

SUPREME COURT OF THE UNITED STATES
No. 142, Original

STATE OF FLORIDA,)
Plaintiff,)
V.)
STATE OF GEORGIA)
Defendants.)

VOLUME XVI

TRANSCRIPT OF PROCEEDINGS

The above-entitled matter came on for HEARING before SPECIAL MASTER RALPH I. LANCASTER, held in the U. S. Bankruptcy Court, at 537 Congress Street, Portland, Maine, on November 30, 2016, commencing at 8:38 a.m., before Claudette G. Mason, RMR, CRR, a Notary Public in and for the State of Maine.

APPEARANCES:

For the State of Florida: PHILIP J. PERRY, ESQ.
JAMIE L. WINE, ESQ.
ABID R. QURESHI, ESQ.
MATTHEW Z. LEOPOLD, ESQ.
STACEY van BELLEGHEM, ESQ.

For the State of Georgia: CRAIG S. PRIMIS, ESQ.
ZACHARY A. AVALLONE, ESQ.
KAREN McCARTAN DeSANTIS, ESQ.
EMILY K. MERKI, ESQ.

Also Present: JOSHUA D. DUNLAP, ESQ.

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1 PROCEEDINGS
2 SPECIAL MASTER LANCASTER: By the size
3 of the crowd, I think they have been rained
4 out.
5 MR. PRIMIS: Good morning, your Honor.
6 SPECIAL MASTER LANCASTER: Good morning.
7 MR. PRIMIS: The game plan for today is
8 to start with a video deposition of Steve
9 Leitman. We will then proceed with
10 Dr. William McAnally, who is an expert in
11 hydrodynamics and, in particular, salinity in
12 Apalachicola Bay. And then we'll move to
13 Dr. Charles Menzie. Dr. Menzie is an
14 ecologist who will testify concerning the
15 ecology of Apalachicola River and Bay and the
16 species that live there.
17 And then tomorrow we plan to have an
18 oyster day with some video designations and
19 an oyster biologist who can answer all of
20 your questions about the oddities of oyster
21 biology.
22 SPECIAL MASTER LANCASTER: Terrific.
23 MR. PRIMIS: Thank you. My colleague,
24 Zachary Avallone, will be handling the video
25 designations.

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1 We think Mr. Perry had a good approach
2 to it with taking breaks to let you get to
3 the document that will be the subject of it,
4 and Mr. Avallone will handle that.
5 SPECIAL MASTER LANCASTER: Thank you.
6 MR. AVALLONE: Good morning, your Honor.
7 As Mr. Primis mentioned, my name is Zach
8 Avallone. I have been at the counsel table
9 throughout this trial, but this is the first
10 time at the podium; so I want to introduce
11 myself.
12 Your Honor, Florida and Georgia have
13 conferred; and we'll be playing clips
14 selected by both parties. The first series
15 of video clips has been organized into topics
16 by Georgia. And some of Florida's requested
17 clips have been included into those sections.
18 And after those sections are complete, we'll
19 be playing some additional video that was
20 requested by Florida.
21 And as we just handed up, Georgia has
22 created a binder to make it easier to follow
23 along with some of the documents that are
24 being discussed in the video.
25 SPECIAL MASTER LANCASTER: Thank you.

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<p style="text-align: center;">4061</p> <p>1 MR. AVALLONE: And we also placed a copy 2 of the testimony in the front of the binder 3 in the order that it will be played in the 4 video so it's easier to follow along. 5 Your Honor, the first set of clips 6 describes Mr. Leitman's background. And 7 there are no exhibits that are going to be 8 discussed during this set of clips. 9 (Whereupon the video was played.) 10 MR. AVALLONE: And, your Honor, the next 11 set of clips discusses the impact of the Army 12 Corps of Engineers on the Apalachicola River. 13 And this discussion does not relate to any of 14 the documents in the binder. 15 SPECIAL MASTER LANCASTER: They do not 16 what? 17 MR. AVALLONE: It does not relate to any 18 of the documents in the binder. 19 SPECIAL MASTER LANCASTER: Thank you. 20 (Whereupon the video was played.) 21 MR. AVALLONE: Okay. Your Honor, the 22 next set of clips relates to the Army Corps 23 of Engineers' operations of the reservoir 24 system in the ACF Basin. The first document 25 that's being discussed is behind tab 1 in <p style="text-align: center;">THE REPORTING GROUP Mason & Lockhart</p></p>	<p style="text-align: center;">4063</p> <p>1 Leitman, Pine, and Kiker. The document is 2 GX-754. And it was marked during 3 Mr. Leitman's deposition as Exhibit 14. The 4 first set of clips relate to the first page 5 on line 27. Then the -- we have included a 6 yellow flag to indicate where there will be 7 another discussion, which is on page 14, 8 lines 397 through 400. 9 (Whereupon the video was played.) 10 MR. AVALLONE: And, your Honor, at the 11 time of Mr. Leitman's deposition, only the 12 draft article behind tab 3 was available. So 13 the final version of that article was 14 published in June of 2016 in a journal titled 15 <i>Environmental Management</i>. And we have 16 included the final version of that paper for 17 your reference behind tab 4. And it has been 18 marked GX-1131. 19 And the net set of clips will be 20 referencing a document behind tab 5. And 21 this document is a presentation titled An 22 Evaluation of the Supreme Court Lawsuit Filed 23 by the State of Florida Against the State of 24 Georgia in 2003. This document is marked 25 GX-683. The first set of clips we'll be <p style="text-align: center;">THE REPORTING GROUP Mason & Lockhart</p></p>
<p style="text-align: center;">4062</p> <p>1 your binder. 2 A number of these documents are 3 PowerPoint presentations that do not have 4 page numbers; so to make it easier, we have 5 put a blue flag on page 26. And that is the 6 page that will be being discussed in this 7 first clip. 8 SPECIAL MASTER LANCASTER: Thank you. 9 (Whereupon the video was played.) 10 MR. AVALLONE: And, your Honor, the next 11 document that will be discussed is behind 12 tab 2 in the binder. The document is titled 13 Seeing the ACF Watershed As a System: 14 Examining the Effect of Reducing Irrigation 15 Withdrawals. The first set of questions 16 relates to a slide entitled Conclusion. And 17 we have marked that page with a green flag 18 with the letter A. 19 SPECIAL MASTER LANCASTER: Thank you. 20 (Whereupon the video was played.) 21 MR. AVALLONE: And, your Honor, the next 22 document that will be referenced is in your 23 binder behind tab 3. It is a draft 24 manuscript titled An Investigation Into the 25 2012 Drought on the Apalachicola River By <p style="text-align: center;">THE REPORTING GROUP Mason & Lockhart</p></p>	<p style="text-align: center;">4064</p> <p>1 discussing the slide at page 15. And we 2 have marked this with a red flag with the 3 letter A. 4 (Whereupon the video was played.) 5 MR. AVALLONE: And, your Honor, we're 6 going to be staying in tab 5. The next set 7 of clips discusses slides 18 through 20. And 8 we have marked slide 18 with a red flag with 9 the letter B; and it begins with, in the 10 lawsuit. 11 (Whereupon the video was played.) 12 MR. AVALLONE: And, your Honor, the next 13 set of clips will be discussing slides 22 and 14 23. And we have placed a red flag with the 15 letter C on slide 22. 16 (Whereupon the video was played.) 17 MR. AVALLONE: And, your Honor, the next 18 document that will be discussed is still in 19 GX-683; and it is marked with a red flag with 20 the letter D. And it's on slide 35. 21 (Whereupon the video was played.) 22 MR. AVALLONE: And, your Honor, the 23 final set of clips designated by Georgia 24 relates to slides 38, 39, and 40. And we 25 have placed a red tab with the letter E. <p style="text-align: center;">THE REPORTING GROUP Mason & Lockhart</p></p>

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1 (Whereupon the video was played.)
 2 MR. AVALLONE: And, your Honor, the
 3 final video we'll show additional clips from
 4 Mr. Leitman's deposition that Florida
 5 requested to be included.
 6 (Whereupon the video was played.)
 7 MR. AVALLONE: Okay. Your Honor, that's
 8 it for the video this morning. Thank you.
 9 MR. PERRY: Good morning, your Honor, I
 10 just have one point I would like to make on
 11 the presentation. I think there was perhaps
 12 just a little bit of confusion with some of
 13 the clips. And so if I might, I would like
 14 to point out just two pages in one of the
 15 exhibits that Georgia put forward. It's
 16 tab 1. It's the 6th and 7th pages that
 17 address the effects of reducing agricultural
 18 irrigation in the Flint Basin. And on those
 19 pages, there's a discussion of, among other
 20 things, sod-based rotation, and on the
 21 seventh page, which is titled The Effects of
 22 Reducing Agricultural Irrigation in the Flint
 23 Basin, there's a description of means to
 24 reduce the need for irrigation in the basin
 25 by 50 to 75 percent on peanut and cotton

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1 crops and a various number of different means
 2 that can be used to reduce irrigation by 22
 3 percent, 15 percent, and the like. So that's
 4 the 7th page.
 5 They're unnumbered, which is why I'm
 6 calling it 7th. It's the 7th page of the
 7 document at tab 1 of the binder that Georgia
 8 handed up.
 9 Thank you, your Honor.
 10 MR. PRIMIS: Your Honor, the State of
 11 Georgia will now call Dr. William McAnally.
 12 My colleague, Karen DeSantis and
 13 Mr. Avallone, will be handling that witness.
 14 THE CLERK: Please raise your right
 15 hand.
 16 Do you solemnly swear that the testimony
 17 you shall give in the cause now in hearing
 18 shall be the truth, the whole truth, and
 19 nothing but the truth, so help you God?
 20 THE WITNESS: I do.
 21 THE CLERK: Please be seated.
 22 Pull yourself right up to the microphone
 23 and please state your name and spell your
 24 last name.
 25 THE WITNESS: My name is William

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1 McAnally, M C A N A L L Y.
 2 MS. DeSANTIS: Your Honor, may I
 3 approach to hand the witness his direct
 4 testimony?
 5 SPECIAL MASTER LANCASTER: Please.
 6 DIRECT EXAMINATION
 7 BY MS. DeSANTIS:
 8 Q. Dr. McAnally, I have handed you your written
 9 direct examination testimony in this matter. Do
 10 you adopt this testimony as your sworn testimony
 11 in this case?
 12 A. I do.
 13 MS. DeSANTIS: I tender the witness.
 14 MR. LEOPOLD: Good morning, your Honor.
 15 SPECIAL MASTER LANCASTER: Good morning.
 16 CROSS-EXAMINATION
 17 BY MR. LEOPOLD:
 18 Q. Good morning, Dr. McAnally.
 19 A. Good morning.
 20 Q. Good to see you again.
 21 Dr. McAnally, you have offered an expert
 22 opinion in this case on the effect of various
 23 hypothetical scenarios of Apalachicola River
 24 flows on average salinity and water quality in
 25 Apalachicola Bay. Correct?

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1 A. That's correct.
 2 Q. And specifically, you evaluated the effects of
 3 changes in those river discharge scenarios on
 4 salinity in Apalachicola Bay. Correct?
 5 A. That's correct.
 6 Q. And to arrive at that opinion, you relied on two
 7 primary types of modeling, a physics-based model
 8 and a statistical-based model. Is that right?
 9 A. That is right.
 10 Q. And you have stated previously that your
 11 statistical-based model alone cannot establish a
 12 cause and effect relationship; isn't that right?
 13 A. A statistical model can establish correlations
 14 and mathematical relationships. Interpretation
 15 of those results to indicate cause and effect is
 16 then another step.
 17 Q. Okay. And you also used those models, sir, to
 18 evaluate the effect of sea level change on
 19 salinity in Apalachicola Bay; isn't that correct?
 20 A. That is correct.
 21 Q. And so I know you have discussed both river
 22 discharge and sea level rise in your opinions. I
 23 want to first focus on your assessment of the
 24 effects of river discharge on salinity. Okay?
 25 A. Okay.

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1 Q. And you're familiar with Dr. Greenblatt,
 2 Florida's expert in this case. Right?
 3 A. I am.
 4 Q. And you know that she assessed the impact of
 5 changes in river flows on salinity in
 6 Apalachicola Bay. Correct?
 7 A. I'm sorry. Could you repeat that.
 8 Q. Sure. Dr. Greenblatt assessed the impact of
 9 changes in river flows on salinity in the bay;
 10 isn't that true?
 11 A. That's true.
 12 Q. And you're aware also that Dr. Greenblatt
 13 testified as a general matter that salinity
 14 decreases when more flow enters the bay from the
 15 river: Isn't that true?
 16 A. I'm aware that she has expressed that opinion in
 17 her report.
 18 Q. And she also said that salinity increases as less
 19 flow from the river enters the bay. Do you
 20 recall that?
 21 A. I recall that her report says that as well.
 22 Q. And you would agree, would you not, Dr. McAnally,
 23 that all else being equal, input increased
 24 freshwater inflows into Apalachicola Bay decrease
 25 salinity. Isn't that true?

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1 A. Since you added the phrase that she did not; that
 2 is, all other things being equal, then I can
 3 agree with the statement.
 4 Q. And in the converse, all else being equal,
 5 decreased freshwater flow leads to higher
 6 salinity in Apalachicola Bay; isn't that true?
 7 A. That is true.
 8 Q. And you testified that you modeled for specific
 9 scenarios of river discharge as part of your
 10 opinion. Right?
 11 A. I did.
 12 Q. And one of those contemplates additional flows
 13 into Apalachicola of a thousand cubic feet per
 14 second, which you call a conservation scenario.
 15 Right?
 16 A. I'm sorry. I missed the first part of your
 17 question about the conservation scenario.
 18 Q. One of those scenarios contemplates a thousand
 19 additional cubic feet per second, which is what
 20 you called a conservation scenario. Right?
 21 A. That was what -- how the conservation scenario
 22 was described, yes.
 23 Q. But you did not model for any scenarios where
 24 there's more than an additional thousand cubic
 25 feet per second into the Apalachicola Bay.

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1 Correct?
 2 A. I don't know the precise comparison of the other
 3 flows that were considered. I tested -- I
 4 tested four flows; plus I did also run two of
 5 Dr. Greenblatt's flows. So how those would
 6 compare to the thousand cfs during the dry season
 7 I'm afraid I can't answer.
 8 Q. But you're aware, aren't you, Dr. McAnally, that
 9 Florida is seeking more than an additional 1,000
 10 cubic feet per second in riverflow as part of the
 11 remedy in this case?
 12 A. I'm not aware of what Florida is seeking, sir,
 13 other than what was expressed in my report.
 14 Q. So you didn't model the effect on salinity of an
 15 additional incremental freshwater inflow as part
 16 of a remedy scenario. Right?
 17 A. As I said, I modeled four scenarios, the 1992 --
 18 that were labeled as 1992 consumption, as 2011
 19 consumption, and as 2040 consumption, and then
 20 the conservation scenario, which was the 2011 or
 21 baseline case plus a thousand cfs during selected
 22 months. Then I also modeled the two flows by --
 23 that Dr. Greenblatt used entitled No Withdrawals
 24 and Remedy. And so those are, a round-up, six
 25 different freshwater flow scenarios. But those

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1 were the only ones that I ran.
 2 Q. And you're aware that Dr. Greenblatt's remedy
 3 scenario was also a thousand cubic feet per
 4 second. Right?
 5 A. I don't recall the specifics of her remedy
 6 scenario. I recall that it included -- the only
 7 thing that I recall specifically about it was
 8 that it included a reduction -- maybe a 50
 9 percent reduction in agricultural use and some
 10 other conservation measures.
 11 Q. Okay. All right. Well, you would agree with me,
 12 sir, would you not, that all else being equal,
 13 additional increments of flow into Apalachicola
 14 Bay would have the effect of decreasing salinity.
 15 Correct?
 16 A. As long as you include the statement all else
 17 being equal, then, yes, additional inflow will
 18 decrease salinity in Apalachicola Bay, although
 19 perhaps not by significant amounts, which is
 20 the -- one of the things that I found in my
 21 analysis.
 22 Q. And you also are aware, are you not,
 23 Dr. McAnally, that Dr. Greenblatt testified with
 24 regard to something called residence time in
 25 Apalachicola Bay. Right?

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1 **A. I recall seeing that in her report.**
 2 **Q.** And you're aware that she looked at the effect of
 3 freshwater flows on residence time in the bay.
 4 Right?
 5 **A. I do.**
 6 **Q.** And are you aware that Dr. Greenblatt testified
 7 that persistent low flows would increase
 8 residence time and corresponding salinities in
 9 the bay?
 10 **A. I do recall that her analysis suggested that**
 11 **decreased freshwater flows would increase**
 12 **residence times in Apalachicola Bay.**
 13 **Q.** I'm sorry. Just to clarify, that persistent low
 14 flows would increase residence time. Right?
 15 **A. I think you can add persistent to that sentence**
 16 **without any problem.**
 17 **Q.** Great. And you didn't conduct any analysis of
 18 residence time; did you, Dr. McAnally?
 19 **A. I did.**
 20 **Q.** Well, you didn't present any analysis regarding
 21 the change in river discharge in residence time
 22 in your direct testimony; did you?
 23 **A. In my direct testimony, I don't believe I**
 24 **included anything about residence time.**
 25 **Q.** And you're not aware, sir, are you, of the effect
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1 of residence time on the Apalachicola Bay
 2 ecosystem; are you?
 3 **A. I have no opinions to offer on ecosystems, sir.**
 4 **Q.** So you -- you're not aware of the biological
 5 impact of the change in freshwater flows on the
 6 bay ecosystem. Right?
 7 **A. I have no opinion to offer on biological effects.**
 8 **Q.** Now -- but you are aware that persistent low
 9 flows occurred in the Apalachicola River in 2011
 10 and 2012. Right?
 11 **A. I'm aware of that.**
 12 **Q.** And, in fact, your expert report included a chart
 13 that reflected the low flows at the Sumatra Gage
 14 in 2011 and 2012. Right?
 15 **A. I believe that -- that chart -- such a chart was**
 16 **in my report, yes.**
 17 MR. LEOPOLD: If you would, Mr. Walton,
 18 please bring up appendix C, page C-48, in
 19 Dr. McAnally's report. And this is tab 2 in
 20 your binder.
 21 Your Honor, may I approach?
 22 BY MR. LEOPOLD:
 23 **Q.** Sir, if you want to turn to the hard copy, it's
 24 tab 2, appendix C at page C-48.
 25 **A. I'm there.**
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1 **Q.** I want to invite your attention to the plate,
 2 plate 1, at the top of the page. Do you see
 3 that?
 4 **A. I do.**
 5 **Q.** And this is your plot of the daily discharge
 6 of -- at the Sumatra Gage from 2002 to 2014.
 7 Right?
 8 **A. The date range on this plot is 2002 to 2014.**
 9 **Q.** And it's plotting riverflow measured at the
 10 Sumatra Gage in the river. Correct?
 11 **A. That's correct.**
 12 **Q.** And I want to direct your attention, if you
 13 would, to the portion of the plot that covers the
 14 years 2011 and '12. Can you see that portion?
 15 **A. I do.**
 16 **Q.** And that's the period of low flows that I'm -- I
 17 have been referring to here plotted on your
 18 chart. Isn't that correct?
 19 **A. Yes.**
 20 **Q.** Now, I would like you to now focus your attention
 21 on plate 2 on the same page. Okay?
 22 And on plate 2 now you have plotted salinity
 23 at Dry Bar in the same time period. Correct?
 24 **A. That's correct.**
 25 **Q.** And if I can invite your attention to the portion
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1 of the chart that reflects 2011 and 2012 on the
 2 right-hand side.
 3 MR. LEOPOLD: If you could highlight
 4 those, Mr. Walton.
 5 BY MR. LEOPOLD:
 6 **Q.** Do you see that that period has a corresponding
 7 period of higher salinity; isn't that true,
 8 Dr. McAnally?
 9 **A. I see that.**
 10 **Q.** And unlike other years, salinity never dropped to
 11 the lower levels that it did in prior years on
 12 this graph. Correct?
 13 **A. If you're saying there were lower salinities in**
 14 **prior years than in 2011-2012, then, yes, that is**
 15 **correct. That is a correct statement.**
 16 **Q.** And are you aware, Dr. McAnally, that those lower
 17 levels of salinity are necessary to flush out
 18 saltwater predators in Apalachicola Bay?
 19 **A. I'm sorry. I didn't follow the question.**
 20 **Q.** Are you aware that biologically the system needs
 21 lower levels of salinity to flush out saltwater
 22 predators in Apalachicola Bay?
 23 **A. I am not offering any opinion on biological**
 24 **predators.**
 25 **Q.** All right. And, now, moving on, your statistical
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1 analysis looked at salinity from three stations
 2 in Apalachicola Bay, East Bay, Cat Point, and Dry
 3 Bar; isn't that correct?
 4 **A. That's correct.**
 5 **Q.** And you would agree that all three of those
 6 stations are influenced by freshwater flow from
 7 the river. Correct?
 8 **A. All three of those stations are influenced by**
 9 **freshwater flow from the river.**
 10 **Q.** And you would agree also, would you not, that the
 11 locations closer to the freshwater discharge are
 12 more impacted from changes in those freshwater
 13 flows. True?
 14 **A. Not necessarily, no, sir.**
 15 **Q.** That's not what your modeling shows?
 16 **A. One of the things that I found was that East --**
 17 **the East Bay station was also influenced by flow**
 18 **out of Tate's Hell Swamp. And so it was the**
 19 **contribution from the Apalachicola riverflow,**
 20 **which is distinct from that, was, therefore,**
 21 **I'll say moderated somewhat or altered somewhat**
 22 **because of the Tate's Hell drainage into the East**
 23 **Bay right -- very close to the East Bay Gage.**
 24 **Q.** And didn't you opine, Dr. McAnally, that the
 25 Tate's Hell influence on salinity was 1 percent

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1 **A. That is true.**
 2 **Q.** And the darker the color indicates the greater
 3 change in salinity. True?
 4 **A. That is also true.**
 5 **Q.** So if I could focus your attention to the upper
 6 portion of the bay, you will see areas that are
 7 in a dark orange color. Right?
 8 **A. I see that.**
 9 **Q.** And you would agree with me, would you not,
 10 those areas are closer to the mouth of the river?
 11 **A. They are close to the mouth of the river. I'm**
 12 **not sure -- closer than what?**
 13 **Q.** And part of that area includes East Bay; does it
 14 not?
 15 **A. That is in East Bay.**
 16 **Q.** Now, you can set that aside for a moment,
 17 Dr. McAnally.
 18 In your testimony you have also offered
 19 opinions regarding salinity levels in the bay
 20 under different discharge scenarios created by
 21 Dr. Bedient. Correct?
 22 **A. I did.**
 23 **Q.** And your model predicted that salinity levels
 24 would be at various locations -- would change at
 25 various locations in the bay given those inputs.

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1 approximately?
 2 **A. I don't recall the percentage at East Bay. I**
 3 **recall that at Cat Point and Dry Bar it was a**
 4 **very small fraction. It was probably on the**
 5 **order of 1 to 3 percent. But I don't recall if**
 6 **that was also the case at East Bay or not.**
 7 **Q.** So, Dr. McAnally, if you would, I would like you
 8 to turn in your testimony to page 12, which is
 9 your demonstrative Exhibit 4. That's tab 1 in
 10 your binder, if you want to use that, or you can
 11 use --
 12 **A. Okay. Tab 5?**
 13 **Q.** Tab 1, page 12.
 14 Are you with me?
 15 **A. I am.**
 16 **Q.** Okay. And this page shows a comparison between
 17 your baseline 2011 consumption scenario and the
 18 proposed 1,000 cubic feet per second remedy.
 19 Right?
 20 **A. It shows a comparison of -- it says salinity**
 21 **changes between the baseline 2011 versus the**
 22 **conservation scenario was 1,000 cfs.**
 23 **Q.** And it's correct, is it not, that the colored
 24 portions of the map indicate the salinity
 25 changes. True?

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1 Right?
 2 **A. My model showed what changes would occur in**
 3 **salinities as a result of differences in those**
 4 **flows that Dr. Bedient provided.**
 5 **Q.** But you didn't do any independent analysis of
 6 Dr. Bedient's flow scenarios. Correct?
 7 **A. I did not.**
 8 **Q.** And you never spoke with Dr. Bedient about how he
 9 conducted his work. Right?
 10 **A. I did not.**
 11 **Q.** You just modeled the scenarios that counsel for
 12 Georgia gave you. Correct?
 13 **A. I modeled the scenarios that Dr. Bedient provided**
 14 **in his spreadsheets.**
 15 **Q.** Which were provided to you by counsel for
 16 Georgia. Right?
 17 **A. I believe that's the case, yes.**
 18 **Q.** And are you aware, Dr. McAnally, that Dr. Bedient
 19 has testified that all his scenarios relied on
 20 data he received from Wei Zeng, who works for the
 21 Georgia EPD?
 22 **A. I am not aware.**
 23 **Q.** Okay. And so you're not aware then that
 24 Dr. Bedient testified that he did not look at
 25 Georgia Tech's criticism of the UIF assessment

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1 report. Is that right?

2 **A. I'm not aware of that discussion.**

3 **Q.** And you have no basis to know how that criticism

4 would affect Dr. Bedient's scenarios. Right?

5 **A. I do not.**

6 **Q.** You just took the scenarios that Dr. Bedient gave

7 you at face value. Correct?

8 **A. I took the flows that Dr. Bedient provided and**

9 **ran them in my model.**

10 **Q.** And then -- so Dr. Bedient also provided you with

11 a -- or one of the scenarios provided was a 2011

12 baseline scenario. Right?

13 **A. That's correct.**

14 **Q.** And you used that baseline as a comparison for

15 the changes in your flow scenarios; isn't that

16 true?

17 **A. I used that as the baseline or the comparison**

18 **point between the -- that and the other three**

19 **scenarios.**

20 **Q.** And you're also aware that 2012 was a drought

21 year. Right?

22 **A. I'm aware of that.**

23 **Q.** As was 2011. Right?

24 **A. Correct.**

25 **Q.** In fact, are you aware that 2012 was a -- was

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1 more impactful in terms of the dry year than was

2 2011?

3 **A. I don't recall the specific measures of degree of**

4 **drought for those two years, but I do know that**

5 **they were both low flow years.**

6 **Q.** But you didn't model salinity based on the 2012

7 Apalachicola riverflow; did you?

8 **A. I did in the -- in the data model. In the**

9 **physics-based numerical model, I stopped at 2011**

10 **because that was the -- at the time I was running**

11 **it, that was all that Dr. Bedient had generated.**

12 **Q.** He didn't provide you with a 2012 scenario.

13 Correct?

14 **A. Not before I completed my report.**

15 **Q.** And you're also familiar that Dr. Greenblatt ran

16 something called an unimpacted scenario which

17 assumed no withdrawals of water in the Georgia

18 portion of the basin. Right?

19 **A. I'm aware that she had a scenario that she called**

20 **no withdrawals.**

21 **Q.** And you aren't offering opinion, are you,

22 Dr. McAnally, on the change in salinity levels

23 based on an unimpacted scenario where there is no

24 Georgia consumptive use. Right?

25 **A. I'm not offering an opinion on that.**

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1 **Q.** But as you have agreed, upstream consumptive uses

2 can result in lower discharges. Right?

3 **A. As a general statement, upstream consumptive uses**

4 **do usually produce downstream flows that are**

5 **smaller.**

6 **Q.** That's an obvious fact; is it not?

7 **A. It is, provided you include that remark about as**

8 **a general matter. I have dealt with some cases**

9 **in which the -- that are not the general matter.**

10 **And things can behave in unpredicted ways.**

11 **Q.** And continuing with Dr. Greenblatt's opinion,

12 one of the things you criticized about

13 Dr. Greenblatt's opinion was that she did not

14 include uncertainty bounds for her model results.

15 Correct?

16 **A. That's correct.**

17 **Q.** And you testified that uncertainty bounds

18 analyses are common in these types of studies,

19 and the omission is a serious deficiency. Right?

20 **A. Could you repeat that?**

21 **Q.** I believe you testified, sir, that uncertainty

22 bounds analysis are -- is common in these types

23 of studies; and the omission by Dr. Greenblatt is

24 a serious deficiency. Right?

25 **A. I did say that, yes. And I believe it.**

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1 **Q.** You're aware that Dr. Greenblatt ran a

2 hydrodynamic model in this case. Right?

3 **A. She ran a hydrodynamic model as well?**

4 **Q.** As part of her opinion in this case, she ran a

5 hydrodynamic model?

6 **A. Yes, she did.**

7 **Q.** Which was similar to your physics-based model.

8 Right?

9 **A. Correct.**

10 **Q.** Now, Dr. McAnally, if you would, please, I would

11 ask you to turn in your binder to tab 5. That's

12 FX-922. And this is a document titled

13 Uncertainty Analysis of Estuarine Hydrodynamic

14 Models: An Evaluation of Input Data Uncertainty

15 in the Weeks Bay Estuary, Alabama. Do you

16 recognize this document?

17 **A. I do.**

18 **Q.** And it's from 2014. Correct?

19 **A. That's correct.**

20 **Q.** And you are listed as a co-author of that.

21 Right?

22 **A. That's correct.**

23 **Q.** Now, if you would, please, look at the bottom

24 paragraph in the right-hand corner which starts

25 with the word despite. Do you see that?

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1 **A. Yes.**

2 **Q.** Take a moment and read that.

3 **A. Yes.**

4 **Q.** So are you -- have you had a chance to review

5 that, sir?

6 **A. I have.**

7 **Q.** So based on this paragraph, despite its

8 importance, your paper says that uncertainty

9 analysis is an uncommon practice in hydrodynamic

10 investigations. Right?

11 **A. In -- yes. That's what it says. And in 2013**

12 **when this paper was written, that was, indeed,**

13 **the case.**

14 **Q.** Thank you, Dr. McAnally.

15 I would like to move on to a new topic.

16 It's your opinion, is it not, that sea level is

17 rising in Apalachicola Bay. Right?

18 **A. It's my opinion that sea level is rising in**

19 **Apalachicola Bay.**

20 **Q.** And you have also offered an opinion that sea

21 level rise has increased salinity in Apalachicola

22 Bay since at least 2002. Correct?

23 **A. That is correct.**

24 **Q.** And to evaluate the effects of sea level rise in

25 the future on Apalachicola Bay, you used your

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1 model to simulate a sea level rise of

2 approximately .26 meters or 10 inches by 2040.

3 True?

4 **A. That's correct also.**

5 **Q.** And that was -- that 10 inches was from a 1992

6 baseline. Correct?

7 **A. That is correct.**

8 **Q.** Now, it's Georgia's position in this case,

9 Dr. McAnally, that this sea level rise is being

10 caused by global climate change. Right?

11 **A. I'm sorry. I don't know what -- how Georgia**

12 **feels on it. It's my opinion that sea level rise**

13 **is -- in Apalachicola Bay is caused primarily by**

14 **climate change.**

15 **Q.** Okay. So you believe global climate change is

16 the driver for the increased sea level that you

17 discuss in your opinion. Correct?

18 **A. I do.**

19 **Q.** But you're not a climatologist, are you,

20 Dr. McAnally?

21 **A. I am not.**

22 **Q.** And you're not offering an opinion in this case

23 about climate change; are you?

24 **A. In this case I'm offering an opinion about sea**

25 **level rise, which is a product of climate change.**

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1 **And to the extent that I can read and understand**

2 **the literature on climate, I have -- do believe**

3 **that climate change is occurring, has occurred,**

4 **and will occur in the future.**

5 **Q.** Okay. And, Dr. McAnally, if you would, I would

6 ask you to turn to tab 3 of your binder, which is

7 a copy of your deposition transcript. If you

8 would, sir, please turn to page 61, lines 12

9 through 61 -- I'm sorry. Starting at line 12 --

10 61, line 12, through 61, 15.

11 Are you with me?

12 **A. Page 61, line 12.**

13 **Q.** Right. And that states, and just going back to

14 your areas of expertise, do you consider yourself

15 an expert in climate change?

16 Answer. I do not.

17 Did I read that correctly?

18 **A. That is correct.**

19 MS. DeSANTIS: Objection, incomplete

20 impeachment. Could the witness please be

21 directed to look at surrounding lines?

22 BY MR. LEOPOLD:

23 **Q.** Sir, would you like to look at surrounding lines

24 of the testimony, Dr. McAnally?

25 **A. Just that I went on to explain that what I have**

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1 **actually said earlier, I think, is that while I**

2 **don't consider myself an expert in climate**

3 **change, I do consider myself expert in sea level**

4 **rise that is caused by climate change.**

5 **Q.** Thank you.

6 **A. Is that -- does that answer your question, sir?**

7 **Q.** I'll move on. Thank you.

8 So if you would, please, turn in your binder

9 to tab 6. And this is FX-339. And my first --

10 are you -- sorry. Are you with me, Dr. McAnally?

11 **A. And what page?**

12 **Q.** Just starting on the first page of tab 6.

13 **A. All right.**

14 **Q.** And do you recognize this document, sir?

15 **A. I believe I do.**

16 **Q.** And this is a chapter, chapter 13, from the

17 IPCC's fifth assessment report, which you cite in

18 your testimony. Correct?

19 **A. It appears to be that, yes, sir.**

20 **Q.** And just for the record, Dr. McAnally, the IPCC

21 is the Intergovernmental Panel on Climate Change

22 which was set up through the United Nations.

23 Right?

24 **A. I believe that's correct.**

25 **Q.** And you're familiar with the IPCC; aren't you?

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1 **A. I have been following their reports for a number**
2 **of years; yes, sir.**
3 **Q.** And you're aware, Dr. McAnally, that it's been
4 regarded by NOAA, the federal government agency,
5 as the most senior and authoritative body
6 providing science advice to global policymakers.
7 Right?
8 **A. I don't guess I have any personal knowledge of**
9 **what NOAA says about the IPCC. There are several**
10 **hundred NOAA scientists that have worked on the**
11 **IPCC. And I do know that in their reports, NOAA**
12 **uses IPCC's data and methods. But as far as an**
13 **official policy, I'm afraid I'm unable to**
14 **comment.**
15 **Q.** Okay. If you would turn in your binder to tab 7,
16 please, sir, which is FX-935. Are you there?
17 **A. I'm there.**
18 **Q.** Take a moment to review it. And I would like to
19 invite your attention, sir, to the second
20 paragraph from the bottom, which begins
21 internationally.
22 **A. I see that.**
23 **Q.** Do you see that?
24 And that -- that's -- you would agree with me
25 that this web page is from NOAA's climate data

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1 **Q.** All right. I would like to focus your attention,
2 if I may, to the four graphs at the top of the
3 page under the section sub(a). Do you see that?
4 **A. I see that.**
5 **Q.** And you have seen this before, correct,
6 Dr. McAnally?
7 **A. I believe I have.**
8 **Q.** And you would agree with me that this is the
9 IPCC's likely range of global mean sea level rise
10 as shown through the gray-shaded bands around the
11 black line. Correct?
12 **A. That's correct. And it's shown for various**
13 **stages.**
14 **Q.** Right. And the stages -- you mentioned there's
15 four different scenarios here. Correct?
16 **A. Correct.**
17 **Q.** And those scenarios are called RCP's, or
18 representative concentration pathways?
19 **A. Correct.**
20 **Q.** And would you agree with me that the different
21 scenarios consider future sea level rise from
22 more conservative to more aggressive. Correct?
23 **A. That is the intent.**
24 **Q.** Right. Now, if you would, sir, please turn in
25 your binder to tab 8. And this is McAnally

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1 center?
2 **A. Yes.**
3 **Q.** Okay. But you did not draw on your sea level
4 rise projections from the IPCC in this case.
5 Correct?
6 **A. I'm sorry. Please repeat that.**
7 **Q.** You did not draw your future sea level rise
8 predictions from the IPCC in your opinion for
9 this case. Correct?
10 **A. Indirectly, yes, sir, I did, because the NOAA and**
11 **Corps of Engineers protections are based on the**
12 **IPCC data and methods.**
13 **Q.** It's -- so as you have testified, you used a
14 planning tool from the Army Corps of Engineers.
15 Right?
16 **A. Army Corps of Engineers and NOAA.**
17 **Q.** Okay. So I would like to invite your attention
18 back to tab 6 of your binder, which is the IPCC
19 document, sir. And at this time if you would
20 turn to page 1181.
21 **A. I'm there.**
22 **Q.** Okay.
23 MR. LEOPOLD: Mr. Walton, if you could
24 bring that up.
25 BY MR. LEOPOLD:

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1 demonstrative Exhibit 1.
2 Now, Dr. McAnally, this is the same page or
3 for the same four scenarios that I just showed
4 you from the IPCC. However, on this one, we have
5 plotted your sea level rise future projections
6 with the red data point, which was .26 meters or
7 10 inches of rise by 2040. Do you see that?
8 **A. I see that.**
9 **Q.** Okay. And as you can see, Dr. McAnally, your
10 prediction is in excess of the gray bands on each
11 of these scenarios. Correct?
12 **A. Sir, by presenting this plot, you have committed**
13 **a fairly bad error. These plots used by the IPCC**
14 **are for global average sea levels. They -- those**
15 **then must be turned into site specific estimates,**
16 **which is what the Army Corps of Engineers and**
17 **NOAA does. And they have done -- taken these**
18 **results and applied them to the standard methods**
19 **to Apalachicola Bay specifically. And that .26**
20 **meters or 10 inches is in the middle of how they**
21 **have applied these results to the specifics of**
22 **Apalachicola Bay, which are different than the**
23 **worldwide averages.**
24 **Q.** So is it your testimony, Dr. McAnally, then that
25 the sea level rise in the future in Apalachicola

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1 Bay is going to exceed the worldwide average? Is
 2 that your testimony?
 3 **A. I don't know what the worldwide average will be.**
 4 **I strongly believe that the worldwide average**
 5 **will be higher than the 2000 -- the 2013 IPCC**
 6 **projections. But the -- as those were used,**
 7 **these 2013 projections that we're looking at**
 8 **here, were the ones that were used by the Corps**
 9 **and NOAA to generate the authoritative results to**
 10 **be used in the United States.**
 11 **Q.** Right. And your point that you selected exceeded
 12 even RCP 8.5, which is the most aggressive sea
 13 level rise scenario that the IPCC used in this
 14 chart. Right?
 15 **A. I believe I have already pointed out that you're**
 16 **making a serious error by --**
 17 **Q.** And, sir --
 18 **A. -- making such a statement.**
 19 **Q.** -- I'll let your counsel -- I'm sure your counsel
 20 will get to that when you're doing your redirect;
 21 but for now, I would just like to try to get
 22 through the questions.
 23 And you testified a moment ago you're not a
 24 climatologist. Right, Dr. McAnally?
 25 **A. That I'm not a what?**

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1 **Q.** A climatologist.
 2 **A. That's correct.**
 3 **Q.** And you're not offering an opinion on future
 4 climate change. Correct?
 5 **A. I am not offering it in this case.**
 6 **Q.** But you testified in your direct testimony, sir,
 7 that there will be a greater level of sea level
 8 rise from glaciers in the Greenland ice sheet.
 9 Do you recall making that statement?
 10 **A. I do.**
 11 **Q.** But you, yourself, do not have any expertise with
 12 Greenland ice sheet melting. Correct?
 13 **A. You seem to be mistaking the -- or**
 14 **misunderstanding the various disciplines.**
 15 **Greenland ice sheet melting is a geophysical**
 16 **process and is included in oceanography. And**
 17 **climatology affects that, but the actual melting**
 18 **of the land-based glaciers is part of coastal**
 19 **engineering and oceanography.**
 20 **Q.** So my question was do you have any personal
 21 expertise with Greenland ice sheet melting?
 22 **A. I would not attempt to do an independent research**
 23 **on Greenland or West Antarctic ice sheet melting.**
 24 **However, once again, I do have a reading**
 25 **familiarity with the professional literature in**

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1 **those areas; and I believe I'm capable of reading**
 2 **and evaluating that literature.**
 3 **Q.** So you haven't done any climate modeling
 4 yourself. Correct?
 5 **A. I have not.**
 6 **Q.** Now, sir, moving on, you opine in your direct
 7 testimony that sea level rose about 3 inches from
 8 2002 to 2014 in Apalachicola Bay. Right?
 9 **A. That's correct.**
 10 **Q.** And when you were asked about that opinion at
 11 your deposition, you couldn't recall how you
 12 arrived at the 3-inch sea level rise. Do you
 13 remember that?
 14 **A. Actually, I don't. But I do recall because I**
 15 **have re-examined my report, perhaps in response**
 16 **to that question.**
 17 **Q.** And you have offered that opinion again in your
 18 direct testimony. Right?
 19 **A. That's correct.**
 20 **Q.** But your prefiled direct testimony doesn't
 21 provide any citation for your determination that
 22 sea level rise has risen 3 inches in 12 years in
 23 Apalachicola. Right?
 24 **A. It cites my original expert report, particularly**
 25 **appendix C. And that's where the 3- inch rise**

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1 **was calculated.**
 2 **Q.** So if you would, please, sir, turn in your direct
 3 testimony, which, again, is tab 1 in your binder,
 4 to page 24; and I would like to focus your
 5 attention to paragraph 49.
 6 **A. I'm at page 24.**
 7 **Q.** Okay. And paragraph 49 is where you authored
 8 this opinion. Right?
 9 **A. Correct.**
 10 **Q.** And, sir, my question is it doesn't offer any
 11 citation to the data that you relied upon to
 12 offer this opinion. Correct?
 13 **A. I'm sorry. Are you complaining that I don't**
 14 **offer a citation in this paragraph?**
 15 **Is that your question or --**
 16 **Q.** My question, Dr. McAnally, is simply you haven't
 17 cited to the basis for your opinion that sea
 18 level rise rose 3 inches in 12 years. Correct?
 19 **A. It does not -- okay. That's part of my confusion**
 20 **here. It says, the statistical analyses of**
 21 **observed data show that. And that is my**
 22 **citation. And that is what occurred in, I**
 23 **believe it was appendix C of my original**
 24 **technical report.**
 25 **So it doesn't cite an external source; it**

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1 **cites my own work. Is that what you mean?**

2 **Q.** All right, Dr. McAnally. So if you would, turn

3 with me to tab 9 of your binder, please. And

4 this is simply a conversion chart which we have

5 to help us with some mathematical calculations.

6 This is demonstrative Exhibit 2.

7 And you agree with me, sir, would you not,

8 that the top line shows that 1 inch equals 2.5

9 centimeters. Right?

10 **A. That is, indeed, what it says.**

11 **Q.** And you agree with that conversion?

12 **A. Yes, sir. It's -- that's slightly rounded; but**

13 **it is correct.**

14 **Q.** Approximate?

15 So -- and you would also agree 25 centimeters

16 is 25 millimeters. Correct?

17 **A. 25 centimeters is not 25 millimeters; no, sir.**

18 **Q.** I'm sorry. I apologize. 2.5 centimeters

19 converts to 25 millimeters. Correct?

20 **A. Yes, sir.**

21 **Q.** And so you would agree with me then that 3 inches

22 is approximately 75 millimeters. Correct?

23 **A. That's correct.**

24 **Q.** And you would also agree that 2002 through 2014

25 is 13 years if it's -- if you include all the

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1 years. Correct?

2 **A. Okay.**

3 **Q.** And so if you -- if you divide 75 by 13, that's

4 approximately 5.8. Do you agree with that math;

5 or I can give you a calculator to -- if you would

6 like to do it yourself.

7 **A. I'll take your word for it.**

8 **Q.** Okay. So a 3-inch sea level change from 2002 to

9 2014 would result in a rate of rise of

10 approximately 5.8 millimeters per year. Correct?

11 **A. I can't -- I can't confirm that calculation. But**

12 **if you wish to say so, then I'll accept it.**

13 **Q.** Well, I just divided 75 millimeters, which is 3

14 inches; right?

15 And dividing that by 13, which is the years

16 that you looked at from 2002 to 2014, that yields

17 a rate -- a rise rate of 5.8 millimeters per

18 year. Correct?

19 **A. Again, I'll take your word for it.**

20 **Q.** But you would agree with me, Dr. McAnally, would

21 you not, that the gage at Apalachicola only shows

22 an observed rate of sea level rise of 1.96

23 millimeters per year. Correct?

24 **A. No, sir; that's not correct.**

25 **Q.** So if you would, sir, please turn in your direct

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1 testimony to page 35. And, again, that's tab 1

2 of your binder.

3 Are you with me, sir?

4 **A. I'm with you.**

5 **Q.** Okay. And this is your demonstrative Exhibit 13.

6 Correct?

7 **A. It is.**

8 **Q.** And specifically, if you look at the bar on the

9 right-hand side, you can see the median rate for

10 sea level rise observed at the tide gage is 1.96

11 millimeters per year. Correct?

12 **A. That is the number on this chart. However, it is**

13 **not directly comparable to the number that we --**

14 **you just calculated.**

15 **Q.** Okay. And so your assertion that sea level rise

16 rose 3 inches over 2002 to 2014 would require a

17 rate of sea level rise that is approximately

18 triple of what this NOAA tide gage suggests.

19 Right?

20 **A. First of all, it's not a triple; it's more like a**

21 **double. But on any trend it's dependent on the**

22 **period of record. And so in the case of the 2015**

23 **figure here, they're using a long-term average**

24 **number, 19 years, sometimes longer, and factoring**

25 **in all of the preceding data. And so rather than**

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1 **taking a specific period, like I did, from 2002**

2 **to 2014, they are taking a very long-term average**

3 **of hourly measurements. So the numbers, again,**

4 **are not directly comparable.**

5 **Q.** So you would agree with me then your rate of rise

6 that you calculated is almost, not quite, three

7 times the long-term average observed at the tide

8 gage?

9 MS. DeSANTIS: Objection, asked and

10 answered and misstating the witness's

11 testimony that he just gave.

12 MR. LEOPOLD: Can he answer, your Honor?

13 SPECIAL MASTER LANCASTER: Can he?

14 I don't know.

15 MR. LEOPOLD: All right.

16 BY MR. LEOPOLD:

17 **Q.** Dr. McAnally, you would agree with me, would you

18 not, that the rate of rise that I presented, a

19 5.8 millimeters, is almost three times 1.96.

20 Correct?

21 MS. DeSANTIS: Same objection.

22 **A. I agree that if you compare apples and oranges,**

23 **you will get a different result.**

24 **Q.** Now, if you would, sir, please turn in your

25 binder to tab 10.

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1 **A. Tab 2?**
 2 **Q.** Tab 10 of the binder, which is Joint Exhibit 61.
 3 All right. And this is a report by NOAA
 4 discussing sea level rise. Correct?
 5 **A. It is.**
 6 **Q.** And you're familiar with this document as well;
 7 aren't you?
 8 **A. I believe so.**
 9 **Q.** I would like to invite your attention to page 6
 10 of the document. Are you there?
 11 **A. Page 6?**
 12 **Q.** Yes. And in the second sentence, NOAA also
 13 reports a rate of sea level rise of 3.2
 14 millimeters per year. Do you see that?
 15 **A. I see that.**
 16 **Q.** And you're familiar with that as well. Correct?
 17 **A. I'm not specifically familiar with this**
 18 **paragraph. It's been awhile since I have looked**
 19 **at this.**
 20 **Q.** But you would agree with me that that reported
 21 rate in the NOAA document I'm showing you is
 22 almost double -- or, excuse me. You would agree
 23 with me the 5.8 which we discussed earlier is
 24 almost double this rate. Right?
 25 **A. Sir, in my age it is many times larger than 3**
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1 **inches; but it has just about as much relevance**
 2 **to the discussion we're having as that number**
 3 **right there.**
 4 **As I told you, these were calculated by two**
 5 **very different methods; and they're based on**
 6 **different ways of treating the data. And so,**
 7 **therefore, they should not be comparable. I**
 8 **would be astonished if they were the same.**
 9 **Q.** Right. I would like to move on to a new topic,
 10 Dr. McAnally, and specifically discuss your
 11 physics-based model with regard to sea level
 12 rise. Okay?
 13 So you tried to predict in your opinion what
 14 would happen to salinity in Apalachicola Bay
 15 under various changes in sea level conditions in
 16 the future. Is that right?
 17 **A. I did.**
 18 **Q.** And you first ran the model with a base condition
 19 for current sea level. Correct?
 20 **A. I did.**
 21 **Q.** And you also ran it with a value of sea level
 22 rise imposed on that base scenario. Right?
 23 **A. I believe that's -- you stated that correctly.**
 24 **Q.** And then you modeled the effects of that same
 25 amount of sea level rise and the effects from the
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1 narrowing of the two easternmost passes based on
 2 Dr. Douglass, Florida's expert's report.
 3 Correct?
 4 **A. That's correct.**
 5 **Q.** And the value of sea level rise I used simply
 6 means that in your future projections, you raised
 7 the mean water level in the Gulf of Mexico by the
 8 amount that you say sea level rise will have
 9 increased. Correct?
 10 **A. We raised the Gulf elevation by the amount that**
 11 **we were testing.**
 12 **Q.** And your -- Dr. McAnally, you're also familiar
 13 with the field of geomorphology. Right?
 14 **A. I am.**
 15 **Q.** And you're familiar with something called
 16 sedimentation; right?
 17 **A. I am.**
 18 **Q.** Now, the Court hasn't heard any testimony on
 19 these topics yet; so I want to ask you a couple
 20 of foundational questions. Okay?
 21 **A. Okay.**
 22 **Q.** And in this case, geomorphology refers to the
 23 study of the shape of Apalachicola Bay. True?
 24 **A. I think that's an oversimplification, but I'll**
 25 **take it.**
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1 **Q.** Okay. I'll ask more detailed questions as we
 2 move forward.
 3 And sedimentation is essentially the deposit
 4 of sand and other sediment in the bay. Correct?
 5 **A. Sedimentation is the deposition of sand, silts,**
 6 **and clay sizes as well as organic material in a**
 7 **water body.**
 8 **Q.** And you would agree that the geomorphology of the
 9 bay can be affected by sedimentation. Right?
 10 **A. It can be, yes.**
 11 **Q.** And you would also agree that sedimentation can
 12 change the depths of the bay. Correct?
 13 **A. It can.**
 14 **Q.** And you would also agree in general other forces
 15 like sand washing into inlets to the bay due to
 16 wave action can change the depth of the inlet.
 17 Right.
 18 **A. It can.**
 19 **Q.** Now, you have acknowledged that your model
 20 simulations do not account for all the responses
 21 of the bay to sea level rise. Correct?
 22 **A. The physics-based model does not respond to --**
 23 **does not include all of the various effects of**
 24 **sea level rise.**
 25 **Q.** For example, your model does not assume any
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1 changes to the depth of the bay. Right?

2 **A. It does not.**

3 **Q.** And it assumes no changes to the size of the --

4 to the depth of the inlets. Correct?

5 **A. It considers only the width of the inlet**

6 **changing, not the depth.**

7 **Q.** So -- right. So you did perform a scenario where

8 you decreased the width of the -- of two of the

9 inlets to Apalachicola Bay. Correct?

10 **A. That's correct.**

11 **Q.** That was East Pass and Dog Island, which are the

12 two easternmost inlets to the bay. Right?

13 **A. That's correct.**

14 **Q.** So in that model run, you attempted to account

15 for this particular geomorphic change. Right?

16 **A. I did account for that particular geomorphic**

17 **change to evaluate in a stand-alone mode how it**

18 **would affect salinity in Apalachicola Bay.**

19 **Q.** So you ran the same amount of sea level rise in

20 this scenario, which was 10 inches; but this time

21 you narrowed the inlets. Right?

22 **A. That's correct.**

23 **Q.** And you would agree with me that narrowing of the

24 inlets, in fact, can result in lower salinities

25 compared to the nonnarrowing of the inlet

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1 **A. I'm sorry. I -- I don't see those words.**

2 **Q.** On the left-hand column. And we're on -- you're

3 on page 29. Correct?

4 **A. Oh, I'm sorry. I'm on the table.**

5 **Yes, sir. I'm sorry. I'm now on page 29.**

6 **Q.** Okay. And you will see on the screen we have

7 highlighted the Mid-Bay and St. George Sound

8 columns or rows.

9 **A. Uh-huh.**

10 **Q.** And you would agree with me that in the pass

11 narrowing scenario, both of those showed a .1

12 reduction. Right?

13 **A. Oh, I see what you're saying. You're saying that**

14 **the Mid-Bay line and the St. George Sound show a**

15 **.1 change in salinity.**

16 **Q.** Isn't that correct?

17 **A. That's correct.**

18 **Q.** A reduction from salinity?

19 **A. That's correct.**

20 **Q.** And, sir, isn't it true that the salinities

21 you're reporting here are average annual

22 salinities?

23 **A. They are.**

24 **Q.** And you didn't present in your report or your

25 opinion monthly or weekly average salinities; did

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1 scenario. Right?

2 **A. No, sir. I could not agree with that.**

3 **Q.** Well, didn't you find that it actually did in

4 that model run that we just discussed?

5 **A. The -- that model run that we just discussed, the**

6 **changes were so slight as to be within -- well**

7 **within the noise level of the model.**

8 **Q.** Okay. If you would turn to page 29 of your

9 direct testimony, sir. That's McAnally

10 demonstrative 12. Are you with me?

11 **A. Not yet.**

12 **Okay. I'm on page 12.**

13 **Q.** Okay. And I would like to invite your attention

14 to -- well, first of all, Dr. McAnally, this is

15 the comparison of the two scenarios we have just

16 been discussing, one with no geomorphic change

17 and the other with the passes narrowed as we

18 discussed. Right?

19 **A. It does.**

20 **Q.** And I would like to invite your attention to the

21 Mid-Bay and St. George Sound lines. Do you see

22 that?

23 **A. I'm sorry. I couldn't hear that.**

24 **Q.** The lines on the chart that say Mid-Bay and

25 St. George Sound, do you see those?

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1 you?

2 **A. In my report I did not include the weekly. I**

3 **believe I included some monthly. But the monthly**

4 **and the seasonal were essentially the same.**

5 **Q.** And your model, again, moving on from this chart,

6 sir, assumes no raising of the bottom of

7 Apalachicola Bay over time. Right?

8 **A. That's correct.**

9 **Q.** And so other than the one example we have

10 discussed where the passes were narrowed, you

11 have essentially increased the depths of the

12 inlets by raising the water levels of the Gulf of

13 Mexico. Right?

14 **A. Yes, sir. That's what will happen. If you raise**

15 **the water level, the inlets will get deeper.**

16 **Q.** And that would result in an increased volume of

17 seawater entering the bay. Right?

18 **A. Not necessarily.**

19 **Q.** Didn't you testify, sir, that the salinity in

20 Apalachicola Bay is a mix of the freshwater

21 discharge from the Apalachicola River and the

22 seawater entering the five passes in the barrier

23 islands in Apalachicola Bay?

24 **A. The -- as I believe I said in my testimony, the**

25 **level of salinity at a location in Apalachicola**

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1 **Bay is a result of the opposing forces of sea**
 2 **level stand and freshwater flow. Tides can make**
 3 **that bounce around a little bit, but basically**
 4 **it's between those two opposing forces.**
 5 **Q.** Right. And all else being equal, if you raise
 6 the level of the Gulf of Mexico, that would mean
 7 more saltwater is entering into the bay. Right?
 8 **A. If all else being equal, raising the Gulf level**
 9 **will increase salinities at a location -- any**
 10 **given location in Apalachicola Bay.**
 11 **Q.** But you did not take into account whether the
 12 bottom of those inlets will also rise over time;
 13 did you?
 14 **A. I considered it. And based on my knowledge of**
 15 **the physics involved and my experience elsewhere,**
 16 **particularly in Louisiana, that it would not have**
 17 **a noticeable effect on propagation of tides or**
 18 **salinity in Apalachicola Bay.**
 19 **Q.** But you're not offering an opinion here on
 20 geomorphology; are you?
 21 **A. Yes, I guess I am.**
 22 **Q.** Okay. If you would, please, sir, turn in your
 23 binder to tab 3, which is your deposition
 24 transcript.
 25 **A. Okay.**

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1 **Q.** And if you would turn to page 325, and I would
 2 like to focus your attention to lines 18 to 22.
 3 **A. I'm on 325.**
 4 **Q.** Okay. Line 18 through line 22, do you see that?
 5 **A. I see it.**
 6 **Q.** You testified under oath that you were not
 7 offering an opinion on the coastal geomorphology.
 8 Correct?
 9 **A. No, sir. That's not what I said.**
 10 **Q.** Doesn't it say, sir, you are offering an opinion
 11 here today on the analysis that Dr. Douglass did
 12 with respect to the geo -- coastal geomorphology
 13 of the barrier islands in Apalachicola Bay?
 14 Answer. I am not?
 15 **A. I did not offer then and I'm not offering now an**
 16 **opinion on Dr. Douglass's analysis on**
 17 **geomorphology.**
 18 **Q.** And, likewise, you have not offered an opinion on
 19 the rates of sedimentation in Apalachicola Bay.
 20 Correct?
 21 **A. I'm trying to recall. I don't believe my report**
 22 **said anything about it. But in my direct**
 23 **testimony, I believe I did offer an opinion on**
 24 **sedimentation in the bay.**
 25 **Q.** And my question was you didn't offer an opinion

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1 on the rate of sedimentation. Correct?
 2 **A. I don't recall estimating a rate.**
 3 **Q.** And you did not model sedimentation for
 4 Apalachicola Bay. Correct?
 5 **A. I chose not to model sedimentation in**
 6 **Apalachicola Bay because I had found in previous**
 7 **instances that it was not a significant factor.**
 8 **Q.** Okay. And, sir, you're aware that sedimentation
 9 rates for Apalachicola Bay have been published.
 10 Correct?
 11 **A. I have -- I have read reports that report on**
 12 **average rates, yes.**
 13 **Q.** Okay. And you're aware of one rate of up to 8
 14 millimeters per year. Correct?
 15 **A. I'm aware that in 19 -- early 1990's that such an**
 16 **estimate was published.**
 17 **Q.** And you're aware that Dr. Greenblatt reports that
 18 rate of sedimentation in her opinion, right, as
 19 well as Dr. Douglass?
 20 **A. I don't recall Dr. Douglass offering that number.**
 21 **But I -- I do recall Dr. Greenblatt offering**
 22 **that number, which I discounted because, No. 1,**
 23 **it's -- it was 20 years ago and then was based on**
 24 **data from years before that. So it was too old**
 25 **to be useful.**

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1 **Q.** And, yet -- sir, you will get a chance to expand
 2 on your opinion in redirect.
 3 And Dr. Douglass, he did opine on the effects
 4 of sedimentation on salinity levels in the bay.
 5 Correct?
 6 **A. Doctor -- both Dr. Douglass and Dr. Greenblatt**
 7 **speculated on the effect of sedimentation. I**
 8 **don't believe that speculation was based on the**
 9 **evidence that I have in my experience. So,**
 10 **therefore, I don't believe they were correct.**
 11 **Q.** Thank you. So, Dr. McAnally, you have offered an
 12 opinion that sea level rise is accelerating in
 13 Apalachicola Bay. Correct?
 14 **A. I have.**
 15 **Q.** And in reaching that opinion, you considered a
 16 number of sources. Right?
 17 **A. I did.**
 18 **Q.** And one of those sources you considered is the
 19 data from the tide gage at Apalachicola Bay,
 20 which is maintained by NOAA. Right?
 21 **A. It is -- I believe it's maintained by NOAA. It**
 22 **is the tide gage there, yes.**
 23 **Q.** And, in fact, you included the chart, which we
 24 discussed earlier, in your direct testimony
 25 showing this data. Right?

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1 **A. I did.**
 2 **Q.** And if you would turn again in your prefiled
 3 testimony to page 35. That's tab 1 in the
 4 binder, page 35.
 5 **A. I see it.**
 6 **Q.** Are you with me?
 7 And, now, if I could -- this is the tide gage
 8 chart that you cited. Correct?
 9 **A. This is the mean sea level rise chart.**
 10 **Q.** Okay. And if you would, turn back just briefly
 11 to page 34. And I would like to invite your
 12 attention to paragraph 77 of your testimony.
 13 **A. Yes.**
 14 **Q.** And you state in the last sentence that this
 15 demonstrative exhibit clearly shows that sea
 16 level rise in Apalachicola accelerated from 1.38
 17 millimeters per year prior to 2006 to 1.96
 18 millimeters per year in 2015 --
 19 **A. I see that.**
 20 **Q.** -- right?
 21 And, now, Dr. McAnally, the image on page 35
 22 of your testimony was taken from NOAA's website.
 23 Right?
 24 **A. That's correct.**
 25 **Q.** And so if you would, please, sir, turn in your
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1 **Q.** So the sentence immediately after the graph
 2 reads, although the mean trend may change from
 3 year to year, there is no statistically
 4 significant difference between the calculated
 5 trends if their 59 percent confidence intervals
 6 overlap.
 7 Is that -- did I read that correctly?
 8 **A. That is what it says.**
 9 **Q.** Okay. And you were aware of that language when
 10 you included this chart in your prefiled
 11 testimony. Correct?
 12 **A. I was.**
 13 **Q.** Now, if you would, please, sir, turn to page 2 of
 14 tab 15.
 15 **A. Of tab 15?**
 16 **Q.** Same tab, just the second page. It's the same
 17 demonstrative exhibit.
 18 **A. Oh, I see. It's the back of it.**
 19 **Q.** The back of the page.
 20 Are you with me?
 21 **A. Yes, sir. I see it.**
 22 **Q.** Now, on page 2 we have highlighted the confidence
 23 intervals in the shaded green.
 24 **A. I see that.**
 25 **Q.** And you would agree that the vertical bar on the
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1 binder to tab 14. And that's FX-923.
 2 **A. I'm at tab 14.**
 3 **Q.** Okay. Now, what we have done here is we have
 4 reproduced the same image, but it includes the
 5 rest of the web page from which it was taken. Do
 6 you agree?
 7 **A. That's what it appears to be, yes.**
 8 **Q.** And, sir, have you had a minute to review it?
 9 **A. I see it.**
 10 **Q.** Just to be clear, the word acceleration does not
 11 appear in the text on NOAA's web page. Right?
 12 **A. I don't believe the word acceleration appears on**
 13 **this page.**
 14 **Q.** And I want to focus your attention to the text at
 15 the bottom of the page. Do you see the sentence
 16 that begins, although the mean trend may
 17 change -- do you see that sentence?
 18 **A. I see that.**
 19 **Q.** Okay. Now, if you would, turn in tab -- to tab
 20 15 of your binder, which is McAnally
 21 demonstrative 3. Dr. McAnally, here we have
 22 simply enlarged the same chart that you used; and
 23 we have enlarged the sentence at the bottom for
 24 ease of reading. Okay?
 25 **A. I see that.**
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1 far right is the confidence interval from 1967 to
 2 2015. Right?
 3 **A. That is correct.**
 4 **Q.** And you would also agree with me that the
 5 vertical bar on the far left is the confidence
 6 interval for 1967 to 2006. Right?
 7 **A. That is correct.**
 8 **Q.** And you can see in the green shading on this
 9 demonstrative that the two confidence intervals
 10 overlap. Correct?
 11 **A. I can see that.**
 12 **Q.** And when you included this in your testimony, you
 13 were aware that this chart demonstrates no
 14 statistically significant change in the trend in
 15 sea level rise. Correct?
 16 **A. No, sir.**
 17 **Q.** So when you testified that NOAA's chart
 18 showed accelerating rates of sea level rise,
 19 you knew this chart didn't show that. Right,
 20 Dr. McAnally?
 21 **A. I used that chart to show it because that caveat**
 22 **is a very standard one. And in essence, NOAA is**
 23 **protecting their rear end.**
 24 **I can read this chart, and I can understand**
 25 **the statistics. And I -- my interpretation of**
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1 **this is that it clearly shows an acceleration of**
 2 **sea level rise.**
 3 **Q.** Okay.
 4 MR. LEOPOLD: No further questions, your
 5 Honor.
 6 SPECIAL MASTER LANCASTER: We'll take a
 7 break.
 8 (Time Noted: 10:50 a.m.)
 9 (Recess Called)
 10 (Time Noted: 11:00 a.m.)
 11 MS. DeSANTIS: Good morning, your Honor.
 12 SPECIAL MASTER LANCASTER: Good morning,
 13 counsel.
 14 REDIRECT EXAMINATION
 15 BY MS. DeSANTIS:
 16 **Q.** Dr. McAnally, before we look at your salinity
 17 modeling and your opinions regarding sea level --
 18 before we look at your salinity modeling and your
 19 opinions regarding sea level rise, I would like
 20 to ask you to look again behind tab 1 of your
 21 binder, page 35, demonstrative 13 in your written
 22 direct.
 23 So it is page 35.
 24 **A.** I'm sorry, which tab?
 25 **Q.** Tab 1.

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1 **A. Tab 1, page 35.**
 2 **Q.** Yes. Your written direct testimony, page 35,
 3 demonstrative 13.
 4 **A.** I'm there.
 5 **Q.** And at the conclusion of his questioning,
 6 Mr. Leopold was asking you about demonstrative 13.
 7 Doctor, how does this chart show accelerating
 8 rates of sea level rise in the Apalachicola Bay?
 9 **A.** **By definition, acceleration is a change in**
 10 **velocity. And so this is in effect a -- the**
 11 **millimeters per year makes it a velocity plot or**
 12 **a speed plot.**
 13 **So it shows that back in the early 2000's, it**
 14 **was -- the calculated speed was about 1.3**
 15 **millimeters per year. And then it -- as it**
 16 **increases, that is a positive acceleration. So**
 17 **that is a -- its acceleration would be whatever**
 18 **the difference is between 1.96 and 1.38, divided**
 19 **by then the time in years.**
 20 **So the fact that it's sloping upwards shows**
 21 **that it's a positive acceleration.**
 22 **Q.** And would you please explain for the Court why
 23 you chose to include this particular graph in
 24 your written direct and how it's relevant to your
 25 testimony.

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1 **A.** **Dr. Douglass, in his analysis and report, used a**
 2 **linear extension of sea level rise into the**
 3 **future, which corresponds roughly to the low**
 4 **estimate that I used. Then in his direct**
 5 **testimony, he added that inspection of this web**
 6 **page showed that there was no evidence of**
 7 **acceleration and says that it has been 1.96**
 8 **millimeters per year for the past 40 years. And**
 9 **clearly, that is a mistaken statement.**
 10 **I don't believe that Dr. Douglass would**
 11 **intentionally misrepresent this; but he simply**
 12 **didn't look at this closely enough to realize**
 13 **that 1.96 millimeters per year is a good bit**
 14 **larger than 1.26 millimeters per year.**
 15 **Q.** Thank you, doctor. We will return to a
 16 discussion of sea level rise, but I do want to
 17 focus on your salinity modeling. And I would
 18 like to focus particularly, again, in your
 19 written direct behind tab 1, page 7. And we will
 20 pull up on the screen the four bullets on page 7
 21 of your written direct testimony on the screen.
 22 And, Dr. McAnally, looking at the particular
 23 bullets in your written direct to guide you, can
 24 you please describe the hydrodynamic modeling
 25 that you did and the scenarios that you used for

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1 your opinions in this matter.
 2 **A.** **I used these four scenarios, which we took --**
 3 **again, they were generated by Dr. Bedient. And**
 4 **they represented the scenario 2011, which I**
 5 **called it the baseline. And that is --**
 6 **represented Georgia's upstream consumptive use**
 7 **quantities of 2011. And scenario 2040, which was**
 8 **the same thing but with upstream consumptive uses**
 9 **to be projected basin-wide in 2040. And then**
 10 **1992 was a look back at what those consumptive**
 11 **uses were occurring in 1992. And then finally,**
 12 **the conservation scenario, which was the same as**
 13 **the baseline except that the flows were increased**
 14 **by a thousand cfs during the low flow season.**
 15 **Q.** And I would now like to ask you to please turn to
 16 page 8 of your written direct testimony -- and
 17 we'll bring that up on the screen -- going over
 18 to the top of page 9.
 19 And, doctor, could you please look at the
 20 bullet points on the bottom of page 8 and the top
 21 of page 9 and describe for the Court your
 22 findings on salinity changes as a result of the
 23 modeling of these scenarios.
 24 **A.** **Okay. The model showed that the -- going back to**
 25 **1992 would decrease salinity -- average salinity**

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1 **in the dry season in Central Bay by up to about**
 2 **.5 psu, or practical salinity units, which is**
 3 **equivalent to ppt.**
 4 **The scenario of 2040, however, was -- had a**
 5 **negligible change from the baseline. It was 0.1,**
 6 **which is really within the level of noise of the**
 7 **model. And I considered it to be equivalent to**
 8 **no change.**
 9 **The conservation scenario had the greatest**
 10 **effect. And it showed that it would decrease**
 11 **both annual and dry season average salinity in**
 12 **Central Bay by as much as 0.7 psu, or practical**
 13 **salinity units, plus or minus the confidence**
 14 **limits.**
 15 **Q.** Doctor, the Court has heard before during the
 16 testimony of Dr. Greenblatt about the meaning of
 17 ppt. But could you please refresh all of us on
 18 the definition of ppt and how that corresponds to
 19 psu.
 20 **A.** **Okay. Ppt, or parts per thousand, is a mass**
 21 **concentration that was used for decades, perhaps**
 22 **centuries, in the oceanographic and water quality**
 23 **fields. It was rather difficult to take -- make**
 24 **that measurement because it involved titration**
 25 **of -- in a lab and so forth, so on.**

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1 **And sometime in the 1980's, I think it was,**
 2 **the international community got together and**
 3 **decided that they would change it over to an**
 4 **electrical conductivity standard and just defined**
 5 **the new practical salinity units based on**
 6 **electrical conductivity; that is, sticking a**
 7 **probe into the water, and making it equivalent --**
 8 **exactly equivalent at 1 ppt and 35 ppt. And then**
 9 **generally they would fit elsewhere.**
 10 **So most of the -- most of the world has**
 11 **converted to using psu, or practical salinity**
 12 **units. There are still some folks in the U.S.,**
 13 **including myself when I forget, that drop back to**
 14 **say ppt.**
 15 **Q.** But is psu equivalent to ppt numerically?
 16 **A.** **For all practical purposes, they are equivalent**
 17 **numerically.**
 18 **Q.** Okay. And, doctor, again, please remind us of
 19 the range of ppt values in the Apalachicola Bay.
 20 **A.** **The values in Apalachicola Bay observed data**
 21 **ranged from very near zero to 39 psu, which is**
 22 **slightly saltier than Gulf water because of local**
 23 **evaporation.**
 24 **Q.** And as you have just described the results of
 25 your hydrodynamic modeling, did your modeling

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1 under any of the scenarios that you used show any
 2 salinity changes in the bay above 1 psu or 1 ppt
 3 as a result of increased flow?
 4 **A.** **There may have been individual locations -- in**
 5 **fact, there were individual locations, individual**
 6 **days when the change would have been greater than**
 7 **that. But averaged over weeks and months and**
 8 **averaged over space -- well, just it's enough to**
 9 **say averaged over weeks and months I didn't see**
 10 **any that were larger than those -- that 0.7 is**
 11 **the highest I saw.**
 12 **Q.** And, doctor, before we go into the details of
 13 some of your hydrodynamic modeling, I don't want
 14 to neglect the second kind of modeling that you
 15 did for this case. Can you please describe the
 16 second type of modeling work, the numerical
 17 modeling work you did, and what that showed.
 18 **A.** **The other -- for many years I have practiced**
 19 **using at least two approaches for every problem.**
 20 **That way if I should make a mistake or miss a**
 21 **decimal point or there may be something**
 22 **fundamentally wrong with the method in one**
 23 **approach, in using a very different approach I'll**
 24 **catch it.**
 25 **And so in this case I used the statistical**

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1 **methods to analyze the observed data from the**
 2 **National Estuarine Research Reserve and to**
 3 **formulate actually a set of opinions and results**
 4 **based on those calculations. And then I was able**
 5 **to compare those with the -- those from the**
 6 **physics-based EFTC numerical model. And they**
 7 **confirmed each other. And so the fact that they**
 8 **confirmed each other and were also consistent**
 9 **with my own experience in the Gulf gives me**
 10 **complete confidence in my conclusions.**
 11 **Q.** And, doctor, would you consider your hydrodynamic
 12 modeling to be more understandable perhaps to the
 13 layperson?
 14 **A.** **Yes, it is, certainly. It -- the layperson tends**
 15 **to regard it as a black box, but -- but it's --**
 16 **certainly, the results look obvious; and people**
 17 **can understand it when they look at the plots.**
 18 **Q.** All right. Well, we're going to focus then on a
 19 couple of particular -- a particular finding of
 20 your hydrodynamic modeling since it is somewhat
 21 more understandable to a layperson. And I
 22 particularly want to focus on the conservation
 23 scenario that you ran. And I also want to focus
 24 on some modeling work done by Dr. Greenblatt
 25 under a remedy scenario.

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1 You are familiar with the work that was done
 2 by Dr. Greenblatt, as you have testified. Right?
 3 **A. I am.**
 4 **Q.** And are you critical of some of Dr. Greenblatt's
 5 methods?
 6 **A. I am, and I was. I think that Dr. Greenblatt is**
 7 **a very bright person and will become a good**
 8 **engineer with sufficient experience and good**
 9 **guidance on how to approach these problems.**
 10 **Q.** Regardless of your criticisms of her
 11 methodologies, are you critical of her findings?
 12 **A. Her -- Dr. Greenblatt's model results were very**
 13 **similar to my own. So I'm -- obviously I can't**
 14 **say that I'm critical of those results.**
 15 **Q.** And did you find the results of her modeling to
 16 be results that you would have expected?
 17 **A. Yes.**
 18 **Q.** All right. And, doctor, in particular, I would
 19 like to look at Dr. Greenblatt's remedy scenario.
 20 What was your understanding of Dr. Greenblatt's
 21 remedy scenario?
 22 **A. My understanding of that -- of Dr. Greenblatt's**
 23 **remedy scenario was that it included a 50 percent**
 24 **reduction in irrigation use of water in Georgia.**
 25 **Plus there were some other conservation measures**

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1 **that escape me at the moment. Probably -- I**
 2 **think it was evaporation control and some other**
 3 **things that were included in that remedy.**
 4 **Q.** And was it your understanding that that remedy
 5 scenario run by Dr. Greenblatt would result in
 6 increased flow into the Apalachicola Bay?
 7 **A. I believe that I recall that it would, yes.**
 8 **Q.** All right. I would like to look now behind tab 4
 9 of the binder that was given to you by counsel
 10 for Florida, which has Dr. Greenblatt's written
 11 direct testimony. And we'll ask the Court and
 12 you, Dr. McAnally, to please turn to pages 36 and
 13 37 where we see Dr. Greenblatt's figures 3-15 and
 14 3-16.
 15 **A. Okay.**
 16 **Q.** And Mr. Smith has helpfully put up both figure
 17 3-15 and 3-16 side by side on the screen.
 18 Is it your understanding, doctor, that these
 19 maps show salinity changes in the bay if
 20 Florida's proposed 50 percent cut remedy were in
 21 place for the years 2011 and 2012?
 22 **A. Yes.**
 23 **Q.** And what do you see with respect to salinity
 24 changes on these maps as modeled by Dr. Greenblatt
 25 if Florida's remedy scenario were in place?

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1 **A. They show that -- well, let me first quibble.**
 2 **One of the things that I am critical of her**
 3 **approach was here she used observed flows versus**
 4 **calculated flows. And in the modeling world,**
 5 **that is -- that's -- that shouldn't be done. It**
 6 **should be model results compared to model**
 7 **results. So she used observed flows versus**
 8 **modeled, which is not a good idea.**
 9 **But, again, that's a quibble rather than a**
 10 **criticism of the results, actually.**
 11 **But what I see here is that over most of**
 12 **Apalachicola Bay, the changes are -- the plot**
 13 **shows all white over most of the bay; so that**
 14 **means changes less than 1 psu. There are areas**
 15 **in July of 2012, for example, that show higher**
 16 **changes of between 1 and 2 psu very close to the**
 17 **river mouth, essentially where the river**
 18 **distributaries discharge into the bay.**
 19 **Q.** So is it your understanding that the white areas
 20 on Dr. Greenblatt's map represent salinity
 21 changes of less than 1 ppt or 1 psu?
 22 **A. That's my interpretation of this plot.**
 23 **Q.** All right. Now, doctor, in your work, did you
 24 run another conservation scenario that was called
 25 the 1000 cfs conservation scenario?

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1 **A. I did.**
 2 **Q.** And I would like to ask you now to turn back to
 3 your own written direct testimony behind tab 1,
 4 and specifically to look at page 12. And
 5 demonstrative 4 -- and Mr. Smith is bringing that
 6 up on the screen.
 7 Now, does demonstrative 4 shows the results
 8 of your conservation scenario and the modeling
 9 that you ran?
 10 **A. It does.**
 11 **Q.** And what did you find when you ran your 1,000 cfs
 12 conservation scenario?
 13 **A. I found that all of the changes were less than**
 14 **1 psu. However, I did -- in this graphic, for**
 15 **example, I used a different scheme for creating a**
 16 **color bar; so I was showing down to actually .25**
 17 **and .1 psu, which is the -- about the lower limit**
 18 **of detection. And so mine, therefore, show a lot**
 19 **more color than hers; but they are showing**
 20 **essentially the same results. If I plotted --**
 21 **used her scale, these would have been all white.**
 22 **Q.** All right. So if you could use Dr. Greenblatt's
 23 color coding scale, your maps would have been all
 24 white?
 25 **A. That's correct.**

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1 **Q.** All right. I'm going to ask Mr. Smith to please
 2 show us your maps as they would have looked if
 3 they had been coded according to Dr. Greenblatt's
 4 color scheme.
 5 And Mr. Smith has put up demonstrative --
 6 what we keyed as demonstrative 4 shows your maps
 7 color-coded according to Dr. Greenblatt's color
 8 scheme; is that right?
 9 **A. That's correct.**
 10 **Q.** All right.
 11 MS. DeSANTIS: I would like to ask that
 12 both this particular map be put side by side
 13 with Dr. Greenblatt's maps from figures 3,
 14 dash -- figure 3-15, which are her results
 15 from 2011.
 16 BY MS. DeSANTIS:
 17 **Q.** Now, Dr. McAnally, when you look at your maps on
 18 the left using your conservation scenario of
 19 1,000 cfs -- additional 1,000 cfs of flow next to
 20 Dr. Greenblatt's maps for 2011 showing the 50
 21 percent cut remedy resulting in increased flow,
 22 what do you see with respect to salinity changes
 23 in the bay under each of these two remedy or
 24 conservation scenarios?
 25 **A. I see the same as my conclusion in my testimony,**

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1 **and that is is that the conservation scenario --**
 2 **and it turns out her remedy scenario -- both**
 3 **produce changes of less than 1 psu in**
 4 **Apalachicola Bay.**
 5 **Q.** Okay. Doctor, I want to turn now to sea level
 6 rise.
 7 **A. I'm sorry. Let me correct that. About 1 psu in**
 8 **hers.**
 9 **Q.** Approximately 1 psu?
 10 **A. Approximately 1 psu, yes.**
 11 **Q.** So whether you run the remedy scenario by
 12 Dr. Greenblatt or your scenario based on the
 13 1,000 cfs additional flow, you are seeing
 14 comparable salinity changes in the bay?
 15 **A. Yes. They are comparable.**
 16 **Q.** Doctor, let's talk about sea level rise. And you
 17 also, as part of your work in this matter,
 18 analyzed the impact of sea level rise on salinity
 19 in the bay, as you testified; correct?
 20 **A. Correct.**
 21 **Q.** And can you please explain the basis for your
 22 opinion that there has been a sea level change in
 23 the bay in the years that you analyzed up to
 24 2014?
 25 **A. Okay. I took the two methods actually, but the**

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1 **NOAA data showed that there has been a sea level**
 2 **rise during that period. But I also took the**
 3 **tide gage data and analyzed it and found that it**
 4 **had -- it had, indeed, risen -- sea level had**
 5 **risen during that period from 2002 -- actually,**
 6 **from 1992 to 2014; but particularly I looked at**
 7 **2002 to 2014. And it showed that it had risen.**
 8 **Q.** And is it your opinion that sea level rise will
 9 have an impact on future salinity levels in the
 10 bay?
 11 **A. It most certainly will.**
 12 **Q.** And what is the basis for that opinion?
 13 **A. It -- that's sort of like asking what is the**
 14 **basis of my opinion the sun is going to rise**
 15 **tomorrow?**
 16 **The literature is unanimous to that effect.**
 17 **I cited some literature about Apalachicola Bay in**
 18 **my report. It's -- that's been a result of, for**
 19 **example, my experience in Louisiana where land**
 20 **subsidence has introduced an apparent sea level**
 21 **rise that is much accelerated over what we see**
 22 **elsewhere in the Gulf. And so in those cases we**
 23 **see the morphological changes. We see the**
 24 **sediment deposition, and we see the shoreline**
 25 **extend inland. In every single case that I'm**

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1 **aware of, salinity has increased, sometimes**
 2 **precipitously.**
 3 **Q.** Doctor, could you please turn again, tab 1, your
 4 written direct testimony, to page 26, and
 5 particularly to your demonstrative 10. Can you
 6 explain, please, what this particular graph
 7 shows.
 8 **A. Okay. Page 26?**
 9 **Q.** Page 26, demonstrative 10, which is on the
 10 screen.
 11 **A. This shows a range of potential projections of**
 12 **salinity increases from 1992 forward based on,**
 13 **first of all, two levels of -- of projected sea**
 14 **level rise. One, the low estimate by the Corps**
 15 **of Engineers; the other, the high estimate by**
 16 **NOAA, which happens to be the same as that for**
 17 **the Corps of Engineers. And then in addition to**
 18 **those -- that range of sea level rise rates, I**
 19 **have applied the -- a low estimate of my**
 20 **calculations showing the effect of sea level rise**
 21 **on salinity and a high -- higher rate, not the**
 22 **highest rate. But these are extremely**
 23 **conservative estimates of the band that would be**
 24 **most likely experienced by average salinity in**
 25 **central Apalachicola Bay in the future due to sea**

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1 level rise.

2 Q. And which of these bands shown do you believe to

3 be the most likely?

4 A. I strongly believe that the highest is the

5 most -- that the actual experience is going to be

6 much closer to the high estimate than it is to

7 the low estimate.

8 Q. And on what do you base that opinion?

9 A. I base that on the fact that the National Academy

10 of Sciences has provided a method to project sea

11 level rise in the future and based on IPCC

12 estimates.

13 IPCC -- I'm putting in too many C's. IPCC

14 estimates in the past have been shown to be too

15 low. They're being too conservative. And in the

16 2013 report, they were -- they were corrected for

17 the effect of Greenland ice sheet melting. And

18 they -- it increased the values. They did not

19 include the effect of accelerated West Antarctic

20 ice sheet melting. And I am -- I read the

21 literature on that; and I am virtually certain

22 that when the next update occurs in the IPCC

23 report and which would then be translated into

24 the Corps' and NOAA's projections, that the

25 number will be higher still. And so I think it

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1 will be pushing certainly the upper limit of this

2 and perhaps being even higher than my high

3 projection.

4 Q. Dr. McAnally, when Mr. Leopold was questioning

5 you, he was asking you to compare what you termed

6 apples and oranges concerning some sea level rise

7 data. Would you please explain why Mr. Leopold

8 was asking you to compare data that should not be

9 compared?

10 A. Okay. The -- well, the data that was shown on

11 NOAA's website are calculated by a prescribed

12 formula that all of us involved in coastal

13 engineering are familiar with that -- but it

14 involves long-term averages of many values per

15 day. And so as a result, the 2015 value is --

16 inherits all of the tendencies of the data going

17 back to the start of the -- of the gage. And in

18 that case, I -- it's sometime in the 1960's, I

19 think, for the Apalachicola Gage. So that 2015

20 value is, in fact, a very long-term average over

21 decades and reflects the weight of all that has

22 happened before.

23 What I did was I took two distinct dates,

24 2002 and 2014, and said, what was the mean sea

25 level on these two years? And I compared those

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1 and got a difference in the two values.

2 So mine was a discrete analysis of the

3 difference of the rise in -- over that 12,

4 13-year period, whereas, NOAA's was a weighted

5 average that goes back decades.

6 Q. Now, Dr. McAnally, in her testimony in this court

7 Dr. Greenblatt suggested that changes in inlet

8 size will offset the impact of sea level rise on

9 salinity in the bay in the future. Is she right?

10 A. No, she's not. It betrays, frankly, a lack of

11 knowledge of coastal processes, and in particular

12 those for -- of those of bay estuaries with

13 multiple inlets.

14 They are very dynamic systems. And so, for

15 example, if they get narrower, if a tidal inlet

16 gets narrower, usually the tidal currents will

17 scour it deeper so that the total exchange

18 remains about the same. We have seen this over

19 and over again throughout the world. So it does

20 not follow that as an inlet narrows, it would

21 also become more shallow. In fact, it's usually

22 the reverse.

23 Q. Did Dr. Greenblatt or any other expert for the

24 State of Florida report on any modeling done

25 regarding changes in inlet size and the effect on

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1 salinity in the bay?

2 A. No. And that's -- that's one of the star

3 differences. Drs. Greenblatt and Douglass did no

4 modeling, did no calculations of the effect of

5 sea level rise on salinity. Instead, they were

6 speculating. And, in fact, Dr. Douglass, to his

7 credit, said likely. And I think even in using

8 that word likely, he was -- he was overstepping

9 what he should have concluded.

10 But neither one of them performed any actual

11 calculations. They simply speculated, whereas,

12 I performed detailed calculations; so did

13 Drs. Freeman and Huang and Clough. And they all

14 came to the same conclusion I did when they made

15 their calculations saying that salinities would

16 increase as a result of sea level rise.

17 Q. Dr. Greenblatt also suggested in her testimony in

18 this court that sedimentation will offset the

19 impact of sea level rise on salinity in the

20 future in the bay. Is she correct about that?

21 A. Absolutely not.

22 Q. And why not?

23 A. First of all, the nature of sedimentation from

24 the river is that the vast majority of that

25 sediment will settle out in the delta. That is

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1 **very close to the mouth of the river. And this**
 2 **is a pattern that we see over and over again**
 3 **throughout the world. And so it does not go out**
 4 **and deposit in the bay. There are -- there's a**
 5 **certain fraction that's very light, settles very**
 6 **slowly, and that would tend to be washed out.**
 7 **And, in fact, if we look at the bottom**
 8 **sediments in Apalachicola Bay, we see that that's**
 9 **the case. It's primarily beach sand and shell**
 10 **fragments throughout much of the bay with a few**
 11 **spots of fine sediment.**
 12 **So there's that. There's also the fact that,**
 13 **again, my experience in other estuaries in**
 14 **which -- for example, Atchafalaya Bay, there is**
 15 **massive sedimentation going on in Atchafalaya**
 16 **Bay. The barrier islands did move and were**
 17 **submerged by sea level rise, and salinity**
 18 **increased steadily throughout the system.**
 19 **And I have -- I have seen that. I have**
 20 **documented it. I have experienced it.**
 21 **So both the -- from basic physics and from my**
 22 **own personal experience I can say that Dr.**
 23 **Greenblatt is totally incorrect when she says**
 24 **that bay sedimentation would offset salinity**
 25 **increases.**

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1 **Q.** Should there be any credence given to an opinion
 2 that the migration of barrier islands will
 3 protect the bay from sea level rise and
 4 increasing salinity levels?
 5 **A.** **I'm trying to think of a case where that has ever**
 6 **actually occurred. And I have seen a lot of**
 7 **cases -- a lot of situations, projects, where**
 8 **barrier islands migrated; but I have never seen**
 9 **where they strongly affected the salinity within**
 10 **the estuary behind them. So I don't think**
 11 **there's any particular reason to give credence to**
 12 **that speculation.**
 13 **Q.** And, doctor, to your knowledge did Dr. Greenblatt
 14 or any other expert for the State of Florida do
 15 any modeling to support an opinion that
 16 sedimentation or migration of barrier islands
 17 will offset the effects of sea level rise on
 18 salinity in the bay?
 19 **A.** **I have not seen anything that Dr. Greenblatt and**
 20 **Dr. Douglass did that would suggest or that they**
 21 **actually did any calculations at all on the**
 22 **subject of the effects of bay sedimentation or**
 23 **barrier island movement on salinity.**
 24 **Q.** Thank you, doctor.
 25 MS. DeSANTIS: I have no more questions.

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1 RE CROSS-EXAMINATION
 2 BY MR. LEOPOLD:
 3 **Q.** Dr. McAnally, just a couple more questions.
 4 You just testified that you have seen the
 5 effects of geomorphic changes in other parts of
 6 the Gulf of Mexico. Right?
 7 **A.** **I have.**
 8 **Q.** And, sir, you agree that geomorphic processes
 9 exist. Correct?
 10 **A.** **Geomorphic processes do occur.**
 11 **Q.** Okay. And, yet, you didn't model any geomorphic
 12 processes other than the narrowing of the pass
 13 inlets that Dr. Douglass suggested. Right?
 14 **A.** **That was the only geomorphic change that I**
 15 **modeled.**
 16 **Q.** And you agree though that sedimentation has the
 17 effect of elevating the bottom of Apalachicola
 18 Bay. Right?
 19 **A.** **No, I did not.**
 20 **Q.** And there is published data that shows a rate of
 21 sedimentation in Apalachicola Bay. Correct?
 22 **A.** **There is some very old data that shows the rate**
 23 **of sedimentation.**
 24 **Q.** And because you thought it was old data, you made
 25 no assumption whatsoever for sedimentation rate.

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1 You assumed a zero sedimentation rate in your
 2 model. Correct?
 3 **A.** **No. That is not correct.**
 4 **Q.** You assumed no sedimentation to the bottom of
 5 Apalachicola Bay; isn't that true?
 6 **A.** **That is not -- that is not true.**
 7 **Q.** And -- so you didn't address in your model,
 8 Dr. McAnally, what the effects of sedimentation
 9 are going to be in the bay and whether it would
 10 offset sea level rise. Correct?
 11 **A.** **I did not model the deposition of sediment in the**
 12 **bay because I knew that it would occur up in the**
 13 **delta and have little or no effect on salinity in**
 14 **Central Bay.**
 15 **Q.** Okay. And, now, turning to the remedy discussion
 16 regarding Dr. Greenblatt's modeling, the maps
 17 that Ms. DeSantis just showed you indicate the
 18 magnitude of change in salinity based on the
 19 remedy scenario. Right?
 20 **A.** **That's -- that's what they show.**
 21 **Q.** But those maps don't show the persistence of the
 22 change in salinity over time. Correct?
 23 **A.** **Actually, they do because they show month by**
 24 **month what those -- what those changes are. So**
 25 **you can -- by looking at the month, you can draw**

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1 **conclusions about persistence.**

2 **Q.** It has no analysis of residence time?

3 **A. Those graphics have no graphics of residence**

4 **time.**

5 **Q.** And they don't show any changes that would be

6 more than a thousand cfs of additional water into

7 Apalachicola Bay. Correct?

8 **A. Again, I think I have answered this once. I**

9 **don't know precisely what the flows were in**

10 **Dr. Greenblatt's remedy scenario. But I know**

11 **what was in mine.**

12 **Q.** And in your conservation scenario there was a

13 thousand cfs; is that correct?

14 **A. That's correct.**

15 **Q.** And you're aware that Florida is seeking more

16 than that in this case. True?

17 **A. I'm not aware of what Florida is asking.**

18 **Q.** And all things being equal, as we have discussed,

19 more water equals lower salinity. Correct?

20 **A. All things being equal, more fresh water produces**

21 **lower average salinity, but not by much.**

22 **Q.** Dr. McAnally, you also just testified that you

23 believe that the IPCC's projections of

24 acceleration in sea level rise will be greater

25 than the 2013 report we discussed. Right?

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1 very much.

2 THE WITNESS: Thank you, sir.

3 MS. DeSANTIS: Your Honor, it's

4 certainly up to the Court; but would this be

5 the best time to break for lunch before we

6 put a new witness on?

7 SPECIAL MASTER LANCASTER: Well, you're

8 right about it being up to me.

9 Sure. Let's break.

10 MS. DeSANTIS: Thank you.

11 MR. LEOPOLD: Thank you.

12 (Time Noted: 11:40 a.m.)

13 (Recess Called)

14 (Time Noted: 12:48 p.m.)

15 MS. DeSANTIS: Good afternoon, your

16 Honor.

17 SPECIAL MASTER LANCASTER: Good

18 afternoon.

19 MS. DeSANTIS: Is the Court ready to

20 proceed?

21 SPECIAL MASTER LANCASTER: Sure.

22 MS. DeSANTIS: We have Dr. Charles

23 Menzie who we will call to the stand.

24 THE CLERK: Please raise your right

25 hand.

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1 **A. I believe the next update will increase that.**

2 **Q.** Okay. Although you haven't done any climate

3 modeling yourself. Correct?

4 **A. I have not.**

5 **Q.** And you offered that opinion, sir, based --

6 because you believe you're qualified to read and

7 interpret the literature regarding sea level

8 rise. Correct?

9 **A. I would like to distinguish the sea level rise**

10 **literature as being separate from climatology.**

11 **It is -- it is more -- it's -- it takes the**

12 **results of the climatological studies and then**

13 **applies them to oceanographic studies, which I am**

14 **much more knowledgeable in. And it's reading the**

15 **literature on the oceanographic studies of ice**

16 **sheet melting on land that leads me to believe**

17 **the IPCC has seriously underestimated that**

18 **component of sea level rise.**

19 **Q.** And you're offering that opinion solely based on

20 your reading of the climate literature. Right?

21 **A. It's based on my reading of the literature.**

22 MR. LEOPOLD: No further questions.

23 SPECIAL MASTER LANCASTER: Any redirect?

24 MS. DeSANTIS: No questions, your Honor.

25 SPECIAL MASTER LANCASTER: Thank you

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1 Do you solemnly swear that the testimony

2 you shall give in the cause now in hearing

3 shall be the truth, the whole truth, and

4 nothing but the truth, so help you God?

5 THE WITNESS: I do.

6 THE CLERK: Please be seated.

7 Pull yourself right up to the microphone

8 and please state your name and spell your

9 last name.

10 THE WITNESS: My name is Charles Menzie,

11 M E N Z I E.

12 EXAMINATION

13 BY MS. DeSANTIS:

14 **Q.** Dr. Menzie, I have placed in front of you your

15 written direct examination testimony in this

16 matter. Do you adopt this as your sworn

17 testimony in this case?

18 **A. I do.**

19 MS. DeSANTIS: I tender the witness.

20 CROSS-EXAMINATION

21 BY MS. WINE:

22 **Q.** Good afternoon, Dr. Menzie.

23 **A. Good afternoon.**

24 MS. WINE: Your Honor, as is our custom,

25 may we approach just to hand out some cross

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1 binders?

2 Thank you.

3 BY MS. WINE:

4 Q. Dr. Menzie, you offered opinions in this case

5 regarding the ecological effects of water

6 consumption by Georgia in the floodplain and

7 forest of the Apalachicola River and on the

8 productivity of the Apalachicola Bay. Is that

9 correct?

10 A. **That's correct.**

11 Q. And you looked at Georgia's incremental increase

12 in consumption between 1992 and 2011; is that

13 correct?

14 A. **That is correct.**

15 Q. And by incremental increase, you mean that you

16 considered only the additional amount of water

17 consumed by Georgia between 1992 and 2011.

18 Correct?

19 A. **For the modeling analysis that you're referring**

20 **to; that is correct.**

21 Q. So you have not analyzed the impact of Georgia's

22 consumptive use prior to 1992. Correct?

23 A. **I haven't used the modeling results to take a**

24 **look at that; that is correct.**

25 Q. Okay. And you haven't analyzed the impact of

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1 Georgia's total consumptive water use over time.

2 Correct?

3 A. **I haven't modeled that particular use, no.**

4 Q. And you have mentioned the models that you have

5 done in support of your opinions; and you have

6 gotten these models -- or you have done this

7 modeling work based on hydrological scenarios

8 that you received from Georgia's expert,

9 Dr. Bedient; is that correct?

10 A. **That's correct.**

11 Q. And these include a 1992 consumptive use scenario

12 and a 2011 consumptive use scenario. Correct?

13 A. **That's correct.**

14 Q. And that 1992 to 2011 time period is the

15 incremental time period that we're talking about.

16 Correct?

17 A. **Yes. For the modeling purposes, that's correct.**

18 Q. Now, throughout your testimony, whenever you

19 refer to consumptive use, you are referring only

20 to this incremental consumptive use between 1992

21 and 2011. Correct?

22 A. **That's not correct. There are other parts of my**

23 **testimony where I'm looking at longer time frames**

24 **in response to some of the analysis that other**

25 **experts for Florida have done.**

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1 Q. For consumptive use are you looking at other time

2 frames?

3 A. **I modeled the time frame that we're talking**

4 **about using the information provided me from**

5 **Dr. Bedient; but I have considered the influence**

6 **of consumptive use that's reflected in the**

7 **other -- Florida's experts for other time periods**

8 **in my response to their expert reports.**

9 Q. Okay. But for the work that you did initially --

10 putting aside any responses to the work that

11 Florida's experts did, for the work that you did

12 it was limited to this incremental time period

13 1992 to 2011?

14 A. **That's correct. For the modeling work.**

15 Q. Okay. Now, you also analyzed two future or

16 conservation scenarios from Dr. Bedient.

17 Correct?

18 A. **I looked at the 1,000 cfs conservation scenario.**

19 Q. Correct. And I think you also looked at a 400

20 cfs conservation scenario?

21 A. **No. What I did was I -- separate from any work**

22 **that Dr. Bedient has done, I independently looked**

23 **at the influence of 400 and 1,000 cfs that would**

24 **be applicable to any point in time prior to or**

25 **after 1992.**

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1 Q. Okay. But you didn't analyze how any additional

2 flow beyond 1,000 cfs would benefit the

3 Apalachicola River or Bay. Correct?

4 A. **I didn't include that in my modeling.**

5 Q. Okay. Now, sir, this case is the first time that

6 you have ever analyzed whether consumptive use of

7 water has caused harm on an ecosystem. Correct?

8 A. **That would be correct, yes.**

9 Q. And you certainly have not ever before analyzed

10 whether a specific quantity of water consumed was

11 the cause of harm on an ecosystem. Correct?

12 A. **That's correct.**

13 Q. But here, you're confident that Georgia's

14 incremental consumption of water since 1992 had a

15 minor impact on flows into the Apalachicola River

16 and Bay. Correct?

17 A. **That is correct.**

18 Q. Now, in reaching this conclusion, you did not

19 analyze the relationship between agricultural

20 irrigation in Georgia and streamflow into the

21 Apalachicola River. Did you?

22 A. **I examined that information, but I relied upon**

23 **the scenarios that were developed and provided me**

24 **by Dr. Bedient for the modeling of that -- of**

25 **those differences.**

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1 Q. You didn't analyze that relationship yourself?

2 A. **That's correct.**

3 Q. And you didn't analyze whether agricultural

4 irrigation by Georgia compounds the impacts of

5 drought on streamflow in the Flint River Basin.

6 Correct?

7 A. **I didn't specifically look at that.**

8 Q. You also didn't look at the impacts of streamflow

9 on the various microhabitats in the Apalachicola

10 River. Correct?

11 A. **I didn't disaggregate or specifically look at**

12 **micro habitats; that's correct.**

13 Q. And you didn't examine basin yield, meaning how

14 much water the watershed yields per unit of

15 rainfall. Correct?

16 A. **That's correct.**

17 Q. Now, you're aware that Georgia's consumption in

18 the ACF Basin began increasing dramatically

19 around 1970. Correct?

20 A. **I'm aware that use may have begun around that**

21 **time. I don't have any sense of whether it was**

22 **dramatic or not.**

23 Q. Okay. Sir, if you could turn to tab 1 in your

24 binder that I handed you.

25 Tab 1 is a document marked FX-575. It's a
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1 USGS publication entitled Georgia Irrigation,

2 1970 to '80, A Decade of Growth. Do you see

3 that?

4 A. **I do.**

5 Q. And you may recall this was an exhibit in your

6 deposition. Correct?

7 A. **That's correct.**

8 Q. And if you could turn to the page in the document

9 that's marked page 1, but it's actually about

10 nine pages into the document. And you will see

11 that there's -- it says Abstract at the top of

12 the page?

13 A. **I do see that.**

14 Q. And, sir, if you could just read the first

15 sentence under Abstract to yourself.

16 A. **I have read it.**

17 Q. And, sir, do you see that the USGS is reporting

18 here that irrigation use in Georgia increased by

19 a factor of 12 between 1970 and 1980. Correct?

20 A. **That's correct.**

21 Q. And that that was the fastest rate of increase

22 among the southern states?

23 A. **Yes.**

24 Q. Okay. But your analysis of the impacts on the

25 Apalachicola River and Bay of Georgia's
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1 consumptive use did not consider this 12-fold

2 increase in agricultural irrigation. Correct?

3 A. **Going back to -- in earlier testimony, I looked**

4 **at the period, specifically post-1992, using the**

5 **scenarios provided me from Dr. Bedient. So I**

6 **didn't specifically look at this 10-year period**

7 **or this aspect of it.**

8 Q. Now, even though you did not evaluate the impact

9 of Georgia's consumption prior to 1992, you did

10 go back earlier than 1992 in assessing a number

11 of other potential causes of harm. Correct?

12 A. **That's correct.**

13 Q. So, for example, you evaluate the potential

14 impacts of road construction and other land use

15 changes in Georgia going back to the 1950's.

16 Right?

17 A. **That's right.**

18 Q. And you analyzed what you called natural and

19 man-made stressors other than Georgia's

20 consumption going back to the 1940's. Right?

21 A. **I did do that, yes.**

22 Q. So you did a modeling analysis and drew

23 conclusions about causality that looked at other

24 potential causes of harm prior to 1992, but

25 limited your assessment of Georgia's consumptive
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1 use to the incremental increase of water starting

2 in 1992; is that correct?

3 A. **Well, the 1992 to 2011 period that we're talking**

4 **about, that was for the purpose of modeling,**

5 **using Dr. Bedient's models. And as I mentioned**

6 **earlier, I looked at the entirety of influences**

7 **on the -- on the system to the extent that**

8 **information was available during that time and**

9 **prior.**

10 Q. But, sir, you didn't look at the influences of

11 consumptive use prior to 1992 on the system.

12 Correct?

13 A. **Not directly. I looked at responses; that's**

14 **correct.**

15 Q. And, sir, you cannot tell this Court how

16 Georgia's water consumption between 1970 and 1992

17 impacted the Apalachicola River and Bay.

18 Correct?

19 A. **I looked at -- as I said, I looked at biological**

20 **responses. So, for example, I would have**

21 **compared -- I did compare the fish community and**

22 **their abundance post-1992 and even in more recent**

23 **times to those that existed in the 1970's and**

24 **1980's. So I did that type of analysis to see if**

25 **there was any influence.**
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1 **Q.** But, sir, your report -- your prefiled direct
 2 testimony does not tell this Court has Georgia's
 3 water consumption between 1970 and 1992 impacted
 4 the Apalachicola River and Bay. Correct?
 5 **A. That's right.**
 6 **Q.** Now, I would like to talk about some of your
 7 specific opinions on the impact of streamflow on
 8 certain riverine species. Okay?
 9 And you understand that riverine species are
 10 just species that live, for example, on the
 11 Apalachicola River. Correct?
 12 **A. That's correct.**
 13 **Q.** Now --
 14 **A. I'll understand it as such.**
 15 **Q.** Okay. Thank you.
 16 Now, you claim that incremental water
 17 consumption by Georgia since 1992 has had at most
 18 a negligible impact on the Gulf sturgeon
 19 population in the river. Correct?
 20 **A. That's correct.**
 21 **Q.** And you conclude that anticipated future
 22 consumptive use by Georgia is expected to have a
 23 negligible effect on threatened and endangered
 24 mussel species. Correct?
 25 **A. That's correct.**

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1 **Q.** And in your direct testimony, you cite as the
 2 basis for both of these opinions the 2012 and the
 3 2016 biological opinions of the U.S. Fish and
 4 Wildlife Service. Correct?
 5 **A. Among other -- among other considerations; that's**
 6 **correct.**
 7 **Q.** Now, you understand that for the biological
 8 opinions, the Service attempted to isolate the
 9 effect of reservoir operations and hold all other
 10 factors constant. Correct?
 11 **A. I understood that they represented what they**
 12 **believed to be the flows that would be present in**
 13 **the river under all other influences, including**
 14 **consumption of water by Georgia, and then**
 15 **compared the differences in reservoir operations**
 16 **with that as an underpinning.**
 17 **Q.** So Georgia's water consumption was one of those
 18 other factors that were held constant by the
 19 Service in its analysis. Correct?
 20 **A. I think the Service represented the flows and,**
 21 **you know, the consumption history of Georgia**
 22 **within their analysis. It wasn't held as a**
 23 **constant number.**
 24 **Q.** Sir, you don't recall that they were isolating
 25 the reservoir operations and holding the other

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1 factors constant?
 2 **A. What they kept the same between the comparisons**
 3 **were the underlying flow regime, which included**
 4 **Georgia's consumption of water. So what they**
 5 **were comparing, including Georgia's consumption**
 6 **of water, what was difference or what biological**
 7 **effect there might be associated with differences**
 8 **in the operation of the reservoirs to look at**
 9 **whether or not those changes in the operations**
 10 **might pose a -- some form of risk to the species**
 11 **that were in the river.**
 12 **Q.** The Service wasn't analyzing the impact of
 13 changes in consumptive use on the ecosystem.
 14 Correct?
 15 **A. That wasn't their focus. They incorporated that**
 16 **in their analysis.**
 17 **Q.** Okay. Now, let's look at some of the things that
 18 the Service did find in the biological opinion.
 19 So if you could turn to tab 2 of your binder.
 20 Tab 2 is JX-72, which is the 2012 biological
 21 opinion. You recognize this document. Correct?
 22 **A. I do.**
 23 **Q.** And, sir, if you could please turn to page 144.
 24 **A. I'm there.**
 25 **Q.** And, sir, do you see the section 7.1 at the

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1 bottom?
 2 **A. Yes.**
 3 **Q.** If could you look at the last paragraph of the
 4 page which begins, take of listed mussels, and
 5 just read that to the end. It continues on
 6 page 145.
 7 **A. I have read it.**
 8 **Q.** Now, sir, you understand from that that the U.S.
 9 Fish and Wildlife Service found that mortality,
 10 either immediate or delayed, may occur when flows
 11 at Woodruff Dam fall below 10,000 cfs. Correct?
 12 **A. Actually, this particular sentence needs to be**
 13 **understood in the context of what their full**
 14 **analysis is. And basically what this means is**
 15 **that there has been circumstances during which**
 16 **mussels have come to occupy areas during higher**
 17 **flows. And when those flows decrease, such as**
 18 **below 10,000 cfs, some of those mussels are**
 19 **stranded. And when they're stranded for an**
 20 **extended period of time, they can die. So that's**
 21 **the context.**
 22 **It's not always the case, but it's the**
 23 **context by which this reference comes from.**
 24 **Q.** Yes. And the Service says that the harm can
 25 occur at flows less than 10,000 cfs as a result

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1 of reduced growth and/or reproduction due to high
 2 temperatures and low dissolved oxygen. Correct?
 3 **A. Right. The causes of mortality in mussels that
 4 are stranded would either be direct exposure,
 5 they might be eaten by animals, or the dissolved
 6 oxygen in remnant pools might decrease. But this
 7 would occur under any circumstance where flows
 8 were changing from a higher flow to a lower flow.**
 9 **Q.** Okay. Now, sir, if you could turn to page 151 of
 10 this document. Do you see the section 8 titled
 11 Conservation Recommendations?
 12 **A. Yes.**
 13 **Q.** And, sir, if you could read the paragraph that's
 14 numbered 3 in that section to yourself.
 15 **A. Yes.**
 16 **Q.** Now, sir, you understand from this that the U.S.
 17 Fish and Wildlife Service was recommending the
 18 reduction of overall streamflow depletions in the
 19 ACF Basin, particularly on the Flint River.
 20 Correct?
 21 **A. Let me read that again with regard to your
 22 question.**
 23 **You said recommending reductions?**
 24 **Q.** Correct. This is under a section called
 25 Conservation Recommendations.

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1 **A. Right. I read that as the Fish and Wildlife
 2 Service under Conservation Recommendations
 3 suggesting that the states work together to look
 4 for alternatives.**
 5 **Q.** And one of those alternatives is reducing overall
 6 streamflow depletions in the ACF Basin,
 7 particularly on the Flint River. Correct?
 8 **A. That's included as an example that water users
 9 and managers can work together to identify
 10 alternatives to agricultural use -- to reduce
 11 agricultural use of water in the Flint River
 12 Basin, yes.**
 13 **Q.** So the answer to my question is, yes, that was
 14 one of the recommendations?
 15 **A. Well, that's something they're recommending that
 16 the states consider. I don't think they're
 17 suggesting that with regard to their biological
 18 opinion.**
 19 **Q.** Sir, do you see right there in No. 3 it
 20 recommends work in consultation with the states
 21 and other stakeholders to assist in identifying
 22 ways to reduce overall depletions in the ACF
 23 Basin, particularly the Flint River. Correct?
 24 **A. Yes.**
 25 **Q.** Okay. Now, sir, let's look at tab 3, which is

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1 the 2016 biological opinion. It's JX-168. And
 2 if you could, sir, first, please turn to page 74.
 3 And, sir, are you there?
 4 **A. I am.**
 5 **Q.** Okay. At the bottom of that page, do you see
 6 there is a section about juvenile sturgeon?
 7 **A. Yes, I do.**
 8 **Q.** And, sir, if you could just read that paragraph
 9 that continues onto page 75.
 10 **A. I have read it.**
 11 **Q.** Okay. So, sir, do you see that the Service there
 12 finds that very young juvenile Gulf sturgeon have
 13 a lower tolerance for saline conditions than
 14 sub-adult or adult sturgeon. Correct?
 15 **A. What's being reported here is from the
 16 literature; and, yes, what they are pointing out
 17 is that the younger sturgeon may be more
 18 sensitive to salinity. That's correct.**
 19 **Q.** And they cite a study that observes 100 percent
 20 mortality of 72-day-old juvenile sturgeon when
 21 exposed to 10 ppt salinity. Correct?
 22 **A. That's what the -- this particular experiment
 23 showed.**
 24 **Q.** And then the Service goes on to say that
 25 conditions like lower salinity in foraging areas

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1 may be vitally important to the growth and
 2 survival of young-of-the-year juvenile sturgeon.
 3 Correct?
 4 **A. That's what they say. Yes, that's correct.**
 5 **Q.** And, sir, you know that changes in streamflow can
 6 affect salinity regimes. Correct?
 7 **A. I do.**
 8 **Q.** Okay. Now, could you turn to page 86 of this
 9 document. And if you could, sir, do you see the
 10 section that says *Interpretation*, in italics?
 11 Right under the figure.
 12 **A. I got it.**
 13 **Q.** Okay. If you could read those two paragraphs to
 14 yourself, please.
 15 **A. I have read it.**
 16 **Q.** And, sir, do you see here that the Service is
 17 saying that reduced floodplain inundation, even
 18 small reductions on the order of 4.7 to 6.3
 19 percent, can have an adverse effect on Gulf
 20 sturgeon. Correct?
 21 **A. I don't think that's a conclusion that they have
 22 reached. I think that -- when I read this, I
 23 read this as a -- populating a concern, because I
 24 know that there is no evidence that these have
 25 had effects on sturgeon in the Apalachicola**

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1 **River.**

2 **Q.** Sir, using your words then, the Service is at

3 least concerned that reduced floodplain

4 inundation, even in very small percentages, can

5 have an adverse effect on Gulf sturgeon?

6 **A. My reading of these parts of the document is that**

7 **it's incumbent upon the Service to identify**

8 **aspects of the operation that could be an issue**

9 **and to articulate what those are. It's when they**

10 **reach their conclusions about the overall effects**

11 **of operations that you get the -- sort of the net**

12 **outcome of their deliberations and analysis.**

13 **So --**

14 **Q.** Sir, I'm just asking if you see that concern

15 stated there by the Service?

16 **A. I see that concern stated there, and I understand**

17 **what it means and what it doesn't mean.**

18 **Q.** Sir, could you please now turn to pages 136 and

19 137 of this document.

20 **A. I'm there.**

21 **Q.** And, sir, do you see that on these two pages

22 there's a discussion of fish hosts?

23 **A. Yes.**

24 **Q.** And, sir, fish hosts encompasses fish other than

25 just the Gulf sturgeon. Correct?

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1 **A. That's correct.**

2 **Q.** And, sir, if you look at page 137 of this

3 document, the paragraph that starts, although

4 mussels. It's the second paragraph. Do you see

5 that, sir?

6 **A. Yes.**

7 **Q.** Do you see that in the second line the Service is

8 saying that reproduction of many fishes is

9 intricately tied to the floodplain. Do you see

10 that, sir?

11 **A. Yes.**

12 **Q.** And that flow regimes can affect reproductive

13 success and other attributes of these fish?

14 **A. Right.**

15 **Q.** Now, sir, could you please turn to page 192 of

16 this document. Do you see there there is a

17 section on mussels. And we don't need to look at

18 it in detail again, but you will see similar

19 language that we looked at from the 2012

20 biological opinion. Correct?

21 **A. Yes.**

22 **Q.** Now, sir, lastly, if you could turn to page 201

23 of this document.

24 **A. Were you asking whether I agreed with what was --**

25 **Q.** No, no, no.

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1 **A. -- in the paragraph?**

2 **Q.** I'm trying to move quickly since it's similar

3 language.

4 **A. Okay. All right.**

5 **Q.** I was just asking if it's similar language.

6 **A. It begins with a similar sentence.**

7 **Q.** So if you can look at page 201, this is the

8 conservation and recommendations of the 2016

9 biological opinion?

10 **A. Yes.**

11 **Q.** And, sir, if you could turn to page 203, which is

12 a continuation of the listing of these

13 recommendations. And if you could read numbers 8

14 and 9 to yourself, please.

15 And --

16 **A. I have.**

17 **Q.** And, sir, do you see here the Service is

18 recommending water conservation measures to avoid

19 impacts to fish and wildlife resources by working

20 with municipal, agricultural, and industrial

21 water users to reduce consumptive uses. Correct?

22 **A. Yes.**

23 **Q.** And that the Service also recommends planning

24 future water management to minimize consumption

25 and thus minimize the detrimental effects on

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1 species from consumptive water use. Correct?

2 **A. That's what it says.**

3 **Q.** Thank you.

4 Now, sir, I would like to talk about your

5 opinion on the impact of Georgia's water

6 consumption on the inundation of the Apalachicola

7 River floodplain. Okay?

8 **A. Yes. By inundation you mean flooding --**

9 **Q.** I was just going to ask you that.

10 **A. -- of the floodplain?**

11 **Q.** Are you referencing the water level of the

12 floodplain that surrounds the Apalachicola River?

13 **A. I am.**

14 **Q.** And you testify in your prefiled direct that

15 floodplain areas are connected to the river via

16 sloughs or channels. Correct?

17 **A. That's correct.**

18 **Q.** And that during low flows, water levels can fall

19 below the mouth of the sloughs. Correct?

20 **A. That's right.**

21 **Q.** And that that can be harmful to the floodplain

22 and the floodplain habitats. Correct?

23 **A. Well, what that means specifically is that once**

24 **that happens, the water is not flowing into the**

25 **floodplain via that slough, yes.**

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1 Q. And that can result in harm to those habitats?

2 A. **It could be a period during which there is**

3 **dryness. But that happens -- you know, that**

4 **would happen also under natural conditions. So**

5 **it's -- it would depend on the matter of degree.**

6 Q. Sure. But those times of dryness can have

7 adverse impacts on the habitats in those sloughs.

8 Correct?

9 A. **That is a time when there's such a potential.**

10 **But it doesn't necessarily mean that that has**

11 **happened.**

12 Q. I'm just asking if it's a possibility?

13 A. **Is it a possibility?**

14 Q. Yes.

15 A. **It's a possibility, yes.**

16 Q. Okay. Now, to the contrary, when flow increases,

17 the inundation expands beyond the boundaries of

18 the slough stream beds; is that correct?

19 A. **That's correct.**

20 Q. And that can be beneficial to the floodplain and

21 the floodplain habitats. Correct?

22 A. **Again, that provides the water that some of the**

23 **plants in the floodplain require to continue to**

24 **grow, yes.**

25 Q. And there are over 300 sloughs in the

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1 Apalachicola River. Correct?

2 A. **That's my understanding.**

3 Q. Now, Dr. Menzie, if hypothetically all of the

4 sloughs in the Apalachicola River were

5 disconnected or cut off, that would decrease

6 floodplain inundation. Correct?

7 A. **Under that hypothetical, yes. If you blocked all**

8 **the sloughs with sediment or something of that**

9 **nature, you would -- you would have that -- an**

10 **adverse effect.**

11 Q. And that would have a harmful impact on the

12 floodplain, including that it would contribute to

13 the drying of the floodplain forest. Correct?

14 A. **Yes. Blockage of all the sloughs would have an**

15 **adverse effect upon the floodplain.**

16 Q. And it would decrease habitat for species that

17 depend on the floodplain forest?

18 A. **It would turn the floodplain forest from a wet**

19 **forest to a dry forest.**

20 Q. Now, turning back to your prefiled direct

21 testimony, you note that USGS researchers have

22 found floodplain inundation has declined since

23 the 1970's. Correct?

24 A. **I believe they -- that's correct, yes. It's been**

25 **a long-term decline.**

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1 Q. And the forest ecosystem of the floodplain is an

2 important habitat for many species. Correct?

3 A. **It does provide habitat for many species.**

4 Q. And trees can be an indicator of changes in the

5 ecosystem?

6 A. **In this particular case where we're talking about**

7 **flooding, trees can be an indicator of changing**

8 **from wetter to drier environments.**

9 Q. And you believe that there has been a shift in

10 the Apalachicola River floodplain towards tree

11 species that are characteristic of a drier, less

12 inundated habitat. Correct?

13 A. **I do believe that has occurred.**

14 Q. And as an example, there's been a change in the

15 abundance of tupelo trees and the production of

16 tupelo honey from those trees. Correct?

17 A. **There's definitely been a change in the abundance**

18 **of tupelo trees.**

19 Q. Okay.

20 A. **The production of honey is influenced by a lot of**

21 **factors.**

22 Q. Now, you conclude that the changes in floodplain

23 forest composition that have been detected since

24 the late 1970's are linked to changes in the

25 extent and duration of floodplain inundation.

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1 Correct?

2 A. **Well, I believe that the changes occurred prior**

3 **to the 1970's. So the 1970's changes continued;**

4 **but they had begun well before that as -- as the**

5 **U.S. Geological Survey has pointed out.**

6 **But, yes, those changes that have occurred**

7 **since the construction of the dam are related to**

8 **a decline in the flooding of the floodplain.**

9 Q. Well, you agree that riverflow and floodplain

10 inundation are related. Correct?

11 A. **They are related.**

12 Q. Okay. And you didn't consider the impact of

13 Georgia's consumptive use on riverflow until 1992

14 despite these changes in floodplain inundation

15 that you know began in the late 1970's. Correct?

16 A. **I have actually looked at the influence prior to**

17 **that. I think the earliest years I looked at**

18 **were around 1996.**

19 Q. Okay.

20 A. **But not prior to 1970, no.**

21 Q. Okay. Now, do you recall that in the report you

22 submitted in this case, you included a figure

23 that showed changes in floodplain inundation

24 between 1922 and 2015?

25 I can help you out if you don't remember.

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1 **A. Yes.**
 2 **Q.** I don't think it was in your prefiled direct; but
 3 if you could in the binder, turn to tab 9.
 4 And what we have done in tab 9, just to try
 5 to save a little paper, we have just included
 6 some excerpts of your report, because it was
 7 quite lengthy.
 8 So if you just turn, like, one page in here,
 9 do you see that we have got page 85 from your
 10 report excerpted here?
 11 **A. Yes.**
 12 **Q.** And it has a chart. Do you see that chart with
 13 the blue line that says climate year underneath?
 14 It's figure 26.
 15 **A. Yes, I do.**
 16 **Q.** Okay. Now, in this chart you were showing annual
 17 acreage of floodplain inundation from 1922 to
 18 2015. Correct?
 19 **A. Yes. I have.**
 20 **Q.** And you include a trend line here. Correct?
 21 **A. That's correct.**
 22 **Q.** And you state that the trend line of these data
 23 indicates that floodplain inundation has changed
 24 over time with a pronounced decline in annual
 25 inundated floodplain acres since the 19 -- since

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1 **because it's averaged over the previous number of**
 2 **years. If we were to look actually at the most**
 3 **recent level of inundation, it would be, you**
 4 **know, not at that depth.**
 5 **Q.** Well, sir, looking at this chart, the beginning
 6 of the decline in floodplain inundation occurred
 7 during a wetter period. Correct?
 8 **A. Yes. There was a wet period in this region.**
 9 **From somewhere in the 1960's to 1970's, the**
 10 **amount of wetness increased in the region.**
 11 **Q.** Okay. So something other than climate was
 12 causing the dramatic decline which began in the
 13 late 1970's. Correct?
 14 **A. No. It was climate.**
 15 **Q.** Sir, the decline began during a wet period.
 16 Correct?
 17 **A. Well, as I just explained, the trend line is**
 18 **affected mainly by the droughts that are**
 19 **occurring. So the -- if you look at the seesaw**
 20 **in numbers that are going up and down, these**
 21 **sharp points that you see periodically occurring,**
 22 **one in the '80's and one in the late '90's, and**
 23 **then, of course, the more recent one, it's those**
 24 **low points that are dragging the line down.**
 25 **That's climate.**

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1 the late 1970's. Do you see that that's right
 2 above the figure?
 3 **A. Yes.**
 4 **Q.** And that this decline is consistent of the period
 5 over which changes in floodplain forest and
 6 declines in tupelo honey production were
 7 observed. Correct?
 8 **A. Correct.**
 9 **Q.** And the decline continues through 2015 on your
 10 figure 26. Correct?
 11 **A. That's correct.**
 12 **Q.** And the post-1970's period includes both time of
 13 drought on the one hand and naturally wetter
 14 periods on the other. Correct?
 15 **A. Right. So --**
 16 **Q.** I'm just --
 17 **A. At this point.**
 18 **Q.** I just want to be clear that the years included
 19 all the years, whether they were dry years or wet
 20 years. Correct?
 21 **A. Right. At this point though when you ask about**
 22 **the decline, you're looking at the trend line.**
 23 **And just so that the Court is clear about the**
 24 **trend line, it's an average over many years.**
 25 **So when you say going through 2015, it's**

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1 **Q.** Sir, you don't know if the cause of this trend
 2 line had anything to do with Georgia's
 3 consumptive use; do you?
 4 **A. I don't believe it does.**
 5 **Q.** Okay. But you don't know?
 6 You didn't do that analysis. You didn't
 7 analyze what was going on with Georgia's
 8 consumptive use starting in 1970 when their
 9 agricultural use also started to dramatically
 10 increase at this time. Correct?
 11 **A. Can you reask me that question?**
 12 **Q.** Sure. You didn't analyze the impact of Georgia's
 13 consumptive use starting in 1970 when we know
 14 that its agricultural consumptive use increased
 15 dramatically?
 16 You didn't look at the impact of that
 17 consumptive use on the floodplain, at least not
 18 until starting in 1992. Correct?
 19 **A. Right. I have looked at dates prior to 1990 --**
 20 **to those periods of time; but you're correct that**
 21 **I did not try to separate out the influence of**
 22 **irrigation in the 1970's in any particular way.**
 23 **Q.** Okay. Now, sir, I want to talk now about your
 24 opinion regarding the impacts of Georgia's
 25 consumptive use on species in the Georgia portion

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1 of the ACF Basin. Okay?

2 **A. Okay. I did not study that, but I would be happy**

3 **to discuss it with you.**

4 **Q.** You didn't put it in your prefiled direct

5 testimony, but you included discussion of that in

6 your expert report. Correct?

7 **A. Insofar as Dr. Allan was talking about it, that's**

8 **the first time I noticed anybody talking about**

9 **resources in Georgia in a case that involved**

10 **Florida. So I responded to Dr. Allan.**

11 **Q.** Okay. And do you recall stating in your report

12 that factors other than the low flow were

13 impacting species like mussels in the Lower Flint

14 River Basin -- the Georgia portion of the Lower

15 Flint River Basin?

16 **A. I don't recall saying factors other than the low**

17 **flow.**

18 **Q.** Sir, if you could, please, turn back to tab 9,

19 which are excerpts from your expert report. And

20 do you see at the bottom of the paragraph on that

21 page that is the continuation -- it's the first

22 paragraph on the page. It says, clearly factors

23 other than low flow events affect mussel

24 distribution and abundance in the Lower Flint

25 River Basin.

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1 **A. Yes, I see that.**

2 **Q.** And do you see that this was part of a Georgia

3 water resources conference in 2015?

4 It says that after where it says reference.

5 **A. Yes.**

6 **Q.** Now, could you please look at the abstract and

7 look at the first two sentences of the abstract.

8 Just please read those to yourself.

9 **A. I'm finished reading that.**

10 **Q.** And, sir, do you see that the authors are looking

11 at the relationship between the increase in

12 agricultural irrigation in Georgia and diminished

13 flows in the Lower Flint?

14 **A. I see that that's what they're studying.**

15 **Q.** And they're looking at the impact of those

16 reduced flows on the river habitat. Correct?

17 **A. That's what they're looking at.**

18 **Q.** Now, if you could review the paragraph just below

19 the figure on that same page, the paragraph that

20 begins, the Lower Flint River Basin. Please just

21 review that and let me know when you're done.

22 **A. Okay. I'm finished reading that paragraph.**

23 **Q.** And do you see there, again, the authors are

24 identifying the rapid expansion of water use for

25 irrigation during the '70's. Correct?

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1 **A. There are literature on the Flint River Basin;**

2 **and I believe that the literature, in addition to**

3 **low flow, talks about substrate type, all the**

4 **types of things that would normally affect the**

5 **distribution of mussels.**

6 **Q.** And, sir, have you reviewed the literature that

7 looks at the impacts of the flow in the Georgia

8 portion of the Flint River Basin?

9 **A. I haven't.**

10 **Q.** And, sir, if you could then, please turn to tab 4

11 in your binder. Tab 4 is a document marked

12 FX-50. And it's an article titled Effects of

13 Reduced Summertime Streamflows on In-stream

14 Habitat in the Lower Flint River Basin, Georgia,

15 U.S.A. Do you see that?

16 **A. I see it.**

17 **Q.** Are you familiar with this article, sir?

18 **A. I may have seen this in general reviews; but it's**

19 **not something I used in my -- for my -- forming**

20 **my opinions.**

21 **Q.** Do you see that the authors are affiliated with

22 the Jones Ecological Research Center in Newton,

23 Georgia?

24 **A. Yes.**

25 **Q.** And the National Park Service in Athens, Georgia?

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1 **A. I see that's what these authors are looking at.**

2 **Q.** And they state that the current levels of

3 agricultural pumping are associated with reduced

4 summertime flows, particularly in droughts.

5 Correct?

6 **A. I see that's what they're writing about, yes.**

7 **Q.** Okay. Now, if you could turn to the next page

8 and read the paragraph under Data Analysis.

9 **A. Yes. I have finished reading the data analysis**

10 **piece.**

11 **Q.** Okay. And you see there the authors are looking

12 at habitat inundation at a reach on

13 Ichawaynochaway Creek in the Flint River Basin in

14 Georgia. Correct?

15 **A. Right. I understand that this is all about the**

16 **Flint River and its resources, and I did not**

17 **include assessment of the Flint River as part of**

18 **looking at the claims with regard to the**

19 **resources in Florida.**

20 **Q.** Do you not think it's relevant what the effects

21 of consumption are on the streamflow of the Flint

22 River in Georgia?

23 **A. It may be relevant for our purposes. It wasn't**

24 **relevant to my report.**

25 **Q.** You know that the Flint River flows down into the

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1 Apalachicola River in Florida. Correct?

2 **A. Of course.**

3 **Q.** And you were looking at the impacts of

4 consumptive use on the Apalachicola River and

5 Bay. Correct?

6 **A. That's correct.**

7 **Q.** Okay. Now, sir, back to this article. They are

8 comparing minimum flows and habitat inundation

9 between a historical drought in 1954 and a more

10 recent 2012 drought. Correct?

11 **A. That is correct.**

12 **Q.** And the authors found that the 1954 and the 2012

13 droughts were similar in duration and intensity.

14 Correct?

15 **A. For those individual years.**

16 **Q.** Okay. Now, if you could please turn to the next

17 page, page 3, and read the paragraph -- the first

18 paragraph under Shoal Inundation.

19 **A. I'm finished reading that.**

20 **Q.** Okay. And, sir, do you see that there the

21 authors estimated that under the minimum

22 streamflow of the 1954 drought, which was 117

23 cfs, 82 percent of the shoal habitat remained

24 inundated? Do you see that?

25 **A. I see it.**

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1 **Q.** But during the drought of similar duration and

2 severity in 2012, the minimum flow was only 5

3 cfs; and only 43 percent of the shoal habitat was

4 inundated. Correct?

5 **A. I see that. Yes.**

6 **Q.** Now, sir, could you look at the right-hand column

7 where it says Conclusions and Future Work, and

8 just read those three bullets to yourself,

9 please.

10 **A. I have read their conclusions.**

11 **Q.** And, sir, do you see that there the authors find

12 that increased agricultural water demand is

13 associated with increased frequency of extreme

14 low flows. Correct?

15 **A. That's correct.**

16 **Q.** And that there's been a more than 20-fold

17 reduction in the minimum flow compared to the

18 minimum flow during the pre-irrigation era;

19 correct?

20 **A. I think -- I see that's what they said.**

21 **Obviously I have not analyzed any of this myself.**

22 **Q.** Okay.

23 **A. But that's what they're saying.**

24 **Q.** And they also found that the reduction in minimum

25 flow caused a substantial decrease in the amount

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1 of in-stream habitat that is available for growth

2 and propagation of aquatic organisms. Correct?

3 **A. That's what they have said about this particular**

4 **little stream, yes.**

5 **Q.** Okay. Now, sir, if you could, please turn to

6 tab 5. Tab 5 is a document marked FX-51. It's

7 another article. The authors are Smith,

8 Golladay, Clayton, and Hicks. Do you see that?

9 **A. I do.**

10 **Q.** And they are affiliated with the Jones Ecological

11 Research Center. Correct?

12 **A. Yes.**

13 **Q.** And you recognize at least Hicks and Golladay,

14 correct, because you have cited work by them in

15 your expert report?

16 **A. I have.**

17 **Q.** Okay. Now, do you see that this paper also was

18 presented at a Georgia water resources conference

19 in 2015?

20 **A. I see that.**

21 **Q.** Okay. And if you could, sir, please just look at

22 the first two sentence of the abstract.

23 **A. I have read that.**

24 **Q.** And, sir, do you see that the authors attribute

25 the declines in mussel populations in the Flint

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1 River Basin with droughts and increasing water

2 withdrawal for irrigation?

3 **A. I see that's what they have said in this**

4 **sentence, yes.**

5 **Q.** Now, sir, I'm not going to belabor it by walking

6 through the rest of that article. Let's just

7 turn to tab 6. And here, now, instead of an

8 article, we have got a document that's marked

9 JX-21. It's the Flint River Basin Regional Water

10 Development and Conservation Plan. Do you see

11 that, sir?

12 **A. I see it.**

13 **Q.** And do you see that underneath the picture it

14 says Georgia Department of Natural Resources

15 Environmental Protection Division?

16 **A. Yes.**

17 **Q.** And, sir, is this a document that you're familiar

18 with?

19 **A. I have seen this document.**

20 **Q.** Okay. Now, sir, if you could, please turn to

21 page 21 of this document. Do you see it says

22 Summary of Technical Findings?

23 **A. I see that. I see it, yes.**

24 **Q.** Okay. Now, if you could turn the page to page 22

25 and just read the numbered paragraph 3 to

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1 yourself.

2 **A. I have read it.**

3 **Q.** Okay. Now, sir, do you see that this document

4 talks about the circumstances since the extensive

5 development of irrigation in the Lower Flint

6 River Basin?

7 **A. I see that, yes.**

8 **Q.** And do you see that the low flow criteria that

9 the U.S. Fish and Wildlife Service established to

10 protect aquatic habitats are not met more

11 frequently and for -- sorry. I'm saying that

12 backwards. That they are not met -- that they

13 are met less frequently and for shorter durations

14 than before irrigation?

15 I'm sorry for fumbling that. Do you want me

16 to repeat that?

17 **A. I think I know what you're saying. And what I**

18 **think you're saying is that post-irrigation that**

19 **those are not met as frequently as they were**

20 **pre-irrigation.**

21 **But what I notice in this is that they're**

22 **being referred to as criteria, and I don't**

23 **believe they are criteria. I believe that these**

24 **were -- I think these were a set of guidelines**

25 **that were developed, not criteria.**

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1 **A. It's one of a number of things I looked at. I**

2 **would say that I made an effort to look at every**

3 **biological community that's present in the bay**

4 **for which there is information.**

5 **Q.** Well, you're --

6 **A. And that's one of them.**

7 **Q.** Your opinion, just to be clear, doesn't cover

8 oysters. Correct?

9 **A. Part of my opinion does cover oysters. But I did**

10 **not devote the type of effort to evaluating the**

11 **oyster situation that was devoted to by another**

12 **expert on behalf of Georgia.**

13 **Q.** Okay. So focusing on submerged aquatic

14 vegetation, or SAV, that's just a fancy term for

15 seagrass. Correct?

16 **A. I think what we're referring to here is probably**

17 **the freshwater plants. So they would not be**

18 **called commonly seagrasses.**

19 **Q.** Okay.

20 **A. It would be the freshwater plants.**

21 **Q.** My mistake. Seagrass is a saltwater SAV?

22 **A. Seagrass is more referred to as a saltwater**

23 **plant.**

24 **Q.** Okay. And as you said, we're more concerned here

25 with the freshwater SAV. Correct?

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1 **Q.** You're familiar with those guidelines that the

2 U.S. Fish and Wildlife Service put out in 1999.

3 Correct?

4 **A. I am.**

5 **Q.** Okay. Now, do you see that Georgia EPD also

6 finds that this is the clearest evidence that

7 agricultural irrigation in Georgia compounds the

8 effect of climatic drought on streamflow in the

9 Flint River Basin?

10 **A. I really can't speak on behalf of the agency.**

11 **Q.** Well, do you see those words here, sir?

12 **A. I see those words here.**

13 **Q.** And you know this was written by the agency.

14 Correct?

15 **A. I know it's -- going back, it is an agency**

16 **document. But I don't -- I haven't had any**

17 **conversation with the agency with respect to**

18 **their views on this.**

19 **Q.** Okay. I would like to switch topics now and

20 focus on the bay as opposed to the river.

21 **A. Okay.**

22 **Q.** Now, you analyzed Georgia's consumptive use on

23 the Apalachicola Bay. And in particular, you

24 look at submerged aquatic vegetation, or SAV.

25 Correct?

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1 **A. All the plants in the Apalachicola Bay are**

2 **important ecologically. These particular plants**

3 **are present at the mouth of the Apalachicola**

4 **River and in what's called East Bay, and they're**

5 **valuable as habitat. And then they transition as**

6 **it gets saltier into seagrass beds. So both**

7 **seagrass beds and freshwater grass beds are**

8 **important.**

9 **Q.** Okay. And this vegetation is important because

10 it's a source of food for many species in the

11 bay. Correct?

12 **A. It's eaten by a lot of species, including the**

13 **manatees.**

14 **Q.** Okay. And would you say in the East Bay nursery

15 area, it's essential habitat for the species that

16 are in the East Bay?

17 **A. It's an important component of the habitat, yes.**

18 **Q.** Okay. Now, one of the important submerged

19 aquatic vegetation species associated with East

20 Bay is Vallisneria americana. Correct?

21 **A. It's one of several species of freshwater plants**

22 **that are present in this area.**

23 **Q.** And -- okay. And can we just call it V

24 americana, so I don't keep screwing up the V?

25 Is that how people refer to it sometimes?

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1 **A. Probably the best thing to call it is either --**
 2 **water celery. That's kind of a common name that**
 3 **would be very familiar.**
 4 **Q.** Okay. Let's use that. Much easier for me.
 5 Now, this water celery -- let me just --
 6 before I agree to that, I just want to make sure
 7 it's -- are water celery and Vallisneria
 8 americana completely coextensive; one doesn't
 9 include something more than the other?
 10 **A. No.**
 11 **Q.** Okay.
 12 **A. That covers it pretty well.**
 13 **Q.** Okay. Now, this water celery serves as a food
 14 source for birds and other mammals; and it
 15 provides habitat. Correct?
 16 **A. Birds don't eat it too much, but mammals like**
 17 **manatees would eat it; and lots of little animals**
 18 **in the -- like, fish -- some fish will eat it,**
 19 **yes.**
 20 **Q.** Okay. And this water celery is more sensitive to
 21 salinity. Correct?
 22 **A. Yes.**
 23 **Q.** Okay. And it doesn't grow particularly well in
 24 high salinity environments. Correct?
 25 **A. That's correct. The saltier the water gets, you**

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1 **transition from freshwater plants to marine**
 2 **plants. So you will find -- in Apalachicola Bay**
 3 **you won't find any of these plants in the outer**
 4 **bay; they will all be the seagrasses. But as you**
 5 **go into East Bay, as you get closer to the river,**
 6 **the seagrasses disappear; and the freshwater**
 7 **plants appear.**
 8 **Q.** Okay. And in your evaluation of how changes in
 9 streamflow affect salinity in the bay, you were
 10 looking at average salinity values on a weekly
 11 basis. Correct?
 12 **A. I was looking at that along with the variation**
 13 **among weekly values. So I looked at the**
 14 **variability in salinity as computed by weekly**
 15 **averages.**
 16 **Q.** Okay. Now, you cite in your direct testimony a
 17 paper by Ken Moore. Correct?
 18 **A. I do.**
 19 **Q.** And if we could just turn to that, it's tab 7 in
 20 your binder.
 21 Tab 7 is JX-32, and this is the paper by Ken
 22 Moore that you referenced. Correct?
 23 **A. That's right.**
 24 **Q.** And if you could please turn to page 9-5. And do
 25 you see there is a section on Salinity Effects on

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1 Wild Celery. Correct?
 2 **A. Yes.**
 3 **Q.** And if you turn to page 9-6, the last sentence on
 4 that page begins, the duration of exposure. Do
 5 you see that?
 6 **A. I do.**
 7 **Q.** And if you could just read that to the end of
 8 that paragraph that continues on 9-7.
 9 **A. I finished reading that.**
 10 **Q.** Okay. Now, in this paper -- is it Mr. Moore or
 11 Dr. Moore; do you know?
 12 **A. I don't know.**
 13 **Q.** Okay. Hopefully, we don't insult him if I say
 14 Mr. Moore.
 15 He writes that the duration of exposure to
 16 high salinity is very important in determining
 17 plant survival and possible recovery. Correct?
 18 **A. That's what he says, yes.**
 19 **Q.** And then he goes on in that paragraph to say that
 20 with salinity increased to 15 ppt for just one or
 21 two days, growth of V americana, which is wild
 22 celery, is reduced.
 23 **A. That's right. And it's important to understand**
 24 **that he's doing a set of experiments.**
 25 **Q.** Okay. And he says on that same page that

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1 exposure to salinity of 25 ppt for just one day
 2 can kill the plants?
 3 **A. Yes.**
 4 **Q.** But your analysis used only a weekly time scale.
 5 Right?
 6 **A. That's correct.**
 7 **Q.** So in a week that is close to the parameters
 8 identified by Mr. Moore, the weekly average
 9 salinity value could obscure -- it could be
 10 obscured if salinity exceeded 15 or 25 ppt for a
 11 day or two. Correct?
 12 **A. I think what you're asking me is if one of my --**
 13 **let's say a weekly average value of 10 parts per**
 14 **thousand might have had a value of 15 in it that**
 15 **was part of the average. And it could.**
 16 **Q.** Okay. Now, let's talk about what you did with
 17 these average salinity values in your SAV
 18 analysis. You calculated salinities for three of
 19 the ANERR monitoring station in Apalachicola Bay.
 20 Correct?
 21 **A. That's correct.**
 22 **Q.** And that included East Bay. Correct?
 23 **A. It included what's called the East Bay station,**
 24 **which is not a location that I consider**
 25 **representative of East Bay; but it's the only**

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1 **station internal to East Bay.**

2 **Q.** Okay. And your direct testimony presents your

3 salinity analysis for only one of those stations,

4 and that's Cat Point. Correct?

5 **A.** Oh, in the direct? You mean the most recent?

6 **Q.** Correct. In your prefiled direct testimony --

7 **A.** Correct.

8 **Q.** -- you only present the salinity data for Cat

9 Point?

10 **A.** That's correct.

11 **Q.** And Cat Point is further from the mouth of the

12 Apalachicola River than East Bay. Correct?

13 **A.** That's right.

14 **Q.** And has a higher salinity than East Bay?

15 **A.** It's definitely higher than the East Bay regions

16 where the plants occur. And it is, I think, also

17 higher than what's recorded at the East Bay

18 station.

19 **Q.** And wild celery, which does not like the higher

20 salinity conditions, typically does not grow

21 around Cat Point. Correct?

22 **A.** That's the part of Apalachicola Bay around the

23 edges where you would find the seagrass beds like

24 eelgrass and plants like that.

25 **Q.** Right.

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1 **A.** So they do very well.

2 **Q.** You find more of the saltwater plants as opposed

3 to the freshwater plants?

4 **A.** Right. Lots of saltwater plants out there.

5 **Q.** Right. Now, you rely in your testimony on a

6 Florida Fish and Wildlife Conservation Commission

7 report on seagrass in Franklin County coastal

8 water. Correct?

9 **A.** I include that in my testimony, yes.

10 **Q.** And you note that that document shows a net

11 increase of 159 acres of submerged aquatic

12 vegetation between 1992 and 2010 in the regions

13 of Apalachicola Bay. Correct?

14 **A.** To put that in some context, there were two

15 surveys that were done that mapped out grass

16 beds, either freshwater or saltwater grass beds

17 throughout the entire region. And then

18 calculations were made of area and subtractions

19 and -- were determined in terms of areas of loss,

20 areas of gain. And over the entire region there

21 was a net gain of 100. But there was -- in

22 certain regions like East Bay there was a

23 reduction that occurred.

24 **Q.** Okay. And we'll look at that in a moment. But

25 you created this report to say that SAV in the

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1 Apalachicola Bay has been steadily increasing

2 since Hurricane Dennis. Correct?

3 **A.** I don't think that's the basis for that opinion.

4 I base that opinion on two things. One is the

5 monitoring that's been going on by the research

6 station since Hurricane Dennis as well as my

7 observations in East Bay. But I don't believe

8 that what you just referred to would be -- would

9 be the basis for a steady increase.

10 **Q.** Sir, if you could, please, turn to page 69 of

11 your prefiled direct testimony. It's on page 31.

12 Do you see there that you referenced GX-1254,

13 which is the document that you're looking at?

14 **A.** I'm on page 69. Correct?

15 **Q.** Paragraph 69.

16 **A.** Oh, paragraph 69. Thank you.

17 I'll get used to the fact that it's over here

18 on my right, but -- let's see. Okay. I'm at 69.

19 **Q.** You're at paragraph 69. And do you see there,

20 sir, that you cite GX-1254, which is the document

21 we're looking at, and other reports that

22 similarly suggest that SAV in Apalachicola Bay

23 has recovered following Hurricane Dennis?

24 **A.** Let me -- let me reread 69.

25 Right. So that includes what we were

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1 referring to earlier as the Franklin County

2 coastal waters for the entire system. And then

3 that's followed by some sentences from other

4 reports from Florida that were -- that was what I

5 was referring to.

6 **Q.** Okay. Now, sir, let's look at GX-1254, which is

7 in tab 8 of your binder.

8 **A.** I have it.

9 **Q.** So, sir, can you turn to page 4. Do you see

10 table 1?

11 **A.** Yes.

12 **Q.** Sir, do you see the line that says Apalachicola

13 Bay?

14 **A.** I do.

15 **Q.** Do you see the column on the far right that says

16 change 1992 to 2010?

17 **A.** Yes.

18 **Q.** And, sir, do you see that instead of showing an

19 increase in SAV in Apalachicola Bay, it actually

20 shows a decrease of 2,000 acres of SAV during

21 that time periods?

22 **A.** Right. And I addressed this in my expert report

23 as to the kinds of reliance you should place on

24 this table.

25 **Q.** Okay. I will let you address that; but you see

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1 that that is what is shown right here, a decrease
 2 of 2,000 acres of SAV in Apalachicola Bay.
 3 Correct?
 4 **A. I don't believe that's what the agency thinks it**
 5 **represents.**
 6 **Q.** Okay. But that's what is here in this table.
 7 Correct?
 8 **A. That's -- that's the number.**
 9 **And to explain that somewhat, that's the**
 10 **number of mapped acres from aerial photographs**
 11 **between these two points in time.**
 12 **Q.** Sir, you don't have any evidence to contradict
 13 that statement as it relates to the wild celery,
 14 the freshwater SAV, for Apalachicola Bay.
 15 Correct?
 16 **A. What I'm -- what I was pointing out is that my --**
 17 **my report is much more detailed than this. And**
 18 **it points out the significance of the fact that**
 19 **wild celery and other plants were growing and**
 20 **increasing in the bay since 1992. They were much**
 21 **more abundant in 2005 than in 1992. And it was**
 22 **the hurricane that occurred that year that**
 23 **decimated them. So that's a really important**
 24 **point.**
 25 **And then since that time, the research agency**
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1 **has gone out and documented the return of the**
 2 **plants. And then I went out to see whether they**
 3 **had returned, and they had.**
 4 **So I think that the agency that developed**
 5 **this table recognizes the limitations of being**
 6 **able to judge what was present. And it was**
 7 **largely affected by the turbidity of the water;**
 8 **what can you see from the sky?**
 9 **So they point that out.**
 10 **Q.** Sir, do you have an analysis of how much of the
 11 wild celery has returned in Apalachicola Bay of
 12 freshwater SAV?
 13 **A. I can speak to my observations.**
 14 **Q.** Sir, other than your observations, do you have an
 15 analysis that would contradict the numbers that
 16 we see here?
 17 **A. I don't think these numbers have anything to do**
 18 **directly with wild celery because they can't tell**
 19 **that from the sky.**
 20 **Q.** Okay. Sir, you don't have an analysis of how
 21 much wild celery or freshwater SAV is in
 22 Apalachicola Bay. Correct?
 23 **A. Other than my observations?**
 24 **Q.** Correct.
 25 **A. Right. I have my observations.**
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1 **Q.** Okay. Thank you, sir.
 2 **SPECIAL MASTER LANCASTER:** Redirect?
 3 **REDIRECT EXAMINATION**
 4 **BY MS. DeSANTIS:**
 5 **Q.** Dr. Menzie, to assist the Court and to put
 6 yourself and your area of expertise in context,
 7 what is your precise area of expertise?
 8 **A. I specialize in an area known as causal analysis.**
 9 **It's kind of like an individual that provides**
 10 **diagnoses of what's ailing an individual or**
 11 **patient. But I basically do that with respect to**
 12 **environmental matters, causal analysis, what**
 13 **causes something to happen. And my broader area**
 14 **of expertise is in marine ecology, riverine**
 15 **ecology.**
 16 **Q.** And so are you an ecologist?
 17 **A. That's by training and by my career, which began**
 18 **in the early 1970's.**
 19 **Q.** Have you previously done work on estuaries and
 20 estuarine systems like the Apalachicola Bay?
 21 **A. I have worked on estuaries in the Gulf of Mexico,**
 22 **but my early years I began in the Northeast. And**
 23 **I have experience working on estuaries ranging**
 24 **from the Penobscot, through the Gulf of Maine,**
 25 **through the Hudson River, through the Delaware**
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1 **River, all the way around the coast to San**
 2 **Francisco Bay, San Diego Bay, Puget Sound.**
 3 **Q.** And what is the scope of the work that you were
 4 asked to do in this matter by the State of
 5 Georgia?
 6 **A. It was pretty narrow. I was specifically asked**
 7 **to look at the claims that were being made of**
 8 **harm to the Apalachicola Bay, to the Apalachicola**
 9 **River, and the floodplain, and to make a**
 10 **determination as to the relative influence of**
 11 **Georgia's consumption of water on any changes**
 12 **that may be occurring within those systems.**
 13 **Q.** Now, counsel for the State of Florida has
 14 questioned you about the years that you analyzed.
 15 Why did you focus your analysis on the years 1992
 16 forward?
 17 **A. Well, my understanding at the very beginning of**
 18 **my involvement in this case was that there was a**
 19 **claim -- a prayer for relief, if you will, on the**
 20 **part of Florida to have waters -- water**
 21 **consumption returned to the levels of 1992**
 22 **because there had been harms that had been**
 23 **experienced since that time as indicated by the**
 24 **loss of oysters and other effects.**
 25 **Q.** Did you in the course of your work, Dr. Menzie,
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1 though also consider data and information from
 2 years prior to 1992 to inform your opinions?
 3 **A. I did.**
 4 **Q.** And, Dr. Menzie, in the course of your analysis,
 5 did you work alone; or did you work with others?
 6 **A. I worked with a team. Typically for these causal**
 7 **analyses approaches that involve bringing**
 8 **together a variety of types of information such**
 9 **as hydrology and whatnot, it's helpful to bring a**
 10 **team together to look at various aspects and then**
 11 **kind of combine that into a whole, a whole**
 12 **analysis.**
 13 **Q.** All right. I would like to ask you and ask the
 14 Court to please look at your written direct
 15 testimony on page 8. And I know we handed your
 16 written direct testimony to the Court; and I know
 17 it is also in the very front of Florida's binder,
 18 although it's not behind a tab number. And there
 19 is a chart. And we'll put this up on the screen,
 20 as well in your direct testimony on page 8.
 21 What does this chart show, Dr. Menzie?
 22 **A. These are the primary members of my team. It**
 23 **shows their names and their degrees. And then**
 24 **the areas that I felt were important for**
 25 **answering the questions I was asked to answer are**

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1 **listed across the top. So the methodology I have**
 2 **just mentioned is something called causal**
 3 **analyses. But the technical fields that need to**
 4 **be called upon to answer the questions include**
 5 **marine ecology, freshwater ecology, statistics**
 6 **modeling, and GIS -- geographic information**
 7 **systems -- and whatnot.**
 8 **So while I'm familiar with all of these areas**
 9 **and have deep expertise in some, I felt it wise**
 10 **to bring together a team that could share**
 11 **knowledge so that we could collaborate in putting**
 12 **together our assessments of what was claimed and**
 13 **also the extent to which Georgia was contributing**
 14 **to any changes in the bay or in the floodplain.**
 15 **Q.** Separate and apart from this team that you
 16 assembled, did you look at the work of other
 17 experts for the State of Florida and the State of
 18 Georgia in order to develop your opinions and
 19 analyses in this case?
 20 **A. I did. One of the things I wanted to be able to**
 21 **do is have as complete an understanding of the**
 22 **technical issues in this case as I could. So on**
 23 **the biology side with respect to Georgia's**
 24 **experts, I spoke with the expert on oysters to**
 25 **understand what that individual was looking at**

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1 **and to share some of my thoughts. And I talked**
 2 **to and read the reports of Georgia's experts**
 3 **on modeling. And we -- you heard earlier from**
 4 **Dr. McAnally, as an example. I reviewed**
 5 **Dr. Bedient's reports. I had conversations with**
 6 **their staff so that I was clear about what they**
 7 **did.**
 8 **And then I also looked at all the work that**
 9 **was done by Florida's experts. So I wanted to**
 10 **make sure that I had a clear understanding of**
 11 **where the differences lied and to help me feel**
 12 **more confident about my results.**
 13 **So I began with Dr. Flewelling who assessed**
 14 **consumption of water, to Dr. Hornberger who**
 15 **translated that into flows, to Dr. Lettenmaier**
 16 **and then all of the biological consultants that**
 17 **Florida has employed, in particular Dr. Allan who**
 18 **looked at floodplains, and Dr. Glibert who looked**
 19 **at the base of the food web, and Dr. Jenkins who**
 20 **looked at the fish.**
 21 **Q.** Did you also review and analyze literature as
 22 part of your work on this case?
 23 **A. I did. It was important to get as -- as broad an**
 24 **understanding of what individual researchers in**
 25 **Georgia and Florida had been discovering over the**

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1 **many years. And so I made a careful examination**
 2 **of those literature to broaden my understanding.**
 3 **Q.** Now, doctor, you have talked about the causal
 4 analysis that you did for this matter. And you
 5 have spoken of your expertise in causal analysis.
 6 I would like to turn to page 22 of your written
 7 direct testimony and particularly to look at
 8 demonstrative 6 on that page to assist in an
 9 understanding of what a causal analysis is. Can
 10 you please describe what you are showing in
 11 demonstrative 6 in your written direct testimony.
 12 **A. Yes. So, you know, recognizing that this is a**
 13 **very complex problem and that ecosystems are**
 14 **complex, it's important to approach this in a --**
 15 **you know, in a step-wise manner so that you**
 16 **can -- you can bite off pieces and look at them**
 17 **and then move on to the next.**
 18 **So I use a three-step process. And the**
 19 **first, really, is to look at all of the available**
 20 **information to see whether there is evidence of**
 21 **change.**
 22 **This case really is about change in the bay**
 23 **and change in the floodplain. And so the first**
 24 **step before going any further was to see whether**
 25 **that premise that changes were occurring was**

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1 supported or not.

2 Then move to tier 2, which in this case is

3 asking the question of whether or not Georgia's

4 consumption of water was sufficient and of a

5 nature that could bring about these types of

6 changes or contribute to them in some way.

7 And so, for example, that would involve the

8 modeling work that I referred to upon cross that

9 looked at the relative influence of Georgia's

10 consumption of water on the floodplains or on

11 changing the salinity in the bay. And then

12 finally, depending on the answer from that step,

13 or to confirm what I found in that step, I

14 consider all the possible causes that may be at

15 play.

16 And there are -- for example, in the case of

17 the river, I was aware, as everybody is aware, I

18 think, that the dam was built; the bottom of the

19 river is decreased. There's been sedimentation

20 that may be blocking some of the sloughs.

21 There's been road construction. There's a

22 variety of things that have happened.

23 And before pointing a finger at one cause and

24 saying, aha, I found the answer, it's important

25 to kind of look across everything to make sure

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1 that that's a correct answer or to perhaps

2 identify the things that may be most at play.

3 So that's the nature of the analysis.

4 Q. And why specifically did you choose to do a

5 causal analysis in this matter?

6 A. Well, it has become the state of practice to

7 do causal analyses. And it -- the logic behind

8 it is that it really helps avoid jumping to

9 conclusions. By considering all the possibilities

10 and by taking a step-wise approach, an analyst

11 such as myself is forced to think about what's

12 going on in the system and to consider

13 everything, and after that careful consideration,

14 to be able to identify the things that are most

15 important.

16 So it's a deliberative process that's been

17 developed for that purpose, very much like in the

18 medical community.

19 Q. When did a causal analysis approach become

20 recognized as best practice in your field?

21 A. While this had been well recognized in the

22 medical community for some time, in the 1990's,

23 because of the clean air -- Clean Water Act and

24 the observation that there were many rivers and

25 streams throughout the United States that were

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1 biologically impaired, that is, the fish were

2 off; they didn't have the right types of benthic

3 invertebrates, or whatever it might be, states

4 came to recognize that they needed some way to

5 figure out what was going on.

6 So interestingly enough, Maine served as the

7 first step and --

8 Q. The State of Maine?

9 A. The State of Maine. And around the corner we

10 have the Presumpscot River, and that became one

11 of the first case studies for applying causal

12 analyses. They had -- they had been gathering

13 data throughout the '90's. There were a number

14 of issues. And the State of Maine got together

15 with the Environmental Protection Agency and

16 began thinking about how to organize information

17 and how to think about it. And that actually

18 became the first case study.

19 Q. Did your approach for assessing the ecology in

20 the ACF Basin differ from the approach of experts

21 for the State of Florida?

22 A. I think it differed in an important material way.

23 I had the impression, anyway, when I read the

24 expert reports that -- of Florida, that they

25 started by presuming that the harm did -- any

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1 harm that was seen must be related to Georgia's

2 consumption of water. And so beginning with that

3 conclusion, at least as it struck me, information

4 was marshalled to prove up that, to kind of help

5 explain how it could be that Georgia's

6 consumption of water was the cause of whatever

7 change that may be occurring or may be seen

8 within either the bay or the river.

9 So that is exactly what the causal analysis

10 method was designed to avoid, jumping to a

11 conclusion like that on figuring out what a cure

12 was when you don't know what the nature of the

13 disease is. And so I had begun with the causal

14 analysis before I saw any of Florida's expert

15 reports. But the most striking difference was

16 that.

17 Q. And, Doctor, does the approach of Florida's

18 experts to assessments of the ecology in the

19 basin, does that approach render your conclusions

20 unreliable?

21 A. I think it must be recognized that the approach

22 that was taken was the one -- was as I just

23 described. And I know of many instances where

24 you can reach a false conclusion if you don't

25 carefully think about the problem and if you

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1 **don't look at what the alternative explanations**
 2 **might be. So for that reason I would consider it**
 3 **unreliable.**
 4 **Q.** And, Doctor, we're going to go into some of your
 5 specific conclusions from your causal analysis;
 6 but can you please briefly summarize for the
 7 Court your conclusions resulting from your causal
 8 analysis here.
 9 **A. Well, in brief -- and I mentioned this three-step**
 10 **process I took. I really didn't see anything**
 11 **happening in the bay that would be considered or**
 12 **be a material change biologically. I did see in**
 13 **my first step changes in the -- in the**
 14 **floodplain. When I looked more deeply at the**
 15 **relative contribution of Georgia's consumption of**
 16 **water to changes, I concluded that while not**
 17 **zero, the influence of Georgia's consumption of**
 18 **water is minor, very small. And then beyond**
 19 **that, for certain aspects of my analysis, I**
 20 **pointed out where some other factors were playing**
 21 **an important role in influencing the changes in**
 22 **the bay or in the river and floodplain.**
 23 **Q.** All right. Now, doctor, moving away from the
 24 specifics of your causal analysis and the
 25 framework for your causal analysis, I want to

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1 move on to talk about your analysis of the
 2 historical hydrological regime. And can you
 3 please describe for us what is a historical
 4 hydrological regime and why was it important to
 5 your analysis and, as a backdrop, your causal
 6 analysis for this matter?
 7 **A. Sure. Well, we -- I think we all know that this**
 8 **past year has been a year of drought. So Maine**
 9 **has had a moderate drought. And Georgia,**
 10 **unfortunately, has got an extreme drought. And**
 11 **we have fires spreading across the Appalachians.**
 12 **So we have been in a period of drought for some**
 13 **time.**
 14 **And in thinking about this ecosystem, it's**
 15 **important to understand whether this is an**
 16 **especially unusual event. These are bad**
 17 **droughts, But also -- so, therefore, to look**
 18 **back in time to see what the history of the**
 19 **system is -- and that's known as the historical**
 20 **hydrological regime -- to gain an understanding**
 21 **of what formed the ecosystem.**
 22 **Q.** And in evaluation of the historical hydrological
 23 regime of the ACF Basin, what did you conclude?
 24 **A. Well, I looked at three things. You know, we**
 25 **have the gage data that are available for the**

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1 **river, and that shows the flows going up and down**
 2 **at different periods. And we're able to take**
 3 **that back to, you know, the 1920's.**
 4 **And then we have, as a second source of**
 5 **information, information that's collected and**
 6 **maintained by the U.S. Government, National**
 7 **Oceanic and Atmospheric Administration -- NOAA --**
 8 **on droughts. So we can look at that information**
 9 **and know what kind of drought occurred here in**
 10 **the Northeast, what kind of drought has occurred**
 11 **in the South. And that information can be looked**
 12 **at going back in time as well.**
 13 **But those sources of information take us back**
 14 **only so far. So the third type of information I**
 15 **looked at were tree rings or studies about tree**
 16 **rings.**
 17 **There's a lot of published literature on tree**
 18 **rings. And any kid that has looked at a stump**
 19 **has been able to count the age of a tree. But**
 20 **the tree rings also carry information on the past**
 21 **hydrological regime. And by putting sets of**
 22 **trees together, the scientists in this field can**
 23 **go back hundreds of years, thousands of years.**
 24 **And so I looked at that information to discover**
 25 **what the long-term historical hydrological regime**

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1 **was in the -- in this basin.**
 2 **Q.** And what did you find?
 3 **A. I found something that has been well known to**
 4 **people that have been working in this field --**
 5 **particular field, and that is that the system**
 6 **periodically flips from wet to dry. And it does**
 7 **that at a cycle of every 20 to 60 years or so.**
 8 **This is -- this has a meteorological**
 9 **understanding to it. And that's -- that's**
 10 **reflected in the people that study the tree**
 11 **rings. Tree rings are very tightly packed when**
 12 **it's dry; and they spread apart when it's wet,**
 13 **and they pack up. And it's possible to see that.**
 14 **So that helped me understand that the**
 15 **Apalachicola River system -- ecosystem was one,**
 16 **as we look at it today, that has come -- has**
 17 **persisted, has moved through this period of time**
 18 **of dryness and wetness.**
 19 **We're currently in a dry period.**
 20 **Q.** And, Dr. Menzie, separate and apart from the
 21 historical hydrological regime, did you look at
 22 other factors that have historically influenced
 23 the ACF Basin and its ecology?
 24 **A. Yes, I did.**
 25 **Q.** And I would like to turn in your written direct

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1 testimony to page 25 and particularly to your
 2 demonstrative 7.
 3 MS. DeSANTIS: And, your Honor, this is
 4 a rather complex graphic. Would it be
 5 acceptable to the Court for Dr. Menzie to
 6 move to the screen to explain this
 7 demonstrative?
 8 SPECIAL MASTER LANCASTER: Certainly.
 9 Please keep your voice up. She has to
 10 take down everything you say.
 11 THE WITNESS: Okay. I think I may be on
 12 a mike. Does that sound clear?
 13 BY MS. DeSANTIS:
 14 Q. Dr. Menzie, as you go to the screen, I would like
 15 to just ask you to please describe what this
 16 figure shows.
 17 THE WITNESS: I'll point at this, but
 18 the Court might also find it helpful to look
 19 at the document.
 20 A. **In thinking about what's influenced the bay and**
 21 **the floodplain over the last many decades, I**
 22 **started by just laying out over time the things**
 23 **that people did. And we already recognize that**
 24 **we're talking about consumption of water by**
 25 **Georgia, so that's a given. You know, that's a**
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1 **simply biological events that have occurred such**
 2 **as low points in oyster landings or losses of**
 3 **these plants that we were talking about, listing**
 4 **of species and things, changes in the forage**
 5 **community.**
 6 **So recognizing that we are focused on the**
 7 **consumption of water, it's important to put that**
 8 **into a broader perspective by looking at all the**
 9 **things that might have gone on that might have**
 10 **also influenced that that could confound the**
 11 **analysis and that we need to try to separate**
 12 **out.**
 13 Q. Thank you, Dr. Menzie. And based on your
 14 analysis of various factors, including those
 15 shown on the demonstrative on the screen, what
 16 have you concluded historically the impact has
 17 been of these various factors on the Apalachicola
 18 Bay and floodplain?
 19 A. **Some have short-term influences that are -- seem**
 20 **catastrophic. So, for example, the hurricanes,**
 21 **big impact; and then you will have a recovery**
 22 **from that.**
 23 **Some have had longer-term influences, such as**
 24 **the construction of the dam. It's hard to take**
 25 **the dam away once the dam is there. And that's**
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1 **given from around the 1970's onward. But I**
 2 **wanted to know what the various other things were**
 3 **that were going on in the system.**
 4 **So we had the dams constructed in the '50's.**
 5 **We had various dredging activities that have gone**
 6 **from the '50's into the 1990's. We have changes**
 7 **in the river that we have heard about as a result**
 8 **of the dam and dredging, straightening the river,**
 9 **things like that. And that's what -- so I get**
 10 **these in my mind in terms of when did they occur.**
 11 **And then, of course, we had logging that was**
 12 **focused on the cypress trees.**
 13 **And then the second panel then lays out**
 14 **things that are natural in occurrence. So there**
 15 **are really two big things that happened. One are**
 16 **the periodic occurrences of hurricanes, so these**
 17 **are in these blue bars and red bars. And you**
 18 **will hear about two major hurricanes, one in**
 19 **the '80's and one in 2005 -- this is Hurricane**
 20 **Dennis -- that literally destroyed large portions**
 21 **of the natural resources in the bay.**
 22 **And then the next set of natural events are**
 23 **the occurrence of droughts. And they're shown**
 24 **here.**
 25 **So -- and then in this bottom panel are**
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1 **changed the bottom of the river. And so**
 2 **that's -- that's a condition that exists as a**
 3 **result of that.**
 4 **The dredging activities, I think as we have**
 5 **heard, the dredge materials were placed on the**
 6 **banks; and to varying degrees they continue to**
 7 **block the sloughs.**
 8 **And those are some of the major things that**
 9 **are affecting it.**
 10 Q. Has the system recovered from historical periodic
 11 episodes of stress?
 12 A. **Well, if we look -- if we think back over the**
 13 **hundreds of years, the system has gone through**
 14 **periodic droughts and wet periods; so what we're**
 15 **looking at today is a system that's resilient in**
 16 **terms of passing through those kinds of**
 17 **conditions. And as I just mentioned, there**
 18 **probably always have been large hurricanes that**
 19 **have occurred periodically; and it does recover**
 20 **from those.**
 21 Q. Is the Apalachicola unique in its resilience
 22 among other estuaries?
 23 A. **I think one of the unique features of estuaries**
 24 **perhaps is that they have to be resilient.**
 25 **They're in this in-between place between land and**
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1 freshwater and the ocean and saltwater. So they
 2 are forever being pushed upon by forces of nature
 3 that are conflicting with one another in their
 4 type.
 5 So if you look around and think about just
 6 for a moment the -- some of the major estuaries
 7 in the world. Even starting up here if we were
 8 thinking about the Penobscot, for example, that
 9 would be a system that is resilient or has, you
 10 know, developed with periodic influences of large
 11 amounts of fresh water, ice melt, snow melt, all
 12 that sort of thing, temperature changes, extreme
 13 temperatures.
 14 If we go to some other part of the world, if
 15 we go to the Amazon, we don't see those extreme
 16 temperatures; but we get tremendous changes in
 17 flow, very wet seasons, very dry seasons. So if
 18 you wanted to fish in the Amazon, you would go
 19 there in the dry season because it concentrates
 20 the fish; and you have a better chance of
 21 catching them.
 22 If you look at the Apalachicola, it's
 23 somewhere in between that. But, again, it does
 24 experience the Gulf of Mexico on one side and the
 25 river on the other and this mixing of the two.

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1 And so estuaries need to be resilient in
 2 order to basically maintain themselves estuaries.
 3 Q. Dr. Menzie, you mentioned in your testimony under
 4 examination by Florida that you had visited the
 5 Apalachicola Bay recently. Is that right?
 6 A. That's right.
 7 Q. And I don't want to spend a lot of time on this
 8 particular visit, but when did you visit the
 9 estuary?
 10 A. I went in April of this year.
 11 Q. And what was the purpose of that visit?
 12 A. I try to visit every system that I might be asked
 13 to look at. So that was important. But there
 14 were particular pieces of information that I
 15 wanted to confirm for myself. I had read about
 16 them and I wanted to see if they were true, and
 17 basically to ground-truth my analysis, to feel
 18 much more comfortable to be able to talk about
 19 the system than if it were just an abstract.
 20 Q. And in the course of that visit, what did you do
 21 and what did you find, if you could just
 22 summarize it for us briefly?
 23 A. There was a lot that I saw, but I distilled it
 24 down to a couple things that I think are worth
 25 sharing. One -- for me, one of the most

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1 important things that I had read in the expert
 2 reports developed by Florida's experts,
 3 Dr. Glibert and Dr. Jenkins, was that -- the
 4 impression was that these plants that we were
 5 talking about were absent from the East Bay,
 6 which is an important nursery area.
 7 So that's an easy thing to check. And I
 8 thought -- and I have done a lot of work in that
 9 in many different estuaries. So I knew that if I
 10 just went down there, got a boat with a person
 11 that was knowledgeable, and went over to where
 12 the plants were supposed to be and see if they
 13 were there. They were either there or they
 14 weren't. And they were there. And so I kind of
 15 got a sense of how extensive they were.
 16 There was another feature of the system that
 17 was really interesting, which was that parts of
 18 the system are fed by rivers that are known to
 19 carry black water. This is water that is deeply
 20 stained by draining through forest systems and
 21 stuff. It's tannins and things like that. And I
 22 had read that this had a strong influence on
 23 conditions at this one station, the East Bay
 24 monitoring station. So I went to see whether
 25 those conditions existed, at least during the

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1 time of my visit. And they did. You could take
 2 a sample of water; it looks like a cup of coffee.
 3 And then, finally, I wanted to visit the
 4 heart of the tupelo honey area. So there is a
 5 little family, the Lanier family, they make honey
 6 and put out bees and stuff where they come off
 7 the tupelos. So I visited their place. And as I
 8 was driving around through there, I noticed that
 9 because of the road construction up along the
 10 side of the river, that the roads were blocking
 11 the flow of water from the river to the
 12 floodplain. That doesn't exist everywhere, but
 13 it does exist along stretches. And so for that
 14 reason I wound up analyzing roads in a little bit
 15 more detail.
 16 Q. All right, doctor. I want to turn now to your
 17 causal analysis and conclusions regarding the
 18 ecology of the river and the floodplain. And you
 19 were asked a number of questions about this
 20 floodplain by counsel for the State of Florida.
 21 Can you please describe for us briefly the causal
 22 analysis that you performed regarding the river
 23 and the floodplain.
 24 A. Sure. So the first step was to see if there were
 25 changes. That's step No. 1. And so I reviewed

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1 the literature and I, like others whom you have
 2 heard from, saw that the literature was pretty
 3 sound on the fact that the floodplain forest has
 4 changed from a wetter type system to a drier type
 5 system. And so, indeed, there had been a change.
 6 So then the second step was to try to get an
 7 understanding of what was causing that change
 8 and, more particularly, what might be the
 9 relative contribution of Georgia's consumption,
 10 at least to river flows, because that's what
 11 Georgia would affect.
 12 And so I did a series of analyses where I was
 13 comparing the amount of areas that were flooded
 14 without that incremental consumption by Georgia,
 15 to flooding with that incremental consumption,
 16 and looked at that difference to see how big a
 17 footprint that was on the various habitats in the
 18 river.
 19 And then, finally, I took a look at some of
 20 the other major factors that may be influencing
 21 the flooding to get a handle on how important
 22 they were.
 23 Q. And as a result of your analysis, what did you
 24 find were the primary factors affecting
 25 floodplain inundation?

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1 A. The biggest one turns out to be climatic
 2 differences between years. Not climate change
 3 per se, but this variation that occurs between
 4 wet years and years in which you have droughts.
 5 If you go from a -- sort of an average year to a
 6 year in which you have a drought, that difference
 7 can account for 68 percent or 60 percent change
 8 in the amount of flooding of the floodplain.
 9 Just that one factor.
 10 The second most important factor was the
 11 change in the river -- physical features of the
 12 river, which were deeper through the upper
 13 portions of the river. And in looking -- and now
 14 holding climate the same, looking at what the
 15 depth of the river was before the construction of
 16 the dam and what it is in the most recent
 17 measurements, that accounts for about a 20
 18 percent change in the flooding. So the -- not as
 19 much water gets into the floodplain because it's
 20 now -- remains within the river. And then
 21 looking at the incremental influence of the
 22 consumption of water, that came out to be a
 23 couple of percent.
 24 So the biggest one was the climate. The
 25 second biggest was this change in the bottom of

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1 the river. And then the third was the
 2 consumption of water.
 3 Q. And, again, the percentage that you're assigning
 4 to Georgia's consumptive use in terms of a factor
 5 that influenced floodplain inundation is what?
 6 A. For the region that is the swamp region where the
 7 tupelo trees and the cypress grow, it's about 2
 8 percent or less.
 9 Q. And today, are the river and the floodplain still
 10 affected by these factors?
 11 A. Yes. These factors will remain important.
 12 Climate itself, you know, from year to year is
 13 going to change. The bottom of the river will
 14 largely be what it is. It may change slowly. So
 15 I -- I would expect that what we're looking at is
 16 what we're going to see into the future.
 17 Q. Will there be any opportunity for the river or
 18 the floodplain to recover?
 19 A. I think the river and the floodplain have
 20 essentially recovered within the constraints that
 21 exist as a result of construction of the dam and
 22 the management of flows and stuff. So the system
 23 has recovered in that degree. It's a resilient
 24 system. The bay, as I mentioned or will talk
 25 about in a moment, is a system that really hasn't

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1 been influenced to any great degree.
 2 Q. While we'll still on the floodplain, doctor, I
 3 want to look at a document that was shown to you
 4 by counsel for the State of Florida, JX-168,
 5 which is behind tab 3 in the binder that was
 6 given to you by Florida's counsel. And this is
 7 the 2016 biological opinion.
 8 And I am going to ask you to turn to a few
 9 sequential pages and paragraphs in the biological
 10 opinion. Beginning with page 3 of the BiOp, and
 11 I would like to ask you to look at the last
 12 sentence of the first paragraph and to read that
 13 to yourself.
 14 A. Okay. I have read that.
 15 Q. And, doctor, I would like to ask you what does
 16 this particular sentence tell you in terms of
 17 population of Gulf sturgeon?
 18 A. Well, in this case the Fish and Wildlife Service
 19 is considering whether the operations of the
 20 reservoirs, given everything that's going on,
 21 including Georgia's consumption of water, would
 22 jeopardize the ongoing populations or the
 23 recovery of the populations of Gulf sturgeon.
 24 And they conclude that it would not, and that it
 25 would not -- these -- neither would it affect the

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1 **critical habitat for that species.**
 2 **Q.** All right. I would like to ask you to look at
 3 the last sentence of the next paragraph, also on
 4 page 3, and to read that to yourself.
 5 **A. Okay. I have finished.**
 6 **Q.** And what does that sentence indicate to you about
 7 the population of mussels?
 8 **A. With respect to the ongoing subsistence and**
 9 **existence of the mussel populations, the**
 10 **sustainability of the mussel populations, given**
 11 **the proposed operation of the reservoirs and**
 12 **everything else being considered, including**
 13 **consumption of water, the Service reaches the**
 14 **opinion that they would not be at risk.**
 15 **Q.** All right. And I would like to ask you to now
 16 please turn to page 63 of the biological opinion.
 17 **A. Yes.**
 18 **Q.** And particularly, to look at the first sentence
 19 of the last paragraph, and please read it to
 20 yourself.
 21 **A. Okay. I have read that.**
 22 **Q.** What does that sentence indicate to you about the
 23 condition of Gulf sturgeon in Apalachicola?
 24 **A. The Fish and Wildlife Service evaluates these**
 25 **species in terms of their populations and whether**

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1 **Service have come to the conclusion that this**
 2 **species is doing pretty well in the river.**
 3 **Q.** And on page 125, the third paragraph that begins
 4 with, considering the recent information, may I
 5 ask you to read that paragraph to yourself.
 6 **A. I have read that.**
 7 **Q.** And what does that paragraph indicate to you
 8 about the fat threeridge?
 9 **A. That the U.S. Fish and Wildlife Service has**
 10 **concluded that it's stable and may be increasing**
 11 **in population size, and that they're going to do**
 12 **some additional studies to -- to refine their**
 13 **estimates.**
 14 **Q.** Now, let's page back through the document,
 15 please, to page 119. And under section 9.1.1 I
 16 would like to ask you about the sentence that
 17 begins with the status of. Can you please read
 18 that to yourself.
 19 And what does that indicate to you,
 20 Dr. Menzie?
 21 **A. It looks -- as this is written, it says the**
 22 **Service is going to review and re-evaluate the**
 23 **status of the species.**
 24 **I know from reading this document and other**
 25 **literature -- some of it is cited here -- that**

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1 **they're stable or not, which means are they**
 2 **ongoing. And -- and in this case the -- the**
 3 **Service reaches the conclusion that that**
 4 **population of sturgeon utilizing the Apalachicola**
 5 **River is, indeed, stable.**
 6 **Q.** Let's turn now to pages 124 and 125 of the
 7 biological opinion. And I am particularly
 8 looking at the second paragraph. And could you
 9 please read that to yourself.
 10 **A. I have finished reading that.**
 11 **Q.** And what does that paragraph tell you about the
 12 condition of the fat threeridge mussel species in
 13 the Apalachicola River?
 14 **A. Okay. This is -- this happens to be the species**
 15 **of mussel that the U.S. Fish and Wildlife Service**
 16 **thought might be most at risk because of it**
 17 **getting stranded. And what they're finding here**
 18 **is that there's abundance of these animals**
 19 **present, much higher than was previously thought.**
 20 **And they made an estimate of the percent of the**
 21 **population that might be adversely affected by**
 22 **the new operations. And that -- that's a**
 23 **percentage of 0.07 percent.**
 24 **So my reading of this and other aspects of**
 25 **the document is that the U.S. Fish and Wildlife**

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1 **there's a general sense that the species is one**
 2 **that could be taken off of the list or delisted**
 3 **because it seems to have -- be quite abundant**
 4 **now.**
 5 **Q.** And before we leave the river and the floodplain,
 6 you are familiar with the opinions of one of
 7 Florida's experts, Dr. Allan; are you not?
 8 **A. I am.**
 9 **Q.** And can you please provide the Court with a brief
 10 assessment of your views on Dr. Allan's opinions.
 11 **A. I think the most notable thing to mention is that**
 12 **Dr. Allan really looked for differences in the**
 13 **amount of flooding or amount of presence of water**
 14 **under certain flows. He was comparing difference**
 15 **scenarios that he had been provided. But my**
 16 **feeling when I looked at that was there's a**
 17 **little bit of apples and oranges among those**
 18 **scenarios. They're not quite equivalent.**
 19 **Nevertheless, the work largely involves**
 20 **looking at the potential of things to occur such**
 21 **as the potential number of days that things might**
 22 **be drier versus wetter. So none of the work**
 23 **really involves looking at populations of any of**
 24 **the species. So there's no population**
 25 **considerations in the work. And I -- I think**

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1 **that's an important aspect of thinking about**
 2 **these species and these ecosystems.**
 3 **As for example, in the biological opinion we**
 4 **just read or looked at, that's what the Service**
 5 **thinks is important to look at is populations.**
 6 MS. DeSANTIS: Your Honor, Dr. Menzie
 7 has been testifying for a little under two
 8 hours. I probably have about 20 minutes
 9 left. I'm happy to proceed; but if the Court
 10 would like to take a break, this might be a
 11 good time.
 12 SPECIAL MASTER LANCASTER: We'll take a
 13 break.
 14 (Time Noted: 2:25 p.m.)
 15 (Recess Called)
 16 (Time Noted: 2:38 p.m.)
 17 MS. DeSANTIS: Good afternoon, your
 18 Honor.
 19 SPECIAL MASTER LANCASTER: Good
 20 afternoon.
 21 BY MS. DeSANTIS:
 22 **Q.** So, Dr. Menzie, a couple of last questions on the
 23 river; and then we're going to move on to your
 24 causal analysis regarding the bay.
 25 You were shown some documents by counsel for
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1 the State of Florida, particularly FX-50, FX-51,
 2 JX-21. They are documents behind tabs 4, 5,
 3 and 6 of the binder that was handed to you by the
 4 State of Florida concerning certain findings
 5 pertaining to the Flint. Do any of the findings
 6 in these documents pertain to the ecology in the
 7 State of Florida?
 8 **A. These documents don't pertain to the ecology of**
 9 **Florida as I was looking at it, no.**
 10 **Q.** And does the Flint run in the State of Georgia
 11 rather than the State of Florida?
 12 **A. The Flint River is in Georgia.**
 13 **Q.** If we could turn now to your causal analysis and
 14 conclusions regarding the ecosystem of the bay, I
 15 would like to publish a demonstrative that the
 16 Court has seen before to assist your testimony.
 17 And we will distribute copies.
 18 Dr. Menzie, does what we have published as
 19 demonstrative 1 on the screen, does that
 20 represent the very basic structure of the food
 21 web in Apalachicola Bay?
 22 **A. Yes. This -- this is really the basic structure.**
 23 **And I think what this demonstrative conveys is**
 24 **that it may be useful to think about the food web**
 25 **in three layers. At the very bottom of the food**
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1 **web are the plants. And then in the middle**
 2 **region of the food web are animals that eat**
 3 **plants, whether they're large plants or very tiny**
 4 **plants. And then in the upper level of the food**
 5 **web you would have fish and some other types of**
 6 **shellfish like crabs and shrimp that feed on**
 7 **these animals.**
 8 **Q.** And are you aware that Dr. Glibert was shown this
 9 demonstrative during her testimony?
 10 **A. Yes.**
 11 **Q.** And, doctor, if you look at the lower food web on
 12 this demonstrative, can you please use that
 13 demonstrative to guide us through your
 14 conclusions as a result of your causal analysis
 15 concerning the health of the lower food web?
 16 **A. Yes. So if you recall step one of the approach**
 17 **is to look to see if there was any evidence of**
 18 **changes. And that requires looking at**
 19 **information that's available.**
 20 **So at the top of the food web, for example,**
 21 **we have fish and shellfish, like blue crabs and**
 22 **shrimp. And so, for example, I look at that**
 23 **information to see if there were any evidence of**
 24 **long-term changes and saw that there were none.**
 25 **And then at the base of the food web, we have**
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1 **information on submerged aquatic vegetation;**
 2 **that's SAV. These are the plants that we're**
 3 **talking about, the wild celery and other plants**
 4 **that are rooted. And then on the right, we have**
 5 **the algae.**
 6 **And there are changes that occur periodically**
 7 **for algae, but they don't cause there to be**
 8 **changes in the overall structure of the food web.**
 9 **There have been periodic losses of the submerged**
 10 **aquatic plants as, for example, following**
 11 **Hurricane Dennis; but they recovered after those**
 12 **events, as I have discussed earlier.**
 13 **So the -- so this is a good representation of**
 14 **the basic structure of the food web. And I -- my**
 15 **conclusion was that the food web has remained**
 16 **relatively similar to what it was back in the**
 17 **'70's and '80's.**
 18 **Q.** And so if I understand your testimony correctly,
 19 did you find changes in the composition or the
 20 types of phytoplankton present at lower flows?
 21 **A. Yes. During the summer months when low flows**
 22 **occur in this river, as they do in many rivers**
 23 **around the country, there is a change that occurs**
 24 **in the types of algae that are present. So in**
 25 **the summer you will get certain species of algae.**
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1 **Some of them are -- they go by the name**
 2 **Dinoflagellate, which is sort of after dinosaurs.**
 3 **Some look like dinosaur heads. And you get**
 4 **little tiny plants present in addition to some**
 5 **that are present during the spring. So you see**
 6 **that kind of shift that occurs.**
 7 **I did studies on this in the '70's back on**
 8 **the Hudson River in the early part of my career.**
 9 **And this is what you see. You see this in every**
 10 **estuary.**
 11 **Q.** Did these changes in composition at the base of
 12 the food web have any ramifications for species
 13 in the higher levels of the food web?
 14 **A.** **The only way to really judge that is to think**
 15 **about the -- whether these plants, whether they**
 16 **be the submerged plants, these big plants, or**
 17 **these little plants, continue to serve as food**
 18 **for the upper food level -- the levels of the**
 19 **food web -- and they do -- and then to check to**
 20 **see whether the animals that would be dependent**
 21 **on this food web sustain themselves.**
 22 **Like, there's a fish called the sand trout or**
 23 **the flounder or the various species that live**
 24 **here. Are they continuing to be in similar**
 25 **population abundance over time?**

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1 **And that is direct evidence as to whether or**
 2 **not the food web is sustained.**
 3 **Q.** All right. Doctor, I would like to ask you,
 4 please, to turn to page 50 of your written direct
 5 testimony, and particularly to demonstrative 20
 6 that is shown on page 50. And we'll also put
 7 that up on the screen.
 8 MS. DeSANTIS: And, your Honor, may I
 9 ask again if Dr. Menzie may go to the screen
 10 to help explain this demonstrative?
 11 SPECIAL MASTER LANCASTER: Sure.
 12 BY MS. DeSANTIS:
 13 **Q.** Doctor, can you please describe what that
 14 demonstrative shows.
 15 **A.** **Sure. So this is a very simple picture of these**
 16 **little tiny plants that are at the base of the**
 17 **food web, the animals that are in the middle of**
 18 **the food web, and then an example of the fish at**
 19 **the top of the food web. And you will find this**
 20 **present in estuaries pretty much around the**
 21 **country.**
 22 **But just a little bit of biology, on the left**
 23 **here are these interesting shapes. These are**
 24 **diatoms. And they're very important all around**
 25 **the coastline. And they -- and they're an**

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1 **important source of food. They're a little bit**
 2 **bigger than these plants here, and they can be**
 3 **eaten directly by these copepods.**
 4 **These are little shrimp, little tiny**
 5 **shrimp-like animals. And these in turn are eaten**
 6 **by this fish, the bay anchovy. This fish, the**
 7 **bay anchovy, is probably one of the most**
 8 **important fish in the bay. It swims through the**
 9 **water with its mouth open and just basically**
 10 **takes in all these little tiny copepods and eats**
 11 **those. And then the bay anchovy is the source of**
 12 **food for all these other fish like the Menhaden**
 13 **that are well known all around the country.**
 14 **They're sources of food for all kinds of other**
 15 **fish and birds and mammals. So this fish can be**
 16 **supported by eating these little tiny shrimp-like**
 17 **animals in between that eat these diatoms.**
 18 **The other way that they can be supported is**
 19 **that during the summer months, there is an**
 20 **increasing amount of these little tiny plankton,**
 21 **little tiny green spheres. And these are eaten**
 22 **by little animals known as ciliates, little tiny**
 23 **animals that you can see in a microscope.**
 24 **They're very tiny. And they in turn are eaten by**
 25 **these copepods, these shrimp, which in turn are**

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1 **eaten by the bay anchovy. So there's two ways in**
 2 **which the bay anchovy continue to be supported in**
 3 **Apalachicola Bay.**
 4 **My check on this was to see over all kinds of**
 5 **conditions since the 1970's, through droughts,**
 6 **through wet periods, whether the bay anchovy**
 7 **continues to be abundant -- it's almost like a**
 8 **barometer -- and it does. So that tells me that**
 9 **one way or the other the grazers exist, and the**
 10 **bay anchovy continues to be supported, sometimes**
 11 **by diatoms coming up this way, as in the spring,**
 12 **or sometimes by a combination of diatoms and**
 13 **little tiny plankton, as in the summer.**
 14 **So it's just an interesting biology piece.**
 15 **Q.** Dr. Menzie, I'm actually going to ask you to stay
 16 at the screen because we are going to put up
 17 another demonstrative as we move on to the upper
 18 levels of the food web from page 65 of your
 19 written direct, demonstrative 27. And as we move
 20 on to talk about the upper food web and about the
 21 fish, including the anchovy that you just
 22 testified about, can you explain to us, please,
 23 what is shown in demonstrative 27.
 24 **A.** **Sure. It turns out that the most extensive data**
 25 **on biological and ecological organisms in the**

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1 **bay, aside from oysters, which, you know, you**
 2 **will hear about, is fish. And fish have been**
 3 **studied in the bay since the early 1970's.**
 4 **What you're looking at here are all the**
 5 **locations where either the State of Florida, the**
 6 **Research Laboratory, or the national government**
 7 **has been studying fish.**
 8 **This is the Apalachicola River, so fish have**
 9 **been studied all through here. This region --**
 10 **this region right in here is the nursery area**
 11 **known as East Bay. That's a central part. Then**
 12 **out here in Apalachicola Bay are all the rest of**
 13 **these stations.**
 14 **Why I felt it was important to share this**
 15 **picture is that there's an extensive amount of**
 16 **information available on fish, and fish tell us a**
 17 **lot about how the food web is structured. The**
 18 **fish can only be there if the food is there. So**
 19 **looking at the fish that are there, they're**
 20 **abundant. And how that abundance changes from**
 21 **year to year or decade to decade gives me direct**
 22 **information on how the overall system is working.**
 23 **Q.** Dr. Menzie, did Dr. Glibert, the expert on the
 24 ecology for the State of Florida, analyze this
 25 data?

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1 **A. Dr. Glibert did not look at this information.**
 2 **Q.** Did you look at this data?
 3 **A. I looked at this information. It's -- I asked**
 4 **and chased after this information until I could**
 5 **get as much of it as was available so that I**
 6 **could --**
 7 **Q.** And what were your conclusions based on all of
 8 this data?
 9 **A. That the fish community of the bay, those are the**
 10 **plants that depend on those little tiny -- I**
 11 **mean, the fish that depend on those little tiny**
 12 **plants, the fish that eat other fish, that**
 13 **they're all present and still in the bay as they**
 14 **were back in the 1970's, and that their**
 15 **populations continue to be sustained regardless**
 16 **of whether it's a little wetter or a little**
 17 **drier.**
 18 **Q.** Okay. Dr. Menzie, in the course of your work and
 19 analysis in this particular matter, have you seen
 20 any evidence that any fish species in the
 21 Apalachicola Bay is being harmed?
 22 **A. I have seen no evidence that these changes in**
 23 **flow have harmed any of these species.**
 24 **Q.** Have you seen any evidence of any harm to the
 25 blue crab population in East Bay or the rest of

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1 the bay?
 2 **A. Information on the blue crab was present in these**
 3 **collections. And I see no evidence that the blue**
 4 **crab populations have declined or changed in any**
 5 **way.**
 6 **Q.** Have you seen any evidence of any harm to the
 7 white shrimp population at any place in the bay?
 8 **A. I have not.**
 9 **Q.** Have you found any evidence of any harm to the
 10 nursery function of East Bay?
 11 **A. I looked into the nursery function in terms of**
 12 **the presence of the plants and in terms of the**
 13 **abundance of the fish that live in that area, and**
 14 **I specifically looked for baby fish. And I found**
 15 **no evidence that they had been harmed.**
 16 **Q.** Doctor, have you found any evidence of any harm
 17 to any species in the Apalachicola Bay?
 18 **A. I have not.**
 19 **Q.** You have assessed some of the work of Dr. Glibert,
 20 an expert for the State of Florida. Correct?
 21 **A. Yes.**
 22 **Q.** And can you please provide the Court with a brief
 23 summary of your opinions regarding Dr. Glibert's
 24 work.
 25 **A. I think Dr. Glibert, as I mentioned earlier, saw**

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1 **changes that have occurred during the summer**
 2 **months in algae, for example, and then presumed**
 3 **that those changes would cascade up through those**
 4 **upper levels of the food web causing there to be**
 5 **changes in the upper levels of the food web. But**
 6 **it was based on a presumption that that would**
 7 **occur.**
 8 **Q.** And, doctor, are you aware that Dr. Glibert also
 9 suggests that there have been changes in
 10 nutrition at the base of the food web that have
 11 affected species at upper levels of the food web?
 12 **A. One of her hypotheses is that there might be less**
 13 **nutritive quality in a little tiny plant at the**
 14 **base of the food web as they change, and that**
 15 **that could cause a cascading effect up the food**
 16 **web. So I know she has said that.**
 17 **Q.** Have you seen any evidence of impaired nutrition
 18 for any species in the bay as a result of the low
 19 flows?
 20 **A. No, I have not.**
 21 **Q.** Doctor, I now want to talk about particular
 22 remedy scenarios and additional flow scenarios,
 23 including the one that you analyzed. And counsel
 24 for Florida referred to a 1,000 cfs scenario that
 25 you looked at. And I want to first talk about

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1 the bay.

2 To assist your testimony regarding the remedy

3 and additional flow scenarios that we're going to

4 talk about, I would like to ask permission to

5 publish a demonstrative; and we will distribute

6 the demonstrative.

7 Now, Dr. Menzie, can you please describe for

8 the Court what this demonstrative shows, and

9 distinguish between the two columns.

10 **A. On the left is the remedy scenario that was**

11 **computed by the State of Florida. And it**

12 **presumes a -- as I understand it, a 50 percent**

13 **cut in water consumption by irrigation and**

14 **perhaps some other factors. So that would result**

15 **in more water basically entering the system that**

16 **wasn't used in agriculture within Georgia.**

17 **And on the right, the 1,000 cfs additional**

18 **flow scenario was one I looked at. And also, I**

19 **believe it's largely consistent with a scenario**

20 **that was put forward by Dr. Sunding on behalf of**

21 **Florida. And it basically adds -- simply adds**

22 **1,000 cubic feet per second of water to the river**

23 **and looks at -- in either of these things looks**

24 **at resulting changes in salinity.**

25 **Q.** Now, looking first at Dr. Greenblatt's 50 percent

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1 cut scenario on the left-hand side of this

2 screen, are you aware that Dr. Greenblatt modeled

3 this scenario for different years?

4 **A. Yes. 2011 and 2012.**

5 **Q.** And particularly, the results of Dr. Greenblatt's

6 modeling for this remedy scenario for the years

7 2011 and 2012 showed what with respect to

8 salinity changes?

9 **A. The changes were, depending on where you were in**

10 **the bay, in the range of near zero to 2 parts per**

11 **thousand or psu's of salinity. There were some**

12 **locations near the mouth of the river, which is**

13 **more sensitive to changes, if you will, in**

14 **freshwater flow where the salinity change was 3**

15 **parts per thousand.**

16 **Q.** And were 2011 and 2012 low flow years?

17 **A. Yes. These were the drought years that got a lot**

18 **of attention.**

19 **Q.** Dr. Menzie, would you expect a change in salinity

20 of up to 2 ppt in most areas of the bay, if the

21 50 percent cut remedy were in place, to have any

22 effect on the ecology of the bay?

23 **A. Yes. No, I don't. And the reason I hold that**

24 **opinion is twofold. First, I have looked at the**

25 **ecological conditions of the bay going back in**

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1 **time. So I have looked at the data from the most**

2 **recent times into the '70's, and there doesn't**

3 **seem to be any evidence that the variation from**

4 **year to year or in salinities of this magnitude**

5 **have brought about any change.**

6 **The second reason is that we're looking at**

7 **kind of an average salinity here. And it's**

8 **helpful in an estuary to put that into**

9 **perspective. So I know that at low flows, for**

10 **example, the salinity at any of these points in**

11 **the bay or at East Bay or at Apalachicola Bay**

12 **will fall within a range that could be as much as**

13 **15 parts per thousand. So that small changes in**

14 **that range are simply swamped; they're not**

15 **noticeable.**

16 **Q.** All right. And, doctor, turning now to the

17 right-hand on this demonstrative, you ran an

18 analysis of a flow scenario that involved the

19 addition of 1,000 cfs of fresh water. Correct?

20 **A. Yes.**

21 **Q.** Could you please explain what your analysis

22 showed with respect to salinity changes of that

23 additional 1,000 cfs of flow?

24 **A. Yes. So I believe this is for the Apalachicola**

25 **Bay. And my analysis looked across all the data**

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1 **that were available and recorded. And based on a**

2 **change of a thousand cfs in flow in the river,**

3 **you would expect something in the order of almost**

4 **a nondetectable change in salinity up to perhaps**

5 **around 1.2 parts per thousand salinity.**

6 **Q.** So, Dr. Menzie, would the change in salinity in

7 the bay attributable either to the 50 percent cut

8 remedy scenario or to the 1,000 cfs additional

9 flow scenario have any effects at all on the

10 ecology of the bay?

11 **A. No. These -- these changes within the type of**

12 **variation in salinity that occurred in estuary**

13 **areas are extremely small.**

14 **Q.** You're aware that Dr. Glibert has suggested that

15 even minor changes in salinity could impact the

16 ecology of the bay?

17 **A. No, I don't think she's correct.**

18 **Q.** And why not?

19 **A. Because of the variation that exists within the**

20 **bay, the animals and plants in the bay are**

21 **adapted to that kind of variation. So any tiny**

22 **change on the order of what we're talking about**

23 **here would essentially be unnoticeable.**

24 **Q.** Now, with respect to the additional 1,000 cfs of

25 flow, you also looked at the impact on the

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1 floodplain habitat. Correct?

2 **A. Yes.**

3 **Q.** And what specifically did you look at?

4 **A. The degree of flooding that would occur as you**

5 **increase the flow by certain amounts.**

6 **Q.** And would the additional 1,000 cfs of flow have

7 an impact on the ecology of the floodplain?

8 **A. No. It wouldn't have any impact on the ecology.**

9 **It would result in small amounts of additional**

10 **flooding of areas, but not really on the ecology**

11 **of the system.**

12 **Q.** All right. Dr. Menzie, we're getting close to

13 the end here.

14 Florida has maintained, as you know, that

15 Georgia's consumptive use of water has harmed the

16 ecology of the bay, the river, and the

17 floodplain. First of all, setting aside the

18 concept of harm, has there been change in the

19 Apalachicola ecosystem over the time period that

20 you examined?

21 **A. Okay. I think of changes in different amounts of**

22 **time. So every year there are changes that will**

23 **occur in the system. In the bay, for example,**

24 **the changes in fish communities are large. Fish**

25 **swim into the bay, reproduce, spend time, and**

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1 **then leave. In the summer months, there's a**

2 **change in the composition of the phytoplankton.**

3 **So these changes we see every year. And they're**

4 **not unexpected.**

5 **Over long periods of time we look at**

6 **something that would be meaningful in terms of a**

7 **change in the population of fish. Let's say over**

8 **a decade, there have not been changes in the**

9 **population status of the fish community of the**

10 **bay. On even longer time scales, for example, on**

11 **the forest, there have been changes. And as I**

12 **discussed earlier, those relate to some**

13 **systematic changes in the flooding of the**

14 **floodplain that have occurred since the**

15 **construction of the dam.**

16 **Q.** Looking back at harm, the concept of harm rather

17 than change, have you found any harm in the bay,

18 the river, or the floodplain attributable to

19 consumptive use of water by Georgia?

20 **A. My analysis very specific to that question did**

21 **not indicate harm as a result of -- to any of**

22 **those ecological components as a result of**

23 **consumption of water by Georgia.**

24 **Q.** Doctor, regardless of whether or not there is

25 harm, would the 50 percent cut remedy or the

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1 1,000 cfs additional flow scenario have any

2 effect on the ecology of the bay, the river, or

3 the floodplain?

4 **A. No.**

5 MS. DeSANTIS: I have no more questions.

6 SPECIAL MASTER LANCASTER: Recross?

7 MS. WINE: Just very briefly, your

8 Honor.

9 Mr. Walton, could we pull up demo 7 that

10 Georgia's counsel just asked Dr. Menzie

11 about.

12 RE-CROSS-EXAMINATION

13 BY MS. WINE:

14 **Q.** Dr. Menzie, you testified about this

15 demonstrative which, according to your prefiled

16 direct testimony, shows the natural and man-made

17 stressors on the ecological system of the river

18 and bay. Correct?

19 **A. Yes.**

20 **Q.** Sir, where is consumptive use on this diagram?

21 **A. As I introduced this diagram I mentioned that**

22 **consumptive use is one of the primary stressors**

23 **that we're looking at. So these are the**

24 **stressors that we need to consider in evaluating**

25 **the role of consumptive use.**

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1 **Q.** Okay. You don't show consumptive use on this

2 diagram. Correct?

3 **A. No; that's right. This is a background piece to**

4 **indicate what other stressors we need to**

5 **consider.**

6 **Q.** And if we were going to draw in consumptive use

7 as a factor that starts influencing things here,

8 where would you draw it in on this diagram?

9 **A. I would place the beginning of it, as I**

10 **understand it, from around 1970 to the present.**

11 **Q.** Okay. Thank you.

12 Now, sir, I think you just testified that you

13 have seen nothing happening in the bay that could

14 be considered a material change and that you have

15 seen no evidence of any harm to any species in

16 Apalachicola Bay. Correct?

17 **A. I did say that, yes.**

18 **Q.** Sir, you're aware there was an oyster crash in

19 2012. Correct?

20 **A. I was thinking of that very question as I**

21 **answered that yes. I did not -- I did not look**

22 **at the oysters.**

23 **Q.** Okay. So you're not trying to say that that

24 wasn't a material change in the bay during the

25 recent time period. Correct?

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1 **A. No. The oysters are a managed fishery, and**
 2 **another individual will be talking about that.**
 3 **Q.** Okay. Now, I want to make sure that I understand
 4 the import of your testimony overall. Are you
 5 saying that there is no basis whatsoever for
 6 limiting Georgia's consumption in the Flint River
 7 Basin?
 8 **A. I am providing the results of the causal**
 9 **analysis. I recognize that the states are**
 10 **discussing these issues and all the policy that**
 11 **may be related to that, and that's not something**
 12 **I'm weighing into.**
 13 **Q.** Okay. And you realize not just the states, but
 14 the U. S. Fish and Wildlife Service and Georgia
 15 itself in many of its documents have recognized
 16 the need to limit consumption or suggested ways
 17 to limit consumption on the Flint River.
 18 Correct?
 19 **A. I certainly realize that all of those discussions**
 20 **are going on and focused my analysis on providing**
 21 **technical information that could be used to**
 22 **inform those kinds of decisions.**
 23 **Q.** Okay. Thank you, sir.
 24 MS. DeSANTIS: I have no further
 25 questions, your Honor.

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1 SPECIAL MASTER LANCASTER: Just a
 2 couple, doctor.
 3 THE WITNESS: Yes?
 4 SPECIAL MASTER LANCASTER: Have you
 5 visited the Penobscot River?
 6 THE WITNESS: Oh, yes.
 7 SPECIAL MASTER LANCASTER: Will you get
 8 to visit it on this trip?
 9 THE WITNESS: No. Unfortunately, I was
 10 able to get out to see -- drive myself up and
 11 down the Presumpscot, which was very
 12 interesting. Interesting history. But I
 13 have to head back home. My son is running a
 14 huge race out on the West Coast, and I have
 15 got to get myself there. But I will be back.
 16 SPECIAL MASTER LANCASTER: Good.
 17 So if I understand your testimony
 18 correctly, as Maine goes, so goes the nation?
 19 THE WITNESS: There's a couple of things
 20 that are unique in that respect in Maine.
 21 And Maine cares a lot about the environment
 22 and the Gulf of Maine and everything that
 23 goes with it. So some of the earliest
 24 research on coastal environments have been
 25 prompted by activities here in -- Bigelow Lab

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1 and others. This is one of the places where
 2 the people look to to learn a little bit
 3 about estuarine ecology, coastal ecology.
 4 SPECIAL MASTER LANCASTER: You may not
 5 be aware of this, but counsel for Georgia
 6 and counsel for Florida have given us
 7 summaries for each expert. And your summary
 8 says that with respect to Apalachicola Bay,
 9 Dr. Menzie's analysis shows that Georgia's
 10 incremental consumption of fresh water has
 11 had a minor incremental influence on salinity
 12 in the bay and that Georgia's water use has
 13 not caused harm to oysters, et cetera.
 14 Now, you just said, if I understood you,
 15 that you're not testifying about oysters.
 16 THE WITNESS: That's right.
 17 SPECIAL MASTER LANCASTER: So they're
 18 wrong?
 19 THE WITNESS: Well, I -- the part that I
 20 looked at was related to nutrition for
 21 oysters. And that was an important aspect of
 22 looking at the -- what Dr. Glibert was
 23 talking about with respect to this poor
 24 nutritive quality and whether that food was
 25 going to be made available to oysters. And

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1 that's the limit of it. I -- I did not look
 2 at other aspects of the oyster story.
 3 SPECIAL MASTER LANCASTER: So you don't
 4 know, for example, how male oysters become
 5 female?
 6 THE WITNESS: I know it's an intriguing
 7 question; and I -- since that question was
 8 recently raised, I have explored it a little
 9 bit.
 10 There's a number of species in the
 11 animal life that change sex for one reason or
 12 another as part of their survival. And I
 13 know someone that you will -- you can ask
 14 that question of who will come later --
 15 SPECIAL MASTER LANCASTER: Okay.
 16 THE WITNESS: -- who really knows the
 17 answer to that question.
 18 SPECIAL MASTER LANCASTER: Who?
 19 THE WITNESS: Dr. Lipcius.
 20 SPECIAL MASTER LANCASTER: Thank you.
 21 I'll tell him you recommended him.
 22 Now, at the risk of oversimplification,
 23 do I understand you to be saying that
 24 underwater plants that are tolerant of
 25 salinity thrive well where salinity is high

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1 and that those that are intolerant to
 2 salinity don't thrive well there?
 3 THE WITNESS: That's right.
 4 SPECIAL MASTER LANCASTER: Thank you.
 5 Redirect?
 6 MS. DeSANTIS: No questions, your Honor.
 7 SPECIAL MASTER LANCASTER: Recross?
 8 MS. WINE: No thank you, your Honor.
 9 SPECIAL MASTER LANCASTER: Enjoy your
 10 son.
 11 THE WITNESS: Yes, thanks.
 12 SPECIAL MASTER LANCASTER: Oh, I have
 13 one more question. I'm sorry.
 14 You were shown this USFIG piece dated, I
 15 think, May 22, 2012. And you were asked
 16 about work in consultation with the state to
 17 identify alternatives to agriculture use or
 18 incentives to reduce agriculture use of
 19 water. That was one of the conservation
 20 recommendations?
 21 THE WITNESS: Yes.
 22 SPECIAL MASTER LANCASTER: Would you
 23 tell me, please, how two states who cannot
 24 even agree on the number of cases -- I'm
 25 sorry, on the number of games that the Gators

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1 and the Bulldogs played can possibly agree on
 2 something like this?
 3 THE WITNESS: They have to put aside
 4 parochial interests.
 5 SPECIAL MASTER LANCASTER: Do you think
 6 that would be possible?
 7 THE WITNESS: I think that's the
 8 challenge.
 9 SPECIAL MASTER LANCASTER: Do you think
 10 they would be here if they could?
 11 THE WITNESS: No.
 12 SPECIAL MASTER LANCASTER: I don't
 13 either.
 14 Thank you.
 15 Any other questions?
 16 Okay.
 17 MS. DeSANTIS: No, your Honor. Thank
 18 you.
 19 MR. PRIMIS: Your Honor, the next
 20 witnesses are going to be two witnesses by
 21 video, Dr. Pine and Dr. Havens, who have
 22 written a number of the oyster-related
 23 documents that we have discussed, and then
 24 our oyster expert, Dr. Lipcius.
 25 Given the time and the fact that the

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1 parties need to hash out a few logistical
 2 issues about the video and the sequence in
 3 which it's played, I would suggest that we
 4 recess, play those first thing in the
 5 morning, and then turn to Dr. Lipcius.
 6 That would then only leave our economist,
 7 Dr. Stavins. And the question would be
 8 whether he could get on Thursday afternoon,
 9 probably on the later side, or start first
 10 thing Friday morning.
 11 I think for scheduling purposes,
 12 Dr. Stavins Friday morning would probably be
 13 best. And I think that that would ensure
 14 that we finish on Friday.
 15 MR. PERRY: That's fine with us, your
 16 Honor.
 17 SPECIAL MASTER LANCASTER: Is Dr. Stavins
 18 in the area?
 19 MR. PRIMIS: Not just yet. But he
 20 teaches at Harvard, so we can get him here.
 21 SPECIAL MASTER LANCASTER: I'm just
 22 suggesting that he be available. Just in
 23 case I'm not long-winded and we could get to
 24 him, it would be very nice.
 25 MR. PRIMIS: Okay. We'll make sure that

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1 happens.
 2 SPECIAL MASTER LANCASTER: Let me just
 3 finish by thanking you again, all of you, for
 4 the rain. The weatherman's prediction for
 5 tonight and tomorrow is driving, driving,
 6 driving rain. I told my wife about it and
 7 she said what, can you do? And I said, great
 8 Scott, nothing. But we'll have to deal with
 9 it.
 10 We'll recess.
 11 MR. PRIMIS: Thank you, your Honor.
 12 (Time Noted: 3:15 p.m.)
 13 (Proceeding adjourned to Thursday,
 14 December 1, 2016, at 9:00 a.m.)
 15 (End of day)
 16 - - - - -
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CERTIFICATE

I, Claudette G. Mason, a Notary Public
in and for the State of Maine, hereby certify
that the foregoing pages are a correct
transcript of my stenographic notes of the
Proceedings.

I further certify that I am a
disinterested person in the event or outcome
of the above-named cause of action.

IN WITNESS WHEREOF, I subscribe my hand
this 13th day of December, 2016.

/s/ Claudette G. Mason
Claudette G. Mason, RMR, CRR
Court Reporter

My Commission Expires
June 9, 2019.

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