No. 142, Original

In the

Supreme Court of the United States

STATE OF FLORIDA,

Plaintiff,

v.

STATE OF GEORGIA,

Defendant.

Before the Special Master

Hon. Ralph I. Lancaster

STATE OF FLORIDA'S POST-TRIAL BRIEF

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TABLE OF CONTENTS

INTRODUCTION AND SUMMARY

For millennia, the State of Florida's Apalachicola Bay and River survived, and flourished, through drought and wet periods. The Bay and River are now recognized nationally and internationally as a unique ecosystem and, indeed, an ecological treasure. This is why Florida, exercising the policy enshrined in its Constitution to "conserve and protect its natural resources and scenic beauty," has for decades systematically taken regulatory and other conservation actions to preserve these areas. What Florida cannot do on its own is take action to ensure that critical quantities of water flow south to the Apalachicola from the State of Georgia.

For years, Georgia pointed to the Supreme Court as the appropriate forum to resolve the parties' dispute over these interstate waters, as Georgia's consumption steadily increased. When Florida had exhausted all efforts to secure relief in the lower courts and filed this action in the Supreme Court, Georgia then told the Court that it had no business hearing this case and that Florida had not even alleged an injury that warranted the exercise of the Court's original jurisdiction. The Supreme Court rejected that argument, pointing out that Florida was seeking a cap only on Georgia's consumption and not relief against the U.S. Army Corps of Engineers (Army Corps, Corps or USACE). Almost immediately, Georgia sought dismissal of the case before the Special Master on the ground that only the Army Corps could provide the relief requested by Florida—an argument that Georgia had already made in unsuccessfully urging the Supreme Court to shut the door on this action at the outset. The Special Master properly rejected that argument as well. Then, at the outset of the trial it fought so hard to avoid, Georgia took the remarkable position that not only had Florida not been injured *at all* by Georgia's ever increasing consumption, but suggested that Florida should be grateful that it had Georgia as a "steward" of this shared resource.

But now Georgia's arguments must be judged against the evidence presented at trial. As the evidence has overwhelmingly demonstrated, Georgia's upstream consumption of water has exploded in recent decades: the Apalachicola River's floodplain has repeatedly dried, and the freshwater flows essential to survival of the Apalachicola Bay estuary have dwindled to the lowest levels in recorded history—far lower than in historic droughts. The evidence also demonstrated that, while recognizing the problem posed by its increasing consumption, Georgia would not, or could not, act to stem its usage, instead repeatedly favoring local interests. Georgia has never been willing to impose any genuine limits on its consumption, even in the face of overwhelming evidence that it was destroying its *own* ecosystem.

The Special Master has already recognized that this action is the last opportunity for Florida to address Georgia's overconsumption of the waters at issue—there is "no other adequate remedy." Dkt. No. 128, Order on Georgia's Motion to Dismiss at 21 (June 19, 2015). And this is exactly the type of case where the Supreme Court should apportion interstate water: twenty years of negotiation have failed, and Georgia has publicly, and repeatedly, stated 'its unwillingness to accept any binding limit on its uses of this shared resource. At stake is not only the real harm that already has been inflicted on the Apalachicola Bay and River and surrounding community, but a framework for redressing a natural calamity that will only worsen over time as Georgia's consumption continues on its steep upward trajectory. Without relief in this case, Georgia's upstream consumption of water will have no limits, and Florida will be powerless to halt the complete destruction of this natural treasure. The Special Master should find that Florida has shown the requisite injury and that the equities tip in favor of granting relief.[1]

[1] Florida continues to hope that developments in this litigation will change Georgia's internal political calculus and break the deadlock that has prevented settlement for decades. Florida remains willing to discuss any genuine settlement offer.

Why this Case is Before the Court

Before discussing the evidence at trial, a brief review of how the States got to this point is warranted to put the case in context. By the early 1990s, Florida and Georgia both acknowledged the need to fairly allocate the waters of the Apalachicola-Chattahoochee-Flint River Basin (ACF Basin) and agreed to a joint "Comprehensive Study" to develop river flow and water consumption data for that purpose. In the ensuing several years, detailed data was developed, and a federal Compact was passed to negotiate a final allocation formula. *See* FX-209. At that time, Georgia's then-Governor Zell Miller expressly recognized that "Florida has a very real and significant interest in the future of Apalachicola Bay and its surrounding environmental ecosystems." FX-205 at GA00128575. Reflecting on the Comprehensive Study specifically, Governor Miller explained:

> Exercising our political will, the information and technical data developed over seven years [in the Comprehensive Study], and the mutual respect resulting from that work, we can allocate the waters of these major river systems in a manner that is equitable and fair to all concerned.

FX-205 at GA00128576.

After five weeks of trial in this case, there is little doubt why the 1990s Comprehensive Study and federal Compact failed. Georgia "rejected" key agricultural and other data assembled by the Comprehensive Study, precisely because Georgia wished to avoid any real limits on its ability to expand agriculture and other water uses in Georgia's portion of the ACF Basin. Reheis Test., Trial Tr. vol. 3, at 711:2-19, 732:19-734:4; *see also infra* at 65-67 (addressing further Reheis testimony on the topic).

Nor is there genuine doubt now why subsequent efforts to settle this dispute have also failed. For agriculture—where "a few thousand farmers" in the Lower Flint Basin will admittedly consume more water than "six or seven million people in metro Atlanta" in a dry

year, FX-15 at GA00181626—Georgia will not give an inch. This trial has revealed the perverse policy of Georgia's "Environmental Protection" Division: To "protect against external and internal threats to agricultural water use," regardless of environmental consequences. FX-54 at GA00478438; Turner Test., Trial Tr. vol. 12, at 2959:15-22. And Georgia's current Governor publicly embraced exactly that policy in a press conference convened even while the trial in this case was ongoing: Georgia ACF farmers should be free to make any market-based farming choices they desire, without *any* kind of "artificial process" limiting their farming practices or water use, no matter how limited or reasonable. FX-941 at 1. No give whatsoever.

The same Georgia sentiment was obvious for water consumption in Metropolitan Atlanta: Georgia witness Katie Kirkpatrick, for example, testified that Atlanta would never accept *any* mandatory or "artificial" limits of any kind on its water use. *See* Kirkpatrick Pre-filed Direct Testimony (PFD) ¶ 72; Kirkpatrick Test., Trial Tr. vol. 13, at 3424:5-8. Of course, according to Georgia's own documents, water consumption in the Atlanta suburbs and elsewhere has already reduced the flow of the Upper Flint River by 70%. FX-285 at 10; FX-286 at 4 (FRK00110). Even the ACF Stakeholders, an organization with multiple Georgia interests, was able to suggest a "consensus" solution providing that Florida should receive at least a portion of the additional needed flows to Apalachicola Bay and River. But Georgia still will not budge. After 20-plus years of trying every possible avenue to resolve this dispute, this case is Florida's last realistic opportunity to address Georgia's unconstrained upstream consumption.

Evidence at Trial

Florida's trial presentation focused on five principal points, each of which has now been proven by any measure and compels an equitable apportionment under the principles applied by the Supreme Court, which are discussed next below.

First, Georgia's consumption of water for agricultural, municipal, and industrial purposes—particularly in dry summer months—has increased exponentially over the past several decades and profoundly altered the hydrology of the ACF Basin. There have always been droughts and there always will be. But through its unrestrained consumption, Georgia is now greatly exacerbating the impacts of drought. *Far* less water now flows to the Apalachicola River in dry years than did throughout history. These extraordinarily low drought year flows are caused by Georgia's upstream consumption of water, and not simply by reduced rainfall. Georgia's own experts and technical advisors admit this. *See infra* at 19-30. Georgia's expert hydrologists in this case used data and models that *they knew contained systematic errors and thus could not present accurate measurements of Georgia's water consumption or of historic and anticipated future low flows*. *See infra* at 21-23. Indeed, Georgia intentionally withheld certain data as privileged that would have demonstrated considerable additional low flow impacts from agricultural consumption in the Flint River Basin.

Georgia's own internal documents from the 1990s through the present, including its own "Sound Science Study" and the work of its "Technical Advisors," *admit* that Georgia is significantly depleting the interstate water system—specifically, that agricultural irrigation in the Flint River Basin is exacerbating the impact of drought on river flows. For example:

- March 22, 1999 Internal Georgia Environmental Protection Division (EPD) "Talking Points": "[W]e've already exceeded the 'safe' upper limit of permittable acreage in the lower Flint." FX-4 at 3. "If new irrigation uses are not limited effectively and soon, it will create a bigger Achilles' heel than we currently have." FX-4 at 6.
- 2006 Plan Resulting from Georgia's "Sound Science Study": "[T]he amount of water *currently* withdrawn for agricultural irrigation in drought years increases both the magnitude

and duration of low flows in streams of the FRB, thus further harming endangered species and potentially limiting the amount of water available for all users." JX-21 at 51.

- 2009 Study by Georgia Technical Advisors: "There is no climatologic indication that recent droughts were more severe or persistent than those in the past *(i.e*., 1930's or 1950's). Thus, we conclude that water use is the ***primary factor*** causing record low streamflow and other alterations in regional hydrology." FX-49d1 at 27 (emphasis added).
- 2013 Study by Georgia Technical Advisors: "Our results indicate that human water use is causing increased severity and duration of low flows during the spring and summer seasons throughout the Flint River. … Current rates of water use are likely unsustainable and pose a significant threat to stream health and the unique biological diversity characteristics of the Flint River." FX-49g.
- 2014 Study by Georgia Technical Advisors: "The flow in the Flint River is on a long-term decline that began more than 45 years ago…." FX-49b at GA00278839.

Second, low flows have caused real and substantial changes to Apalachicola Bay. The United States, the United Nations, the State of Florida, and a host of environmental experts have recognized the unique estuarine environment that has evolved over millennia from the mixing of freshwater flows from the Apalachicola River and saltwater from the Gulf of Mexico, behind the protective barrier islands of Apalachicola Bay. When the Apalachicola River flows dramatically change, so does the estuary; rather than a unique estuarine environment supporting oysters, juvenile species of shrimp, blue crab and other fisheries, the Bay transforms into a salt water marine environment that is simply an extension of the Gulf of Mexico. Unique estuarine species do not survive. The testimony of Florida witnesses Mark Berrigan, Tommy Ward, Dr. David Kimbro, Dr. Patricia Glibert, and several others tell a vivid story of destruction.

If fishery mismanagement by Florida (*i.e.*, "overharvesting," as Georgia alleges) was actually responsible for the crash of the oyster population in the Bay, the United States could not have legally issued a Fisheries Disaster Declaration in 2013. But it did. FX-413; FX-412; 16 U.S.C. § 1861(a). And while Georgia argues that two University of Florida professors insist that there still may be some uncertainty about the cause of the 2012-13 oyster crash, it tellingly did not subpoena those professors to testify at trial. The reason why is obvious: those very same professors published an article in 2015 which concluded that the "likely" cause was exactly what Florida's witnesses say—low flows leading to high salinity, which in turn caused disease, predation, and mortality. JX-167 at 6. And both professors explained they found no evidence that "overharvesting" could be the cause of the Bay-wide oyster crash. GX-1349, Havens Dep. 268:7-14; GX-1339 at 1. Indeed, even Georgia's expert ultimately had to concede at trial that there was evidence of oyster mortality due to widespread saltwater predators. *See* Lipcius Test., Trial Tr. vol. 17, at 4414:8-14.

Third, low flows have also had real and substantial adverse impacts on the Apalachicola River ecosystem. In 1999, the United States Fish and Wildlife Service (USFWS) and Environmental Protection Agency (EPA) issued final guidelines identifying minimum Apalachicola River flows that would be necessary to preserve the river and its floodplain. FX-599. Those criteria have been violated nearly every dry year since 2000. *Id.* at FL-ACF-02545908; JX-128 (U.S. Geological Survey (USGS) Gages); FX-D-1; *see infra* at 50-53. Likewise, Florida's expert Dr. David Allan explained how low flows are impacting flow-dependent species in the river, its floodplain, and sloughs, and causing the loss of tree species in the floodplain forest. Allan PFD ¶¶ 23, 32, 60. Georgia's primary response to these injuries is that certain threatened and endangered species in the Apalachicola River's ecosystem will

survive (*i.e.*, will not become extinct), perhaps in isolated pockets, despite Georgia's consumption. But, as both USFWS and EPA recognized, Florida has a legitimate sovereign interest in protecting the entire ecosystem and in preventing harms to that ecosystem—not just extinction. FX-599; *see* Allan PFD ¶ 91.

Georgia's attempt to shield itself from blame by pointing to the Army Corps of Engineers is unpersuasive. Yes, the Army Corps' dredging activities caused some harm to the River—*in service to Georgia,* to facilitate barge traffic to Georgia's upstream ports. But Florida halted Army Corps dredging operations more than a decade ago and the River has been recovering from dredging ever since. Whatever happened in the past, the fact remains that *today* Georgia is causing injury to the River, and this harm will continue absent a judicial remedy. Without adequate water, the Apalachicola sloughs and floodplain simply cannot fill, and the ecosystem cannot return to its former health. *See* Hoehn PFD ¶ 44; Allan PFD ¶¶ 3(f), 72.

Fourth, an equitable apportionment is appropriate, and necessary, to ensure the sustainability of the ACF Basin. Florida presented overwhelming evidence at trial that Georgia has not and will not act on its own to protect this interstate resource. Over and over again for the past 20 years, Georgia government personnel and expert technical advisors have concluded that irrigation practices are consuming enormous amounts of water in dry years, that such consumption is beyond "sustainable" limits, FX-24 at 3-6, and that Georgia's water resources are "over allocated," FX-6 at FL-ACF-0254447. Independent experts like the USFWS repeatedly warned Georgia that it was destroying its own ecosystem. *See, e.g.,* FX-46 at 7 ("[A] homeowner may avoid replacing shingles for a while but eventually the roof will develop a hole and the rain will come inside. The roof for the Flint River Basin is leaking, in some places quite badly."). Georgia nonetheless repeatedly made the policy choice to expand and protect its

farming economy no matter the consequences, issuing permits for hundreds of thousands of additional acres of irrigation, and refusing to exercise its own laws to curb that irrigation in drought years. FX-D-11 (Data Compilation from JX-132 and JX-129) (showing 315,000 new irrigated acres since 1999); *see infra* at Section II.C.

The evidence overwhelmingly establishes that, left to its own devices, Georgia will not commit any substantial resources or impose any real limits on its farmers. The most Georgia will do on its own is indefinitely "study" the problem without undertaking any genuine action to fix it. *See, e.g.*, JX-154; Turner Test., Trial Tr. vol. 12, at 2974:8-2977:13. Without a remedy in this case, Georgia will have no reason to pursue any conservation measures, much less at any significant cost; the situation will only continue to worsen substantially; and, Florida's fragile ecosystems will be gravely harmed if not permanently lost. And there is no basis to accept Georgia's reckless suggestion that the Court should do *nothing at all*, because (according to Georgia) the requested relief might not remedy 100% of the harm.

Finally, Florida has demonstrated that a cap on Georgia's consumption would result in material benefits to Florida, especially during drought years, and that there are sensible and equitable solutions that can be adopted to implement that cap. Indeed, Georgia's own internal documentation identifies a range of potential solutions. *See, e.g.*, JX-154 at 2 (listing five specific measures that Georgia can and should implement); FX-69a at GA00291505 ("We've been blessed and other states have spent far more money than we have/do. We may have to 'afford' it in the future."). These and other available solutions do not require any of Georgia's nightmare scenarios to play out. Indeed, even implementing the measures that *Georgia has already internally proposed*—for example, transferring some water users to deeper aquifers, and temporarily and/or permanently removing parcels from irrigation, JX-154 at 2—could

significantly help alleviate the injury to Florida. And as Florida's expert Dr. Sunding demonstrated, Georgia can implement any number of combinations of these or other measures to reduce its consumption at a reasonable cost—far less than other states spend on similar measures. These measures are particularly necessary in drought years, when equity should require Georgia to share the pain with Florida rather than exacerbate it at Florida's expense. *See*, *e.g.*, FX-35a at FL-ACF-03781838 (USFWS 1999 recommendation that the states negotiate consumptive use limits); FX-35b (EPA 1999 recommendation that Compact allocation sustain "existing aquatic communities.").

In sum, Florida has proven its case and Georgia must be held to account for its over consumption of the waters at issue under longstanding equitable apportionment principles.

LEGAL FRAMEWORK

The Special Master's decision in this case should be guided by the Supreme Court's "equitable apportionment" decisions. *See, e.g.*, *Colorado v. New Mexico I*, 459 U.S. 176, 183 (1982) (citing *Kansas v. Colorado*, 206 U.S. 46, 98 (1907) ("Equitable apportionment is the doctrine of federal common law that governs disputes between States concerning their rights to use the water of an interstate stream" or waterway.). As the Supreme Court has made clear, equitable apportionment doctrine is "neither dependent on nor bound by existing legal rights to the resource being apportioned," and is "based on broad and flexible equitable concerns rather than precise legal entitlements." *Idaho ex rel. Evans v. Oregon*, 462 U.S. 1017, 1025 (1983). "Each state stands on the same level with all the rest," *Kansas*, 206 U.S. at 97, and "[a]t the root of the doctrine is the … principle that … a State may not preserve solely for its own inhabitants natural resources located within its borders." *Idaho ex rel. Evans v. Oregon*, 462 U.S. at 1025.

Consistent with these principles, the Supreme Court has stressed that "States have an affirmative duty under the doctrine of equitable apportionment to take reasonable steps to

conserve and even to augment the natural resources within their borders for the benefit of other States." *Id.* at 1025. Where a downstream State shows that it faces "'real or substantial injury or damage'" as a result of an upstream State's diversions from a shared water resource like a river, the Court has repeatedly held that it is appropriate to limit the upstream State's usage—unless the upstream State can demonstrate that limiting its usage would be inequitable. *Colorado v. New Mexico I*, 459 U.S. at 187 n.13 (quoting *Connecticut v. Massachusetts*, 282 U.S. 660, 672 (1931)); *see also, e.g.*, *Colorado v. New Mexico II*, 467 U.S. 310, 317 (1984).

The evidence at trial overwhelmingly shows that Florida—and, in particular, the Apalachicola region—has been seriously injured by Georgia's ever increasing use of the shared waterways at issue, and that the balance of equities tips decisively toward imposing a limit on Georgia's diversions in order to redress Florida's injuries and equitably apportion the waters at issue. That result follows not only from the two-step analysis that the Supreme Court has traditionally applied in equitable apportionment cases (discussed next), but also from the "broad and flexible equitable concerns" that ultimately govern the Court's inquiry in this action. *See Idaho ex rel. Evans v. Oregon*, 462 U.S. at 1025.

A. The Supreme Court Employs A Two-Step Analysis To Determine Whether Equitable Relief Is Appropriate

The Supreme Court has given practical effect to these longstanding principles through use of a two-step framework. At the first step, the State seeking to enjoin or prevent the other State's diversions (Florida, here) "bears the burden of proving that the diversion will cause it 'real or substantial injury or damage.'" *Colorado v. New Mexico I*, 459 U.S. at 187 n.13. The injury must be "established by clear and convincing evidence." *New York v. New Jersey*, 256 U.S. 296, 309 (1921) (citing *Missouri v. Illinois*, 200 U.S. 496 (1906)). Throughout this case, Georgia has treated this standard as if it were virtually insurmountable. But in fact, the Supreme

Court has described the "clear and convincing evidence" standard as simply "an intermediate standard of proof," *Santosky v. Kramer*, 455 U.S. 745, 756 (1982), which requires a greater showing than a preponderance of the evidence, but does not rise to the level of the reasonable-doubt standard applied in criminal cases, *Addington v. Texas*, 441 U.S. 418, 431-33 (1979).

In addition, in evaluating whether the complaining State has met its burden, the Supreme Court casts a wide net. For example, an injury need not be economic to qualify; Georgia itself has conceded that ecological injuries qualify as well. Trial Tr. vol 1, at 52:18-20 ("Georgia does not take the position that ecological harm alone can never justify an equitable apportionment …."). The inquiry, moreover, is a holistic one that evaluates all of the complained-of injuries together, rather than holding each one up for independent examination. In *New Jersey v. New York*, for example, the Special Master concluded that the proposed diversion by New York would cause only slight injury to most of New Jersey's interests but "more than slight damage to the recreational uses of the river and the oyster industry." Report of the Special Master at 193, *New Jersey v. New York*, 283 U.S. 336 (1931) (No. 16, Original). The Special Master then found that "adding all of these elements of damage together gives a total of substantial damage" that was "more than New Jersey should be expected to bear under the principle of fair and equitable apportionment." *Id.* The Supreme Court affirmed the Special Master's analysis and finding of injury. *See New Jersey v. New York*, 283 U.S. at 345 ("The total is found to be greater than New Jersey ought to bear ….").

Once the complaining State has shown that it has been injured by upstream diversions, the focus shifts to whether the "diversion should nevertheless be permitted under the principle of equitable apportionment." *Colorado v. New Mexico I*, 459 U.S. at 187 n.13; *see also Colorado v. New Mexico II*, 467 U.S. at 317-18, 320, 323-24. Here again, the Court looks to a wide array

of factors. In addition to the party States' own water-rights doctrines, past cases have considered, for example, how much of the water usage in the river system was consumptive, the recent and long-term climactic conditions of the river basin, the practical consequences that wasteful uses will have on downstream areas, potential damage to environmental and ecological interests, harm to commerce, and the effect on fisheries. *See Nebraska v. Wyoming*, 325 U.S. 589, 618 (1945); *Colorado v. New Mexico I*, 459 U.S. at 183; *Nebraska v. Wyoming*, 515 U.S. 1, 13 (1995); *New Jersey v. New York*, 283 U.S. at 345; *Wisconsin v. Illinois*, 278 U.S. 367, 408-09, 420 (1929). At this stage, the Court also looks to whether the costs of "reasonable conservation measures" to mitigate downstream harm "would be outweighed by the benefits to [the upstream State] from the diversion." *Colorado v. New Mexico II*, 467 U.S. at 317.

New Jersey v. New York illustrates how this two-part framework has been applied in an analogous context. New York sought to divert 600 million gallons per day from tributaries of the Delaware River to increase water supply for New York City. In challenging the diversion, New Jersey claimed harm to a variety of interests, including damage to its oyster fisheries caused by higher salinities in Delaware Bay. *See New Jersey v. New York*, 283 U.S. at 343-44. New Jersey experts testified that increases in salinity would lead to heightened predation by drills and other enemies of the oyster. *See* Report of the Special Master at 164, *New Jersey v. New York*, 283 U.S. 336 (1931) (No. 16, Original) ("The proof of plaintiffs is that the oyster lives and thrives in a salinity lower than that in which these enemies can survive, and that an increase in salinity over the oyster beds will permit the inroad of these enemies and that these enemies will do great destruction to the young seed oysters."). New York's experts pointed to the adaptability of oysters, positing that they would survive in a range of salinities including those that would likely result from the proposed diversion. *See id*. at 168-75.

Despite the existence of conflicting expert testimony on harm to oysters, the Special Master determined that New Jersey satisfied the clear and convincing standard because of evidence that the proposed diversion by New York would ***exacerbate*** harm to oysters in Delaware Bay:

> It is to be remembered, however, that the water diverted by New York never returns to Delaware River and Bay and that the diversion will at times increase and accentuate natural adverse variations in salinities and other conditions, except at those periods of very low flow when water is released from the impounding reservoirs. The evidence of practical oystermen as to larger [crops] in wet years than in dry years should also not be overlooked. In the conflict of evidence as to the effect on oysters[,] I reach the conclusion and so find that while the New York diversion will not have the very great damaging effect claimed by New Jersey, yet undoubtedly ***it will have the effect of producing more than slight damage and there will result a greater damaging effect than New Jersey should be called upon to bear under the principle of fair and equitable apportionment of the waters of the Delaware***.

Id. at 176 (emphasis added).

After making this finding, the Special Master then assessed the equities of halting New York's proposed diversion, and balanced that with the harm to New Jersey. In balancing the equities, the Special Master concluded that, while "New York should not be denied the right to obtain … the use of the best, purest, most dependable and most economic water supply from sources within its own boundaries," "the taking from such supply should not be so great as to unreasonably injure New Jersey or be more than the fair share to which New York is entitled under the principle of fair and equitable apportionment." *Id.* at 194. The Supreme Court adopted the Special Master's Report and required New York to reduce the amount of its proposed diversion to minimize harm to New Jersey's oyster fisheries. *New Jersey v. New York*, 283 U.S. at 345-346.

In this case, Florida has embraced the burden under the first step of the analysis of showing, by clear and convincing evidence, that it has been injured by Georgia's diversions—

and it meets that burden for the reasons explained in Section I below. But the parties dispute whether that burden shifts to Georgia at the second, equitable-balancing step of the analysis. In *Colorado v. New Mexico I*, the Supreme Court stated clearly that, once the complaining State has shown injury, the "burden … shift[s] to [the diverting State] to establish that a diversion should nevertheless be permitted under the principle of equitable apportionment." 459 U.S. at 187 n.13; *see also Colorado v. New Mexico II*, 467 U.S. at 317-18, 320, 323-24. But despite that unequivocal "burden shifting" language, Georgia argues that the burden does *not* shift even after Florida has shown injury. That argument should be rejected.

Relying primarily on original actions involving western States that utilize prior appropriation doctrines, Georgia argues that the Court's overriding concern in cases like *Colorado v. New Mexico I* is with preserving "the status quo," and that insofar as its diversions had become "the status quo" before this suit was filed, Georgia bears no equitable burden in defending them. Dkt. No. 502, Ga. Pretrial Br. 5 (Oct. 7, 2016) (citing *Kansas v. Colorado*, 206 U.S. 45, 117 (1907); *Idaho ex. rel. Evans v. Oregon*, 462 U.S. at 1028; *Washington v. Oregon*, 297 U.S. 517, 522 (1936)). On Georgia's theory, its upstream status means that it is free to take as much water as it wants, and that, having done so, its use can only be displaced in the future if Florida can make out a clear-and-convincing case that Georgia's diversions are inequitable.

Here, the parties dispute what the "status quo" was concerning the waters at issue and, as explained below, the status quo is not Georgia's "take as much water as it wants" regime. But the more fundamental point is that, whatever merit Georgia's "status quo" approach might have in a case involving prior appropriation States (such as *amicus* Colorado), that approach is inapplicable here, where *both* States have eschewed prior appropriation doctrine and its emphasis

on the priority of established uses in favor of a riparian regime, which focuses on whether the challenged uses are reasonable as opposed to which use came first.

As noted above, the Supreme Court considers the water rights law applied by the party States in conducting an equitable apportionment. *See, e.g.*, *Wyoming v. Colorado*, 259 U.S. 419, 470 (1922). Florida and Georgia's common riparianism thus "serves as the "'guiding principle' in an allocation" here, *Colorado v. New Mexico I*, 459 U.S. at 184, because a State that employs riparian doctrine within its own borders "cannot complain if the same rule is administered between herself and a sister [S]tate," *Kansas v. Colorado*, 206 U.S. at 104-05. And within a riparian regime, unlike a prior appropriation regime, water use rights "originate from land ownership and remain vested even if unexercised." *Colorado v. New Mexico I*, 459 U.S. at 179 n.4. Georgia's argument that it has effectively vested rights in its existing diversions that can only be displaced by a clear-and-convincing showing by Florida is therefore fundamentally misplaced.

Even if Georgia's prior appropriation-like approach were applicable here, Georgia would still bear the burden of proving that many of the diversions at issue are reasonable and equitable. By Georgia's own logic, this would include all future diversions Georgia has claimed it is entitled to make. Georgia, after all, is the one with direct access to any proof showing why its planned diversions would be reasonable (or why consumption limits would be inequitable). *Cf. Int'l Bhd. of Teamsters v. United States*, 431 U.S. 324, 359 n.45 (1977) ("Presumptions shifting the burden of proof are often created to reflect judicial evaluations of probabilities and to conform with a party's superior access to the proof."). Georgia also bears the equitable burden with respect to existing diversions that are illegal under its own laws. As the Supreme Court has noted in a slightly different context, "[n]o State can use its lax administration to establish its

claim to water." *Colorado v. New Mexico II*, 467 U.S. at 321. Having enacted a permitting regime and acknowledged through the Flint River Drought Protection Act (FRDPA) that reductions in irrigation are necessary during times of drought, Georgia cannot deny that the *lawful* status quo requires far more protection of Florida's interests than Georgia has, in practice, afforded them. If Georgia believes that enforcing its very own laws would be inequitable, it must bear the burden of proving that fact (and could not do so on the record here).

In any event, as explained in Section II below, whether the burden of proof shifts or not, the evidence overwhelmingly establishes that Georgia's upstream diversions are inequitable.

B. The Court Can Fashion A Remedial Decree With The Flexibility Needed To Preserve Equitable Rights Under Varying Future Conditions

The only remaining question is whether Florida is entitled to the relief it has requested—a cap on Georgia's consumption. Here, Georgia's primary position seems to be that, even if Florida has shown that it has been injured, the Special Master should simply look the other way and allow Georgia's diversions to continue unabated while a treasured ecological resource and community collapses because the remedy's complete success cannot, according to Georgia, be certain. But the Special Master need not determine that success will be *either* complete *or* certain; all it need find is that a consumption cap of the sort Florida has proposed would be reasonably likely to meaningfully alleviate the harm Florida faces as a result of Georgia's ever increasing diversions. As the Court explained in *Idaho ex rel. Evans v. Oregon*, "[u]ncertainties about the future … do *not* provide a basis for declining to fashion a decree. Reliance on reasonable predictions of future conditions is necessary to protect the equitable rights of a State." 462 U.S. at 1025-26 (emphasis added); *see also, e.g.*, *Connecticut v. Massachusetts*, 282 U.S. 660, 674 (1931) ("Injunction issues to prevent existing *or presently threatened* injuries." (emphasis added)).

As explained in Section III below, the evidence shows that the consumption cap remedy Florida has proposed is almost certain to meaningfully alleviate the injuries caused by Georgia's increased consumption. It will do so, moreover, without inequitably impacting Georgia's interests. As Dr. Sunding explained at trial, the proposed consumption cap has two primary components: a reasonable every year limit on consumption that Georgia could readily achieve with minor variations in its current water usage, and a specific drought year cap that would prevent Georgia from imposing severe harm on Florida when Florida needs the water most. By design, the proposed remedy would take account of natural variation in climactic conditions to ensure that the restrictions on Georgia's use in any given year are not out of proportion to the benefit those restrictions will produce. That is because, as the riparian doctrines of both States sensibly recognize, upstream uses that are reasonable (and thus permissible) in particularly wet years may nevertheless be unreasonable (and thus impermissible) in regular or dry years. *See United States v. Willow River Power Co.*, 324 U.S. 499, 505 (1945); *Colorado v. New Mexico I*, 459 U.S. at 179 n.4; *Stewart v. Bridges*, 292 S.E.2d 702, 704 (Ga. 1982); *Roughton v. Thiele Kaolin Co.*, 74 S.E.2d 844, 846 (Ga. 1953); *5F, LLC v. Dresing*, 142 So. 3d 936, 941 (Fla. Dist. Ct. App. 2014); *Florio v. State ex rel. Epperson*, 119 So. 2d 305, 310 (Fla. Dist. Ct. App. 1960).[2]

Ultimately, absolute certainty about exactly how the remedy may apply in every future climatic scenario is not required—but *equity* is. And here, equity calls for reasonable limits on Georgia's ever-growing and unsustainable consumption of the *shared* waters at issue.

[2] The Supreme Court's decisions demonstrate that it is appropriate to utilize equitable principles to plan for and address future water flow variations in this manner. *See, e.g.*, *New Jersey v. New York*, 283 U.S. at 346-47 (providing for variation in decree requirements based on changes in flow of the Delaware River).

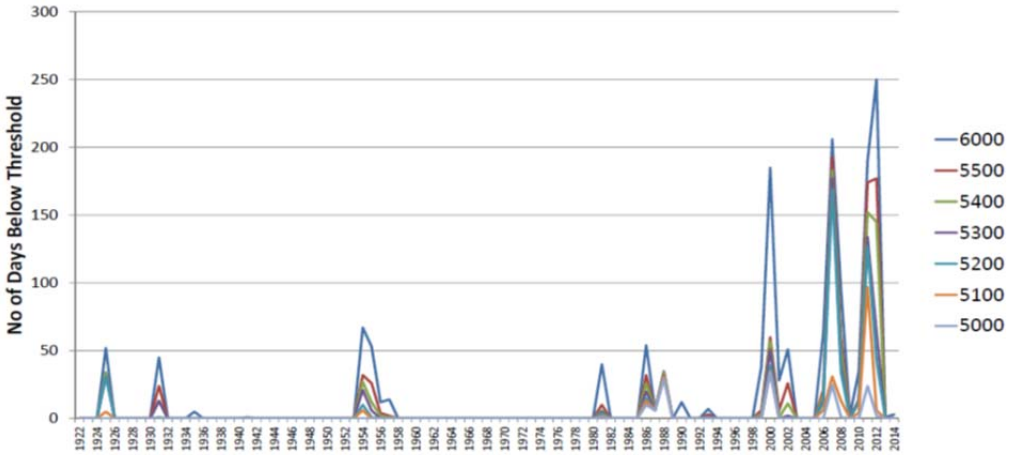
I. GEORGIA'S CONSUMPTION HAS CAUSED AND WILL CONTINUE TO CAUSE REAL OR SUBSTANTIAL INJURY TO FLORIDA

The evidence presented at trial overwhelmingly establishes that Georgia's ever increasing consumption of water in the ACF Basin has caused real or substantial injury to Florida.

A. Georgia's Ever Increasing Consumption Of The Waters At Issue Has Fundamentally Altered The Hydrology Of The ACF Basin

1. Objective Evidence Demonstrates An Explosion In Georgia's Water Consumption

At trial, Florida presented undisputed evidence on the dramatic increase in Georgia's consumption of water in the ACF Basin since the 1970s. *See, e.g.*, Hornberger PFD ¶ 3(e). Since that time, U.S. Geological Survey (USGS) flow records for the Chattahoochee gage on the Apalachicola River near the state line "show that the magnitude, frequency, and duration of low flows entering Florida from Georgia are much more severe in recent decades than before 1970." *Id.* ¶ 44. For instance, average monthly flows below 6,000 cubic feet per second (cfs) at the Chattahoochee gage were very rare before 1970, occurring in only six months during the more than 40-year period the gage operated before that time. But in 2011 and 2012 alone there were 14 months averaging below 6,000 cfs at this gage. FX-D-1. Georgia's experts agree. The following figure (FX-D-17), from Georgia's hydrology expert, shows the increasing frequency of severe low flows on the Apalachicola River in Florida:



Source: "Bedient Demo. 52-53.xlsx" Workbook, "ChattaQ&H" Worksheet

An almost identical pattern of low flows is strikingly evident on the Flint River in Georgia. For example, USGS gage data shows declines in flows at the Bainbridge gage, downstream of areas with heavy agricultural water use. *See* FX-D-2; Hornberger PFD ¶¶ 39, 47; *see also* Hornberger PFD ¶¶ 55-56. USGS has explained that historic low flows are particularly apparent in the lower Flint Basin which is subject to intensive Georgia irrigation, contrasting those low flows with, for example, the Chipola River in Florida, which is not. *See, e.g.,* FX-251 at 3-4 ("The 7Q10 for Ichawaynochaway Creek at Milford, Georgia (02353500), ***declined about 74 percent*** from period 2 [pre-irrigation conditions 1958 to 1970] to period 3 [post-irrigation conditions 1976 to 2010], whereas the 7Q10 at Chipola River near Altha, Florida (02359000), ***decreased by about 7 percent*** from period 2 to period 3.") (emphasis added). Likewise, during low flow times, the upper Flint River has suffered a 70 percent decline in flow. FX-285 at 10.

Even Georgia's own water consumption calculations, which Florida believes are underestimated for the reasons detailed below, demonstrate that Georgia is fundamentally altering the hydrology of the Basin. Georgia's witnesses and experts defined the term "consumptive use" to mean the amount of streamflow depletion that resulted from Georgia's consumption of water, and conceded that streamflow in the Georgia portion of the ACF had

decreased by nearly as much as 1,900 cfs in peak summer months as a result of Georgia's consumption. *See* Zeng PFD ¶¶ 4 n.1, 22 (Zeng Demo. 3); Bedient PFD ¶ 37 n.4; Bedient Test., Trial Tr. vol. 15, at 3989:12-20; 3992:2-12. In fact, Georgia's consumption is admittedly *at least* approximately one third of state-line flows that make it to Florida during peak consumption summer months of recent drought years. *See* Zeng Test., Trial Tr. vol. 13, at 3370:14-3371:4; *see also* Bedient Test., Trial Tr. vol. 15, at 3992:2-12; *id*. at 3994:20-3995:4.

Importantly, Georgia's estimates *undercount* its consumption, as is evident from multiple lines of evidence, including from the work of hydrologists at the Georgia Institute of Technology's Water Resources Institute (GWRI). GWRI prepared the Unimpaired Flow Assessment for the ACF Basin in the Fall of 2012 (hereinafter "GWRI UIF Report"). *See* FX-534. The GWRI UIF Report—which was "reviewed by a multitude of federal and state agencies, and other stakeholders, and has been widely praised for its scientific validity and comprehensive treatment of the subject," FX-49v at B&V0063207—concludes that Georgia's own estimates of its consumptive uses, which are a key component of the UIF dataset, contain systematic errors, which need to be remedied before that data can be utilized, including in ResSim modeling. *See, e.g.*, FX-534 at iv-v, 189-94. In addition, the GWRI UIF Report concluded that:

- Errors in Georgia's consumption data may substantially undercount the consumption of Georgia's agricultural irrigation, by "up to 70% of the actual crop water requirement," *see* FX-534 at 10, and "seasonal agricultural withdrawals (from surface waters as well as groundwater aquifers) are potentially overestimated during wet years and underestimated during dry years," *id.* at 191;

- Georgia's consumption data also failed to account for evaporation from Georgia surface water impoundments (mostly "farm ponds"), which GWRI estimated might result in net evaporative losses of up to 1,200 cfs, FX-534 at 191; and

- Model outputs from the ResSim model "are not representative of actual system conditions" on a daily time scale, *see* FX-534 at iv, 193; *see also id.* at 193 ("These errors undermine the results of ResSim and other river basin simulation models …."); and on a monthly time scale certain UIF errors are "significant enough to challenge the validity of water management assessment results and conclusions," *id.* at iv.

GWRI concluded that the ResSim model thus could not reliably be employed to estimate the extent and severity of low flows in the ACF Basin—exactly the issue this case addresses. Notably, the USFWS reached similar conclusions. *See* FX-530 at 1 (USFWS cautioning that the UIF data set "was not intended to accurately identify historic daily discharge or be a predictive model"); *id.* at 6 (identifying guidance for low flows far higher than 5,000 cfs). The ACF Stakeholders also agreed:

> After reviewing this analysis and learning about the UIF data set being used by USACE and the states, ACFS considered undertaking the effort to improve the UIF dataset. However, given the time and monetary commitment to support this effort, and the time needed to coordinate with the three states and USACE for agreement on the improvements, ACFS decided to proceed with current conditions modeling runs using existing UIFs for trends and relative comparisons rather than for absolute numbers.

FX-883 at 15.

GWRI proposed a far reaching process with multiple federal agencies for resolving these "systematic" and "random" errors with Georgia consumption data and the UIFs. *See* FX-534 at iv-v ("The overarching study finding is that while the existing UIFs contain valuable technical information, they need to be improved before they can support valid water management assessments."). But this process has not occurred, principally because neither Georgia nor any other entity has funded and completed it. *See* Turner Test., Trial Tr. vol 12, at 2954:6-14; FX-883 at 84. The GWRI Report also explained that, absent corrective action, different modeling tools—other than ResSim (*i.e.*, rainfall runoff models)—would be required to obtain accurate estimates of low flows:

> The two challenging improvements relate to the effects of (i) human-induced groundwater changes and (ii) small and medium size impoundments [including farm ponds]. Direct and full consideration of these issues would respectively require the development of new or better groundwater models and non-trivial data collection efforts. **As an alternative, these effects can be assessed through *rainfall-runoff models.* Such models can be calibrated based on early hydrologic periods (when these effects were negligible) and subsequently used to generate hydrologically consistent UIFs for recent periods**.

FX-534 at 193 (emphasis added).

Despite knowing of these GWRI critiques and recommendations, as well as a warning from the USFWS cautioning that the UIF data set "was not intended to accurately identify historic daily discharge or be a predictive model," FX-530 at 1, Georgia presented ***uncorrected data*** and what they knew to be ***unreliable analyses*** to this Court as evidence in this case. Georgia's expert Dr. Bedient acknowledged that Georgia took the UIF data at "face value" in its use of ResSim for the very purposes that GWRI and the USFWS warned against. Bedient Test., Trial Tr. vol. 15, at 3968:1-9; *see also id.* at 3970:8-3972:17 (acknowledging awareness of numerous critiques of the UIF dataset). Dr. Bedient admitted that he used ResSim to identify historic daily flows at the state line and predict what those daily flows would have been under conservation scenarios. *Id.* at 3976:2-7. For that and many other reasons (*see infra* at 27-30, 33-34) Georgia's hydrologic analyses are unreliable.

By sharp contrast, Florida's experts utilized the precise modeling approach recommended by GWRI. *See* FX-534 at 193, GWRI UIF Report. Following the instructions in the GWRI UIF Report, Florida used well-established tools and models—including objective gage data and recommended ***rainfall runoff modeling***—to demonstrate that the impacts on streamflow from Georgia's consumption greatly exceed the almost 1,900 cfs that Georgia has already conceded. Florida's experts used multiple lines of evidence to demonstrate that Georgia currently depletes approximately 3,500 to 4,000 cfs on average in the summer of low flow years.

Florida's experts analyzed the basic hydrologic data, including rainfall and streamflow at many locations across the Basin. For example, in Table 1 of his pre-filed direct testimony, Dr. Hornberger compared objective rainfall, temperature, and streamflow data at the Chattahoochee gage on an annual as well as seasonal basis (June to September) for the years 1954, 1955, 2011, and 2012. Dr. Hornberger's testimony shows that despite the fact that past historic droughts had fewer inches of precipitation and similar temperatures as compared to 2011-2012, the Apalachicola River flows were considerably higher in those past droughts than in 2011-2012, both from the annual and summer seasonal perspective.[3] *See* Hornberger PFD ¶¶ 50-52, Table 1 (comparing data for 1954, 1955, 2011, and 2012); *id.* ¶ 53, Table 2 (showing an approximately 3,600 cfs decline in summer streamflow between the drought years of 1931 and 2011). Dr. Hornberger also analyzed basin yield, which is the fraction of rainfall that becomes streamflow over a given period. This basin yield analysis showed a decline of approximately 3,900 cfs from the 2003-2013 period as compared to the pre-1970 period. Hornberger PFD ¶ 64, Table 4. Dr. Hornberger's data analysis showed that Georgia's consumption has unequivocally led to "fundamental hydrologic change" in the ACF Basin. Hornberger Test., Trial Tr. vol. 8, at 2096:14-21; *id.* at 1970:13-23 (same); Hornberger PFD ¶ 3a (same).

Florida's experts also used rainfall runoff models to calculate how much river flow will result from a given rainfall amount in order to understand how much consumptive use has

[3] This decline in streamflow between the 1954-1955 and 2011-2012 droughts cannot be explained by the installation of dams and reservoirs in the ACF Basin in the intervening years (rather than by Georgia's consumption). Georgia itself argues that the operation of the Army Corps' dams in the river system has actually increased the amount of flow reaching Florida during summer months of extreme drought periods. *See, e.g.*, Dkt. No. 502, Ga. Pretrial Br. 11 ("Through its operation of dams and reservoirs, the Corps often provides Florida with more water than it would otherwise receive during dry months or times of drought."). According to Georgia's argument, the summer impacts of Georgia's consumption are likely even greater than the difference between 1954-1955 and 2011-2012 identifies.

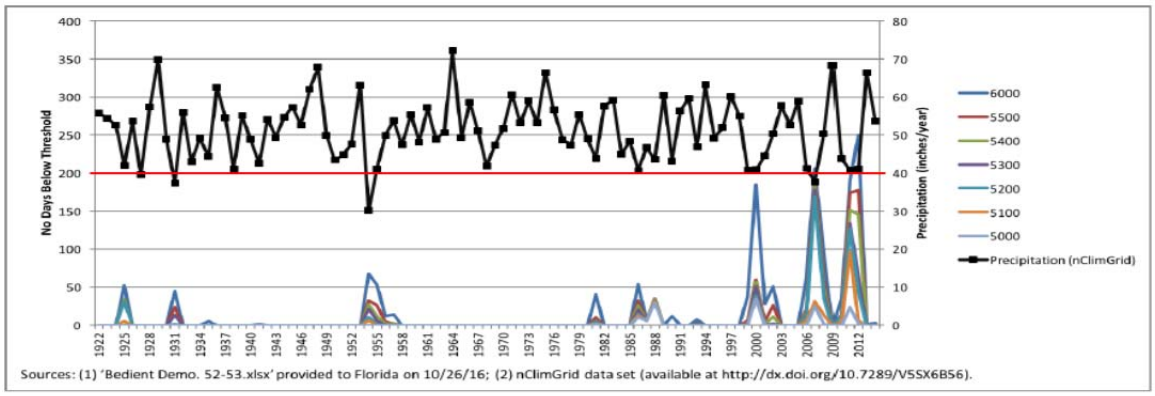
changed over the past decades. Florida experts took care in utilizing the rainfall runoff models to assess the performance of those models based on actual flow data from the 1930s and 1950s—which is exactly what GWRI recommended. *See* FX-534 at 193 (recommending that models be calibrated based on earlier hydrologic periods); Hornberger PFD ¶¶ 71, 83-95. In addition to Dr. Hornberger's work, Florida expert Dr. Lettenmaier used a different rainfall runoff model, the Variable Infiltration Capacity model, which independently produced similar results. Lettenmaier PFD ¶¶ 17, 40-41; *see also* Hornberger PFD ¶¶ 83-85 (describing a rainfall runoff modeling approach to quantifying the impact of Georgia's consumption on streamflow and concluding that streamflow depletions range generally from 3,000 to 4,000 cfs in summer months); Lettenmaier PFD ¶¶ 39-40 (Rainfall runoff modeling shows a streamflow depletion of approximately 3,800 cfs in "flow that would have occurred under the climate conditions that actually occurred, absent human consumptive water use, streamflow regulation, or signatures of other long-term changes such as land use."). The similarity in the results of Drs. Hornberger and Lettenmaier, despite their independent approaches, reinforces the reliability and accuracy of their rainfall runoff modeling. *See, e.g.*, FX-534 at 193 (recommending rainfall runoff model). None of Georgia's hydrology experts used this type of rainfall runoff model to reach conclusions about Georgia's consumptive use in the ACF, despite the recommendation from GWRI to do so.

In addition, Florida accounted for climate variability through rainfall runoff modeling and in separate analysis of climate data, which demonstrated that Georgia's upstream consumption *had to be the cause* of the declining flows into Florida in recent decades. The trial evidence showed that climate variables cannot explain the massive depletions in river flow. Dr. Lettenmaier, Florida's climate expert, showed that precipitation in the ACF Basin has not significantly declined and recent droughts are not unprecedented. *See, e.g.,* Lettenmaier Test.,

Trial Tr. vol. 10, at 2446:22-2447:7 ("We found that the *recent droughts are by no means exceptional*." (emphasis added)); *see also* Lettenmaier PFD ¶ 24 ("no statistically significant trend in precipitation in any of the data sets"); *id.* ¶ 25. This fact was graphically demonstrated at trial in FX-893, by superimposing over 80 years of cyclical climate cycles over Dr. Bedient's graph of the increasing low flows to the Apalachicola River (FX-D-17). As this combined graph demonstrates, climate changes cannot explain the severe low flows over recent decades. The only possible explanation is Georgia's ballooning upstream consumptive water uses. *See, e.g.*, Hornberger PFD ¶¶ 3(f)-(g), 37, 42, 51, 64, 71; Lettenmaier PFD ¶¶ 26, 39-41, 60.

FX-893

Number of Days With Flows at the Chattahoochee Gage (USGS 02358000)
Below Certain Thresholds
and Annual Precipitation Data



Because of the well-accepted "warming hole" over the Southeastern U.S., gridded climate data, including NOAA data, show no significant temperature increases in the ACF Basin. *See, e.g.*, Lettenmaier PFD ¶¶ 22-23.[4] Moreover, even if climate were to change in the distant future in a manner that reduced available precipitation, those climate changes would further demonstrate the unreasonableness of Georgia's excessive consumption: It would be

[4] Georgia notably did not call any climate change expert to testify in this proceeding.

inappropriate under Georgia's own riparian legal doctrine for Georgia farmers to consume so much water after a change in climate conditions made such uses unreasonable and harmful to downstream users. *See* JX-21 at 43, GA EPD Flint River Basin Plan ("Georgia is a 'regulated **riparian**' state, which provides property owners with 'reasonable use' of the waters flowing on, past, or under their property."); *id.* at 79, § 5.1.5 (Georgia authority to halt irrigation if water use would cause "unreasonable adverse effects.").

2. Georgia's Groundwater Consumption Estimates Are Unreliable for Additional Reasons

Perhaps the worst flaw of Georgia's groundwater analysis was its continued failure to use accurate agricultural consumption data. Without accurate data, no groundwater model results can be trusted. "Garbage in" results in "garbage out." *See supra* at 21-22.

Georgia's total consumptive use estimates also fail to account for any streamflow losses associated with pumping groundwater from aquifers other than the Upper Floridan aquifer. *See* Zeng Test., Trial Tr. vol. 13, at 3215:3-11; Zeng PFD ¶¶ 4 n.1, 61 (Dr. Zeng did not include non-Upper Floridan aquifer pumping in his streamflow depletion estimates). The Claiborne aquifer, for instance, interacts directly with Georgia streams in the Flint River Basin in the outcrop area where the Claiborne aquifer is the aquifer closest to the surface. *See* FX-933 at 1 (Georgia Geologic Survey report); Panday Test., Trial Tr. vol. 15, at 3769:25-3770:6, 3772:9-13, 3775:1-10. While it may be possible to withdraw water from the Claiborne with minimal effects in the southern portion of the Flint Basin, such withdrawals in the outcrop area *do* impact river and stream flow. *See id.* Even Georgia's own groundwater expert, Dr. Panday, acknowledges that there are streamflow impacts from pumping in these other aquifers in the ACF Basin in Georgia. *See* Panday PFD ¶ 4(v); Panday Test., Trial Tr. vol. 15, at 3769:25-3770:6. Dr. Zeng, Georgia's chief hydrologist, admitted that Georgian farmers irrigate more than 154,000 acres with

groundwater pumped from aquifers other than the Upper Floridan, which include the Claiborne, Clayton, and Cretaceous aquifers. Zeng PFD ¶ 52 (Zeng Demo. 7); *see also* Zeng Test., Trial Tr. vol. 13, at 3217:25-3218:1. Dr. Zeng also acknowledged that streamflow losses do occur as a result of pumping from such aquifers. Zeng Test., Trial Tr. vol. 13, at 3215:3-11; Zeng PFD ¶¶ 4 n.1, 61. Despite these admissions, Dr. Zeng still testified that Georgia treated the surface water impacts of these other aquifer withdrawals as zero. Zeng Test., Trial Tr. vol. 13, at 3381:3-18.

Moreover, Georgia's expert groundwater hydrologist's own work showed systematic declines in groundwater levels in drought years. *See* Panday PFD ¶¶ 113-14 (Zeng Demo. 35) (showing 11 of 20 wells with "decreasing" or "probably decreasing" trends between 1975 and 2015); Panday Test., Trial Tr. vol. 15, at 3884:19-3885:16 (Dr. Panday's trial testimony regarding same). During the 2011 drought after highly significant groundwater pumping for agriculture, Georgia's chief hydrologist found that "the lack of groundwater recovery in this year was stunning" and that the results of his groundwater level analysis "indicate[d] lower groundwater storage across the region." *See* FX-82 at 1. Likewise, Georgia technical experts have found profound impacts from groundwater pumping for irrigation. *See, e.g.*, FX-49b at GA00278840 ("Many streams in the lower Flint drainage, have experienced severe reductions in short-term and long-term flow. The combined effects of irrigation pumping and drought create non-flowing conditions that did not exist prior to the late 1990's."); FX-49f at JWJONES0000548 ("Intensification of agricultural irrigation in the lower FRB has resulted in significant baseflow declines evident in reductions in low-flow durations and 1-, 7-, and 14-day minimum flows in the post-irrigation records for both Ichawaynochaway and Spring Creeks.").

In addition, Georgia's expert Dr. Panday intentionally used groundwater impact factors substantially lower than he had estimated in the past. Dr. Panday previously did modeling work

for the Northwest Florida Water Management District in which he found a 60 percent impact factor (rather than the impact factor of approximately 40 percent that Dr. Panday testified to in his pre-filed testimony). Panday Test., Trial Tr. vol. 15, at 3799:4-3804:24; FX-594 at 25. But it is also important to understand exactly what these "impact factors" are and are not. According to Dr. Panday, groundwater pumping for irrigation has an "impact factor," which measures how much of the impact of groundwater pumping is felt during the same year as the withdrawals. This impact depends upon how distant the pumping is from a stream or tributary. There is no question that the impacts on streamflow of all groundwater pumping will eventually occur, but the key is to understand what the period of delay is and the extent to which the aquifer has been recharged by winter rains before the impact is actually felt. What Dr. Panday did not explain is that his "impact factor" is a measure of the short-term impact only (within one year). Panday PFD ¶ 86 (Dr. Panday's conclusion that annual impact factor is approximately 38 to 40 percent); Panday Test., Trial Tr. vol. 15, at 3789:4-20 (Dr. Panday's trial testimony regarding annual average impact factors). In other words, the impact factors do not account for the ***long-term impacts*** of agricultural ground water pumping, which may be significant, ***especially in a multi-year drought***. *See* Panday PFD ¶ 68 (impact of pumping on streamflow "is spread over many months"); *id.* ¶ 70 (Dr. Panday's testimony admitted that "impact to streamflow takes 100 to 1,000 days to be almost fully (97%) realized at the rivers"); FX-585 at 1, Langseth Pumped Water Source Notes (2016).

In a multi-year drought, the impacts in the first year may be significant. But if the aquifer does not substantially recharge with winter rains (as was the case in 2011-2012), many of the impacts from the first drought year's groundwater pumping are felt dramatically in the second year, along with the impact of pumping that second year. Hornberger PFD ¶¶ 105-06. Thus, in a

multi-year drought, the impacts of agricultural irrigation can be substantially greater than any single year "impact factor"—whether 60% or 40% or some other number. *See* FX-585 at 1. In 2011-12, intense irrigation pumping in the Upper Floridan aquifer consumed approximately half of the recharge—in other words, Georgia's pumping was reducing the recharge precisely when it was needed most to replenish the aquifer. *See* Hornberger PFD ¶ 105. This pumping caused groundwater to decline significantly, which reduced the aquifer's ability to provide baseflow and ultimately resulted in the aquifer losing connection with river flow. Hornberger PFD ¶¶ 105-06; FX-795 at SS-6, Langseth Expert Report (2016) ("higher groundwater pumping rates in the Georgia portion of the ACF basin, especially in consecutive drought years, have caused large declines in water levels"); *id.* at 32-33 (groundwater levels show "strong impact of two consecutive severe drought years"); FX-593, Kennedy Baseflow Estimates Supplemented by USGS PART Method (2016) (showing significantly reduced baseflow on Flint River in 2011-2012 drought); FX-968, Langseth Dep. 1172:10-1174:7 (testimony regarding same). In other words, in a multiyear drought, aquifers are particularly vulnerable to the impact of groundwater pumping for agriculture. It is thus particularly important that Georgia constrain irrigation during those periods. But Georgia refused to do so in 2011-2012, resulting in the worst low river flows in recorded history.

3. Georgia's Arguments About the Army Corps Are Also Wrong

Georgia's arguments also misrepresent the ways the Corps actually stores water within Georgia. Georgia made many of the same arguments in support of its motion to dismiss based on the fact that Florida does not seek relief against the Army Corps. The Special Master properly denied that motion. And the evidence at trial only bolsters the factual premises on which the Special Master's order was predicated. Georgia has failed to point to anything, much

less prove with evidence, that the Special Master's order was based on any misunderstanding of either how the Corps operates or the relief sought by Florida here.

The reality is that the majority of the ACF Basin area in Georgia (62 %) is essentially unregulated by the federal reservoirs because, as shown in Shanahan Figure 1 below, this area does not drain into the reservoirs with significant storage capacity. As the Special Master has already recognized in denying Georgia's motion to dismiss, the federal reservoir near the state line between Florida and Georgia, Lake Seminole, has minimal storage capacity and is operated as a run-of-the-river project. *See* Shanahan PFD ¶ 21; Order Denying Georgia's Motion to Dismiss at 4, 14. The vast majority of the conservation measures Florida has shown through evidence in this case that Georgia could implement would be located in that unregulated portion of the Basin. *See infra* at Section III.B; Hornberger PFD ¶ 112.

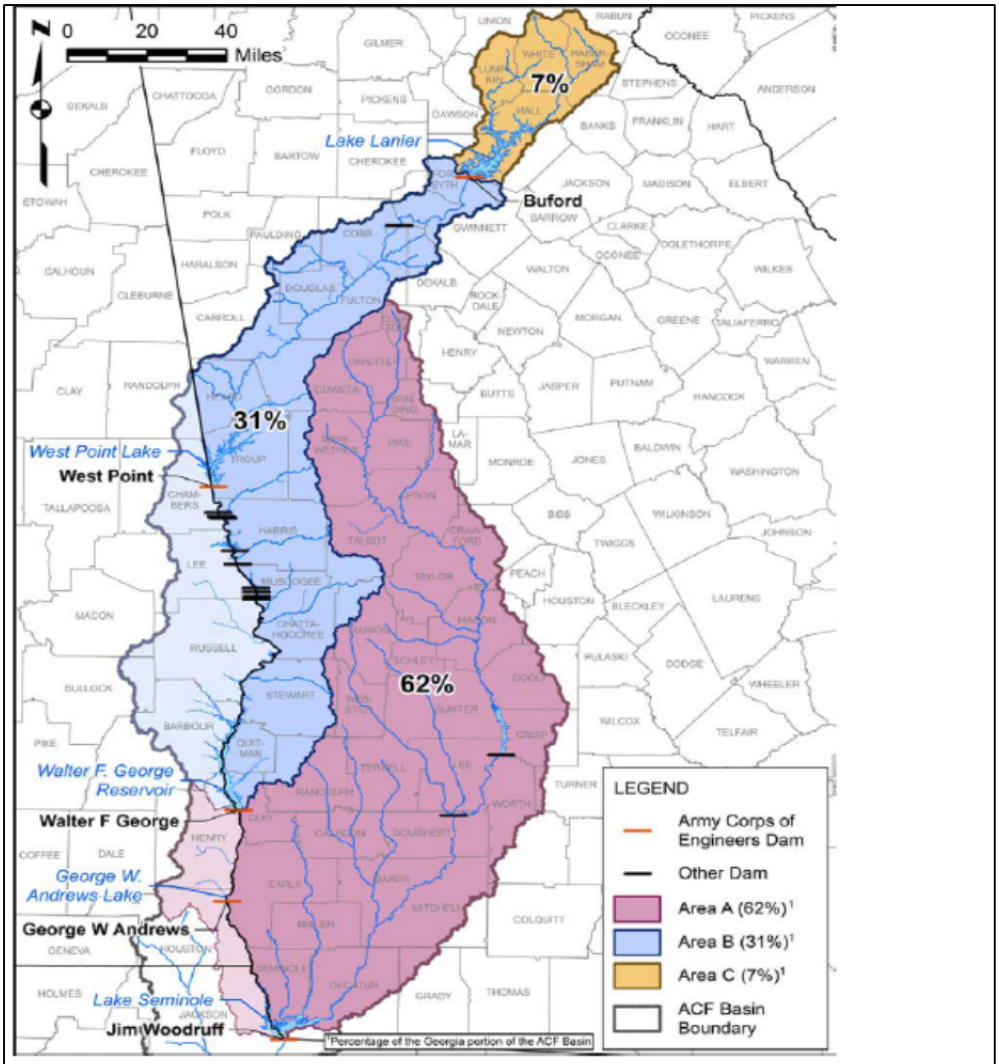


Figure 1. Map of the Georgia portion of the ACF Basin showing unregulated Area A and regulated Areas B and C. (Pre-filed Direct Testimony of Dr. George Hornberger.)

Shanahan PFD Figure 1.

Lake Lanier is the largest of the ACF Basin federal reservoirs, containing 65 percent of the storage capacity of the entire reservoir system. Yet because it is in the very northern part of the Basin, it receives water from only 7% of the land area in the Georgia portion of the Basin, as illustrated in the figure below. Shanahan PFD Figure 1, ¶ 20; Shanahan Test., Trial Tr. vol. 10, at 2524:7-2525:1; *see* Order Denying Georgia's Motion to Dismiss at 4, 14. The consequence of these geographic and hydrologic realities, as Dr. Shanahan explains, is that "it is physically impossible to offset or trade significant quantities of water conserved during the summer of dry

years in the Flint River or lower Chattahoochee River for additional water to be stored in distant Lake Lanier." Shanahan PFD ¶ 37. Lake Lanier simply does not receive enough water as inflow above its required minimum releases to enable significant additional water storage for substantial periods of time during droughts. Shanahan PFD ¶ 50.

In addition, there is little to no reason for the Army Corps to hold water for any significant period downstream of Lake Lanier at the two other reservoirs with storage capacity—West Point Lake and Walter F. George Lake. Unlike Lake Lanier, which stores water for Atlanta's water supply, West Point and Walter F. George do not face similar water demands and receive much more inflow than Laker Lanier because water flows into these reservoirs from a greater portion of the Basin. Shanahan PFD ¶¶ 43-45; Shanahan Test., Trial Tr. vol. 10, at 2525:11-23. Thus, "[a]ttempting such an offset would be unnecessary to fill the lakes (as adequate basin inflow is typically available) and it would be unnecessary for local water-supply needs around those two lakes (which needs are limited)." Shanahan PFD ¶ 45. Furthermore, Dr. Shanahan's analysis of historical data confirms, as he testified, "that West Point and W.F. George basically pass water during the dry time of year." Shanahan Test., Trial Tr. vol. 10, at 2527:13-2528:9.

Therefore, contrary to Georgia's claims, the evidence at trial showed that a remedy capping Georgia's consumption will almost always provide immediate and significant flow benefits to the Apalachicola River in Florida. Indeed, it is a hydrologic certainty that the vast majority of water conserved in Georgia will flow over time to Florida. *See, e.g.*, Shanahan Test., Trial Tr. vol. 10, at 2522:23-2523:16 ("There is really no place … for it to go. It's not going to disappear someplace. All the water is going to Florida eventually. It's not a question of if; it's a question of when. And that's a hydrologic certainty."); *see also* Shanahan PFD ¶¶ 39-40 (there is

a "very strong positive correlation" between inflow from the Flint River Basin and discharges from Woodruff Dam).[5] And that certainty remains true even under the Army Corps' recently released Environmental Impact Statement (EIS). *See* FX-794 at 44.

Georgia argues that the Corps will always provide the absolute minimum releases possible to meet a 5,000 cfs "target" at the Chattahoochee gage on the Apalachicola River. But the Corps specified that 5,000 cfs is a *minimum* release, not a target. *See, e.g.*, JX-124 at 2-72 to 2-73, USACE Draft Environmental Impact Statement (DEIS) ("The flow rates included in Table 2.1-5 prescribe minimum, not target, releases for Jim Woodruff Lock and Dam."); USACE Final Environmental Impact Statement at 2-75 (same language), http://www.sam.usace.army.mil/Portals/46/docs/planning_environmental/acf/docs/01_ACF_FEIS_Dec%202016_Volume%201.pdf?ver=2016-12-07-164912-723. Notably, Georgia's chief hydrologist and self-proclaimed "expert" on Corps operations, Dr. Wei Zeng, acknowledged that he was unaware that the Corps explicitly stated the 5,000 cfs flows were not a target. *See* Zeng Test., Trial Tr. vol. 13, at 3363:13-3365:16 ("Q. And you are aware, sir, that there are many places in the DEIS where the Corps explicitly states the 5,000 is not a target. Are you aware of that? A. I'm not aware of that. Q. Okay. Well perhaps I can walk through some of those.… Q. Do you see the reference to prescribed minimum not target releases? A. I see that. Q. Okay. Were you aware of this section when you wrote your direct testimony? A. Well, apparently I didn''t read that. Q. Okay. A. Or didn''t read that carefully."). Rather than use 5,000 cfs as a target, the Corps in fact exercises its

[5] Conversely, Georgia's expert, Dr. Bedient, improperly relied on "provisional data" he received from Georgia EPD (GX-143) when evaluating state line flows. *See* Bedient PFD ¶ 161. Provisional data is inherently unreliable according to the USGS, and this particular dataset contained a number of errors. *See* Bedient Test., Trial Tr. vol. 15, at 3953:20-24, 3955:19-23. When presented with another set of provisional data that he relied upon (GX-949), Dr. Bedient could not even testify as to which set of provisional data he used or whether what he used was correct. *See* Bedient Test., Trial Tr. vol. 15, at 3961:4-21.

discretion to often release more than the 5,000 cfs minimum during the low flow summer months. *See, e.g.,* Shanahan PFD ¶ 8(d). Thus, Georgia's core theory that the Corps will always withhold any additional flows above 5,000 cfs is flatly wrong. *See* Bedient Test., Trial Tr. vol. 15, at 3926:11-15, 3936:16-3937:11, 3942:15-3944:15 (Georgia expert admitting as much, and acknowledging that he changed his initial expert report to correct that error). Even if delayed temporarily on occasion, the vast majority of the water will ultimately reach Florida. As Dr. Shanahan testified, the additional water saved by reductions in Georgia consumption must flow south.[6]

B. Georgia's Consumption And The Resulting Low Apalachicola River Flows Have Significantly Harmed The Apalachicola Ecosystem And Communities

As noted, Georgia has conceded that ecological harm alone can justify an equitable apportionment. The evidence at trial showed that Georgia's consumption of the waters at issue not only already has inflicted serious ecological harm, but risks an environmental catastrophe. The evidence also showed that those ecological injuries have inflicted major damage to Apalachicola communities whose well-being is tied to the health of the ecosystem—and attendant natural resources, including oysters—that define the region.

[6]In pre-filed testimony, various Georgia "hydrology" witnesses claimed—admittedly, without any supporting rationale—that, since 1978, there have been large losses of water in the Apalachicola River between the Chattahoochee and Sumatra Gages in Florida. Georgia's argument was that several thousand cfs of river flow has essentially *disappeared* in recent decades, as if the water were consumed by a lost city of Atlantis operating somewhere deep underground below the Apalachicola Basin. Although Georgia counsel made that argument in his Opening Statement, Georgia wisely did not press that theory at trial, because the uncontroverted evidence demonstrates that this perceived change in flows is the result of unreliable Sumatra gage data at high flows that the USGS is currently revising due to measurement errors. *See* FX-515 at 1.

1. Harms To The Apalachicola Bay

There can be no serious dispute that the Apalachicola Bay has been substantially harmed by reduced freshwater flows that have altered the ecosystem and food web of the Bay. The most stark example of this is the collapse of the Apalachicola Bay oyster fishery in 2012, from which there has been no recovery. Further, there is ample evidence that critical habitat and primary food sources are harmed by lack of freshwater flow. If this situation is not remedied, the Bay will transform from a freshwater estuary into an extension of the Gulf of Mexico.

a. Low Flows Have Resulted In Increased Salinity Which In Turn Caused The 2011-12 Oyster Crash

The evidence presented at trial establishes that (1) reduced freshwater flow caused an increase in salinity in the Bay; (2) increased salinity led to oyster disease, predation, and recruitment failure; and (3) the progression of this depletion event culminated in a Bay-wide crash from which there has been no recovery. The evidence refutes Georgia's allegations that the crash instead was caused by poor fisheries management. Indeed, as detailed below, the National Oceanic and Atmospheric Administration (NOAA) came to the opposite conclusion in declaring a disaster declaration, although Georgia would prefer that the Court disregard this federal agency determination. FX-413, NOAA Final Decision Memorandum. Indeed, Georgia's expert, Dr. Lipcius, claimed (without basis) that NOAA did not have a scientific rationale for its decision and instead made the determination as "a socioeconomic issue" because "you tend to be liberal in trying to help out these fishing communities." Lipcius Test., Trial Tr. vol. 17, at 4423:19-4424:24. In other words, according to Dr. Lipcius, the federal government ignored the law. Of course, Dr. Lipcius himself—in the face of all the contemporaneous evidence he reviewed—ended up conceding at trial that his pre-filed direct testimony was "false" and that there was in fact evidence of increased oyster mortality due to predation. Lipcius Test., Trial Tr.

vol. 17, at 4414:8-14. Rather than accept Dr. Lipcius's invitation to ignore the findings of an expert federal agency, under well-established principles of federal law, this Court should defer to them. *See*, *e.g.*, *Marsh v. Oregon Nat'l Res. Council*, 490 U.S. 360, 377 (1989) (holding that where resolution of a particular question "requires a high level of technical expertise, [the Court] must defer to the informed discretion of the responsible federal agencies" (citation and internal quotation marks omitted); *Baltimore Gas & Elec. Co. v. Natural Res. Defense Council, Inc.*, 462 U.S. 87, 103 (1983) ("When examining this kind of scientific determination ... a reviewing court must generally be at its most deferential."); *Federal Power Comm'n v. Florida Power & Light Co.*, 404 U.S. 453, 463 (1972) ("Particularly when we consider a purely factual question within the area of competence of an administrative agency created by Congress, and when resolution of that question depends on 'engineering and scientific' considerations, we recognize the relevant agency's technical expertise and experience, and defer to its analysis unless it is without substantial basis in fact.").

The contemporaneous accounts of what happened to oysters in Apalachicola Bay in 2011-12 could not be more vivid or conclusive. In 2012, Mark Berrigan, Florida's most knowledgeable and experienced employee regarding oyster resources in Apalachicola Bay (*see* Berrigan PFD ¶ 2), documented the progression of the depletion event that he observed first-hand and explained its cause. Berrigan PFD ¶ 48. In his 2011 and 2012 Oyster Resource Assessment Reports (JX-50 and JX-77), Mr. Berrigan detailed the effects of decreased freshwater flows and high salinity on the oyster population. *See* JX-50 at 4 ("It is evident from divers' observations that many reefs in Apalachicola Bay are showing the negative effects of decreased rainfall and freshwater flow rates from the Apalachicola River over the past year,

including decreased recruitment and increased natural oyster mortality (predation, disease, and stress associated with high salinity regimes.")); JX-77 at 3, 5 (same).

What Mr. Berrigan witnessed was an incredible abundance of predators, like nothing ever before seen in Apalachicola Bay: "Snails passed across entire reefs, devouring every oyster and then moving on to the next reef. In all of my experience, I had never encountered such an abundance of snails or the devastation they left behind."[7] Berrigan PFD ¶ 44. Mr. Berrigan also recounted the observations of divers during the depletion event:

> Additionally, divers noted abundant stone crabs, Menippe mercenaria, on the primary oyster reefs in Apalachicola Bay. Stone crab burrows were easy to recognize and the appetite of these destructive predators was obvious. Stone crab burrows were surrounded by living and dead oysters; the result of crabs actively foraging and bringing live oysters to their burrows. The shells of devoured oysters were also present and formed a ring around burrows. Examining dead oyster shell provided confirmation of the crushing action of stone crabs on the shell of oysters. Stone crabs are considered primary predators of oysters when salinities remain high for extended periods and crab populations become established on oyster reefs.

Berrigan PFD ¶ 45. After he saw these reports, he went out again to survey the entire Bay:

> [T]he mortality in those outer bars was substantial, if not 100 percent. I have never seen natural mortality like that. The conchs were more abundant than you can imagine. It's almost like a science fiction movie how many conchs there were out there. Conch eggs. And these animals are going through their entire life cycle and that environment, which is not good for oysters, because they will eat them, every one. Every size.

Lipcius Test., Trial Tr. vol. 17, at 4336:6-4337:3 (quoting Berrigan Dep. 161:13-162:1); *see also* Berrigan PFD ¶ 44. This was all documented in Mr. Berrigan's 2012 Oyster Assessment Report. *See* JX-77 at 6-7 ("Oyster drills are considered as one of the most serious oyster predators along Florida's Gulf Coast, and have become established in Apalachicola Bay over the past two years.

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[7] Throughout his documents and testimony, Mr. Berrigan discusses snails, oyster drills, and other salinity-preferring predators, referring to all as "conchs." Berrigan Test., Trial Tr. vol. 4, at 976:2-3 ("And I'm just going to use the word conchs because that's what we use to commonly call that.").

Reports from oystermen suggest that drills are more abundant than at any time in recent memory.… The presence and establishment of snail populations correlate with prolonged high salinity waters. It is also disturbing that drills completing their life cycles within the estuary, since egg cases, juvenile, subadult, and adult snails are abundant on oyster reefs.").

Mr. Berrigan's contemporaneous statements at the Franklin County Board of Commissioners Meeting on September 6, 2012 confirm that the primary cause of the collapse was the lack of fresh water. FX-608 (video) and FX-875 at 3 (transcript) ("But in my opinion, in having looked at this for a long time and having seen what happens in a drought situation, the primary problem is lack of freshwater."). Mr. Berrigan explained to the meeting attendees:

> All of you know what has happened out there on St. Vincent Bar. It started two years ago and it's further in and now the whole bar is that way. Little Gully is that way. All of those areas that are subject to marine waters and high salinity, they are all the same way. The only difference is that in that part of the bay, the conchs have overwhelmed everything. On Cat Point, you can't see this from the surface but as soon as you're under water there, the most obvious thing is there's a stone crab every three feet. There's a big stone crab growth. Those stone crabs have got all the oysters piled up and they're just eating them and they've been doing that for three years now. They're real aggressive, they forage and they eat.

FX-875 at 2. The degree of predation Mr. Berrigan had observed was "unbelievable" and was unlike anything he had ever seen before. *Id.* at 4. Those observations allowed for only one conclusion: "[t]he beginning and progression of the extensive oyster population depletion in Apalachicola Bay provided ample evidence that this mortality event was directly associated with high salinity and the lack of freshwater inflow." Berrigan PFD ¶ 41; *see also id.* ¶ 36 ("Depletion of oyster populations in Apalachicola Bay in 2012 was directly associated with high salinity in the Bay, resulting from reduced freshwater inflows from the Apalachicola River."). Moreover, Mr. Berrigan testified to the scary fact that he was seeing conch egg cases in Apalachicola Bay for the first time in his 30 years managing oysters there. Berrigan Test., Trial

Tr. vol. 4, at 1005:23-1006:6 ("The fact that the snails were able to complete their life cycle is confirmation of the prolonged period of high salinity….").

Tommy Ward, an oyster dealer in Apalachicola for more than 30 years, also testified how the 2012 oyster collapse differed from what he has seen in his lifetime. Ward PFD ¶ 34 ("In the past, conchs were not a significant problem on my beds, as fresh water from the Apalachicola River flowed into the Bay and decreased salinities so that the conchs could not survive."). While some predators have always found their way into Apalachicola Bay for periods of time, the persistent high salinity in 2011 and 2012 (and thereafter) allowed these predators to inhabit the Bay at unprecedented levels:

> When there's not enough freshwater, the water salinity in the Bay goes up, drawing predators into the bay, particularly conchs. In all of my years, I have never seen the number of conchs that are in Apalachicola Bay today. They eat our oysters, leaving nothing left to harvest. It used to be common to harvest hundreds of oysters and maybe find one conch. Now, there's probably 100 conchs for every oyster.

Ward PFD ¶ 5. Mr. Ward also concurred with Mr. Berrigan that for the first time in their memory, predators were completing their entire life cycle in the Bay. *See* Ward PFD ¶ 34 (noting the presence of conchs and the fact that they are now "laying their eggs" in Apalachicola Bay). Dr. Kimbro, Florida's oyster expert, observed the exact same thing when he found his experimental cages covered in conch eggs during his work in Apalachicola Bay during May 2013—the eggs on his cages alone contained thousands of future oyster predators.

FX-770b (Photograph by David Kimbro, as used in Florida's Opening Statement)

Mr. Ward's testimony was particularly poignant and revealed the devastation that the decimation of the oyster population is causing the oystermen who depend on the Bay for their livelihood and on the broader Apalachicola Bay communities. As Mr. Ward testified, many oystermen are without work and the family businesses that have been around for generations will continue to die away:

> Oystering is more than just a business for me and the people of Apalachicola; it's a way of life that has been passed down from generation-to-generation for more than a century. The 2012 collapse of the oyster industry has put good, hard-working people out of work, devastated my private oyster leases, and threatens to put Buddy Ward & Sons out of business after almost 60 years.

Ward PFD ¶ 42; *see also id.* ¶ 40 ("Just looking at these numbers, without more fresh water, 13 Mile is going to go out of business."); Ward Test., Trial Tr. vol. 7, at 1811:20-1812:5 (detailing impact of the lack of freshwater on the local community and economy).

The conclusions drawn by Mr. Berrigan and Mr. Ward have since been confirmed by the work of Florida's experts. Apalachicola Bay is an estuary where saltwater and freshwater mix, and that delicate balance supports a unique set of species, including oysters. Glibert PFD ¶ 1 ("Estuaries are ecologically rich environments where fresh water from a river meets salt water from the ocean, and are home to numerous species of plants and animals that thrive in this transition zone."). When freshwater flows decrease, as they did in 2011 and 2012, the salinity in the Bay rises. Greenblatt PFD ¶ 13; *see also* McAnally PFD ¶ 17 ("If all else is equal, reducing freshwater flow increases average salinity and adding freshwater flow decreases average salinity."). When freshwater river discharge is too low, the most pronounced effect is the infestation of Apalachicola Bay by oyster predators that typically require high salinity water to survive, such as conchs and stone crabs.

Dr. Kimbro concluded that "the cause of the oyster fishery collapse in 2012 was a reduction in freshwater from the Apalachicola River into Apalachicola Bay." Kimbro PFD ¶ 4. As he explained, the reduced river flows allowed for "high salinity conditions to develop and in turn promoted oyster disease, oyster predators, and oyster recruitment failure." Kimbro PFD ¶ 4. And by comparing salinity levels and predation in nearby Ochlockonee Bay with Apalachicola Bay, Dr. Kimbro ruled out regional drought as the cause of the crash and instead concluded "that salinity-induced predation on oysters is intensified in Apalachicola Bay" and that "[t]his intensification is linked to a factor(s) unique to Apalachicola Bay." Kimbro PFD ¶¶ 91, 96. Dr. Kimbro's experiments in Apalachicola Bay showed that there would have been some natural stress on the oyster population in 2012 due to prevailing drought conditions, but the oyster population "would not have collapsed." Kimbro PFD ¶ 99. Instead, Dr. Kimbro showed through his experiments that "the fishery collapse would not have occurred if the State of Georgia had

not removed freshwater from the Apalachicola River and increased the water salinity of Apalachicola Bay." *Id.*

The evidence of the harms caused to oysters in this case by Georgia's consumptive use far exceeds in terms of both depth and scientific sophistication the evidence that the Special Master and Supreme Court found sufficient in *New Jersey v. New York*.

b. Low Flows, Not Poor Fisheries Management, Caused The Crash

The trial evidence also did not support Georgia's contention that Florida mismanaged its oyster fishery and thereby caused the collapse. In fact, in issuing its Disaster Declaration, NOAA considered exactly that question and concluded that low river discharge and the resulting high salinity were the central cause of the oyster fishery collapse. FX-413, NOAA Final Decision Memorandum, at 3 (NOAA-0022897) ("In this case, the physical (high salinity) and biological (increased predation and natural mortality) environmental issues have played a more central role in the declines to the oyster stock in this area."). NOAA explained the importance of river discharge on salinity levels in Apalachicola Bay and recognized that "[t]he low discharge rate [from the Apalachicola River] is compounded by increased upstream water consumption during the drought periods." *Id.* at 2. Ultimately, NOAA found that the oyster collapse was driven by low river discharge and declared a fishery disaster. *See id.* at 3. ("The prolonged drought conditions would constitute a natural cause, and the reduced river outflow constitutes a man-made cause beyond the control of fishery managers, leading to an apparent fishery resource disaster. The resulting high salinities in the bays stressed the oyster populations, reducing reproductive potential, spatfall, and ultimate recruitment and survival. In addition, the high salinities allowed a persistent occurrence of oyster predators, such as stone crab and oyster drills,

leading to an apparent fishery resource disaster, as demonstrated by the declining stock sizes documented in the resource surveys, and in landings.").

Georgia does not (and cannot) dispute NOAA's determination. Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), NOAA could not have issued that declaration if it concluded that poor oyster management practices caused the collapse. *See id.* at 1 (allowable causes under the MSA only included natural disasters or man-made causes "beyond the control of fishery managers to mitigate through conservation and management measures"). In fact, because the Florida Fish and Wildlife Conservation Commission (FWC) acknowledged the existence of some degree of intense harvesting, there was actually a presumption *against* NOAA finding a disaster declaration. FX-423 at 3, Menashes Testimony ("There is a presumption against a finding of a fishery resource disaster when overfishing is occurring in a fishery."). The evidence NOAA reviewed allowed it to overcome that presumption and conclude that decreased river flows and the associated increase in salinity was the central cause of the oyster decline.

It is important to note the evidence NOAA reviewed in arriving at its conclusion. FWC provided NOAA with the oyster landing records, the 2012 Oyster Resource Assessment Report, and the shell planting data that Georgia cites as evidence of mismanagement. Sutton Test., Trial Tr. vol. 6, at 1442:19-23, 1445:15-18, 1460:8-11, 1462:3-17, 1465:8-18; *see also* JX-96 (2012-2013 Florida Gulf Coast Oyster Disaster Report including appendices of materials provided to NOAA with FWC submission). In addition, FWC provided NOAA with the Oyster Situation Report, compiled by several University of Florida professors including Dr. Karl Havens and Dr. Bill Pine, that Georgia claims supports the position that overharvesting caused the oyster

collapse. *See* JX-96 at Appendix 2, Oyster Situation Report. NOAA's determination is not consistent with that view.

Indeed, the ultimate analysis and conclusions of Drs. Havens and Pine support Florida's position. In the article upon which Georgia primarily relies, Dr. Pine endorsed the need for additional research on the connection between low flows and oyster mortality. *See* GX-789 at 2, William E. Pine III et al., *The curious case of eastern oyster Crassostrea virginica stock status in Apalachicola Bay, Florida* ("Note that we did not study or reach any conclusions about any effect of water withdrawals affecting the Apalachicola River Basin or oyster population in Apalachicola Bay. This is an area that warrants future research."). And Drs. Pine and Havens found no evidence to suggest overharvesting *caused* the collapse. Just like Mr. Berrigan concluded, Dr. Havens explained that overharvesting was a *result* of the crash:

> The collapse seems to be a result of some environmental factor – a disease that was facilitated by the high salinity, predators that got out of control because of the high salinity or just the oysters reaching some kind of ecological tipping point after three years of successive drought. Harvesting of sub-legal oysters did occur late in 2012, however, we believe it happened **BECAUSE OF** the collapse, as the bay no longer had an adequate level of legal oysters to support harvesting, but it was not the cause

GX-1339, K. Havens email to B. Pine (Apr. 23, 2013). In response, Dr. Pine agreed that "it doesn't appear that sub-legal harvest drove the collapse of oyster resources in 2012." *Id.*

Dr. Havens made this point again at his deposition, testifying that they "did not find evidence to link overharvesting with the crash of the population." GX-1349, Havens Dep. 268:7-14. And when Dr. Havens appeared before Congress on this issue, his testimony was consistent with that of Florida's fact and expert witnesses. *See* FX-485, Havens Dep. for Cong. Field Hr'g (Aug. 13, 2013). First, Dr. Havens explained to Congress that "When the river flows were low, salinities increased to levels similar to those found in the Gulf, and both predators and

parasites of oysters were abundant. Oysters were heavily infested with boring clams, sponges and worms and they had a high level of internal parasites. What previously had been a place for oysters to thrive became a place for them to die." FX-485 at 2. Second, Dr. Havens explained that his group's "data analysis and modeling provided no evidence that over-harvesting was a cause of the decline." *Id.* at 3. Instead, he testified that even though "we don't know the proximal cause of the sudden decline in oysters … it is reasonable to link it to a disease, predators or some other factor related to the long period of low river inflow and high salinity." *Id.*

While they did not subpoena them to testify at trial, Georgia nevertheless tried to coopt Drs. Pine and Havens to suggest that because they did not reach firm conclusions regarding the relationship of river flow and oyster mortality, Florida cannot carry its burden in this case. But Georgia relied on work that Drs. Pine and Havens themselves characterized as preliminary. Georgia fails to acknowledge that Drs. Pine and Havens separately published an article in which Dr. Pine concluded that "a sequence of events occurred whereby: (1) low river flow led to increased salinity in Apalachicola Bay for a multiyear period; (2) which likely led to increases in oyster parasites, predators, or unknown pathogens; (3) causing elevated mortality, particularly among juvenile oysters; (4) which led to recruitment failure, potentially exacerbated by shell removal from fishing or environmental events; and then (5) population collapse of adult oysters." JX-167 at 6, Edward V. Camp & William E. Pine et al., *Collapse of a historic oyster fishery: diagnosing causes and identifying paths toward increased resilience* (2015). Georgia focuses instead only on the article by Drs. Pine and Havens acknowledging that the effects of water withdrawals on the oyster population "warrant[] future research." GX-789 at 2. That "future research" is exactly the work that Dr. Kimbro conducted to arrive at his conclusions in

this case. *See, e.g.*, Kimbro PFD § H; *id.* ¶¶ 55, 59, 63, 66, 78, 82, 91, 96, 99 (detailing the various methods Dr. Kimbro used for his analysis of river flows and the Bay oyster population). In other words, the preliminary findings and hypotheses of Drs. Pine and Havens ***actually support*** Dr. Kimbro's conclusion that low river flows and high salinity—and not overharvesting—caused the oyster collapse in 2012.

Further, even Georgia's expert, Dr. Lipcius, has now conceded that there was indeed evidence of mortality due to predation. When confronted with his own testimony that there was "no evidence of increased mortality due to predation," Dr. Lipcius admitted "No, that's false." Lipcius Test., Trial Tr. vol. 17, at 4414:8-14. Dr. Lipcius testified that marine scientists like him routinely rely on contemporaneous documentary evidence and observations by state officials and those in the field. Lipcius PFD ¶¶ 163, 167; *see also* Lipcius Test., Trial Tr. vol. 17, at 4323:15-22 (stating that Mr. Berrigan is a reliable source of information on the status of the oyster resource and what had occurred in Apalachicola Bay). Yet Dr. Lipcius seemingly ignored the most central statements by Mr. Berrigan (shown above) that low river flow and high salinity was the primary cause of the oyster collapse. *See supra* at 38-39. Likewise, Dr. Lipcius ignored Major Rob Beaton's testimony regarding the infrequency of sub-legal harvesting; instead he misrepresented an email from Major Beaton about night harvesting in Chaires Creek as "evidence" to support his conclusions regarding sublegal harvesting in Apalachicola Bay. Lipcius PFD ¶ 170 (citing GX-459). At trial, Dr. Lipcius admitted that he knew Chaires Creek was in Ochlocknee Bay and not Apalachicola Bay when he relied upon that particular statement in his pre-filed testimony. Lipcius Test., Trial Tr. vol. 17, at 4371:15-20. In other words, Dr. Lipcius admits he knew Major Beaton's statements did not actually support Georgia's argument here. *See also* Beaton Test., Trial Tr. vol. 5, at 1158:12-17 ("A. If he used this specific statement

from me, he was way off base."). And that is because the actual contemporaneous statements, the analysis presented by Florida's experts, and the final determination from NOAA all belie Dr. Lipcius' manufactured conclusions.

c. Low Flows Also Have Led To The Loss Of Important Habitat And Food Supply In The Bay

Oysters are just part of the story. The harms inflicted on Apalachicola Bay by Georgia's upstream consumption extend to other natural resources as well and, indeed, the entire ecosystem. Florida established at trial that the freshwater flows from the Apalachicola River bring important nutrients into the Bay. Dr. Patricia Glibert, an expert on estuarine ecology, testified that the Apalachicola Bay has historically been very productive, supporting fish, shellfish, plants, and other life, and that productivity is driven by the freshwater flow and nutrients from the Apalachicola River. Glibert PFD ¶ 16. Conversely, Dr. Glibert identified the drastic effects of low river flow on the Bay's ecology.

Productivity starts at the bottom of the food chain with microscopic algae called phytoplankton. *See id*; *see also* Glibert Test., Trial Tr. vol. 7, at 1827:7-13 (phytoplankton "forms all of the food or virtually all of the food that supports the upper levels"). Phytoplankton is eaten by the next consumers up the food chain, which are eaten by predators at higher levels of the food chain. Glibert PFD ¶ 16. Dr. Glibert explained that "[t]he change in flow affects the composition of the base of the food web because of the change in salinity and the change in delivery of the important nutrients on which these algae grow." Glibert Test., Trial Tr. vol. 7, at 1830:20-23. Dr. Glibert's analysis of Apalachicola Bay nutrient data showed a decrease in the relevant nutrients for key plankton in the Bay. *See* Glibert PFD ¶ 30. In fact, Dr. Glibert testified that, absent Georgia's consumption, concentrations of the preferred nutrients would be between three and four times higher throughout the Bay. *See id.* ¶ 31, Figure 10 (bar chart). Dr.

Glibert's analysis of nutrients tied to certain plankton showed that there is a shift during low flows towards a much greater abundance of a less nutritious type of plankton. *See id.* ¶ 39, Figure 12. Importantly, those changes reverberate up the food chain. Glibert Test., Trial Tr. vol. 7, at 1831:8-13. Thus, at extremely low flows when nutrient balance changes, and salinities increase, plankton change as well, and estuarine species that normally live in the Bay are harmed. Glibert PFD ¶¶ 4, 13.

Both Florida's and Georgia's Bay ecology experts agree that low flows and higher salinity can be harmful to submersed aquatic vegetation (SAVs), another important food source for organisms in the Bay as well as important habitat for juvenile fish and invertebrates. Glibert PFD ¶ 18; Menzie Test., Trial Tr. vol. 16, at 4184:9-17, 4185:13-19. As Dr. Menzie, Georgia's expert, explained at trial, there are species of submersed aquatic vegetation that grow in saltier water—commonly called seagrass—and species that are more sensitive to higher salinities and prefer the freshwater areas of the Bay, including the East Bay area. Menzie Test., Trial Tr. vol. 16, at 4183:13-4184:8. Because of the reduced flows and resulting higher salinity, the salt-tolerant seagrasses further from the Apalachicola River have expanded, whereas the freshwater species of vegetation have not. Glibert PFD ¶ 64; Menzie PFD ¶ 64 n.10. Indeed, Georgia's expert, Dr. Menzie agreed that species of SAV are highly sensitive to salinity and acknowledged that, according to the literature he relied upon, those SAV species are harmed if salinities are too high for even a day. Menzie Test., Trial Tr. vol. 16, at 4185:20-22, 4187:19-4188:3.

Again, the weight of scientific literature corroborates that there is harm to the upper food web in Apalachicola Bay during times of low flows. *See* Glibert PFD ¶ 71. For example, the work of Dr. Robert Livingston and the data collected by Apalachicola National Estuarine Research Reserve ("ANERR") establish that the upper food web—fish, crabs, oysters, and so

forth—changes during low flows. FX-379 (Livingston); FX-401 (ANERR). Dr. Livingston analyzed his own data and other fish data and found that "river flow was a controlling factor" for the Bay biology, including fish and shrimp. FX-379 at 32-33. ANERR researchers came to very similar conclusions. FX-401 at 11. 459-61. Based on the severe losses of valuable species during the 2007 drought, (FX-379 at 55, 65), "permanent base flow reductions of even a relatively small magnitude could cause the system to be more vulnerable to droughts." FX-379 at 11, 54. And that is exactly the point: even small changes in flow can have massive effects on the Bay ecosystem.

2. Harms To The Apalachicola River

The Apalachicola River is a unique ecosystem with a large variety of plants and trees, insects, fish, amphibians, reptiles, birds, and mammals—including threatened and endangered mussels and sturgeon. Hoehn PFD ¶¶ 30-32; Allan PFD ¶¶ 3(a), 12-17. Without adequate river flows, this entire ecosystem suffers. Allan PFD ¶¶ 18-19. Georgia did not—and cannot—challenge this ecological truth. Instead, Georgia argues, that Florida failed to measure the harm through population studies, and that the Corps, not Georgia, is responsible for the harms associated with low river flow. Both arguments are clearly refuted by the evidence at trial.

a. Harms To The Entire Ecosystem

In their October 1999 "Instream Flow Guidelines" issued in connection with the ACF compact negotiations, the EPA and the USFWS identified "flow regime features … [that are] ***necessary*** for maintaining the present structure and function of the riverine ecosystem." FX-599 at 1 (emphasis added); Struhs Test., Trial Tr. vol. 2, at 364:4-13, 364:23-365:9 (guidelines represented two federal expert agencies' finding of "flows that we believe are necessary to preserve the functioning of the water quality and ecosystem in the Apalachicola River and Bay"). These Guidelines, established by expert federal agencies acting within the scope of their

delegated authority, merit this Court's respect and deference. *See*, *e.g.*, *Marsh*, 490 U.S. at 377; *Baltimore Gas & Elec. Co.*, 462 U.S. at 103; *Florida Power & Light Co.*, 404 U.S. at 463.

Based on the entire hydrologic record of the region, the Guidelines set 1-day minimum flows for the Apalachicola River, measured at the Chattahoochee gage. FX-599 at 14 (Appendix A). Over the last twenty years, these one-day minima were violated regularly and for several months in a row, particularly during summer months of dry years. *See* FX-D-23. The consequences are catastrophic:

> Extreme low-flows are likely among the most stressful natural events faced by river biota. As flow level decreases, available habitat constricts and portions of the channel become dry. Aquatic animals that are unable to move to remaining pools or burrow into the stream bed itself perish … Because of the physical and biological harshness of extreme low-flow conditions, decreasing the magnitude of the lowest 1-day minimum flow events at a particular time of year, or increasing the inter-annual frequency of these events is likely to have detrimental effects on native riverine biota.

FX-599 at 3; *see also* JX-168 at 50, 2016 Biological Opinion (same). And it is not only one-day minima that are violated frequently. The Guidelines also set minimum flows that should be met in three out of every four years, recognizing that repeated low flows over a longer period of time are harmful to the ecosystem. FX-599 at 14. These flow levels were exceeded almost every year in the past 16 years. *See* FX-D-23 at 4.

Florida's River ecology expert, Dr. David Allan, and Florida Fish and Wildlife Conservation Commission biologist Ted Hoehn, detailed the injuries the Apalachicola River ecosystem suffers during these periods of low flows. Using well-established ecological procedures, Dr. Allan developed ecological metrics that rely on flow thresholds and durations to identify harmful impacts to four exemplary species that are representative of the larger Apalachicola River ecosystem—mussels, fish, the young-of-year gulf sturgeon, and swamp trees in the floodplain forest. Allan PFD ¶¶ 36, 64. He established that "[t]he frequency, magnitude

and duration of flows throughout the year, and especially flow conditions that occur during dry periods of episodically dry years, all affect the many species of plants and animals in the River basin." Allan PFD ¶ 18. Florida also demonstrated the importance of microhabitats in the River and their sensitivity to even modest changes in water levels as well as the network of sloughs that connect to the Apalachicola River at adequate flows and provide important habitat for fish and mussels. *See* Allan PFD ¶¶ 11, 23; Hoehn PFD ¶¶ 33, 47, 49.

The hundreds of sloughs disconnect at varying levels of River flow. *See* Allan Test., Trial Tr. vol. 3, at 580:23-581:12. Swift Slough is a representative example of these sloughs, many of which require flows greater than 6,000 cfs to remain connected to the River. *See* Allan PFD ¶ 45; Allan Test., Trial Tr. vol. 2, at 438:18-25 (explaining that selection of 5,000 to 6,000 cfs connection range for harm to mussels in Swift Slough was conservative because mussels in other sloughs are stranded at even higher flows); GX-7 at Appendix II, USGS Technical Paper (listing connection ranges from 4,000 to 19,000 cfs for streams and sloughs of the Apalachicola River). As Mr. Hoehn explained, without connection to the River, sloughs "turn into puddles and ponds, sometimes drying up altogether in the dr[i]er late summer months when flows are the lowest." Hoehn PFD ¶ 44. When that occurs, dissolved oxygen in the stagnant water "drops to levels that are lethal for many fish and mussels within a matter of days" and continued disconnection can dry up sloughs entirely, "killing all aquatic animals trapped in the slough when the River declined." *Id.* Results are both visually stark and ecologically disastrous:

Hog Slough near River Mile 40 disconnected from the river. Hoehn PFD ¶ 44 (August 2, 2016)

Dog Slough near River Mile 50 disconnected from the river. Hoehn PFD ¶ 49 (August 31, 2016)

Even Georgia's biologist, Dr. Charles Menzie, agrees with the fundamental ecological truth expressed by the EPA, USFWS, and Florida. He testified that when water levels are low, sloughs can be cut off from the River and conceded that "[t]he inundation cycle of floodplain depends upon the seasonal river flow." Menzie PFD ¶ 151.

b. Harms to Key Apalachicola River Animal and Plant Species

Dr. Allan documented that the same low flows that harm the broader Apalachicola River ecosystem hurt exemplar species that he evaluated: mussels, fish, tupelo swamp forest, and young-of-year Gulf sturgeon. "[H]arm to the organisms, habitats and ecosystems of the Apalachicola River and Floodplain has increased significantly as flows have declined in the Apalachicola River over the historical record, which Dr. Hornberger has tied to Georgia consumption." Allan PFD ¶ 37. Dr. Allan also concluded that because of the variety of habitat requirements and needs of his four target species, he considered them "surrogates for harm to the hundreds of other unique and in some cases endangered plant and animal species reliant upon flow in the Apalachicola River and floodplain." Allan PFD ¶ 2; *see also id.* ¶ 96.

The Apalachicola River has historically supported "one of the most intact and diverse freshwater mussel assemblages in North America" including 26 mussel species presently in the River. Allan PFD ¶ 13. However, mussels in the main channel—for example, on flats—become exposed at low flows, stranding and killing them.

Allan PFD, Figure 11 (August 2016)

Mr. Hoehn personally observed harm to mussels with reduced flows, including "substantial drying of bank habitat," "substantial mortality of a full range of mussel species up and down the system," and "drying of the sloughs, some that [] hadn't gone dry before." Hoehn Test., Trial Tr. vol. 2, at 278:25-280:16. When the River level drops, Mr. Hoehn routinely observes the stranding of mussels along the River's banks. Hoehn PFD ¶ 53.

Georgia's water consumption and the resulting low flows also have harmed the fish population in the Apalachicola River. A total of "142 freshwater and estuarine fish species" inhabit the Apalachicola River, "including popular sport fish and the federally listed Gulf Sturgeon." Allan PFD ¶ 12. Both Dr. Allan and Mr. Hoehn testified to the importance of the inundated floodplain habitats for fish spawning and rearing habitats. *See id.* ¶ 47; Hoehn PFD ¶ 49. Dr. Allan documented how multiple years of data on the Apalachicola floodplain fish assemblage show that low flows reduce the total amount of young fish that are produced by adult spawning in a given year. *See* Allan PFD ¶¶ 47, 50, 64. Dr. Allan separately analyzed harms to the threatened Gulf Sturgeon, a species for which U.S. FWS has designated the entire Apalachicola River as a "critical habitat … essential for … conservation." *Id.* ¶ 52. Dr. Allan determined that adequacy of Apalachicola River flow is essential to the Gulf sturgeon based on their salinity tolerance levels and the need for young Sturgeon to feed on invertebrates that only occupy lower salinity waters. *See id.* ¶¶ 53-54.

Finally, the low flow conditions also harm the swamp trees that occupy the River floodplain. Tupelo and other swamp species "require saturated or shallowly inundated soils during the growing season for rapid height growth of seedlings and saplings—dry soils stunt their growth." Allan PFD ¶ 58. But the composition of the floodplain forest is "changing in large part due to reduced river flows occurring throughout the life span of swamp trees." *Id.*

¶ 60. Georgia's biologist, Dr. Menzie, agreed that "there is evidence of a decline in the densities of tree species that are characteristic of swamps throughout the non-tidal floodplain and evidence of a successional shift through the floodplain forest habitats to species that are more typical of the next-drier habitat." Menzie PFD ¶ 155. Florida demonstrated that "[t]he floodplain trees would experience 60% fewer years and 68.9% fewer total days of harm without Georgia's consumption." Allan PFD ¶ 64; Hoehn Test., Trial Tr. vol. 2, at 278:25-280:16 ("We have seen species of trees that are more tolerant of upland conditions migrating into the floodplain. And we have also seen parts of the floodplain that used to be wide open that would be muddy or, you know, full of cypress trees starting to come up with grasses, which is not usual in a floodplain.").

In sum, the evidence presented at trial overwhelmingly shows that Florida has suffered a number of real and substantial injuries in the River ecosystem as a result of Georgia's consumption of the waters at issue. Whether considered individually or collectively, those injuries are more than sufficient to satisfy Florida's burden at the first step of the analysis.

c. Georgia's Contrived Definition Of Harm Is Unsupportable

Georgia's myopic focus on a few species, the extinction of those species, or the destruction of their critical habitat as the only indicators of harm is alarming. Preservation of an ecosystem requires minimizing low flows that place undue stress on a range of riverine species. USFWS has repeatedly criticized Georgia for fixating on minimum flows necessary to prevent the extinction of species without recognizing that harm occurs during periods of low flow: "[M]eeting minimum flows is not an indication that water is plentiful or … that the aquatic system is being sustained." FX-48 at 2-3, 9 (explaining that 5,000 cfs is not the amount of water that aquatic species need, but rather the amount they receive given current reservoir operations). Accordingly, in its 2016 Biological Opinion, the USFWS included "conservation measures" that would "minimize or avoid the adverse effects" of changes in reservoir operations, such as

reductions in and minimizing consumptive use to minimize "detrimental effects to species." JX-168 at 201-03 (recommending reductions in consumptive use by municipal, agricultural, and industrial water users to minimize detrimental impact of low flows on fish and wildlife resources). As Dr. Allan explains, harms to populations occur when individuals die or young are not born (that is, the population suffers low recruitment). Allan PFD ¶ 89; Allan Test., Trial Tr. vol. 3, at 572:8-573:9, 609:25-610:17.

Nonetheless, some of Dr. Allan's metrics are built upon population-level data (for example, fish and floodplain swamp tree metrics). Allan Test., Trial Tr. vol. 3, at 570:19-572:7. And as Ted Hoehn explained at trial, one of Florida's goals is to keep "common species common," and to prevent unnecessary loss of species even if they continue to exist. Hoehn Test., Trial Tr. vol. 2, at 288:19-289:7.

d. Florida's River Harms Here Are Not Attributable To The Army Corps

The harms to the Apalachicola River detailed at trial are caused by decreased flows associated with Georgia's increased consumption. To deflect responsibility, Georgia argued that all of these harms are really attributable to the actions of the Army Corps, including navigation maintenance activities, such as dredging, bend-easing, channel straightening, and the disposal of dredge spoils, and the Corps' operation of the reservoirs on the ACF system.

Georgia's attempt to evade the harm its consumption has caused fails for many reasons. *First*, it is undisputed that Florida successfully halted the Corps' navigation maintenance, including dredging, of the Apalachicola River—there has been no dredging for at least fifteen years. Hoehn PFD ¶ 60; Hoehn Test., Trial Tr. vol. 2, at 222:6-222:24. As Dr. Kondolf testified, the channel fills back in with sand when there is no dredging. Kondolf Test., Trial Tr. vol. 11, at 2687:7-18. And, when dredging ended, so did the disposal of dredge spoils. As Mr. Hoehn

testified, dredge spoils have been mostly "recaptured by the River" and habitats have recovered. Hoehn Test., Trial Tr. vol. 2, at 224:23-225:19. The harms Florida identified at trial are ongoing, present harms caused by low flows. Georgia has not and cannot connect the harms that are currently occurring on the River to dredging that ceased more than a decade ago.

Second, Dr. Allan's biological metrics and Dr. Hornberger's hydrologic analyses provide "a scientifically sound way to isolate the effects of flow from the effects of channel change." Allan PFD ¶ 84. Dr. Allan pinpointed what harms are directly attributable to Georgia's consumption of water, and concluded that "[r]emoving Georgia's consumption (the unimpacted comparison), while keeping the channel [and all else, including Corps operations] constant, invariably results in a significant decrease in harm." *Id.*

Third, Dr. Kondolf testified regarding harms to the ecosystem suffered in reaches of the River that were not at all impacted by Army Corps dredging. Kondolf PFD ¶ 34; *see also* Kondolf Test., Trial Tr. vol. 11, at 2715:8-2715:11 ("Certainly from river mile 23 downstream we can attribute all the reduction in river stage to reduced flows from upstream because there is for [*sic*] channel change down there."); *see also* Hoehn Test., Trial Tr. vol. 1, at 221:14-222:1 (majority of the dredging took place in relatively limited locations). And Dr. Allan explained how that part of the River was included in Dr. Allan's metrics evaluating harm for the swamp forest, young-of-year Gulf sturgeon, and the fish assemblage. *See* Allan PFD ¶ 83. Thus, "[t]hose metrics are … unaffected by channel erosion." *Id.* Georgia's effort to meld past criticisms of Corps dredging with the more recent harms to the River identified in this case simply is unsupported in the record.

e. Tellingly, These Same Harms Exist On Streams In Georgia

Georgia's attempt to evade responsibility for the harms it has caused in Florida is also refuted by what is happening in *Georgia*. Georgia's increased consumption harms not only the

Apalachicola River, but also streams within Georgia itself. Georgia scientists at the Joseph W. Jones Ecological Research Center studied habitat for mussels in the Flint River Basin and observed that "[i]ncreased agricultural water demand over the past several decades is associated with an increased frequency of extreme low flows in Ichawaynochaway Creek and a more than 20-fold reduction in the minimum flow compared to the pre-irrigation era." FX-50 at 3. They attributed the reduction to a "substantial decrease in the amount of instream habitat that is available for growth and propagation of aquatic organisms." *Id.* Another study observed that "[w]ater use in the lower FRB has increased dramatically since the development of center pivot irrigation technology in the mid-1970s," concluding that "[d]eclines in mussel populations appear to be associated with periodic droughts along with increasing demand for irrigation water supply." FX-51 at 1, 2. Similarly, national organizations like American Rivers have noted that the normal low flows on the upper Flint are half their historical levels and the low flows during drought are now 70% lower than they were as recently as the 1980s. *See* FX-286 at 4-5, American Rivers, *Upper Flint Resiliency Action Plan* (Oct. 2014). And just this year, American Rivers named the ACF Basin the Most Endangered River Basin in the country. *See* FX-903 (American Rivers, *Apalachicola-Chattahoochee-Flint River Basin Named #1 "Most Endangered"* (Apr. 16, 2016)). The organization noted that some of these rivers are "so heavily exploited" that they "run at drought flows even in normal years." *Id.* And the chief threat to the Basin is "increasing and unsustainable water use." *Id.* Such conclusions only bolster the showing Florida has made in this case.

II. AN EQUITABLE APPORTIONMENT IS JUSTIFIED AND NECESSARY HERE TO ENSURE THE SUSTAINABILITY OF THE INTERSTATE ACF SYSTEM

As discussed, once a State has shown that the diversions at issue have inflicted real or substantial injury, the focus shifts to whether the diversion should be allowed under an equitable

apportionment. *See supra* at 12-15. At this step, the Special Master essentially assumes the role of a court in equity. Thus, as the Supreme Court has admonished, "broad and flexible equitable concerns rather than on precise legal entitlements" control. *Idaho ex rel. Evans v. Oregon*, 462 U.S. 1017, 1025 (1983). Here, the evidence overwhelmingly establishes that the equities favor an apportionment that limits Georgia's diversions—and ensures that Florida will receive its fair share of the waters at issue.

A. Equity Strongly Favors The Preservation Of The Apalachicola Basin

It is virtually impossible to place a precise value on preserving natural resources, but that value is undoubtedly extraordinary. Florida's citizens have mandated, through a constitutional amendment, that it "shall be the policy of the state to conserve and protect its natural resources and scenic beauty" and that "[a]dequate provision shall be made by law for … conservation and protection of natural resources." Fla. Const. art. II, § 7(a). And the Supreme Court has recognized for over a century that the States of course have a compelling sovereign interest in protecting the natural resources within their own borders. *See, e.g.*, *Massachusetts v. EPA,* 549 U.S. 497, 518-19 (2007); *Georgia v. Tennessee Copper Co.*, 206 U.S. 230, 237 (1907) (noting that a state can sue "for an injury to it in its capacity of quasi-sovereign" concerning "the earth and air within its domain," and "whether its mountains shall be stripped of their forests and its inhabitants shall breathe pure air"); *see also, e.g.*, *Nebraska v. Wyoming*, 515 U.S. 1, 12 (1995) (noting appropriateness of considering injury to "wildlife and wildlife habitat[s]").

The Apalachicola Bay and River are not only invaluable to Florida and its residents, but they are national and, indeed, international treasures that must be preserved. Allan PFD ¶ 8; Hoehn PFD ¶ 16; Steverson PFD ¶ 10. Together, they form a unique and nearly pristine interconnected ecosystem of forests, floodplains and marshes, and an estuary that supports an incredible diversity of animals and plants—including many that are listed as threatened or

endangered. Hoehn PFD ¶¶ 2, 29-34; Allen PFD ¶¶ 3, 15-17. The floodplain is the largest in Florida, and—as a result of Florida's preservation efforts—is one of the most intact remaining forested floodplains in the entire United States. Hoehn PFD ¶ 16. The Bay was historically a highly productive fishery. Glibert PFD ¶¶ 16, 27. And the Basin as a whole is one of the most beautiful and unique ecosystems in the United States. Steverson PFD ¶ 8.

The Court need not take Florida's word for it. "[T]he federal government and the United Nations have also recognized the unique ecological and cultural values of the Apalachicola River and Bay. The United Nations, for example, describes the Basin as 'one of the most productive estuarine systems in the northern hemisphere' and the place with 'the highest species density of amphibians and reptiles in all of North America (north of Mexico).'" *Id.* ¶ 9; *see also id.* ¶ 13 (describing establishment of United Nations Biosphere Reserve); FX-154. There is a compelling equitable interest in protecting that unique resource.

B. Florida Has A Longstanding Record Of Seeking To Protect And Preserve The Apalachicola Basin And Its Natural Resources

Florida and its residents have long recognized how precious this region and its natural resources are—and has taken action to protect them. Nearly fifty years ago, when Atlanta was a fraction of its current size and very few Georgia farmers irrigated, Florida began protecting the Basin through a series of conservation actions. Steverson PFD ¶ 22. These efforts have come at a considerable expense borne by the State and its residents. Since 1965, Florida has spent approximately $466 million (2014 dollars) to conserve 342,489 acres in the Basin by purchasing parcels in fee simple or acquiring conservation easements. Steverson PFD ¶ 16; FX-144 (containing list of purchased land); Steverson PFD ¶ 19 (map). These efforts are complemented by those of the federal government and non-profit organizations, which have conserved over 500,000 additional acres in the Basin. Steverson PFD ¶¶ 18, 19 (map). For example, in 1979,

NOAA and Florida collaborated to create the Apalachicola National Estuarine Research Reserve, the operations of which are primarily funded by Florida. *Id.* ¶ 24. The Reserve encompasses nearly *235,000* acres of public lands and waters, which are now set aside for research and preservation. *Id.* ¶ 25. As a result of these combined efforts, much of the Apalachicola Basin region is now permanently protected from commercial development. *Id.* ¶ 22.

The State also has spent significant amounts of money to restore related land holdings such as Tate's Hell State Forest, which is comprised of 202,436 acres of land that is adjacent to and drains directly into Apalachicola Bay. Steverson PFD ¶ 30. These restoration efforts were intended to help improve the quality of water draining into the Bay and to preserve land that is also important to the River and Bay ecosystems. *Id.* And Florida engaged in restoration efforts along the River to remedy the impacts of dredging, channel widening, and other activities undertaken by the Corps to benefit navigational interests in Georgia. Kondolf PFD ¶¶ 13, 30-33; JX-1 at 39; *see also* FX-199 at 11, Primary Statements of ACF River Basin Commission Meeting (Mar. 18, 2002) (Georgia acknowledging that navigation along the ACF generated the most economic value for interests in that State). While these activities were occurring, Florida required that the Corps mitigate impacts on the Apalachicola River, Kondolf PFD ¶¶ 22-29, and Florida itself has undertaken projects to restore the river ecosystem after dredging ceased more than ten years ago. *See id.* ¶¶ 32-33. These restoration efforts include removal of sediment and reconnecting the blocked oxbow mouth at Battle Bend to the Apalachicola River. *See id.*; Kondolf Test., Trial Tr. vol. 11, at 2702:17-2703:6. The Apalachicola River is now recovering from the damage caused by dredging and will continue to recover—provided it receives adequate flows. *See* Kondolf PFD ¶¶ 38-45; Kondolf Test., Trial Tr. vol. 10, at 2623:8-18 ("We have a lot of evidence that that part of the riverbed [rm 30-38] … has … aggraded. It's built up. People

run their boats aground through there all the time now."); *see also* Hoehn PFD ¶ 61; Hoehn Test., Trial Tr. vol. 1, at 142:16-143:15.

Florida has also taken a number of *legal* measures to protect the Bay and the River. In 1969, for example, Florida designated the Bay as an Aquatic Preserve under state law, "set aside forever … for the benefit of future generations," triggering rules that limit potential development. *See* Fla. Stat. §§ 258.36, 258.39(18); Steverson PFD ¶ 22; FX-142; FX-395. And between 1971 and 1984, Florida took a series of actions to provide the Apalachicola and Chipola Rivers the "highest protection" against permanent degradation of water quality. Steverson PFD ¶ 33; FX-140 at FL-ACF-01812993-94; Fla. Admin. Code § 62-302.700; JX-29 at 2; FX-137 at 1-2; *see also* 40 C.F.R. § 131.12(a)(3). Finally, in 2006, Florida prohibited new withdrawals from the Apalachicola and Chipola Rivers. Cyphers PFD ¶ 48; JX-84 at 1-3 to 1-4, 3-80.

It is not just about the environment, either. The Basin is home to a close-knit community of multi-generational oystermen and fishermen. Scyphers PFD ¶¶ 7, 17 ("Historically, the oyster resources of Apalachicola Bay have been a cornerstone of the identity and livelihoods of those living in the region."); Steverson PFD ¶¶ 26, 28. The oyster fishery has been harvested since the *mid-1800s*. Steverson PFD ¶ 26. Until recently, it produced 90% of Florida's and 10% of the nation's oyster harvests. *Id.*; Scyphers PFD ¶ 18. To ensure sustainability of this resource, unlike in many areas of the United States, no automated or mechanical means of oyster harvesting are allowed in public lands in Apalachicola Bay—instead, oystermen harvest from small boats using handheld tongs. Steverson PFD ¶ 27; Fla. Admin. Code § 68B-27.018(4); Lipcius Test., Trial Tr. vol. 17, at 4414:21-25; FX-957 at 30, 34. Along with other species such as shrimp and blue crab, the fisheries form the economic and cultural backbones of the Basin communities. Steverson PFD ¶ 26. In addition, the "Apalachicola River region is one of the few

places in the world where Tupelo honey is produced commercially, and some families have been harvesting it for over 100 years." Scyphers PFD ¶ 19. All of "[t]hese communities depend upon the health of the ecosystem for their identity and well-being." Scyphers PFD ¶ 20; *see also id.* ¶¶ 34-55 (demonstrating that the surrounding communities depend on the health of the ecosystem).

There is very limited irrigated farming in Florida's portion of the ACF. Cyphers PFD ¶ 25 (only 36,000 acres). Florida has nonetheless imposed stringent conservation measures on its farmers' water use to protect the natural resource. In Florida's portion of the ACF, unlike in Georgia's, agricultural water use permits contain numeric limits on the total amount of water a permit holder may pump for irrigation. Cyphers PFD ¶ 36; Masters Test., Trial Tr. vol. 14, at 3355:13-21. To even obtain a permit, an agricultural water user must demonstrate that the quantity of irrigation requested is consistent with actual agricultural needs. Cyphers PFD ¶ 37. And Florida *forces* its ACF farmers to engage in deficit irrigation, the very practice that Georgia insists is impossible in Georgia's portion of the ACF. Stavins PFD ¶ 60; Stavins Test., Trial Tr. Vol. 17, at 4463:14-4468:15. In Florida's portion of the ACF, for example, a farmer is only permitted to use sufficient irrigation for *optimal* growth 80% of the time. Cyphers PFD ¶ 39. Thus, during a period of drought, farmers are restricted to far less than 100% of their projected water demand. *Id.* Georgia has imposed no such limits on its farmers.

Overall, for all types of water users, Florida withdraws approximately ***65 cfs*** from the Basin, most of which is in the form of groundwater withdrawals. Cyphers PFD ¶¶ 22, 23. But it has still engaged in extensive conservation efforts. Florida has documented approximately 7.7 MGD in agricultural irrigation savings since 2006—approximately 23% of the total used in Florida's portion of the ACF today for irrigation. *Id.* ¶ 5. Florida has heavily invested in Mobile Irrigation Labs that travel to farms to analyze irrigation systems, free of charge, to ensure they

are operating at maximum efficiency. *Id.* ¶ 53. Florida also provides cost-share funding to help farmers implement best conservation practices. *Id.* ¶ 54. Efforts like Mobile Irrigation Labs are critical because even modern center pivot systems need to be configured and maintained properly to reach levels of efficiency close to their theoretical maximum. *See* Masters Test., Trial Tr. vol. 14, at 3674:9-3675:4. Between 2006 and 2015, Florida's Mobile Irrigation Labs visited over 79% of center pivot systems in Florida's portion of the ACF (most of them *more than one*), yielding significant efficiency gains. Cyphers PFD ¶ 56. By sharp contrast, Georgia's similar Mobile Irrigation Lab has visited less *1%* of its center pivots. GX-1126; Cyphers PFD ¶ 55; *see also* Masters PFD at 21 (Demo. 6) (number of center pivots); Masters PFD ¶¶ 74-75 (Georgia's witness touting benefits of Georgia's Mobile Irrigation Lab); Test., Trial Tr. vol. 14, at 3674:13-23 (same witness admitting he does not know how many fields have been visited).

C. Georgia, By Contrast, Has Been Aware Of The Need For More Aggressive Conservation Measures For Decades, But Simply Declined To Act

Georgia has long been aware of the significant issues its agricultural consumption is causing on the Flint River, but has refused to take the necessary steps to address that consumption. *See* FX-6 at FL-ACF-02544445; Reheis Test., Trial Tr. vol. 3, at 639:5-641:14. In a series of **1999** letters, Director Reheis explained that the over-allocation of water for agricultural purposes was due to the fact that the Georgia General Assembly was simply unwilling to impose any real regulation on farmers. FX-2 at GA02257044; FX-5 at GA01186515. Even to this day, Georgia's agricultural permits do not limit the amount of irrigation water that can be applied per acre by a farmer. Cowie Test., Trial Tr. vol. 9, at 2223:19-2224:4; Masters Test., Trial Tr. vol. 14, at 3655:13-21. Indeed, in a moment of candor, Director Reheis admitted that while the permitting system had "worked well for the farmers," it had not "worked very well for the water resources." FX-2 at GA02257045. He also

acknowledged in 1999 that Georgia would, at some point, need to impose a "cap" on agricultural acreage. FX-5 at GA01186514.

At trial, Director Reheis admitted that, after publicly announcing a permitting "moratorium" on November 30, 1999, he nonetheless issued roughly 864 *additional* permits for more than 100,000 more irrigated acres. Reheis Test., Trial Tr. vol. 3, at 645:11-646:24; JX-132; FX-D-16 (Total Permitted Acreage in ACF Basin By Year). Director Reheis issued these additional permits despite his staff acknowledging that there was a "water grab" going on in the Flint River Basin by farmers. Reheis Test., Trial Tr. vol. 3, at 731:19-732:12.

Flint River Drought Protection Act

Around that same time in 1999, Georgia's environmental officials negotiated what Georgia hoped would be a solution with Georgia agricultural groups. FX-9 at GA01185040; *see also* Reheis PFD ¶¶ 51-52. That solution, legislation called the FRDPA, mandated an "irrigation auction[]" in the Flint River Basin whenever severe drought was predicted so that farmers with preexisting permits would be paid not to irrigate during such droughts. Reheis PFD ¶ 51. Indeed, Reheis pointedly admitted at trial that ACF Georgia farmers "should not" be irrigating during periods of severe drought. *Id.* Georgia's legislative history for the Act explains that it was explicitly intended to fend off litigation from Florida. FX-10 at 30-31 ("The underlying driving force behind [the FRDPA] was, in large part, the litigation between Georgia, Florida and Alabama over water rights in the region. … [The Act] was viewed by many as a good faith effort by Georgia to reduce the amount of water consumption by farmers during times of drought, thus preserving the river flow into Florida." (citation omitted));[8] *see also* FX-15 at

[8] *See Mannato v. SunTrust Banks, Inc.*, 708 S.E.2d 611, 612 n.1 (Ga. Ct. App. 2011) (noting that the Georgia State Legislative Summaries—known as the "Peach Sheets"—have been recognized as "legislative history" by the Georgia Supreme Court).

GA00181626; Reheis Test., Trial Tr. vol. 3, at 637:7-638:3.

Director Reheis acknowledged that the relevant farming and agribusiness leaders all agreed that this solution "is good and fair." FX-9 at GA01185040. Indeed, even one of Georgia's experts in this case acknowledged that the FRDPA was a "reasonable" measure to deal with droughts. *See* GX-868 at 62-63, Expert Report of Dr. Suat Irmak (May 20, 2016). And, of course, such an auction is very similar to one of the measures proposed by Florida's expert, Dr. Sunding. *See infra* at Section III.B.

But Georgia's progress soon stalled. Georgia invoked the FRDPA exactly twice—in **2001** and **2002**—after which its auction fund was depleted. Reheis Test. Trial Tr. vol. 3 at 685:4-7. Soon after, in **2006**, Georgia inexplicably decided to lift major portions of its "moratorium" on new applications for irrigation permits in the Flint River Basin. *See* JX-21 at 23-24. Expert biologists in Georgia's Wildlife Resources Division immediately recognized the predictable consequences that would follow:

> [T]his sub-basin is grossly over-allocated and further allocation of water withdrawal permits for either surface water or Upper Floridian Aquifer groundwater would unquestionably destroy or irreparably harm the ecological health and diversity of the Spring Creek sub-basin.

FX-23. As did the experts from the USFWS:

> [E]ven a casual reader comes to conclusion that some portion of the current permits, or some portion of the volume of water currently permitted for withdrawal is beyond the volume of water that is protective of downstream users.

FX-46 at GA00537489-92, GA00537494.

Georgia nonetheless proceeded with lifting its moratorium, rationalizing that it could offset the impacts by buying farmers' irrigation rights under the FRDPA in drought years. JX-21 at 45. Indeed, after January 1, 2007, Georgia would issue 1,387 permits for 161,623 additional acres—a *17%* increase! FX-D-16 (data compiled from JX-132). But the FRDPA's irrigation

auction was ***never again*** invoked by Georgia EPD. Turner Test., Trial Tr. vol. 12, at 2968:19-2969:14. In particular, to the surprise of everyone, the Act was never implemented in **2007** and **2008**, despite severe droughts those years. *See* FX-47 at GA00537496-98 (letter from USFWS to Georgia admonishing it for not invoking the FRDPA). By **2009**, a Georgia EPD funded study concluded that "streamflow data show consistent and substantial declines in minimum and seasonal streamflow associated with the development and implementation of agricultural irrigation in the FRDP area of southwestern Georgia" and that "water use is the primary factor causing record low streamflow." FX-49d1 at 27.

Georgia's Failure To Act In 2011-12

By the **2011-12** drought, Georgia' scientists stressed that the need to implement the FRDPA was again critical, but they again were ignored by policymakers in Georgia. For example, in January **2011**, a Georgia hydrologist wrote to members of Georgia's Flint Regional Water Council with an unmistakable warning:

> NOAA has released their climate forecasts for Winter-Spring 2011 …. To say that it reflects "doom and gloom" for the SE Region may be an understatement.… I am concerned that we are not hearing any discussion from GaEPD regarding pre-drought planning…. Clearly the hydrologic and agricultural impacts on our region of Georgia will very likely be extreme.

FX-49a at GA01048557.

EPD hydrologists initially recommended in January **2011** that a drought declaration be made, but they inexplicably reversed course just a few weeks later (*compare* FX-78 at GA01597629, *with* JX-51 at GA00080572), and EPD decided in February *not* to declare a severe drought and invoke the FRDPA. FX-81; Cowie Test., Trial Tr. vol. 9, at 2259:23-2260:1. Dr. Cowie admitted that there was not even funding available for the auctions in 2011. *Id.* at 2258:17-2259:1.

Just a few months later, in June **2011**, USFWS was again warning that "[o]ver-allocation

of the ground water aquifer in the lower Flint and other areas needs immediate attention." FX-48 at GA00186367. Unsurprisingly, by September **2011**, Georgia's chief hydrologist, Wei Zeng, was noting record high depletions of the Upper Floridan Aquifer and identifying record-setting low flows on the Flint River. *See* FX-82 at GA01614062-63. At this same time, Georgia's Lower Flint-Ochlockonee Regional Water Planning Council and the Upper Flint Regional Water Planning Council released their respective Regional Water Plans (the "LFO Plan," FX-24, and the "UF Plan," GX-1247). These regional plans were developed pursuant to state law to ensure that water uses within the state were consistent with conservation and sustainable use. *See* Ga. Code. Ann. § 12-5-31(h) (noting plans "shall promote the conservation and reuse of water within the state"); *id.* § 12-5-96(e) (noting plans should address "sustainable use"). The regional plans demonstrated that Georgia was far exceeding its own "sustainable yield" limits for the Upper Floridan Aquifer in the Dougherty Plain (the Lower Flint River Basin), as well as Georgia's "sustainability criteria" in dry and drought years for the Flint River generally. *See* FX-24 at 3-6, 3-9 (horizontal row for Bainbridge gage identifying 1,376 cfs shortfall); GX-1247 at ES-4 ("The [resource assessment] model identified a substantial shortfall in meeting EPD criteria for surface water flows in the Flint River Basin at Bainbridge under both current and forecast demands."); *id.* at 3-4, 3-6; Caldwell Dep. 37:15-25 ("I can only conclude that the estimated current use of groundwater from the Upper Floridan aquifer in the Dougherty plain is incongruent with the sustainable yield as determined by the sustainable yield criteria used in the groundwater assessment."). These groundwater sustainability limits were required by Georgia's Groundwater Use Act, *see* JX-21 at 14, 38-39, 75-80, and were based on an analysis of a range of stream flows throughout the Flint Basin. *See* JX-57 at 7-10.[9]

[9] Georgia attempted to rationalize its failure to meet the sustainability requirements by arguing

By early **2012**, the massive levels of 2011 agricultural withdrawals combined with the ongoing drought so significantly reduced the levels of the Upper Floridan Aquifer that it ceased to feed the flow of the Flint River or Flint tributaries in certain portions of the Lower Flint River Basin. FX-87 at GA00000368. In February **2012**, Georgia's mussels expert, Jason Wisniewski, detailed threats to threatened and endangered species in critical mussel reaches in the Lower Flint River Basin. *See generally* FX-97. That same month, EPD hydrologists *again* recommended that a drought be declared in the Flint River Basin. FX-89 at GA00864524-25.

Despite admitting the continuation of the severe drought, Georgia cynically (and incorrectly) concluded that there was no reason to invoke the FRDPA irrigation auction in 2012—*because the Flint River's surface water and the Upper Floridan Aquifer had already been so depleted by drought and 2011 agricultural withdrawals that even more pumping could not further worsen river flows*. FX-87 at GA00000368; Turner Test., Trial Tr. vol. 12, at 2999:7-19. On March 1, 2012, Georgia's then-current EPD Director, Judson Turner, confessed in a press release: "[N]o funds are currently appropriated" for use of the FRDPA, and "[t]here is no doubt that we need a viable management tool to deal with drought in the Flint River basin." JX-69 at GA00208715. He nonetheless declared that invoking the Act would have a "negligible impact on surface water flows this year." *Id.* But this was a palpably false statement: Georgia's chief hydrologist, Dr. Zeng, in fact could only justify a conclusion that invoking the Act in 2012 would not have benefits to *Spring Creek—not the entirety of the Flint Basin*. Turner Test., Trial Tr. vol. 12, at 3081:9-3082:15; FX-904 ("Also, the work that Wei [Zeng] and Menghong [Wen]

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that they were artificially set based on a small stream segment in the northern portion of the Flint Basin. This argument is demonstrably untrue. As JX-57 describes, the analysis was based on a long list of stream and river segments throughout the Basin which were each evaluated separately before a comprehensive conclusion regarding sustainable flows was reached. *See* JX-57 at 7-10 & tables 1-3.

did ONLY allows us to make the assertion (i.e., little stream flow benefit in suspending irrigation) in the Spring Creek basin. We CANNOT make a similar assertion elsewhere in the Flint either because we don't have the data, or the data we do have do NOT support this conclusion…. [W]e cannot conclude that there is little or no flow benefit to suspending irrigation elsewhere within[] the lower Flint."); Zeng Test., Trial Tr. vol. 13, at 3252:18-3255:12. Although EPD staff had urged that Director Turner "be forthright," FX-85 at GA01120386, Georgia was not. Director Turner at trial admitted this stark inconsistency between the press release he personally wrote, and what his agency's analyses actually said. Turner Test., Trial Tr. vol. 12, at 3081:22-3082:6 ("Q. And if you read the sentence after what I just referred to, it says, we cannot make a similar assertion elsewhere in the Flint because we do not have the data, and the data we do have do not support this conclusion. Do you see that, sir? A. I see that this e-mail says that. Q. And, yet, you did make that assertion; didn't you? A. I did."). Following Director Turner's refusal to invoke the FRDPA, Georgia scientists reported some of the lowest flows in history and disastrous results for endangered mussel populations in Georgia. *See generally, e.g.*, FX-49b; FX-50; FX-51; FX-56; FX-97; Turner Test., Trial Tr. vol. 12, at 3005:6-3007:10. This instance was a stark display of exactly how Georgia's supposed "environmental" policies operate.[10]

[10]Although Director Turner issued a "moratorium" on new agricultural withdrawal permits in certain areas of the lower Flint Basin, the so-called "moratorium" was fatally limited: Among other things, it only restricted new applicants, while applications for tens of thousands of additional acres had already been pending. Many of those pending applications were thereafter granted, and ***continue to be granted***. JX-132 (database shows 242 permits for 26,267 acres issued in the Subarea 4 moratorium zone since Jan 1, 2013). Moreover, Georgia evaluates whether to lift the moratorium each November. JX-73; Turner Test., Trial Tr. vol. 12, at 3090:16-3091:2.

Failure To Take Genuine Remedial Action Since 2012

In **2014**, Georgia amended the FRDPA to make the auction process discretionary instead of mandatory. JX-105 at 3-4 (changing the term "will" to "may"); Turner Test., Trial Tr. vol. 12, at 2969:15-2970:5. But, still acknowledging that a "long term solution" was necessary, Georgia continued "studying" ways to implement an improved measure—including the specific unimplemented recommendations of the 2011 LFO and Upper Flint Plans. Cowie Test., Trial Tr. vol. 9, at 2246:25-2248:25; Turner Test., Trial Tr. vol. 12, at 2974:12-2976:22; *see* FX-24 at 6-4 to 6-9 (Table 6-1); GX-1247 at 6-3 to 6-9 (Table 6-1). In internal documents, Georgia expressly recognized the "[r]egional and state benefits from increasing low flows in streams that flow into Florida." FX-67 at GA00217831; *see also* FX-56 at GA01643091 (Option 2B).

In late **2014**, EPD personnel met with groups of interested Georgia parties. A presentation given to key stakeholders by a Georgia technical adviser during that meeting accurately described the current state of the Basin: "The flow in the Flint River is on a long-term decline that began more than 45 years ago…. Flows have declined in the **upper** part of the Flint from human consumption, [inter-basin transfers], and from [evapotranspiration] loss from myriad lakes and ponds constructed in the Flint watershed…." FX-49b at GA00278839 (emphasis added). Correspondingly, "[f]lows in the **lower** Flint have declined in response to reduced inflow from the upper Flint and to agricultural withdrawals from the aquifers, which reduce inflow to [the] river, and from streams, which have a direct effect on the resource." *Id.* at GA00278840 (emphasis added). As a result, "[m]any streams in the lower Flint drainage[] have experienced severe reductions in short-term and long-term flow. The combined effects of irrigation pumping and drought create non-flowing conditions that did not exist prior to the late 1990's." *Id.*; *see also* FX-49b at GA00278832 (acknowledging long term 2,600 cfs flow

reductions on the Flint River at the Newton gage).

At that same meeting, Director Turner explained that Georgia had only taken "modest" steps to address the problem in recent state legislation. JX-154 at 1; Turner Test., Trial Tr. vol. 12, at 2970:6-14. He acknowledged that more legislation is needed to address low flows. *See* JX-154 at 2; Turner Test., Trial Tr. vol. 12, at 2973:1-9. Contemporaneous meeting notes record his instructions to the assembled group:

> Florida's equitable apportionment action before the Supreme Court is a challenge, of course, which can seem overwhelming…. However, Director Turner emphasized the importance of identifying the steps that can be taken today, rather than freezing to see what happens.

JX-154 at 1-2. But Georgia *did freeze*. Although the internal notes then identify a series of remedial steps Georgia could take to alleviate low drought year flows, it has implemented none of them in the two years since the November 2014 meeting. It put forth *no* legislative packages in 2016 whatsoever, even though Director Turner acknowledged that one of the reasons for the legislation would be to increase low flows in streams that flow into Florida. *See* Turner Test., Trial Tr. vol. 12, at 3021:6-10, 3021:25-3022:16. Thus, like so many of Georgia's past study efforts, no tangible benefits resulted from this study process either, leaving Florida with no relief. Today, as the Basin continues to suffer from a six-month drought that may continue to worsen in 2017, Georgia is still "studying" these options. *See id*. at 2980:14-2981:4; Cowie Test., Trial Tr. vol. 9, at 2246:25-2251:6. And while Former Director Turner admitted that Georgia would look at whether the FRDPA must be invoked in 2017 to address drought conditions and restrict agricultural irrigation in the Flint River Basin, *see* Turner Test., Trial Tr. vol. 12, at 3027:3-3028:1, 3028:22-3029:4, he conceded that many potential solutions will still not be available in

2017 to ameliorate the effects of the drought, *id.* at 3028:2-21.[11]

Finally, just in **2016**, it became apparent that Georgia does not even know the true extent of irrigation in its portion of the ACF Basin. In comparing the *irrigated acreage* data provided by Georgia in a Wetted Acreage Database produced on the eve of the close of discovery (JX-129, FX-659) to the data for *permitted acreage* data in Georgia's Agricultural Permitting Database (JX-132), Florida discovered that roughly 90,000 irrigated acres in the Flint River Basin are not even permitted. *See* FX-311; FX-708; FX-D-7; FX-D-16; FX-D-11. These irrigated acres are *illegal* under Georgia law. *See, e.g.*, FX-312 at 2 (setting forth permit requirements); JX-73; *see also* Ga. Code Ann. § 12-5-105. Many of those acres are in sensitive portions of the Lower Flint River Basin, where withdrawals from the Upper Floridan Aquifer have greater impacts on streamflow on the Flint and thus Apalachicola Rivers. *See* JX-21 at 23-29; FX-D-11. Only after Florida identified this unpermitted irrigation did Georgia convene an Agriculture Permitting Compliance Task Force. Turner PFD ¶¶ 125-127; FX-921 (Executive Order). But it is a ruse. The Task Force is composed entirely of non-EPD personnel, all but one of whom are affiliated with Georgia farm-interests—*including farming interests that have filed an amicus brief in this case opposing any restriction at all on Georgia agriculture*. *See* FX-921 (detailing Task Force members). Georgia cannot genuinely expect those individuals to enforce the law against their fellow farmers.

[11] Given Georgia's acknowledgment that the FRDPA might be utilized in the event of a 2017 drought, along with all the other conservation and sustainable use measures that Georgia documents indicate should be taken in drought years (*see infra* at Section III.B; JX-154 at 2; FX-24 at 64 to 6-9 (Table 1); GX-1247 at 6-3 to 6-9 (Table 6-1); JX-105 at 3-4 (Auction Provisions)), Georgia cannot credibly maintain that the "status quo" is to allow unrestrained irrigation during a severe drought.

Past Negotiations With Georgia

For the past two decades and with overwhelming evidence of a significant problem, Georgia has chosen to kick the can down the road, prioritizing its own needs and desires at Florida's expense. Absent an equitable apportionment by this Court, Georgia will continue to do so and will *never* agree to compromise or institute a voluntary cap on its consumption. Struhs PFD ¶¶ 19, 26. Indeed, Georgia induced Florida to enter the 1998 federal Compact without disclosing that it intended to insist on far higher levels of Georgia consumption after the Compact passed—a "bait and switch." *See also* FX-206 at GA02322676 (handwritten notes of Harold Reheis noting "FL and AL will learn sooner or later what we want, and won't like it. Big question is, should they know sooner, or later (after compacts pass?) … FL and AL may be scared off. Compacts may get scuttled."); FX-212 at FL-ACF-02578457 (letter from Florida complaining of "new and significantly higher demand sets"); Reheis Test., Trial Tr. vol. 3, at 670:3-8 ("Q. And it's true, isn't it, that Georgia only provided those new demand sets after the federal Compact passed. Right? A. I expect that's true. I don't remember exactly when we first put our M & I demands on the table, but most likely after the federal Compact passed."). And that was far from the only historic issue with the parties' attempts to negotiate. *See*, *e.g.*, Struhs PFD ¶¶ 23-25 (describing Georgia's abandonment of the 1999 Guidelines propounded by the EPA and USFWS); FX-599; Struhs PFD ¶¶ 27-33, 38-44 (describing Georgia's constantly changing positions and its secret negotiation of a separate water allocation with the Army Corps, subverting the very purpose of the Compact negotiations); *Alabama v. U.S. Army Corps of Eng'rs*, 357 F. Supp. 2d 1313, 1318 (N.D. Ala. 2005) (federal court declaring Georgia's conduct bad faith), *vacated and remanded on other grounds*, 424 F.3d 1117 (11th Cir. 2005).

More recent attempts at a solution have fared no better. In 2009, when a court order threatened to restrict Georgia's access to its Lake Lanier water supply, Georgia comprehensively studied how to minimize its water consumption and to create additional sources of supply. *See* Water Supply Contingency Task Force 2009 Findings & Recommendations, JX-41. In 2010, Georgia even passed the seminal Water Stewardship Act, whose legislative history admits it was meant "to influence the ongoing negotiations with Florida and Alabama, Congress, and the court hearing Georgia's appeal of the recent district court's decision." FX-905 at 204 (citation omitted). But as soon as that court order was reversed in 2011, Georgia abandoned all but the easiest of these conservation mechanisms. Katie Kirkpatrick admitted that several of the recommendations that the Task Force suggested Georgia undertake regardless of the legal proceedings order still have not been implemented today. Kirkpatrick Test., Trial Tr. vol. 13, at 3396:15-3397:4, 3397:9-19, 3397:20-3398:10. Georgia also abandoned many of the so-called "contingency options" that the Task Force recommended for consideration. *Id.* at 3399:12-3400:19. And today, Ms. Kirkpatrick takes the position that "[a]ny cap on water consumption in metro Atlanta" would be untenable and inappropriate. Kirkpatrick PFD ¶ 72; Kirkpatrick Test., Trial Tr. vol. 13, at 3424:5-8. That view was echoed by Georgia's governor even in the midst of this trial. Governor Deal made clear that Georgia remains committed to ensuring that there are no limits on its water consumption. *See* FX-941 ("Deal said limits on water use could be a 'disaster for agriculture' that could force farmers to change the types of crops by restricting irrigation."); *see also id.* ("In the interview, Deal said he wanted to make sure South Georgia farmers and other leaders were aware of the 'possible serious consequences' if Florida succeeds in capping agriculture water use.").

In short, Georgia's actions over the course of multiple decades make it absolutely plain that, absent a court order, it will not limit its water consumption for the benefit of Florida. Indeed, given that Georgia is not willing to take the steps necessary to even protect its *own* ecosystem, Florida's has no chance without this Court's intervention. There is truly "no other adequate remedy" (Order Denying Georgia's Motion to Dismiss at 21) unless the Court acts.

D. Any Balancing Of The Equities Strongly Favors An Apportionment That Limits Georgia's Consumption Of The Waters At Issue

The evidence overwhelmingly establishes that the equities favor an apportionment that limits Georgia's consumption. On the one hand, Florida has a longstanding practice of seeking to protect and preserve an ecosystem that is widely recognized as not only a national but an international treasure. On the other hand, while Georgia has recognized the threat that its ever increasing consumption of the waters at issue poses to Florida and itself, it has declined to act in any meaningful fashion to curb its usage. Instead, it has allowed usage to increase, especially for irrigation purposes in the Flint River Basin, and made clear that it will not adopt any limits on that use—ensuring that the problem will only worsen if this Court does not act.

III. AN EFFECTIVE AND REASONABLE EQUITABLE APPORTIONMENT CAN AND SHOULD BE IMPLEMENTED HERE

At bottom, Georgia believes it is entitled to take almost unlimited quantities of interstate water without regard to the consequences downstream. But equity requires Georgia to *share with Florida* the burden of lower rainfall when it occurs. As the Supreme Court has recognized, equity requires that *both* States' interests be considered, such that neither State is required to bear the full cost on its own. In *New Jersey v. New York*, for example, the Court concluded that while New York's desire for additional sources of clean drinking water was reasonable in the abstract, the "total [effect of New York's diversion] is found to be greater than New Jersey ought to bear." 283 U.S. at 345. It therefore entered a decree that in part capped New York's proposed

diversion. *Id.*[12] Likewise, the Supreme Court has made clear that there is an "affirmative duty under the doctrine of equitable apportionment to take reasonable steps to conserve and even to augment the natural resources within [its] borders for the benefit of other [S]tates." *Idaho ex rel. Evans v. Oregon*, 462 U.S. at 1025; *see also Colorado v. New Mexico I*, 459 U.S. at 185.

Florida is requesting that the Special Master enter an order requiring Georgia to cap its consumption at existing levels and reduce its consumption by up to 2,000 cfs in peak summer months of a drought year like 2011, and granting any other relief the Special Master deems just and proper. An order imposing such a consumption cap would have material benefits for the Apalachicola Bay and River. This proposed remedy would afford Georgia a wide range of avenues to comply with the Court's order through a variety of relatively modest steps. As Dr. Sunding's testimony and other evidence demonstrated, Georgia could adopt a range of low-cost, practical, and verifiable measures to comply with such an order. Indeed, most of the conservation measures Florida identifies have already been considered by Georgia itself or implemented successfully in other regions of the United States. Compliance with the order could easily be verified by an independent administrator, who could use adaptive management principles to verify that the specific conservation measures Georgia chooses to implement to comply with the order are achieving their expected results.

A. Additional Flows Will Improve The Apalachicola Ecosystem

As demonstrated at trial, Florida's request for an equitable apportionment that allows for additional freshwater flows would produce significant benefits and minimize harm to both the

[12] In its Order denying Georgia's Motion to Dismiss, the Special Master observed that the Supreme Court had established a minimum flow requirement in *New Jersey v. New York*. See Order 9 (parenthetical accompanying case citation). To be clear, the relief ordered in *New Jersey* consisted of both a minimum flow requirement and a cap on New York's diversion. *See* 283 U.S. at 346-47. Here, Florida is only seeking the latter.

Apalachicola River and Bay ecosystems. On the River, additional flows will "allow the ecosystem to stabilize, avoiding long periods of significant harm, and will facilitate the preservation of the River's ecology," particularly in comparison "to a future with increased Georgia consumption, which could cause permanent ecological harm to the River." Allan PFD ¶ 65. Likewise, on the Bay, "[i]ncreases in flow will allow the Bay ecosystem to become stabilized, and potentially recover to its historic state." Glibert PFD ¶ 5(e). Those additional flows will benefit the oyster population and efforts toward a recovery. *See* Greenblatt PFD ¶ 42 ("[F]uture reductions [in consumptive use] will lead to decreases in salinity – and with those decreases, improvement to and potential recovery of the Bay ecosystem."); White PFD ¶ 164 (""In general, if Georgia withdraws less water, particularly during drought periods, the Apalachicola Bay oyster population will benefit."); Kimbro PFD ¶ 7 ("[T]he oyster fishery in Apalachicola Bay can recover if a sufficient amount of freshwater is discharged from the Apalachicola River, because sufficient discharge prevents the prolonged periods of high water salinity that promote the proliferation of disease and predators."). Indeed, even small increases in streamflow are beneficial. *See*, *e.g.,* Allan PFD ¶¶ 43, 73-74 and Figure 27; Greenblatt PFD ¶ 4 ("The changes in salinity patterns are particularly pronounced in the lower salinity areas near the River, such as East Bay."); JX-122, U.S. FWS Draft Fish and Wildlife Coordination Act Report at 34 (recognizing that even a 1.0 ppt increase in median salinity would be important); *see also* McAnally PFD ¶ 17 ("If all else is equal, reducing freshwater flow increases average salinity and adding freshwater flow decreases average salinity."); McAnally Test., Trial Tr. vol. 16, at 4073:6-16 (same).

Georgia suggests that if Florida's proposed remedy does not mitigate *all* the harm to the River and Bay, now and in the future, then Florida's equitable apportionment claim must

fail. But that is not the law. *See Idaho ex rel. Evans v. Oregon*, 462 U.S. at 1025-26; *New Jersey v. New York*, 283 U.S. at 345-347 (adopting remedy that would minimize certain identified harms). Nor would any reasonable application of the equitable apportionment doctrine dictate such a result. Consistent with Supreme Court precedent, Florida has proposed a remedy to accommodate both States' needs that (a) is both reasonable and practicable for Georgia to implement, and (b) will minimize the harms to Florida from Georgia's upstream consumption.

B. Florida's Proposed Remedy Is Economical and Efficient

Georgia could adopt a range of low-cost, practical, and verifiable measures to cap its consumptive use and comply with an equitable apportionment in this case. Most of the conservation measures Florida identifies have already been considered by Georgia itself or implemented successfully in other regions of the United States. *See* JX-154 at 2.

Responsible water management in the ACF must begin with a solution to Georgia's water consumption for agricultural irrigation. Tackling the irrigation problem is critical because it is Georgia's largest *consumptive* use of water. Sunding PFD ¶ 18. At trial, Georgia tried to suggest that any limits on its farming irrigation would be devastating to its economy, but that is simply false. Row crop farming *is less than one half of one percent* of the overall economy of the ACF in Georgia. *Id.* ¶ 21. And critically, *irrigation is not even required to farm in the ACF*. *Id.* ¶ 22. Irrigation was not even used in the area until the 1970s, and still to this day is only deployed on about 44 percent of farms in Georgia's portion of the Basin. Masters Test., Trial Tr. vol. 14, at 3627:21-3628:2; FX-270; Sunding Test., Trial Tr. vol. 11, at 2876:2-4. But Florida is *not* asking for Georgia to stop irrigating entirely. Florida is simply asking Georgia to implement *reasonable* measures to limit the impact of its irrigation on downstream users, particularly in times of severe drought. Georgia can do this through any combination of reasonable conservation measures.

Georgia can and should start by eliminating irrigation on the 90,000 ***illegally*** irrigated acres in the ACF Basin. Sunding PFD ¶ 90 & Tables 4-6; *id.* ¶¶ 46-47 (discussing how Dr. Sunding determined Georgia had widespread illegal irrigation using Georgia's own data); Turner PFD ¶ 127 (announcing illegal irrigation task force, essentially admitting it has a problem, and recognizing the impact of these acres on "streamflow").

Georgia can and should also prohibit its farmers from engaging in wasteful irrigation practices. Dr. Sunding analyzed Georgia's own Agricultural Metering Database, JX-138, which contains field-level agricultural water use data recorded by meters installed on over half of the agricultural wells in the Flint Basin. Using the USDA's Cropland Data Layer, which is compiled annually by the federal government from the results of regular satellite flyovers of agricultural areas, Dr. Sunding then matched the field-level water use data to crop types grown in individual fields. Sunding Test., Trial Tr. vol.11, at 2856:22-2857:19; Sunding PFD ¶ 27. This analysis revealed that a significant number of farmers are using more water than the optimal amount for the crop they are growing. Sunding PFD ¶¶ 49-50. This water is literally wasted—the crop cannot benefit and may even be harmed from it. *Id. Florida already imposes* such restrictions in its portion of the ACF. *Id.* ¶ 83; Cyphers PFD ¶¶ 37-41.

Georgia could also purchase permanent easements for irrigation rights via a buyback program. Sunding PFD ¶¶ 59-66. Permanent and temporary buyback programs are a common water management tool, *id.* ¶¶ 59-61, 67-70, and Georgia has repeatedly considered implementing similar measures in the past, JX-154 at 2. In other areas of the country where agricultural water use has also overshot sustainable use levels, courts or regulators have implemented similar programs to protect the environment or other water users. In the Klamath River Basin, for example, an auction has successfully reduced or eliminated irrigation during dry

periods. Sunding PFD ¶ 67; Sunding Test., Trial Tr. vol. 11, at 2851:3-22-; FX-784 ¶¶ 161-65. In Nevada's Newlands Irrigation District, a permanent buyback of irrigation rights both returned water to a stream that was critical for migratory birds and allowed the expansion of an existing wildlife refuge. Sunding Test., Trial Tr. vol. 11, at 2852:5-2853:7.

Georgia could also move irrigation for certain higher-value crops—like pecans, fruits and vegetables—to irrigation wells fed from the Claiborne aquifer, which has less hydrological connectivity to the Flint River in parts of the Basin. Sunding PFD ¶ 86-87. This is the type of measure Georgia itself has considered. JX-154 at 2; Turner Test., Trial Tr. vol. 12, at 2980:18-2981:4, 2974:22-2976:9; Cowie Test., Trial Tr. vol. 9, at 2250:5-19.

Relatedly, Georgia could implement a technique known as deficit or limited irrigation, a form of which Florida already mandates in its portion of the ACF Basin. *See supra* at 63. Deficit irrigation also is required in the Imperial Irrigation District in California and the Republican River (and elsewhere) in Nebraska. Sunding Test., Trial Tr. vol. 11, at 2853:16-2854:23; 2855:3-2856:4; FX-784 ¶¶ 173-77. The basic principle is that in times of drought, farmers should apply less irrigation than is optimal for crop growth. Sunding PFD ¶¶ 80-82. Georgia's own witness, Mark Masters, participated in a long term study of deficit irrigation at a research farm in Georgia's portion of the ACF, which confirms Florida's expert analysis that there can be relatively significant reductions in irrigation without large losses in yield. JX-169; Masters Test., Trial Tr. vol. 14, at 3634:8-3635:20; FX-929. Sunding PFD ¶¶ 80-85. Georgia could implement deficit irrigation through many means, including most simply by specifying a cap on irrigation using a methodology similar to what Florida uses in its portion of the ACF Basin. Sunding PFD ¶¶ 83-85.

Similarly, Georgia has acknowledged that implementing Variable Rate Irrigation ("VRI") would achieve agricultural water savings of 15 percent in a dry year. GX-868 at 77; FX-911 at 1; Masters Test., Trial Tr. vol. 14, at 3668:12-15. Yet the number of Georgia ACF irrigators using VRI can be counted on two hands. JX-141; Masters Test., Trial Tr. vol. 14, at 3670:6-13. In addition, improving irrigation scheduling—the timing of when irrigation is used—could reduce agricultural water use by an additional 15 percent. GX-868 at 78. Although Georgia praises the benefits of irrigation scheduling, Masters PFD ¶ 76, it does not require its farmers to use it. Masters Test., Trial Tr. vol. 14, at 3668:18-22. Moreover, nearly 1,900 of the least-efficient irrigation systems known as "travelers" remain in use in the Lower Flint-Ochlocknee region; those irrigation systems could be converted to center pivot or drip irrigation systems for additional water savings. *Id.* at 3672:8-12, 3673:12-15; Masters PFD ¶ 63, Demo. 6; *see also* FX-960 at 44-45 (possible 70-80% water savings from sod-based crop rotation, with more than 1,000 cfs impact at the Flint River Bainbridge gage). Lastly, as a longer-term solution, Georgia has considered but not implemented aquifer storage and recovery or similar streamflow augmentation, in which surface water is stored in the aquifer during wet months and years and used to augment streamflow in times of low flow. JX-154 at 2.

On the municipal and industrial side, Georgia could reduce consumptive use principally by keeping its commitment to reduce leaks in Metro Atlanta's aging water pipes, and implementing restrictions on urban outdoor water use that are already in place in times of drought. There is no need to impose the types of multi-billion in impacts on Atlanta that Georgia hypothesizes. In 2009, Georgia's Water Contingency Planning Task Force recommended leak abatement as a "no-regrets" conservation measure that would save 27 MGD (approximately 42 cfs). JX-41 at 28 Figure 13, 32; Sunding PFD ¶ 43. Dr. Sunding also analyzed seasonal patterns

of urban outdoor water use captured by individual permit data in Georgia's municipal and industrial withdrawals database. JX-139; Sunding PFD ¶ 74. Using this analysis, he calculated water savings from implementing cutbacks up to 50 percent of urban outdoor water use. *Id.* ¶ 75. Homeowners' lawns could brown due to such restrictions, but would regain their green color when the rain returned. *Id.* ¶ 73. Georgia law already requires a ban on outdoor watering in Metro Atlanta in times of drought, but Georgia failed to put such a ban in place during the 2011-12 drought when the worst of the drought occurred south of the Metro area. *Id.* ¶ 16. Such drought-year restrictions would not entail significant job losses in the landscaping industry; Dr. Sunding's analysis of employment data in Georgia's Bureau of Labor Quarterly Census showed minimal job losses in 2008, the last year a summertime outdoor watering ban was implemented. *Id.* ¶ 78; *see also* FX-710.

Feasibility Of Consumption Caps

An independent administrator could easily verify the effectiveness of the conservation measures Georgia implements, ensuring compliance with any order in this case. Key to verification is adaptive management, in which environmental performance standards are evaluated to ensure that conservation measures put into place are achieving the expected benefits. Sunding Test., Trial Tr. vol. 11, at 2887:13-2888:4. In this case, adaptive management to check both compliance and the functioning of the implemented conservation measures can involve monitoring agricultural water use using new and existing agricultural meters and evaluating flow at stream gages and evaluating impacts on groundwater. *Id.* at 2886:13-2887:12.

In combination, Dr. Sunding estimated the cost of implementing a selection of these measures to achieve a reduction of 2,000 cfs peak streamflow. Sunding PFD ¶ 90, Table 4. The measures would carry a *fiscal cost* incremental to existing policies of only $35.2 million per

year. *Id*. Georgia could likely accomplish the reduction much more cheaply by using a variety of the agricultural efficiency improvements discussed above that Dr. Sunding did not include in his cost modeling. *See supra* at 82 (discussing *inter alia* irrigation scheduling and VRI technology).

In no way would any of these measures "wipe out half of Georgia's ACF agriculture" as Georgia's counsel suggested in his Opening Statement. Georgia's economic expert, Dr. Stavins, admitted that he evaluated only a small subset of these types of conservation measures. Stavins Test., Trial Tr. vol. 17, at 4453:18-21, 4455:5-15, 4463:2-13, 4464:10-15, 4484:18-23 (admitting that he failed to evaluate using different crop rotations, aquifer storage and recovery, streamflow augmentation, VRI and other efficiency measures, deficit irrigation, and moving higher-value crops to deeper aquifers). The analysis Dr. Stavins did do exaggerated the costs involved. For example, for the purchase of "easements" from farmers preventing them from irrigating on particular parcels, Dr. Stavins supplied an anticipated cost per acre for the "easement" that was more than twice as high as buying the acreage outright. *Compare* Stavins PFD ¶¶ 109-110, Demo. 17, *and* FX-D-49, *with* FX-927 (Farm Land Average Values Per Acre); *see* Stavins Test., Trial Tr. vol. 17, at 4474:7-4476:17. The actual costs of the easements would be about 10 percent of Dr. Stavins' estimates. Sunding PFD ¶ 62. Likewise for cutting irrigation amounts, Dr. Stavins assumed that it would be ***impossible*** to put any actual per acre limit on how much irrigation water any farmer used, even though Florida does exactly that. Dr. Stavins thus constructed his cost estimates assuming that all irrigation would be absolutely banned. Stavins PFD ¶¶ 60-61 Demo. 9; Stavins Test., Trial Tr. vol. 17, at 4463:2-13. This approach unnecessarily produced much higher cost estimates than Dr. Sunding's analysis.

Likewise, large segments of Dr. Stavins analyses were simply irrelevant: for example, Dr. Stavins analyzed the economic output of industries in Metropolitan Atlanta and elsewhere that would never be impacted in any way by Florida's proposed remedies. *See* Stavins PFD ¶¶ 12-20 & Demos. 1, 2. In the real world, the impact of Florida's proposed remedy would, at most, affect a very, very small portion (a fraction of 1%) of the Georgia ACF economy, and would certainly not "wipe out" even that sliver of Georgia's ACF economic sector. Sunding PFD ¶¶ 21, 90 (Table 4); Stavins Test., Trial Tr. vol. 17, at 4542:19-4543:2. Indeed, if Georgia's State government were to take the types of remedial actions they have themselves proposed, payments from the State to farmers could offset most of the impact. And Dr. Stavins failed entirely to assess how massive federal farm programs, including *subsidized crop insurance*, and many other federal payments to farmers (which were collectively in excess of one quarter of a billion dollars in recent years) play a role in the profitable operation of a Georgia farm. Stavins Test., Trial Tr. vol. 17, at 4498:14-4500:1. In other words, Dr. Stavins was simply guessing about how the proposed measures might impact farmers.

The upshot of these shortfalls in Dr. Stavins' analyses are that his conclusions have no persuasive value—particularly his testimony seeking to compare costs and benefits of a remedy. *See* Stavins PFD ¶¶ 131-39. Dr. Stavins admitted almost all these material flaws in his analyses, and even admitted he personally did not undertake the type of valuation methodology for the Apalachicola River and Bay that he claims Dr. Sunding should have employed. Stavins Test., Trial Tr. vol. 17, at 4537:10-12, 4511:22-4542:1.

CONCLUSION

After 20 years, Florida is entitled to the type of consumption cap remedy both USFWS and EPA recommended in the 1990s. The remedy can be administered by an independent party, using principles of adaptive management. None of the nightmare scenarios Georgia predicts is

necessary to implement this remedy. Instead, the Court can and should apportion the waters of the ACF Basin in a way that is equitable for both States.

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Respectfully submitted,

/s/ Philip J. Perry

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No. 142, Original

In the
Supreme Court of the United States

STATE OF FLORIDA,

Plaintiff,

v.

STATE OF GEORGIA,

Defendant.

Before the Special Master

Hon. Ralph I. Lancaster

CERTIFICATE OF SERVICE

This is to certify that the STATE OF FLORIDA'S POST-TRIAL BRIEF has been served on this 15th day of December 2016, in the manner specified below:

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