 2004, Fish School: Basic Fish Population Dynamics, Mote Marine Laboratory, Sarasota, Florida.
- Instructor, February 2003, Tagging Models: Estimating Population Size and Mortality, Continuing Education Technical Workshop, Southern Division of the American Fisheries Society, Wilmington, North Carolina.

### **Refereed Journal Publications**

- Camp, E. V., C. L. Staudhammer, W. E. Pine, III, J. C. Tetzlaff, and T. K. Frazer. In-Review. Relationships between small-bodied fishes and macroinvertebrates and submersed aquatic vegetation: Implications of the effects of habitat change on faunal communities. *Ecology of Freshwater Fish*.
- Burgess, O. T., W. E. Pine, III, and S. J. Walsh. In-Review. Importance of floodplain connectivity in the Apalachicola River, Florida. *River Research and Applications*.
- (36) Seavey, J. R., W. E. Pine, III, P. Frederick, L. Sturmer, and M. Berrigan. 2011. Decadal changes in oyster reefs in the Big Bend of Florida's Gulf Coast. *Ecospace*.  
<http://www.esajournals.org/loi/ecsp>
- (35) Korman, J., C. J. Walters, S. J. D. Martell, W. E. Pine, III, and A. C. Dutterer. 2011. Habitat use, growth, and survival of age-0 rainbow trout in a large regulated river. *Canadian Journal of Fisheries and Aquatic Sciences* 68:1097-1109.
- (34) Coggins, L. G., M. D. Yard, W. E. Pine, III. 2011. Nonnative Fish Control in the Colorado River in Grand Canyon, Arizona: An Effective Program or Serendipitous Timing? *Transactions of the American Fisheries Society* 140:456-470.
- (33) Camp, E. V., D. G. Gwinn, M. V. Lauretta, W. E. Pine, III, and T. K. Frazer. 2011. Use of recovery probabilities can improve sampling efficiency for throw traps in vegetated habitats. *Transactions of the American Fisheries Society* 140:164-169.

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- (32) Saarinen, E. V., H. J. Flowers, W. E. Pine, III, F. Parauka, and J. D. Austin. 2011. An evaluation of genetic methods for estimating egg kin groups in the Threatened Gulf sturgeon. *Journal of Applied Ichthyology* 27:492-495.
- (31) Cowan, J. H., Jr., C. Grimes, W. Patterson, C. J. Walters, A. Jones, W. Lindberg, D. Sheehy, W. E. Pine, III, J. Powers, M. Campbell, K. Lindeman, S. Diamond, R. Hilborn, and T. Gibson. 2010. Red snapper management in the Gulf of Mexico Science-or faith based? *Reviews in Fish Biology and Fisheries* 21:187-204.
- (30) Cañas, C. M. and Pine, W. E., III. 2011. Documentation of the temporal and spatial patterns of Pimelodidae catfish spawning and larvae dispersion in the Madre de Dios River (Peru): Insights for conservation in the Andean-Amazon headwaters. *River Research and Applications* 27:602-611.
- (29) Tetzlaff, J. C., H. J. Flowers, and W. E. Pine, III. 2010. Consumption and growth patterns of flathead catfish derived from a bioenergetics model. *The Open Fish Science Journal* <http://www.bentham.org/open/tofishsj/>
- (28) Flowers, H. J., J. C. Tetzlaff, B. VanPorten, and W. E. Pine, III. 2010. Bioenergetic approach to describing Gulf sturgeon growth in two Florida rivers. *The Open Fish Science Journal* <http://www.bentham.org/open/tofishsj/>
- (27) Tetzlaff, J. C., W. E. Pine, III, and T. K. Frazer. 2010. Comparison of bioenergetics parameters from two spring-fed riverine largemouth bass populations. *The Open Fish Science Journal* <http://www.bentham.org/open/tofishsj/>
- (26) Coggins, L. G., Jr., and W. E. Pine, III. 2010. Development of a temperature-dependent growth model for endangered humpback chub using capture-recapture data. *The Open Fish Science Journal* <http://www.bentham.org/open/tofishsj/>
- (25) Flowers, H. J., W. E. Pine, III, A. C. Dutterer, K. G. Johnson, J. W. Ziewitz, M. S. Allen, and F. M. Parauka. 2009. Spawning site selection and potential implications of modified flow regimes on viability of Gulf sturgeon populations. *Transactions of the American Fisheries Society* 138:1266-1284.
- (24) Catalano, M. J., A. C. Dutterer, W. E. Pine, III, and M. S. Allen. 2009. Effects of variable mortality and recruitment on performance of catch-curve residuals as indicators of fish year class strength. *North American Journal of Fisheries Management* 29:295-305.
- (23) Pine, W. E., III, S. J. D. Martell, C. J. Walters, and J. F. Kitchell. 2009. Counterintuitive responses of fish populations to management actions: Some common causes and implications for predictions based on ecosystem modeling. *Fisheries* 34: 165-180.
- (22) Binion, G. R., M. S. Allen, M. J. Catalano, and W. E. Pine, III. 2009. Direct and indirect estimates of black crappie size selectivity to a common sampling gear: Potential biases and limitations for assessment. *Fisheries Research* 95:47-54.
- (21) Flowers, H. J. and W. E. Pine, III. 2008. An observation of a juvenile Gulf sturgeon in the Santa Fe River, Florida. *Southeastern Naturalist* 7:559-561.
- (20) Martell, S. J. D., W. E. Pine, III, and C. J. Walters. 2008. Parameterizing age-structured models from a fisheries management perspective. *Canadian Journal of Fisheries and Aquatic Sciences* 65: 975-988.
- (19) Pine, W. E., III, S. J. D. Martell, O. P. Jensen, C. J. Walters, and J. F. Kitchell. 2008. Effects of post-release mortality of the efficacy of length limits and catch-and-release policies: a case study of blue, white, and striped marlin. *Canadian Journal of Fisheries and Aquatic Sciences* 65:975-988.
- (18) Coggins, L. G. Jr., M. J. Catalano, M. S. Allen, W. E. Pine, III, and C. J. Walters. 2007. Effects of cryptic mortality and the hidden costs of using length limits in fishery management. *Fish and Fisheries* 9:196-210.

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- (17) Pollock, K. H. and W. E. Pine, III. 2007. The design of field studies to estimate catch and release mortality. *Fisheries Ecology and Management* 14:1-8.
  - (16) Pine, W. E., III, T. J. Kwak, and J. A. Rice. 2007. Modeling management scenarios and the effects of an introduced apex predator on a coastal riverine fish community. *Transactions of the American Fisheries Society* 136:105-120.
  - (15) Adams, A. J., R. K. Wolfe, W. E. Pine, III, B. L. Thorton. 2006. Efficacy of PIT tags and an autonomous antenna system to study the juvenile state of an estuarine-dependent fish. *Estuaries* 29:311-317.
  - (14) Taylor, R. G., J. A. Whittington, W. E. Pine, III, and K. H. Pollock. 2006. Effect of rewards on angler return rates of tagged common snook in southeast Florida. *North American Journal of Fisheries Management* 26:645-651.
  - (13) Coggins, L. G., W. E. Pine, III, C. J. Walters, D. R. Van Haverbeke, D. Ward, and L. Johnstone. 2006. Abundance trends and status of the Little Colorado River population of Humpback Chub *Gila cypha*. *North American Journal of Fisheries Management* 26:233-245.
  - (12) Coggins, L. G., W. E. Pine, III, C. J. Walters, and S. J. D. Martell. 2006. Age Structured Mark Recapture Analysis (ASMR): A VPA Based Model for Analyzing Age Structured Capture-Recapture Data. *North American Journal of Fisheries Management* 26:201-205.
  - (11) Kwak, T. J., W. E. Pine, III, and D. S. Waters. 2006. Age, growth, and mortality of introduced flathead catfish in Atlantic rivers and a review of other populations. *North American Journal of Fisheries Management* 26:73-87.
  - (10) Pine, W. E., III, T. J. Kwak, D. S. Waters, and J. A. Rice. 2005. Diet selectivity of introduced flathead catfish in coastal rivers. *Transactions of the American Fisheries Society* 134:901-909.
  - (9) Waters, D. S., T. J. Kwak, J. B. Arnott, and W. E. Pine, III. 2004. Evaluation of stomach tubes and gastric lavage for sampling diets from blue catfish and flathead catfish. *North American Journal of Fisheries Management* 24:258-261.
  - (8) Pine, W. E., III, K. H. Pollock, J. E. Hightower, T. J. Kwak, J. A. Rice. 2003. A review of tagging methods for estimating fish population size and components of mortality. *Fisheries* 28:10-23.
  - (7) DeVries, D. R. D., D. L. Armstrong, Jr., M. Topolski, W. E. Pine, III, J. A. Johnson, R. A. Dunham, L. Robison, J. Dibona, K. Norgren, P. Hartfield, and S. Cook. 2003. Distribution, habitat use, and genetics of *Tulotoma magnifica*. *Southeastern Naturalist* 2: 35-58.
  - (6) Pine, W. E., III, M. S. Allen, and V. J. Dreitz. 2001. Population viability of the Gulf of Mexico sturgeon: Inferences from capture-recapture and age-structured models. *Transactions of the American Fisheries Society* 130:1164-1174.
  - (5) Pine, W. E., III and M. S. Allen. 2001. Differential growth and survival of weekly age-0 black crappie cohorts in a Florida lake. *Transactions of the American Fisheries Society*. 130:80-91.
  - (4) Allen, M. S., and W. E. Pine, III. 2000. Detecting fish-population responses to a minimum length limit: effects of variable recruitment and duration of evaluation. *North American Journal of Fisheries Management* 20:672-682. \*Finalist for best paper award
  - (3) Pine, W. E., III. 2000. A comparison of two otter trawls of different sizes for sampling black crappie. *North American Journal of Fisheries Management* 20:819-821.
  - (2) Pine, W. E., III, S. A. Ludsin, and D. R. DeVries. 2000. First summer survival of largemouth bass cohorts: is early spawning really best? *Transactions of the American Fisheries Society* 129:504-513.

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- (1) Allen, M. S., M. M. Hale, and W. E. Pine, III. 1999. Comparison of trap nets and otter trawls for sampling black crappie in two Florida lakes. *North American Journal of Fisheries Management* 19:977-983.

#### **PEER REVIEWED CONFERENCE PROCEEDINGS**

- Melis, T. S., S. J. D. Martell, L. G. Coggins, W. E. Pine, III, and M. E. Anderson. 2006. Adaptive Management of the Colorado River Ecosystem below Glen Canyon Dam, Arizona: Using Science and Modeling to Resolve Uncertainty in River Management. American Water Resources Associate Summer Specialty Conference 1-6.

#### **BOOKS, BOOK CHAPTERS, STOCK ASSESSMENTS, AND MONOGRAPHS**

- Atlantic States Marine Fisheries Commission. 2007. Terms of Reference and Advisory Report to the American Shad Stock Assessment Peer Review. Stock Assessment Report 07-01. Washington, DC.
- Hewitt, D. A., W. E. Pine, III, and A. Zale, editors. 2006. *AFS Guide to Fisheries Employment, 2nd Edition*. American Fisheries Society Education Section Publication, Bethesda, Maryland.
- Pine, W. E., III and K. L. Leber. 2006. Chapter 10, Nongovernmental Organizations in Hewitt, D.A., W. E. Pine, III, and A. Zale editors, *AFS Guide to Fisheries Employment, 2nd Edition*. American Fisheries Society Education Section Publication, Bethesda, Maryland.

#### **BOOK REVIEWS AND OTHER MINOR PEER REVIEWED PUBLICATIONS**

- Pine, W. E., III. 2003. Biology, management, and protection of North American sturgeon. *Quarterly Review of Biology* 78(1):108.
- Noble, R. L. and W. E. Pine, III. 2002. A celebration of 50 years of progress in the Southern Division. *Fisheries* 27: 9-12.

#### **PRESENTATIONS**

##### **Professional Society and Working Group Meetings Last 5 Years (\* denotes student presenter)**

- Mintzer\*, V. J. A. R. Martin, V. M. F. daSilva, W. E. Pine, III, K. Lorenzen and T. Frazer. 2011. Apparent survival and population growth rate of Amazon River dolphins (*Inia geoffrensis*) in an Amazonian floodplain. 19th Biennial Conference on the Biology of Marine Mammals. November 27-December 2, Tampa, Florida.
- Camp\* E., D. Gwinn, W. Pine & T. Frazer. 2011. Changes in submersed aquatic vegetation affect predation risks of common prey fish *Lucania parva* (Cyprinodontiformes: Fundulidae) in a spring-fed coastal river. Mid-year meeting of the American Fisheries Society Southern Division. January 13-16, 2011. Tampa, Florida.
- Tetzlaff\* J., C. and W. E. Pine, III. 2011. Alternative harvest policy assessments for gag group in the Gulf of Mexico: the role of discard mortality. Mid-year meeting of the American Fisheries Society Southern Division. January 13-16, 2011. Tampa, Florida.
- Finch\*, C. and W. E. Pine, III. 2011. Juvenile fish growth responses to modified flow regimes: An example from the Colorado River. Mid-year meeting of the American Fisheries Society Southern Division. January 13-16, 2011. Tampa, Florida.
- Lauretta\* M. V. L, Camp E., W. E. Pine, III, and T. K. Frazer. 2011. Modeling ecosystem responses to shifting nutrient loads and submersed aquatic vegetation. Mid-year meeting of the American Fisheries Society Southern Division. January 13-16, 2011. Tampa, Florida.

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- Pine, W. E., III. 2010. Nearshore ecology of Grand Canyon fish, Project update. Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group. June 3, 2010. Flagstaff, Arizona.
- Pine, W. E., III. 2010. Integrating results from the nearshore ecology of Grand Canyon fish project with ongoing aquatic resource management programs in Grand Canyon National Park. Grand Canyon National Park science staff. June 4, 2010. Grand Canyon, Arizona.
- Camp\*, E.V., W.E. Pine III, C.L. Staudhammer, T.K. Frazer. 2010. Consequences of aquatic habitat shifts on specific size classes and taxa of a small fish and macroinvertebrate community Florida Chapter of the American Fisheries Society Annual Meeting. February 16-18, 2010, Ocala, Florida.
- Camp\*, E. V., W. E. Pine, III, C.L. Staudhammer, T. K. Frazer. 2009. Relationships between aquatic habitats and small fish and macroinvertebrates: Consequences of habitat shifts. Annual meeting of the American Fisheries Society. August 30-September 3 2009, Nashville, Tennessee.
- Camp\*, E. V., W. E. Pine, III, C. L. Staudhammer, T. K. Frazer. 2009. Macrophyte declines in Florida's spring-fed rivers: Implications for faunal organisms. Annual meeting of the Ecological Society of America. August 1-7, 2009, Albuquerque, New Mexico.
- Pine, W. E., III. S. J. D. Martell, L. G. Coggins, Jr., M. S. Allen, M. J. Catalano, and C. J. Walters. 2009. Counterintuitive population effects due to interactions among common fisheries management strategies. Mid-year meeting of the American Fisheries Society Southern Division. February 15-18, 2009, New Orleans, Louisiana.
- Lauretta\*, M. V., W. E. Pine, III, T. K. Frazer, and E. Nagid. 2009. Vegetative habitat changes in Florida's spring-fed, coastal rivers: consequences for faunal communities. Mid-year meeting of the American Fisheries Society Southern Division. February 15-18, 2009, New Orleans, Louisiana.
- Camp\*, E. V., W. E. Pine, III, and T. K. Frazer. 2009. Assessing relationships between aquatic habitats and small fish and macroinvertebrates: does plant type matter? Mid-year meeting of the American Fisheries Society Southern Division. February 15-18, 2009, New Orleans, Louisiana.
- Coggins, L. G., Jr., M. Catalano, M. S. Allen, W. E. Pine, III, and C. J. Walters. 2008. Effects of cryptic mortality and the hidden costs of using length limits in fishery management. 5th World Fisheries Congress. Yokohama, Japan. October 20-24th, 2008.
- Burgess\*, O. T., A. Bunch D. Gwinn, W. E. Pine, III, and M. S. Allen. 2008. A simple binomial likelihood model to estimate the probability of habitat use: a case study for lotic fishes from the Apalachicola River, Florida, USA. 138th Annual Meeting of the American Fisheries Society. August 17-August 21. Ottawa, Canada.
- Tetzlaff\*, J. C., W. E. Pine, III, and T. K. Frazer. 2008. Energetic consequences of habitat loss to an apex predator. 138th Annual Meeting of the American Fisheries Society. August 17-August 21. Ottawa, Canada.
- Flowers\*, H. Jared, W. E. Pine, III, and S. J. D. Martell. 2008. Status of Gulf sturgeon in Florida waters: Using age-structured population modeling techniques to reconstruct and project population trends and evaluate conservation targets. 138th annual meeting of the American Fisheries Society. August 17-August 21. Ottawa, Canada
- Tetzlaff\*, J. C., W. E. Pine, III, T. K. Frazer, and M. V. Lauretta. 2008. Energetic consequences of habitat loss to an apex predator. Florida Chapter of the American Fisheries Society Annual Meeting. February 19-21, 2008. Altoona, Florida.
- Burgess\*, O. T., W. E. Pine, III, and S. J. Walsh. 2008. The importance of floodplain connectivity to fish populations in the Apalachicola River, Florida: Insights from telemetry. Florida

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- Chapter of the American Fisheries Society Annual Meeting. February 19-21, 2008. Altoona, Florida.
- Dutterer, A. C., E. V. Camp, M. V. Lauretta, and W. E. Pine, III. 2008. Development of a fish monitoring program for non-wadeable streams: A test case from the Santa Fe River, Florida. Florida Chapter of the American Fisheries Society Annual Meeting. February 19-21, 2008. Altoona, Florida.
- Flowers\*, H. J., W. E. Pine, III, and S. J. D. Martell. 2008. How many Gulf sturgeon were there? A preliminary stock reduction analysis (SRA) to estimate historical population size. Florida Chapter of the American Fisheries Society Annual Meeting. February 19-21, 2008. Altoona, Florida.
- Tetzlaff\*, J. C. W. E. Pine, III, and T. K. Frazer 2008. Activity and energetics of largemouth bass in two spring-fed coastal rivers. Management and research of coastal and estuarine largemouth bass populations working group. January 23-24, 2008. Spanish Fort, Alabama.
- Pine, W. E., III, H. J. Flowers, S. K. Bolden, and J. Estes. 2007. Assessing what we know, what we think we know, and what we want to know about the status of Gulf sturgeon stock in the Gulf of Mexico. 9th Annual Gulf Sturgeon Working Group meeting. November 10-11, 2007. Spanish Fort, Alabama.
- Flowers\*, H. J. and W. E. Pine, III. 2007. Age-structured models for Gulf sturgeon in the Apalachicola River, Florida. 9th Annual Gulf Sturgeon Working Group meeting. November 10-11, 2007. Spanish Fort, Alabama.
- Pine, W.E., III and L. G. Coggins, Jr. 2007. Using science and modeling to resolve uncertainty in river management: A case history from the Colorado River ecosystem below Glen Canyon dam. Annual Meeting of the Florida Chapter of the American Fisheries Society. February 19-21, 2007. Ocala, Florida.
- Marcinkiewicz\*, L. L. and W. E. Pine, III. 2007. Examining movement patterns and seasonal habitat use of adult common snook. Annual Meeting of the Florida Chapter of the American Fisheries Society. February 19-21, 2007. Ocala, Florida.
- Flowers\*, H. J. and W. E. Pine, III. 2007. Movement of Apalachicola River Gulf Sturgeon in 2006. Annual Meeting of the Florida Chapter of the American Fisheries Society. February 19-21, 2007. Ocala, Florida.
- Coggins, L.G., Jr., M. Catalano\*, M. Allen, W. E. Pine, III, and C. Walters. 2007. Modeling the Effects of Discard Mortality on Fishery Sustainability and Performance. Southern Division of the American Fisheries Society. Memphis, Tennessee.
- Coggins, L.G., Jr., M. Catalano\*, M. Allen, W. E. Pine, III, and C. Walters. 2007. Modeling the Effects of Discard Mortality on Fishery Sustainability and Performance. Annual Meeting of the Florida Chapter of the American Fisheries Society. February 19-21, 2007. Ocala, Florida.
- Coggins\*, L.G., Jr., M. Catalano, M. Allen, W. E. Pine, III, and C. Walters. 2007. Effects of cryptic fishing mortality on fishery sustainability and performance. 137th annual meeting of the American Fisheries Society. August 30-September 6. San Francisco, California.
- Coggins\*, L.G., Jr., M. Catalano, M. Allen, W. E. Pine, III, and C. Walters. 2007. Modeling the Effects of Discard Mortality on Fishery Sustainability and Performance. Florida Fish and Wildlife Conservation Commission, Stock Assessment Working Group, St. Petersburg, Florida.
- Coggins\*, L.G., Jr., M. Catalano, M. Allen, W. E. Pine, III, and C. Walters. 2007. Modeling the Effects of Discard Mortality on Fishery Sustainability and Performance. National Marine Fisheries Service, Southeast Fisheries Science Center. Miami, Florida.

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- Pine, W. E., III and L. G. Coggins, Jr. 2006. Realistic expectations for capture-recapture programs for monitoring sturgeon populations. 8th Annual Gulf Sturgeon Symposium. October 11-13, 2006. White Springs, Florida.
- Pine, W. E., III, and M. S. Allen. 2005. Population viability of the Gulf of Mexico sturgeon in the Suwannee River, Florida with comments on the Apalachicola Population. 25th Annual Meeting of the Florida Chapter of the American Fisheries Society. February 22-24, 2005. Ocala, Florida.
- Pine, W. E., III, R. G. Taylor, and J. A. Whittington. 2005. Angler reporting rates of tagged common snook in southeast Florida: Does monetary reward matter? Spring Meeting of the Southern Division of the American Fisheries Society. February 10-13, 2005. Virginia Beach, Virginia.
- Pine, W. E., III, D. S. Waters, T. J. Kwak, and J. R. Rice. 2003. Estimating population size of an exotic, highly mobile piscivorous fish in coastal rivers. 133rd Meeting of the American Fisheries Society. August 10-14, 2003. Quebec City, Canada.
- Pine, W. E., III, D. S. Waters, T. J. Kwak, and J. R. Rice. 2003. Estimating population size of a mobile exotic catfish in coastal rivers. Spring Meeting of the Southern Division of the American Fisheries Society. February 13-16, 2003. Wilmington, North Carolina.
- Waters, D. S., W. E. Pine, III, T. J. Kwak, and J. R. Rice. 2003. Flathead catfish movement and habitat selection in North Carolina coastal plain rivers. Spring Meeting of the Southern Division of the American Fisheries Society. February 13-16, 2003. Wilmington, North Carolina.

### **Invited Presentations**

- Pine, W. E., 2011. Population ecology of juvenile native fish in the Grand Canyon reach of the Colorado River. Glen Canyon Dam Adaptive Management Program Technical Working Group. January 18, 2011, Phoenix, Arizona.
- Carlos, Canas and W. E. Pine, III. 2010. Temporal and spatial patterns of Pimelodidae catfish larvae in the Madre de Dios River, Peru: Catfish recruitment from headwaters to lowlands. American Geophysical Union. Meeting of the Americas. August 8-13, 2010. Foz do Iguassu, Brazil.
- Pine, W. E., III. 2010. Using Gulf sturgeon recovery to inform flow policies in the Apalachicola River. Apalachicola-Chattahoochee-Flint River Water Conference and Summit, Managing Flows from a Human and Ecological Perspective. June 1-3, 2010. Bainbridge, Georgia.
- Pine, W. E., III. 2010. Implications of modified flow regimes on viability of Gulf sturgeon populations in the Apalachicola River, Florida. University of Florida Water Institute Symposium, Sustainable Water, Complex Challenges, Integrated Solutions. February 4-5, 2010, Gainesville, Florida
- Pine, W. E., III. 2009. Active adaptive management of native fish in the Grand Canyon reach of the Colorado River. Water, Wetlands, and Watersheds seminar series. Howard T. Odum Center for Wetlands, University of Florida, January 21, 2009. Gainesville, Florida.
- Pine, W. E., III, S. J. D. Martell, O. P. Jensen, C. J. Walters, and J. F. Kitchell. 2008. Size-limits, harvest-limits, and release mortality: Counterintuitive population effects due to interactions among common fisheries management strategies. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, Florida.
- Coggins, L.G., Jr., M. Catalano, M. Allen, W. E. Pine, III, and C. J. Walters. 2007 Effects of Cryptic Mortality and the Hidden Costs of Using Length Limits in Fishery Management. Department of Fisheries and Wildlife Sciences, Michigan State University, East Lansing, Michigan.

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- Pine, W.E., III, L.G. Coggins, Jr. and C. J. Walters. 2007. Adaptive management of humpback chubs in the Colorado River, lessons from Grand Canyon. Department of Biology, Imperial University, June 19, 2007. London, United Kingdom.
- Pine, W.E., III. 2007. Water distribution, minimum flows, and freshwater fish resources. Florida Stakeholders' Fish and Wildlife Forum. June 6-7, 2007. Orlando, Florida
- Pine, W.E., III. 2005. Sampling considerations and impact assessment of introduced catfishes in Grand Canyon: Southeastern Perspective. Grand Canyon Monitoring and Research Center. December 5-11, 2005. Flagstaff, Arizona.
- Pine, W. E., III. 2005. Update on the status and trends of humpback chub in Grand Canyon Monitoring and Research Center, Colorado River Science Symposium. October 25-27, 2005. Tempe, AZ
- Pine, W. E., III. 2005. Design challenges for monitoring stream fish populations in Florida, Part 1: Modified habitats and nasty exotics. Program for Environmental Statistics, University of Florida, October 18, 2005.
- Pollock, K. H., and W. E. Pine, III, 2004. The design of field studies to estimate catch and release mortality. 134th Meeting of the American Fisheries Society. August 22-26, 2004. Madison, Wisconsin.
- Pine, W. E., III and M. S. Allen. 2004. Population viability of Gulf Sturgeon in the Suwannee River, FL: Inferences from capture-recapture and age-structured models. 6th Annual Gulf Sturgeon Research and Management Workshop. November 16-18, 2004. Big Branch, Louisiana.
- Pine, W. E., III, T. J. Kwak, J. R. Rice and D. S. Waters. 2004. Modeling management scenarios and the impact of introduced flathead catfish on native fishes. Ecology and Management of Catfishes. Special Symposium. Spring Meeting of the Southern Division of the American Fisheries Society. February 26-29, 2004. Oklahoma City, Oklahoma.
- Pine, W. E., III. 2002. Have I been trained to do the jobs that will need to be done? Plenary Session, Spring Meeting of the Southern Division of the American Fisheries Society. February 10-12, 2002. Little Rock, Arkansas.

## **MEMBERSHIPS**

American Fisheries Society, Education and Fish Management Section Member  
Florida Chapter of the American Fisheries Society

## **REVIEWER**

National Science Foundation  
Fisheries Ecology and Management  
Transactions of the American Fisheries Society  
North American Journal of Fisheries Management  
Canadian Journal of Fisheries and Aquatic Sciences  
Quarterly Review of Biology  
Bulletin of Marine Science  
Proceedings of the Southeastern Association of Fish and Wildlife Agencies  
Gulf of Mexico Science  
SeaGrant  
Environmental Protection Agency  
NOAA Fisheries

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## DON WEITKAMP

Dr. Weitkamp is a fisheries biologist with 44 years' experience dealing with fish and invertebrate biology, habitat evaluation-restoration, river operations (primarily hydroelectric), and water/sediment quality issues. Don routinely works on Endangered Species Act permitting and environmental impact assessments. Don has conducted evaluations of the anadromous and resident fish, and their habitats for many shoreline development and hydroelectric projects. His experience includes:

- estuarine and freshwater invertebrate populations
- sediment contamination effects,
- salmonid spawning and rearing,
- juvenile and adult fish passage,
- effects of dissolved oxygen, temperature and supersaturation,
- smolting physiology and genetics,
- fish transportation, and
- preparation of ESA and EIS evaluations of biological resources.

He has conducted projects such as a 15-year study of fall Chinook spawning in the Hanford Reach for an area strongly influenced by river regulation. He has directed studies of genetics and migration survival of salmonids. Don helped to evaluate the potential biological effects of reservoir drawdown in the Snake and Columbia Rives. His experience includes participation in the development of turbine intake screens, fish bypass and outfall systems, surface collection systems, and smolt transport. He routinely works with engineers and project operators to resolve structural and operational issues related to production and survival of fish, including work with physical and computational hydrodynamic modelers to resolve structural and operational issues. Don has conducted ESA evaluations for a wide variety of water and shoreline projects. The following identifies Don Weitkamp's relevant project experience, expert testimony, and publications/reports.

### EDUCATION

PhD Fisheries 1977  
MS Invertebrate Pathology 1971  
BS Zoology 1966

### RELEVANT PROJECT EXPERIENCE

#### Habitat Restoration via Pier Removal

Don led ESA analysis, permitting, sediment monitoring, and laboratory studies for the WA Dept. of Natural Resources for removal of three large derelict docks at the former ASARCO Smelter site on Commencement Bay in southern Puget Sound. These efforts helped produce clean sediment conditions following dock removal together with information on the release of creosote compounds during pile removal.

#### Spokane River Project FERC Relicensing

Don prepared an assessment of northern pike predation on cutthroat and bull trout in Coeur d'Alene Lake from existing information to address Tribal and Work Group concerns. He helped develop and analyze a resident rainbow trout tagging and tracking investigation for the

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Spokane River to evaluate the effects of hydro operations. He prepared an evaluation of the biological effects of Lake Spokane reservoir fluctuations from existing information and conducted an analysis of ramping rate effects in the free flowing reach of Spokane River downstream from Post Falls HED. He also conducted an evaluation of the potential entrainment of fish in the Spokane River Project HEDs based on physical and operational characteristics of the projects and the biological characteristics of the fish potentially present.

### **Cowlitz FERC Water Quality Monitoring Plan**

Don assisted Tacoma Power with water quality monitoring plan issues raised by National Marine Fisheries Service and the Washington Department of Ecology. The agencies requested FERC include provisions for total dissolved gas monitoring that were not appropriate for the Cowlitz Project. Following review of the issues with the agency representatives and minor modifications a FERC accepted a reasonable plan.

### **Post Falls HED FERC Relicensing**

Don worked with the fisheries work group of the FERC relicensing process to address a variety of issues related to operation of the Post Falls HED and its potential effects on the upstream watershed of the Coeur d'Alene Basin. He assembled and evaluated available information, and developed additional field investigations that provided a sound basis for evaluating biological effects of project operations. Don provided testimony in the Dept. of Interior hearing to establish factual information that resulted in the judicial decision that the Project operation had little effect on the basins biological resources.

### **Ruskin Dam TDG**

Don and two other experts evaluated the alternatives for reducing total dissolved gas (TDG) supersaturation produced by Ruskin Dam and the Stave Fall Project on the Stave River for BC Hydro. The analysis identified operational and structural alternatives for reducing TDG supersaturation during future project upgrades.

### **Clark Fork River Supersaturation Investigations**

He designed and directed investigations of total dissolved gas supersaturation issues involved in FERC relicensing. These investigations evaluated dissolved gas supersaturation, its biological effects in the lower Clark Fork River, and TDG control measures for Noxon Rapids and Cabinet Gorge Dams. Investigations included establishing a monitoring network to record TDG levels and development of TDG abatement measures. Downstream fish investigations documented a low incidence and severity of gas bubble disease during high supersaturation.

### **SR 520 Bridge Replacement EIS**

Don collected existing information on fish resources and habitat conditions potentially affected by replacement of the SR 530 Bridge. He conducted coordination with key resource agency staff to identify issues of concern and obtain available information. With this information Don prepared sections of the EIS for the Lake Washington crossing of the SR 520 route. Don also led intertidal habitat evaluation for alternative pontoon construction sites.

### **Calistoga Floodplain Restoration**

Don assisted the City of Orting, WA with agency coordination and habitat design to permit and construct setback of the Calistoga Levee along the Puyallup River to restore floodplain

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functions and natural meander processes to the presently channelized river. This project will restore natural habitat conditions supporting ESA listed species.

### **Seattle Seawall & Alaskan Way Viaduct EIS**

Don worked with the federal Services and state resource agency representatives to develop appropriate means for restoring previously lost critical shoreline habitat along the Seattle Seawall and prepare the cumulative impact assessment provides a basis for joint actions to restore the lost habitat functions for Chinook and bull trout to allow permitting of the Seawall reconstruction. He prepared natural resource sections of the EIS and a BA that identified the potential impacts and mitigation measures for reconstruction of the Seattle Seawall. His efforts included gathering all available information on the fish and habitat resources, preparing an underwater video demonstrating those resources.

### **Columbia River Channel Deepening BA**

He prepared the analysis of channel deepening on ESA listed fish species migrating through the lower Columbia River. This involved working with the Federal Services and state resource agency representatives to provide adequate information for their preparation of a favorable BO and issuance of permits and approvals.

### **Niagara Falls TDG Monitoring**

Parametrix helped the New York Power Authority evaluate the effect of the Robert Moses Niagara Power Plant on TDG conditions in the lower Niagara River. FERC Relicensing stakeholders were concerned that the Power Plant might increase TDG resulting in harm to fish. We established a monitoring program that identified TDG produced by Niagara Falls was actually reduced downstream by the power plant discharge.

### **WA DNR Aquatic Lands HCP EIS**

Don acquired and synthesized information on marine species potentially affected by DNR actions through management of state lands. This information was prepared to provide the basis for use in impact assessment of the various activities allowed by DNR on its managed aquatic lands.

### **Seaplane Base Renton Municipal Airport**

Don worked with Federal, Washington State and Muckleshoot tribal representatives to prepare a BA for dredging of the seaplane basin and reconstruction of docks. He has led development of habitat restoration actions to improve conditions for ESA listed Chinook where they enter Lake Washington from the Cedar River. Working with the agency representatives has led to development of actions that will improved existing conditions and allow permitting of the project.

### **Shoreline Master Program Revision**

Don conducted the evaluation of the existing shoreline habitat conditions within the City of Renton along the Cedar River and Lake Washington. He then developed measures to enhance and protect shoreline habitat that are compatible with existing uses for inclusion in the Shoreline Master Program.

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### **Chelan Falls §401**

Don assisted Chelan Co PUD with total dissolved gas (TDG) issues for the FERC relicensing of the Lake Chelan Hydroelectric Project. Don evaluated the TDG supersaturation potential discharging water through the spillway into the Chelan River and provided testimony at the State Water Pollution Control Hearing Board. He addressed DO, and temperature issues that have been raised in the Section 401 Certification.

### **Dredging Assessment, Duwamish R.**

Don gathered information on the biological resources of the Duwamish River East Waterway to evaluate the potential impacts of dredging the contaminated sediment from the waterway. This information documented that removal of the contaminated sediment would improve the habitat of the East Waterway, supporting permitting of the dredging action.

### **Seattle Built Environment**

Parametrix and consultants prepared a response to the ESA listing of Puget Sound Chinook salmon and other species. Don advised the City on the best use of resources to restore salmon habitat within the City limits and watersheds under City control. Using a science-based approach, Parametrix developed a methodology to determine the most effective use of public resources, resulting in recommendations for City actions.

### **Auburn Floodplain FEMA Map Revision**

To support rezoning of lands within the flood plain, Don evaluated the habitat and ESA listed species impacts of the combined habitat restoration action constructed and planned (wetlands and channel reconnection) within the rezone area. He prepared a biological identifying the benefits and impacts to Chinook salmon and steelhead in the Green-Duwamish River basin.

### **Culvert Replacement**

Don worked with Tulalip Tribe, National Marine Fisheries Service, WA Dept. of Transportation and design representatives to prepare a Biological Assessment addressing and resolving issues for stream relocation and habitat design for redevelopment of an interstate highway interchange on the Tulalip Indian Reservation. The BA allowed the project to be completed on schedule with minor revisions to the design. He coordinated with resource agency representatives to allow in-stream construction to continue outside the standard work window when unanticipated challenges arose.

### **South Park Bridge EIS**

Don led an environmental review of water resources impacts associated with five proposed alternatives for Seattle's South Park Bridge on the Duwamish River. A HEC-RAS hydraulic model was used to evaluate floodplain impacts and estimate scour potential of the proposed pier and abutment configurations. We assessed water quality impacts of each alternative to the Duwamish Waterway. These results were supported an EIS that evaluated aquatic and riparian species, habitat conditions, and potential impacts on a migratory corridor and juvenile rearing area for Chinook salmon and bull trout. He prepared a BA to allow extensive geotechnical investigation.

### **Glacier NW Aggregate Mine Expert Review**

Don reviewed fish habitat information for Steilacoom Creek and the previous evaluation of habitat changes that would occur through dewatering of a proposed expansion to the DuPont

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gravel mine. He used this assessment to recommend changes to the City of DuPont's staff report allowing permitting of the mine expansion that would allow the action to conform to local regulations.

### **Best Available Science**

Don assisted City of Seattle staff in assembling and abstracting pertinent information from recent literature dealing with salmon and bull trout to provide an analysis of "Best Available Science" to support the update of Seattle's Environmental Critical Areas ordinance.

### **Biological Review, Tri-County Model 4(d) Rule Response**

Don led Parametrix assessment of the program prepared by the three major Puget Sound counties (King, Pierce, and Snohomish Counties) to address the 4d rule prepared by National Marine Fisheries Service and the U.S. Fish and Wildlife Service for Chinook salmon. This third party evaluation included working with the Services to develop an acceptable methodology for evaluating the various elements of the Tri-County program. It was necessary for Parametrix to develop a Pathways and Indicators matrix for several habitat types since the Services had not yet completed this aspect of their program.

### **Tolt River Floodplain Reconnection**

Don guided a team assisting the Seattle City Light and King County to assess salmonid habitat conditions in the lower Tolt River that support and limit production. Both field and existing data were collected on Chinook spawning and rearing habitat and determine means to increase the amount of habitat available and to identify and evaluate alternatives for reconnection of flood plain of Lower Tolt River to support spawning and rearing habitat. We conducted spawning surveys that identified habitat characteristics of Chinook. They developed and evaluated alternative means for reconnecting the floodplain in the levy-constrained reach to improve salmon habitat conditions and natural habitat forming processes.

### **Cowlitz R. Hydroelectric Section 410 Water Quality Monitoring Plan**

Don assisted Tacoma Power in dealing with temperature, dissolved oxygen, total dissolved gas, turbidity, nutrient, and exotic macrophyte issues of concern to the WDOE and National Marine Fisheries Service. Information provided by Parametrix and discussions with agency representatives supported resolution of these issues and development of a water quality monitoring plan approved by the WDOE.

### **Lockheed Sediment Strategy**

Don provided evaluation of the biological resources and habitat conditions that could be restored by shoreline clean-up and restoration at the Duwamish River site. This included a diving video of the habitat conditions showing altered habitat that could be improved through site restoration.

### **Monorail Green Line EIS**

He conducted the impact and cumulative impact analysis for Seattle's Monorail Greenline crossing and potential habitat modification for the Lake Washington Ship Canal, Duwamish River, and Longfellow Creek. This work included assessment of the effects of over-water structures and a draft Biological Assessment, including coordination with resource agency and tribal staff.

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### **Restored Habitat Salmonid Monitoring**

Don supervised a monitoring effort to document the use of restored intertidal habitat near the mouth of the Puyallup River in Commencement Bay. Monitoring demonstrated that juvenile Chinook and other young salmon were routinely using the restored habitat in substantial numbers.

### **Sediment Contamination NRDA**

Don evaluated the probable damages to natural resources resulting from releases of end seal paint inadvertently released at Weyerhaeuser's Aberdeen Saw Mill. End seal paint was released over a prolonged period to Shannon Slough, a side channel of the Chehalis River in southwestern Washington. Don assessed the natural resource damages from past maintenance practices to the saltmarsh habitat. Existing sediment and biological conditions, together with information on past water quality, and toxicity data were used to evaluate the impacts to the estuarine environment assisting in settlement with the Natural Resource Trustees.

### **Middle Waterway Habitat Restoration**

Don provided management, technical design, and agency coordination for habitat restoration on Middle Waterway in Commencement Bay, Puget Sound. This joint project by natural resource trustees (state and federal agencies) and Simpson Tacoma Kraft Company restored saltmarsh habitat in a previously filled tideflat. The project mitigated past damages to natural resources and sediments. Services included site investigation, design, coordination, and monitoring.

### **Sediment Remediation & Habitat Restoration**

Don managed confined capping of contaminated nearshore sediments associated with a large pulp and paper mill in Tacoma, WA. Don prepared sampling plans for characterizing extent of contamination, prepared monitoring plans for construction, and performed post-construction surveys to meet EPA consent decree criteria. He led disposal configuration design to provide nearshore habitat for juvenile salmonids. He also prepared technical documents in support of permit applications and conducted monitoring to verify the constructed project's success. Don helped develop the public participation process that was key to the success of this project.

### **Section 404 Permitting, Water Transmission Line**

Don conducted evaluations of various options for breaching and reconstructing a dike to allow protection of the City of Everett's water supply pipeline No. 5 that was compatible with restoration of floodplain habitat. Don assisted with agency coordination to identify specific permitting issues.

### **Redevelopment Lockheed Shipyard No. 1**

Don managed habitat evaluation studies and mitigation design for a large cleanup and redevelopment project at the mouth of the Duwamish River. He determined existing intertidal and subtidal habitat value and designed new intertidal habitat areas in relation to public shoreline access areas and a potential nearshore confined disposal site for contaminated sediments. Don also conducted agency coordination/negotiation to develop acceptable mitigation alternatives.

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### **Habitat Appeal Testimony**

Don provided expert testimony on the potential biological impacts and benefits of proposed intertidal habitat mitigation at Slip 5 site in Port of Tacoma. His testimony before the State Shoreline Hearings Board helped the board determine that the proposed mitigation was appropriate.

### **Net-Pen Aquaculture Programmatic EIS**

Don led preparation of the SEPA programmatic EIS on net-pen rearing of salmon in Puget Sound for the WA Dept. of Fisheries. This project, for the State of Washington, identified alternatives, a vision of how aquaculture could be implemented, and assessed impacts and mitigation potentials for this generic action.

### **Sea Farms Environmental Assessment**

An operational net-pen farm in southern Puget Sound was accused of producing unfavorable environmental impacts, and thus prevented from expansion. We conducted environmental monitoring and computational modeling to assess these impacts. Dr. Weitkamp then provided expert testimony at regulatory hearings to obtain permits necessary for expansion of the net pen operation.

### **Harding Creek Aquaculture Project**

Directed a two year effort to assess the environmental impacts of a proposed hatchery and net pen facility in a remote area of Puget Sound in Washington State. The project had the potential to impact both commercial fisheries and recreational use of the local area. The project conducted water quality monitoring and computational modeling to identify impacts and prepared environmental documentation. Dr. Weitkamp also provided expert testimony at regulatory hearings on the controversial project.

### **Skagit Net Pen Siting**

A private enterprise and a native American tribe proposed to construct a large net pen operation in northern Puget Sound in an area commonly used for recreational purposes. He directed an evaluation and computational modeling effort to identify a favorable site within the proposed area. A site was identified that would have no environmental impacts on the benthic habitat.

### **Net Pen Deposition Modeling**

Directed a project to allow siting of a salmon net-pen operation in a bay adjacent to the Strait of Juan de Fuca, between the Olympic Peninsula and Vancouver Island, Canada. Recreational and commercial fishing interests necessitated a thorough examination of potential impacts to sediment and water quality. Computation modeling was used to predict impacts showing that waste accumulation would be limited to a thin layer within 100 m of the pens.

### **Aquaculture Monitoring Program, Maine**

Assigned Principal for development of an environmental monitoring program for the State of Maine related to marine aquaculture. This project included evaluating state and federal water quality regulations, reviewing regulations in other countries, and developing a water quality and sediment monitoring plan for incorporation into state regulations. He also presented the findings and recommendations before a state legislative committee.

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### **Hatchery Production Environmental Assessment**

Oversaw a NEPA environmental assessment of a large salmon and steelhead hatchery program for the Yakima River, a major Columbia River tributary. Analysis of multiple proposed sites included potential effects on existing fisheries populations, water quality and quantity, land use and recreation, and wildlife. This hatchery system incorporates adaptive management strategies for program development and is being used as a prototype for the entire Columbia Basin.

### **Hatchery Effectiveness Survey**

He led a comprehensive survey to identify non-published research projects conducted in the prior 10 to 15 years on all aspects of salmon, trout, and sturgeon culture. The project developed a computerized database that summarizes this information and makes it readily available.

### **Remediation/ASARCO Smelter Sediments**

Directed the remedial investigation and feasibility study of the upland and marine superfund site contaminated by a copper smelter. Designed marine sampling plan, helped Asarco negotiate with the U.S. EPA, and resolve the area to be remediated. Prepared an underwater video to demonstrate to public and agencies the existing limit of biological effects. Helped develop alternative remediation plans for contaminated areas, prepared shoreline habitat characterization, and guided shoreline protection design.

### **Commencement Bay Studies**

Dr. Weitkamp designed and conducted studies for the Corps of Engineers to identify the timing and habitats used by young salmon as they pass through Commencement Bay. Several capture techniques were used to collect comparative samples of young salmon and other fish using the shoreline habitats of various locations with the general port area of Commencement Bay. These collections of young salmon identified which species used the shoreline habitats, and when they are present in Commencement Bay.

### **Seattle Harbor Studies**

Conducted a number of studies in the harbor area to monitor juvenile salmon and resident fish populations and to evaluate the effects of dredging/filling and other shoreline modifications on these young fish and invertebrate populations. These studies of the benthos and fish involved sampling to establish population densities and habitat types, measuring effects of habitat alterations and enhancement, and determining fish behavior to evaluate the impacts of dredging, filling and pier construction. Juvenile salmon studies included trapping, marking, stomach content analysis, diving observations, and boat observations of behavior within different shoreline habitats.

### **Under-Pier Habitat, Commencement Bay**

Designed and conducted studies of young salmon migrating and rearing under piers in the Port of Tacoma to determine their presence, food sources, and potential predation. Young salmon were found to commonly use areas under pier aprons with food production to be about 50% of that occurring in similar adjacent areas without aprons. Fish predators were not found in the shallow water depths under aprons where the young salmon were found.

### **Cedar River Sockeye Project**

Assigned Principal and technical expert for the site selection of a sockeye spawning channel or hatchery on the Cedar River in Washington State. Duties include the identification and evaluation

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of impacts to natural spawning populations in the river in general and at specific proposed sites and preparation of the fisheries section of the EIS.

### **Hatchery Accelerated Smoltification**

Directed a three-year study to evaluate the feasibility of accelerating the growth of spring Chinook at the Leavenworth Natural Fish Hatchery using warm well water. This project evaluated the potential benefits of establishing an age-0 Chinook program in the Columbia River to increase survival and reduce rearing time.

### **Wanapum Dam Spillway Deflector Evaluations**

Don helped Grant County PUD develop and implement monitoring programs to evaluate TDG reduction resulting from various spillway deflector designs for Wanapum Dam. These services included working with hydraulic engineers and the University of Iowa Institute for Hydraulic Research to develop alternative deflector designs. Parametrix conducted field monitoring to evaluate the reductions in TDG resulting from both successful and unsuccessful designs.

### **HCP Mid-Columbia Utilities**

Expert consultant to team that prepared the EIS on the habitat conservation plan for operation of the mid-Columbia dams operated by Chelan and Douglas Public Utility Districts. His role was to provide information and assist with strategy in reaching agreement between the utilities and National Marine Fisheries Service on means to adequately address environmental issues in the EIS.

### **Portland Regional Water Supply Plan**

Don conducted analysis of environmental impacts associated with various alternatives for increasing the water supply to the Portland metropolitan area. He evaluated fishery impacts to the Clackamas, Willamette, Columbia, and Bull Run Rivers. This project required maintenance of natural resource and recreational values as part of water development. Don participated in an evaluation of potential water supply options for the City of Portland by assessing potential impacts to aquatic resources. Effects of water withdrawal, habitat alteration and intake screening options were evaluated.

### **Southwest Harbor Cleanup-Redevelopment**

Don led marine resource tasks for programmatic redevelopment of an 80-acre area in the southwest Seattle harbor. This project involved redevelopment of several sites that included both upland and in-water contamination sediment contamination. The project became a combined EIS and Remedial Investigation to provide an opportunity for redevelopment in a relatively short time. He helped the Port develop public participation in planning and development of both alternative actions and mitigation.

### **Yakima Watershed Plan**

Don led the effort for a detailed review of instream flow studies to determine the adequacy of available information. Simultaneously, negotiations were conducted between resource agency experts and user group representatives to define biological criteria for the basin. These criteria defined the species and life stages utilizing specific segments of the river system. This information was then used to develop acceptable flow recommendations for the Yakima River Basin and its storage reservoirs.

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### **Methow and Okanogan Rivers Smolt Sampling**

Don designed and directed a field investigation to monitor natural smolt timing and abundance by sampling juvenile migrants in the Methow and Okanogan Rivers for Douglas Co. PUD. This included designing a custom trap and operating a scoop trap in the Methow River during the spring high flows.

### **Wells Dam Passage Survival**

Designed, directed, and analyzed results for evaluating passage survival of juvenile salmonids passing through turbines and the spillway at Wells Dam. This involved catching and releasing approximately 300,000 juveniles and coordinating recovery of data from multiple downstream dams. The results demonstrated moderately high rates of survival during passage through the dam.

### **Wells Dam Steelhead Genetics Characterization**

He directed a study to genetically identify the portions of a returning steelhead run that originated from hatchery and wild fish production. Samples were collected from adults trapped at Wells Dam for hatchery production. Electrophoresis examination of these samples identified the portions of these fish produced by the hatchery and by wild fish spawning.

### **Mid-Columbia System Survival Studies**

Controversy over the effects of hydroelectric projects in the mid-Columbia led to the conduct of system survival studies (5 dams). Responsibilities included coordinating efforts to design the study, mark juvenile salmon, and evaluate the transport and release, stress and short-term survival.

### **Surface Collector Rocky Reach Dam**

As a member of an engineering team, he led efforts to incorporate biological criteria in the design of a unique collector for juvenile salmon. This system will incorporate hydraulic characteristics with fish behavior tendencies to provide a practical bypass solution that avoids expensive installation of intake diversion screens. His role is to help develop and evaluate alternative designs by incorporating fish behavior characteristics with hydraulic evaluations.

### **City Caucus ESA**

Habitat Restoration/NRDA – Don assisted the City of Tacoma with development of a plan to construct new estuarine habitat that would satisfy Natural Resource Damage Claims. His developed alternative concepts, coordinate with Natural Resource Trustees, and develop a specific habitat restoration concept for a portion of Middle Waterway adjacent to a previous habitat restoration project he had guided.

### **Intake Screens Wanapum/Priest Rapids Dams**

Provided biological expertise to help develop a unique turbine intake screen and bypass system for these hydroelectric projects. Directed prototype testing which has shown favorable results of high diversion rates, very high survival, and very low stress in diverted fish.

### **Salmon Spawning Assessment Vernita Bar**

He helped design and conducted extensive studies of fall Chinook spawning for over 15 years at the largest natural spawning site in the U.S. (Hanford Reach). This FERC license study evaluated all factors potentially affecting spawning success with special emphasis on spawning habitat and flow

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fluctuations. It included development of an artificial spawning area to mitigate possible impacts due to flow regulation. These efforts resulted in operating criteria for Priest Rapids Dam, during the spawning period, that minimize the upper elevations at which the Chinook spawn, resulting in lower required flows during crucial spring periods.

### **Summer Chinook ESA Review**

Don helped the East Columbia Irrigation District and the U.S. Bureau of Reclamation conducted review of information on the status of summer Chinook in the mid-Columbia region to address a proposed listing of summer Chinook as a threatened species under the Endangered Species Act. Our paper reviewed the historical run timing data and other biological criteria to document the artificial differentiation from fall Chinook. The information we provided helped NMFS come to the conclusion that the summer and fall Chinook in the mid-Columbia were not separate evolutionary units, therefore summer Chinook should not be listed.

### **Fish Diversion Screen Analysis Rock Island/Rocky Reach Dams**

Worked with hydraulic engineers and hydraulic laboratories to develop screen design and fish bypass criteria for these hydroelectric projects. Using biological information together with physical modeling, we developed the appropriate criteria to provide direction for engineers to design successful screens and bypass systems.

### **Orifice Collection Bypass Gallery**

Responsible for biological evaluation of engineering alternatives for moving diverted fish efficiently from dam gatewells to downstream outfalls for Wanapum and Priest Rapids Dams. These evaluations involved 1:4 scale model evaluations of various orifice models together with modeling conduits and control gates. Models were assessed using both hydraulic parameters and small fish.

### **Fish Bypass Outfall Design**

Biologist member of an interdisciplinary team to develop an outfall design and location to be constructed at Wanapum Dam. This effort involved field evaluations, construction of a 1:100 scale model of the dam and three miles of the river, and videotaping both the real site and the model to identify a location that will minimize predation. A 1:10 scale model of the outfall was constructed to evaluate the best means for discharging young salmon.

### **Rock Island Dam Fish Outfall**

Providing biological analysis for the design and location of a fish bypass outfall to be built for the first powerhouse at Rock Island Dam. This assessment is being done through field studies and biological evaluation of the hydraulic conditions. Responsible for agency coordination to involve agency representatives in the development of this project.

### **Forbes Creek Stream Restoration**

Don provided fish habitat analysis and design services to restore natural habitat characteristics to Forbes Creek, a Lake Washington tributary, previously channelized by a large gravel pit development. Habitat and flow control features were incorporated to provide natural stream habitat within a large residential development.

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### **Cedar River Watershed Secondary Use Analysis**

Don provided aquatic habitat evaluation for a programmatic EIS and secondary use plan for alternative uses of Seattle's municipal watershed. This EIS and plan evaluated recreation, education, wildlife, and timber harvest opportunities along with the need to protect water quality. Don was the technical expert for the site selection of a sockeye spawning channel or hatchery on the Cedar River in Washington State. He identified and evaluated impacts to natural spawning populations in the river in general and at specific proposed sites.

### **Impacts of Green River Diversion**

Don evaluated the potential impacts on fisheries habitat in the Green River, which would result from the increased withdrawal of water to serve City of Tacoma domestic requirements. This project included evaluating the adequacy of the Washington State Department of Ecology requirements for minimum flows and special conditions for instream flows within the Green River watershed. Don provided expert testimony before the State Shorelines Hearing Board on behalf of the City of Tacoma and the Washington State Department of Ecology concerning these water rights issues, the IFIM analysis, and the impact of

### **Priest Rapids Smolt Transportation**

Conducted a five-year transportation study of Chinook and sockeye smolts that were carried by truck from Priest Rapids to below Bonneville Dam; helped design the studies and supervised the design of the handling/transport facilities, stress studies, and release strategies. Sockeye and Chinook smolts were collected from both Priest Rapids and Wanapum Dams, marked, and transported by truck to downstream of Bonneville Dam to several release points, with stress evaluated by blood chemistry parameters. Sockeye were also transported to McNary Dam and loaded onto Corps of Engineers barges for transport downstream.

### **Bulb Turbine Survival Study**

Under agency direction, the new bulb turbines installed at Rock Island Dam were tested to identify survival rates of salmon and steelhead smolts passing through them. Responsible for designing the holding facilities and marking all smolts to be released. He conducted downstream recovery of smolts by traps and seines.

### **Dissolved Gas Supersaturation**

Dr Weitkamp has designed and conducted long-term and short-term, site-specific monitoring programs for private and public hydroelectric operators in the Columbia River System (Grant, Douglas, and Chelan County PUDs; Idaho Power Company, and U.S. Bureau of Reclamation.) These monitoring studies identified levels of dissolved gas supersaturation, incidence of gas bubble disease, and causes of supersaturation. He conducted in situ bioassay experiments to determine maximum tolerable supersaturation levels under river conditions, and assisted computational modelers in developing a computer model of supersaturation dynamics for a hydroelectric spillway.

### **Smolt Bypass Development**

Dr. Weitkamp was a member of a number of engineering teams developing various systems for bypass of juvenile salmon at hydroelectric projects on Pacific Northwest rivers. He lead efforts to incorporate biological criteria in the design of a variety of collection and bypass systems, including the unique Rocky Reach collector. These systems incorporate hydraulic characteristics with fish behavior tendencies to provide practical bypass solutions. He helped develop bypass outfall

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evaluation criteria and techniques that identify the best locations to release bypassed smolts. His helped develop and evaluate alternative designs by incorporating fish behavior characteristics with hydraulic evaluations through hydraulic model interpretation, prototype design, and field evaluation of prototype systems.

### **Yakima R. IFIM and Recommendations, Bureau of Reclamation**

Don directed a detailed review of IFIM studies to determine adequacy of available information for establishing instream flow requirements for the Bureau of Reclamation. He led negotiations with resource agency experts and representatives of public and tribal user groups. The team evaluated the effects of flow conditions on water quality to evaluate potential habitat conditions. The project included development of biological criteria defining pertinent species and life stages and flow recommendations

### **Literature Review Physiology of Smoltification**

Because the health of juvenile salmon migrants is directly related to the physiological changes they undergo during the process of smoltification, Douglas, Chelan and Grant PUDs retained Parametrix to conduct a thorough review of the literature pertaining to smoltification. This review of relevant literature provided the information supporting an understanding of migration timing and hatchery releases in the mid-Columbia.

### **Green River Diversion**

Evaluated the potential impacts on fisheries habitat in the Green River, which would result from the increased withdrawal of water to serve City of Tacoma domestic requirements. This project included evaluating the adequacy of the Washington State Department of Ecology requirements for minimum flows and special conditions for instream flows within the Green River watershed. Dr. Weitkamp provided expert testimony before the State Shorelines Hearing Board on behalf of the City of Tacoma and the Washington State Department of Ecology concerning these water rights issues, the IFIM analysis, and the impact of instream flows on fisheries resources.

### **Sultan River Hydroelectric Impacts**

Dr. Weitkamp helped Snohomish Co. PUD develop and implement both phases of the evaluation of the Henry M. Jackson hydroelectric project. This included strategy on development of the IFIM analysis during the first phase prior to operation. During the second phase, he helped develop and conduct the study plan and analysis for evaluation of salmon passage and spawning to evaluate operational impacts.

### **Dams as Point Sources of Discharges**

Don provided expert testimony of behalf of the U.S. EPA to defend their policy of not regulating dams as point sources of discharge. His testimony on total dissolved gas supersaturation helped achieve a favorable judgment in the case.

### **Homeport EIS, Everett, WA**

Assigned Principal and Program Manager for the technical studies conducted for the U.S. Navy. He was responsible for client and regulatory agency liaison and helping the Navy prepare alternative development plans. He participated in both public and agency participation efforts. His responsibilities also included designing the studies, supervising the scheduling and data collection, and participating in the data interpretation and report writing. The technical studies included baseline surveys of the crab, demersal fish, benthos, epibenthos and salmonid

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populations in the Everett Harbor vicinity to evaluate dredging and shoreline redevelopment impacts and mitigation measures.

### **Programmatic EIS State Net-Pen Aquaculture**

Oversaw and participated in preparation of the SEPA programmatic EIS for net-pen rearing of salmon in Puget Sound. This project identified alternatives, a vision of how aquaculture could be implemented, and assessed impacts and mitigation potentials for this generic action.

### **Cedar River Watershed Programmatic EIS**

Assigned Principal and technical participant in a programmatic EIS and development of a secondary use plan for alternative uses of Seattle's municipal watershed. This EIS and plan evaluated recreation, education, wildlife, and timber harvest opportunities along with the need to protect water quality. Our role was to help clarify the vision of alternative opportunities and to assess both the benefits and impacts.

### **Outfall Improvements Design Evaluation**

Don designed and supervised physical and biological investigations to site and permit an 18-mgd outfall for Seattle Metro's Alki sewage treatment plant. These studies identified and led to the design of an outfall that exceeded U.S. EPA requirements.

## **EXPERT TESTIMONY**

### **Federal Energy Regulatory Commission Hearings**

#### **HIGH ROSS DAM FERC LICENSE**

Project No. 553  
Seattle City Light, Seattle, Washington  
1973

#### **KOOTENAI RIVER HYDROELECTRIC PROJECT FERC LICENSE**

Project No. 2752-000  
Northern Lights Inc., Sandpoint, Idaho  
1983

#### **ROCK ISLAND DAM FERC RELICENSE**

Project No. 943-002 (Phase III)  
Public Utility District No. 1 of Chelan County, Wenatchee, Washington  
1985

#### **PRIEST RAPIDS DAM FERC RELICENSE**

Project No. 2114. The Mid-Columbia Proceedings  
Public Utility District No. 2 of Grant Co., Ephrata, Washington  
1991

#### **U.S. SENATE SUB-COMMITTEE ON ENERGY AND NATURAL RESOURCES**

Testimony at field hearing on Hanford Reach  
1997

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AVISTA, POST FALLS HYDROELECTRIC PROJECT  
Docket No. DCHD-2007-01 (FERC Docket No. 12606)  
U.S. Department of Interior Trial Type Hearing on disputed issues of material fact  
2006

**United States District Court**

WESTERN DISTRICT OF WASHINGTON AT TACOMA  
City of Tacoma v. State of Washington  
No. C82-525T  
1982

DISTRICT OF COLUMBIA  
National Wildlife Federation v. Gorsuch  
No. 530. F. Supp. 1291 (D.D.C. 1982)  
Reversed. 693 F. 2d 156 (D.C. Cir. 1982)

WESTERN DISTRICT OF WASHINGTON AT SEATTLE  
Sierra Club v. Port Townsend Paper Corp.  
Civil C87-316-C  
Deposition, 1988

WESTERN DISTRICT OF WASHINGTON AT SEATTLE  
Weinstein et al. v City of Bellevue  
No. 10-35389  
Prepared analysis of habitat restoration vs. Settlement Agreement conditions  
2010

**Superior Court, State of Washington**

THORNTON CREEK LEGAL DEFENSE FUND V. CITY OF SEATTLE, SIMON PROPERTY GROUP, *et al.*  
Superior Court of the State of Washington in and for King County  
No. 99-2-17841-6SEA  
Testimony 2000 (prior testimony before City Hearings Examiner in 1999)

State of Washington, Shoreline Hearings Board

SEQUIM BAY MARINA  
Port of Port Angeles  
1982

GREEN RIVER WATER RIGHT  
City of Tacoma  
1983

HARBOUR POINTE MARINA  
BCE Development Corp.  
1987

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U.S. NAVY HOMEPORT, EVERETT, WASHINGTON  
U.S. Navy and Washington State Department of Ecology  
1988

DISCOVERY BAY SALMON PENS  
Jamestown S’Klallam Tribe  
1988 SHB 88-4&5

HOPE ISLAND SALMON PENS  
Skagit System Tribal Cooperative  
1988 SHB 88-14

SEATAC THIRD RUNWAY WATER QUALITY PERMITS  
Port of Seattle  
2003 PCHB 01-133

LAKE CHELAN HYDROELECTRIC PROJECT 401 CERTIFICATION  
Public Utility District No. 1 of Chelan County  
2004 03WQCR-5420

### **State Legislative Hearings**

STATE OF NEW MEXICO  
Hearings on Ground Water Standards, Selenium  
Kerr-McGee Nuclear Corp.  
1974-1975

STATE OF CALIFORNIA  
Legislative Hearings, Peripheral Canal Project  
Central Delta Water Agency, Stockton, California  
1978-80

STATE OF MAINE  
Senate Hearings, Aquaculture Monitoring Regulations  
Maine Department of Marine Resources  
1990

GRANT COUNTY PUD  
Help utility deal with federal and state agency concerns regarding dam operations on the  
Columbia River.  
1977- 2002

SIMPSON TACOMA KRAFT MILL  
Shorelines permit hearing for contaminated sediment remediation and natural resource damage  
assessment at a superfund site.  
1987

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- Parametrix. 2009. Puget Creek beach site, sediment investigation and feasibility study. Report to Washington Department of Natural Resources and Pierce County, Tacoma, Washington. 46 p.
- Weitkamp, D. E. 2009. Informal ESA Consultation Report. Blackwell Island Marina. To U.S. Fish and Wildlife Service, Spokane Washington. 16 p.
- Weitkamp, D. E. 2008. Report on potential effects of Post Falls Hydroelectric Project on fish resources. Report to Avista Corporation, Spokane, Washington. 69 p. + appendix.
- Weitkamp, D. E. 2007. Fisheries resources additional analysis and supplemental information on bull trout and bull trout critical habitat in the Coeur d'Alene Lake Basin. Report to U.S. Fish and Wildlife and Avista Corporation, Spokane, Washington. 89 p.
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- Avista and Parametrix. 2007. Ramping rate evaluation Spokane River Hydroelectric Project. Report prepared in cooperation with the Washington Department of Fish and Wildlife and the Idaho Department of Fish and Game, Avista Corporation, Spokane, Washington. 50 p. <http://198.181.17.155/hydrodocs/2004-0513.pdf>
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- Weitkamp, D. E. 2006. Steelhead Mid-Columbia annotated bibliography. Report by Parametrix to Quincy-Columbia Irrigation District and others, Quincy, Washington. 32 p.
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- Underwood, K., D. Weitkamp, and R. Cardwell. 2004. Factors influencing successful fisheries in Lake Roosevelt, WA. Unpublished report by S. P. Cramer & Associates and Parametrix. Inc. 59 p.
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- Weitkamp, D. E. 2003. Potential northern pike control to enhance cutthroat trout survival, Coeur d'Alene Lake. Report by Parametrix to Fisheries Workgroup Spokane River Relicensing Project, Avista Corp., Spokane, Washington. 9 p. <http://198.181.17.155/hydrodocs/2003-0648.pdf>
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- Sullivan, B. D., and D. E. Weitkamp. 2000. Total dissolved gas monitoring Cabinet Gorge And Noxon Rapids hydroelectric projects 2000. Unpublished report to Avista Corp. Spokane, Washington. 37 p. + Appendices.
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## STEVEN P. QUARLES

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### PROFILE

Steve Quarles is a partner and former chair of the Environment & Natural Resources Group of the Washington, DC law firm of Crowell & Moring LLP. His practice includes counseling, litigation and legislative representation for a wide range of energy, forest products, mining, agricultural and land development associations and companies, state and local governments, and land conservation trusts. He addresses issues concerning wildlife and endangered species, federal lands (including mineral, forestry, land exchange, siting and access law), and water pollution (including matters involving nonpoint source controls and point source permitting, impaired waters and Total Maximum Daily Loads, and wetlands regulation). Steve serves on the 6-member U.S. delegation to the Bi-National Softwood Lumber Council, established in accordance with Article XIII and Annex 13 of the 2006 Canada-United States Softwood Lumber Agreement. He is also a member of the Secretary of the Interior's Federal Wind Turbine Guidelines Advisory Committee and the Secretary of Agriculture's National Agricultural Research, Extension, Education, and Economics Advisory Board.

*Litigation Practice:* Steve represents clients in federal courts in all the federal circuits and the Supreme Court. He litigates on behalf of American Forest & Paper Association, CropLife America, Edison Electric Institute, National Pork Producers Council, National Association of Homebuilders, American Farm Bureau Federation, and a coalition of silvicultural, agricultural, and other interests on Clean Water Act and Endangered Species Act issues. Steve defends a variety of companies in citizen suits involving the same issues. He also represents several states as both plaintiffs and defendants in ESA matters. Steve argued successfully on behalf of the petitioner before the Supreme Court in *Ohio Forestry Association v. Sierra Club*, 118 S. Ct. 1665 (1998), in which a unanimous Court ruled that federal courts do not have jurisdiction to hear most lawsuits against national forest plans.

*Administrative Practice:* Steve has a broad administrative practice that includes securing policy constructions and changes from federal agencies in Washington, DC (through rules, guidance documents, general counsel opinions, etc.) and advising on, and preparing the documentation for, the permitting of projects throughout the country (habitat conservation plans, environmental impact statements, historic preservation reviews, etc.). Steve counseled the pork industry representatives in the National Environmental Dialogue on Pork Production (with representatives from the U.S. Department of Agriculture, U.S. Environmental Protection Agency, and the States) and was principal author of its report "Comprehensive Environmental Framework for Pork Production Operations," December 16, 1997. He also worked with the

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Environmental Protection Agency on the 1997 Nationwide Clean Water Act Enforcement Agreement that honored agriculture's first industry-wide (pork industry) environmental auditing program.

*Legislative Practice:* Steve's legislative practice is similarly diverse. For example, he served as general counsel to the Endangered Species Coordinating Council, a coalition of numerous trade associations, companies, and labor unions seeking to reform the Endangered Species Act. Steve has represented several forest products trade associations on multiple legislative initiatives, including the Healthy Forests Restoration Act of 2003. He represents a coalition of agricultural associations and companies concerned with Clean Air Act and CERCLA compliance by Concentrated Animal Feeding Operations. Steve has counseled a coalition of gold companies in the efforts to amend the General Mining Law of 1872 and a coalition of coal companies seeking legislation to resolve disputes between coal developers and oil and gas producers in the Powder River Basin, Wyoming and Montana. Steve also has worked with land conservation trusts and landowners to secure statutory direction for federal land exchanges and appropriations for federal land acquisitions to add lands to the National Park, Forest, and Wildlife Refuge Systems.

*Governmental and Other Positions:* Steve held several Executive Branch and Congressional positions before entering private practice. During the Carter Administration, he served as Deputy Under Secretary of the Department of the Interior, advising Interior Secretary Cecil Andrus on a wide range of environmental and natural resource issues, and Director of the Department's Office of Coal Leasing, Planning, and Coordination, developing the current coal leasing program. He also was special counsel to the Committee on Energy and Natural Resources of the United States Senate, under Chairman Henry M. Jackson, and chief counsel for its Public Lands and Resources Subcommittee, under Chairmen Lee Metcalf and Dale Bumpers. He was the principal Senate staffer responsible for drafting and shepherding landmark natural resource laws (e.g., National Forest Management Act, Federal Land Policy and Management Act, and Deep Seabed Hard Mineral Resources Act), and major conservation laws (e.g., Alaska National Interests Land Conservation Act, Eastern Wilderness Areas Act, Montana Wilderness Areas Act, Omnibus Wild and Scenic Rivers Act Amendments, and over two dozen individual wilderness and wild and scenic river acts). He also assisted in the enactment of ground-breaking Native American laws (e.g., Indian Health Care Improvement Act and Indian Self-Determination and Education Assistance Act). Very early in his position on the Committee, Steve had the dubious distinction of drafting legislation -- Wild, Free-Roaming Horses and Burros Act -- that, promptly after enactment, was declared unconstitutional by a federal court (before the Supreme Court reversed, thereby salvaging Steve's career).

Prior to his government service, Steve was a program coordinator for the Ford Foundation in Rio de Janeiro, Brazil. Steve has been a member of the Board of Mineral and Energy Resources of the National Academy of Sciences. He served on the National Research Council's Committee on Onshore Oil and Gas Leasing, established by the Federal Onshore Oil and Gas Leasing Reform Act of 1987, and Committee on Abandoned Mine Lands. Steve was an invited participant in the Endangered Species Act at Thirty project of the University of California, Santa Barbara, Columbia University and University of Idaho (2002-2003), the Stanford University Forum on the Endangered Species Act and Federalism (2005), and the Endangered Species Act Working Group on Habitat Issues sponsored by The Keystone Center (2005-2006). He has been Vice-Chairman of the Endangered Species Committee, the Alternative Energy Committee, and

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the Public Lands and Land Use Committee of the Environment, Energy and Resources Section of the American Bar Association.

Steve currently sits on the boards of the American Forest Foundation, Henry M. Jackson Foundation, Maryland Environmental Trust, Catoctin Land Trust, and Bat Conservation International.

## EDUCATION

A.B. Princeton University (1964)  
Herrick Prize of the Woodrow Wilson School of Public and International Affairs  
J.D. Yale Law School (1968)

## PROFESSIONAL MEMBERSHIPS AND RECOGNITION

Steve is a member of the bar of the state of New York, the District of Columbia, and various federal courts. Steve is listed in The Best Lawyers in America (in Administrative Law, Environmental Law, Natural Resources Law, and Mining Law categories); Marquis Who's Who in America; Marquis Who's Who in American Law; Marquis Who's Who in the World; and Marquis Who's Who in Finance and Business.

## PUBLICATIONS

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- "Encouraging Self-Auditing Within the Pork Industry: The Nationwide Clean Water Act Enforcement Agreement for Agriculture's First Industry-Wide Environmental Auditing Program," 29 *ENVIRONMENTAL LAW REPORTER* 10395 (1999). Co-Authors: Richard E. Schwartz, Steven P. Quarles and Ellen Steen.
- "The Supreme Court Restricts the Availability of Forest-Wide Judicial Review in *Ohio Forestry Ass'n v. Sierra Club*," 28 *ENVIRONMENTAL LAW REPORTER* 10621 (1998). Co-Authors: Steven P. Quarles and Thomas R. Lundquist.
- "The Pit Bull Goes To School: The Endangered Species Act at 25: What Works?," 15 *THE ENVIRONMENTAL FORUM* 55, Environmental Law Institute (1998). Author: Steven P. Quarles.
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#### Alerts & Newsletters

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- "Controversy Over Sage-Grouse Threatens Multiple Use Development Across 11 Western States," *Environment & Natural Resources Law Alert* (January 16, 2008). Contacts: Steven P. Quarles, R. Timothy McCrum, Thomas R. Lundquist.
- "The Supreme Court Limits The Scope Of The Endangered Species Act In *Defenders of Wildlife*," *Environment & Natural Resources Law Alert* (June 25, 2007). Contacts: Thomas R. Lundquist, Steven P. Quarles, J. Michael Klise.

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## STEVEN P. COURTNEY

Dr. Steven Courtney is Director of RESOLVE' s Science Program. He has worked as a scientist for 30 years, in both academia and since 1992 in resource-management. His technical background is in the sciences, and he has led several large-scale science programs regarding water, forests, and endangered species. He has also developed a strong program in facilitating communication between scientists and decision-makers, and on using multi-disciplinary approaches to complex ecosystem management decisions. He is an expert in the application of technical information in policy and management. A respected biologist with a solid reputation for mediating environmental disputes using an open, transparent process, Dr. Courtney is the solid choice to lead RESOLVE's science program. Dr. Courtney most recently worked as Vice President of the Sustainable Ecosystems Institute and as a Visiting Scholar at Stanford University.

### SELECTED MEDIATION CASES

**Peer Review and Science Advising Program** (1992-ongoing) Dr. Courtney has set up and administered a national program for science peer review and advising that serves many federal, state and tribal governments, as well as private and public benefit entities. Approximately 1000 scientists serve in this network.

**U.S. Forest Service Programmatic EIS** (2011) USDA-FS is in process of selecting a preferred alternative for an overall EIS process for all forest lands. This entails an independent scientific assessment of all technical aspects of the different alternatives.

**Taxonomy and Genetics of Wolves** (2010) Conservation and management decisions on wolves critically depend on understanding the identity of different populations. The US Fish and Wildlife Service sought independent scientific evaluation of the genetic status of different populations, ultimately leading to decisions on which populations require protection, and at what level (species, subspecies, DPS).

**Ecosystem versus Species Management** (2007-2010) Previously all endangered species were administered on a single-species basis. On his own initiative Dr. Courtney approached the USFWS with a proposal for a multi-species approach to crisis conservation cases such as those in Hawaii. This resulted in a policy change at the Department of Interior, and a multi-species listing/critical habitat approach that explicitly takes an ecosystem stance. The first such listing document, for Kauai forest systems was enacted by the Bush administration, and this innovative approach is now being extended under the current administration to other ecosystems.

**Rio Grande Ecosystem Recovery Planning** (2009-2010) The US Bureau of Reclamation is responsible (together with other agencies) for management of Rio Grands water flow regimes. This project entailed independent evaluation of the scientific basis for alternative options, based on the hydrology of the system, and effects on endangered species.

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**Northern Spotted Owl Recovery Plan Review (2008)** The Department of the Interior's proposed recovery plan for the Northern Spotted Owl drew criticism, with accusations of political interference, and congressional investigations. In response DOI asked Dr. Courtney to perform an independent and transparent evaluation. This evaluation successfully transformed the debate, and led to an approved Recovery Plan. The Oregonian newspaper editorialized: "heartening is the U.S. Fish and Wildlife Service's appointment of the independent scientist to lead this review. He is the widely respected biologist Steven Courtney....a perfect choice"

**USGS Missouri Programmatic Review (2008)** The Geological Survey requested an independent evaluation of all its research and outreach activities for one of its science centers. This review helped USGS to set priorities for future research and communication.

**Lahontan Cutthroat Trout Status Review (2007-2008)** The US Fish and Wildlife Service required mediation of the multi-state, multi-agency management of the Lahontan Cutthroat (the largest trout species). This involved listening and consulting with tribal governments, as well as many stake-holders regarding a diversity of interests, and led to the final issuance of a status review for this species (the first such assessment)

**Atlantic Salmon Hatchery Protocols, Production and Assessment (2006)** NOAA, USFWS and the state of Maine agencies were in disagreement over management of Atlantic Salmon hatcheries. The independent review team discovered that these differences were not (as previously thought) matters of scientific opinion, but of governance problems. The parties were able to agree on this perspective, and successfully moved to an adaptive management approach.

**Catfish Harvest Evaluation (2006)** The state of Missouri currently outlaws recreational hand-fishing, or 'noodling' for trophy catfish. This activity has resulted in human deaths, and is of questionable impact on catfish populations. Dr. Courtney negotiated with state and other biologists and with 'anonymous' illegal fishermen to evaluate impacts to catfish populations. Ultimately the state decided to retain laws outlawing the activity.

**Preble's Meadow Jumping Mouse Genetic and Taxonomic Review (2006)** The stakes in this project were very high. Protection measures for PMJM seriously restrict development in the Colorado and Wyoming front range. Different biologists had reached diametrically opposite conclusions regarding the status and even existence of PMJM. Dr. Courtney developed and led a team that determined the true taxonomic status of the mouse, leading to USFWS retaining protection measures in Colorado.

**Barred Owl Biology and Management (2005)** This highly emotive issue required analysis of the effects of one attractive native bird (the Barred Owl) on its endangered cousin (the Spotted Owl). Ultimately, through a series of workshops and discussions, involving animal welfare groups, conservationists, resource managers and others, the USFWS elected to start a trial program of shooting Barred Owls. Without Dr. Courtney's careful management of the process, this controversial and painful decision would probably have been impossible and would have been mired in litigation.

**Missouri River Pallid Sturgeon Review Program (2004-2007)** Pallid Sturgeon are a highly endangered species, which occupy the full length of the Missouri River. Hence management for the species affects numerous stake-holders (agriculture, shipping, water use, fishermen, conservation interests) and is administered by large numbers of agencies in 13 states. A solid and uniformly agreed scientific basis is essential for negotiation among these many interests.

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**Northern Spotted Owl Status Review (2004)** Prior to this project, all status reviews had been carried out by US government agencies. This scientific evaluation, led by Dr. Courtney, sought, through a transparent and completely impartial process, to perform the first comprehensive analysis of Spotted Owls. Initially met with distrust by the various parties, who had been warring for decades over the Northwest forest's most iconic species, this analysis now provides the benchmark for all status reviews carried out by USFWS. The findings of the status review finally ended the long period of litigation among timber interests, conservation groups, and the federal agencies, ultimately leading (after 16 years) to the first agreed Recovery Plan for the species.

**Everglades Avian Multi-Species Plan (2002-2004)** Everglades restoration entails coordination and negotiations between 35 state and federal agencies, two Indian nations, and numerous stakeholder groups (water users, agriculture, municipalities, conservation groups, fishermen, marine interests etc.). Against this backdrop, decisions must be reached on how to manage whole ecosystems, often requiring complex trade-offs between competing interests, and even between different endangered species that have opposite requirements. This created a management impasse, where there appeared to be no management options that were legally permissible. Dr. Courtney's leadership allowed participants to find the 'sweet spot' whereby conflicts were avoided, and restoration actions could move forward with general support.

**Headwaters Forest negotiations (1995-present)** The Pacific Lumber Company owned the last remaining stands of 1,000 year old redwood trees subject to logging. The company sought to liquidate these assets (valued at \$2.3 Billion). The federal and state governments sought to protect the forests under the Endangered Species Act and Clean Water provisions. The company sought compensation under the takings provision of the US constitution. This litigation took place against a backdrop of civil disobedience, that involved extensive years-long tree-sits, jailing of protestors, and even the death of one person. Dr. Courtney turned this situation around, and developed an open transparent joint fact-finding process that allowed complex negotiations to move forward. Ultimately the Headwaters grove was purchased by government for \$500 Million, and is now a permanent reserve. Other old-growth stands are protected by the current private landowners.

**Lower Columbia River Channel Deepening (2001)** Negotiations over deepening the Columbia river for navigation involved NOAA, USFWS, EPA, and the Army Corps, as well as numerous stakeholder interests, Tribal nations, and state agencies. Problems arose over the expected effects of deepening on salmon. These disagreements led ultimately to NOAA withdrawing its BiOp, leading to mutual recrimination and accusations of bad faith. Dr. Courtney and RESOLVE staff turned this situation around and through confidence building exercises, public workshops, and joint fact-finding before an impartial scientific panel, helped the parties to repair their relationships. Ultimately the science proved clear: channel-deepening would have little effect on salmon. NOAA issued a new favorable BiOp, and channel deepening has been funded and carried out by the Corps. The initial negotiations of the parties took 10 years before reaching a roadblock - the intervention and successful mediation took just 5 months to unlock the problem.



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### **ON-LINE LINKS TO REPORTS**

Everglades Multi-Species Avian Ecology and Restoration Review  
<http://sei.org/everglades/reports.htm>

US Fish and Wildlife Service: Scientific Review panel for the Northern Spotted Owl  
<http://sei.org/owl/home.htm>  
<http://sei.org/owl/finalreport/finalreport.htm>

Independent Science Review of the Pallid Sturgeon Assessment Program  
<http://sei.org/sturgeon/population.htm>

The Columbia River Channel Deepening Project.  
<http://sei.org/columbia/home.html>

Preble's Meadow Jumping mouse  
[www.fws.gov/mountain-prairie/species/.../preble/Prebles SEI report.pdf](http://www.fws.gov/mountain-prairie/species/.../preble/Prebles_SEI_report.pdf)

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## DEBBIE Y. LEE

Debbie Lee is a program associate in RESOLVE's Washington, DC office, where she assists in convening and facilitating consensus building and policy dialogues. Ms. Lee provides support in meeting logistics, communication with participants, agenda development, issue identification, and production of written materials. She has worked on a wide range of issues, including drinking water policy, agricultural biotechnology, watershed management, and children's environmental health.

She received a Master degree in Public Policy, with a specialization in Environmental Policy, and a Certificate in Ecological Economics from the University of Maryland, College Park. She received a Bachelor of Arts in History, Political Science, and Public Policy; and Certificate in Environmental Studies from St. Mary's College of Maryland, St. Mary's City, MD.

### SELECTED PROJECTS

**Continental Dialogue of Non-Native Forest Insects and Diseases.** (2010-present) The Continental Dialogue is sponsored by The Nature Conservancy. It is a group of from federal, state, and local agencies, industry, conservation groups, researchers, and land managers working together to address the introduction and spread of non-native and invasive forest pests. The Dialogue's activities are coordinated by a Steering Committee comprised of members representative of the overall Dialogue's participants.

**Science Review of the USFS Draft EIS for National Forest System Land Management.** (2011) The US Forest Service contracted RESOLVE to coordinate an external science review of the draft Environmental Impact Statement (DEIS) for National Forest System Land Management Planning. The basic charge of the review process was to 'evaluate how well the proposed planning rule DEIS considers the best available science.'

**GeSI-EICC In-Region Sourcing (GEIRS) Stakeholder Panel.** (2010-2011) The GEIRS stakeholder panel of the GeSI-EICC Extractives Work Group is a group of end-use companies, NGOs, and government agencies providing recommendations on supply chain tracing and certification schemes related to conflict minerals in the Democratic Republic of the Congo and the surrounding Great Lakes region of Africa.

**Acoustic Monitoring and Mitigation Systems: Status and Applications for Use by Regulated Offshore Industries.** (2009-2011) This three-day technical workshop was held by the Minerals Management Service on the current status of acoustic hardware and software tools for marine mammal monitoring and mitigation as applied to offshore industries.

**Revised Total Coliform Rule Stakeholder Process.** (2009-2011) The US EPA held annual public meetings up update stakeholders on the agency's revisions to the Total Coliform Rule, as promised in the Agreement in Principle of the Total Coliform Rule/Distribution System Advisory Committee.

**Produce Safety Project Stakeholder Discussion Series.** (2010) The Produce Safety Project of the Pew Charitable Trusts sponsored a series of meetings around the United States to help inform the anticipated FDA produce safety standard for the growing, harvesting and packing of fresh fruits and vegetables.

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**Research and Information Collection Partnership.** (2009-2010) As per the Agreement in Principle of the Total Coliform Rule/Distribution System Advisory Committee, the EPA and the Water Research Foundation partnered to develop a research agenda for drinking water distribution system issues. The Steering Committee held regular conference calls and face-to-face meetings to advise the partners on the analytical framework used to determine the research agenda.

**Fairfax County Watershed Planning Process.** (2008-2010) Fairfax County, Virginia, developed watershed management plans for each of the watersheds within the county borders. RESOLVE supported the public involvement process in developing three of those plans: Accotink Creek, Nichol Run and Pond Branch, and Sugarland Run and Horsepen Creek watersheds. For each watershed, the county established a Watershed Advisory Group (WAG) to assist the Fairfax County Office of Stormwater Planning in developing watershed management plans. These WAGs met four to six times each over the course of a year. The county also held Public Issue Forums before and after the development of each watershed plan.

**EPA Small System Variance and Affordability Stakeholder Meeting.** (2009) The EPA held a public meeting on the agency's options to address small system variance and affordability. Stakeholders were asked to provide feedback to EPA on the revised national-level affordability methodology EPA intends to use in the development of future drinking water standards to determine if affordability-based variances can be made available to small drinking water systems.

**Children's Health Protection Advisory Committee (CHPAC)** (2007-2009). The 41-member Federal Advisory Committee was established by the EPA administrator to address environmental health issues related to children. Activities include coordinating the work of the RESOLVE team, preparing technical meeting summaries, designing agendas, communicating with participants, and preparing advance materials. The types of issues addressed by the Committee include the selection of existing EPA rules for reassessment, improvements to methods for setting reference doses that more effectively account for children, improvements in benefits assessment methods for regulatory impact assessments, and community outreach strategies.

**USDA Advisory Committee on Agricultural Biotechnology for the 21st Century (AC21).** (2007-2009) The federal advisory committee was convened to provide advice to the Department of Agriculture on the long-term impacts of biotechnology on agriculture and the work of USDA. AC21 developed reports that project future products of agricultural biotechnology, highlights key issues associated with these products, and make recommendations for how USDA can best prepare for these products. The Committee produced four consensus reports and one consensus letter.

**EPA Advisory Committee on the Total Coliform Rule.** (2007-2008) The EPA established the Total Coliform Rule / Distribution System Advisory Committee (TCRDSAC) to achieve an agreement in principle about key concepts in a revised Total Coliform Rule, and future research on distribution system issues. A Technical Work Group was convened to assist the TCRDSAC with its work.

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## EDUCATION

- 2007 *Master of Public Policy, Specialization in Environmental Policy; and Certificate in Ecological Economics.* University of Maryland, College Park, MD
- 2005 *Bachelor of Arts, History, Political Science, and Public Policy; and Certificate in Environmental Studies.* St. Mary's College of Maryland, St. Mary's City, MD

## EMPLOYMENT HISTORY

- 2007-Present RESOLVE, Washington, DC, Program Associate
- August 2005- University of Maryland School of Public Policy, College Park, MD, Graduate  
May 2007 Assistant in Finance & Administration
- Summer 2005 Barrie Day Camp, Silver Spring, MD, Nature Specialist  
and 2006
- 2002-2005 St. Mary's College of Maryland, St. Mary's City, MD, Environmental Studies  
Research Assistant

## PUBLICATIONS

- Debbie Lee. 2011. "Books review: exploring the dangers of daily life." Chinadialogue. Online. Available at <http://www.chinadialogue.net/article/show/single/en/4180-Books-exploring-the-dangers-of-daily-life>.
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