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. Paul J. Kelly Jr.

# STATE OF FLORIDA'S PROPOSED FINDINGS AND CONCLUSIONS


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### *Background: ACF Basin*

**1.** Three major rivers comprise the Apalachicola-Chattahoochee-Flint (ACF) River Basin. *See Florida v. Georgia*, 138 S. Ct. 2502, 2508-09 (2018); Report of the Special Master (Lancaster Rep.) 4-10. Multiple tributaries drain into the ACF rivers or Lake Seminole directly and feed the Apalachicola, including Spring Creek. Hornberger Pre-filed Direct Test. (PFD) ¶¶ 55-56, 66-70, Figs. 4-5; FX-50. The Apalachicola region is a widely recognized ecological treasure and has supported one of the Nation's most iconic oyster fisheries. Lancaster Rep. at 8-10, 31-32; Steverson PFD ¶¶ 9-10, 26; FX-675 (video);[1] Glibert PFD ¶¶ 1, 5, 18, 80; FX-789 at 11-12, 46 (Bay is a key nursery for shrimp and other species). Since the 1960s, Florida and the federal government have set aside a large portion of the Apalachicola region for preservation. Steverson PFD ¶¶ 9-10, 18-34. This includes 235,000 acres in the Apalachicola National Estuarine Research Reserve (ANERR) and the St. Vincent National Wildlife Refuge. *Id*. at 24-25.

**2.** The Upper Floridan aquifer (Upper Floridan) is a naturally-occurring, underground water source underlying much of the ACF Basin. Hornberger PFD ¶¶ 34-35, 66-70. The Upper Floridan is a key source of flow for both the Flint and Chattahoochee Rivers; these rivers and their tributaries cut directly into the aquifer in many places, allowing groundwater in the Upper Floridan under natural conditions to discharge directly into these rivers and provide a substantial portion of their flows whether or not it is raining. *Id.*

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[1] https://www.youtube.com/watch?v=E7v1a9BLXW4; *see also* FX-66 at GA55244.

***Fundamental Hydrological Changes Over Recent Decades***

**3.** For more than 80 years, river flow measurements have been recorded for each of the three ACF rivers, including near the Florida/Georgia border. Flint River flows began to fall in the 1970s and 1980s with the rise in irrigation and dropped even further in the 1990s and thereafter. Hornberger PFD ¶¶ 42-65. In the 72 years of recorded data before the year 2000, flow near the Florida/Georgia border (recorded by the USGS "Chattahoochee" gage) rarely dropped below 6000 cubic feet per second (cfs), even during the worst drought periods in the history of the ACF Basin. FX-D-1 (USGS gage record highlighting all months with average flows below 6000 cfs); Hornberger Tr. Test. (vol. 8) 2043-50. But since 2000, average monthly flows in dry, drought, and even normal precipitation years are substantially lower, falling and remaining below 6000 cfs on average *for weeks or months at a time, year after year,* including in moderate, dry and drought periods in 2000, 2001, 2002, 2006, 2007, 2008, 2010, 2011, and 2012. FX-D-1.

**4.** In the forty years from 1930 to 1970, USGS recorded only *six* months in total (October and November in 1931, 1954 and 1955) in which average flow fell below 6000 cfs at the Chattahoochee gage. *Id.* But following the expansion of Georgia's irrigation and water consumption over recent decades, average monthly streamflow in 2011 and 2012 at the Florida/Georgia border was persistently below 6000 cfs for *fourteen months* (including almost every month from May through December of each year), and for *thirty-four total months* between 1999 and 2012, including certain months in years where Georgia did not declare a climatic drought (*e.g.,* 2006 and 2010). *Id.*; Hornberger PFD ¶ 46; GX-141.

**5.** The statistic "basin yield" measures how much river flow results from each inch of rain in the basin. Florida's expert, Dr. Hornberger, demonstrated that "basin yield" has fallen substantially in the Georgia portion of the ACF basin. Hornberger PFD ¶ 64 & Table 4. Using the period from 1924-1970 as a baseline, the data show marked declines *for every time-period compared since 1970,* when Georgia began to irrigate in the Flint Basin. *Id.* A particularly pronounced difference is apparent when comparing pre-1970's data to recent data: Dr. Hornberger calculated an <u>*average*</u> decline in river flow of 2500 cfs for the time period from 1992-2013 and 3900 cfs for the time period from 2003-2013 (both periods included a mix of drought and non-drought years) relative to the record before 1970. *Id.* The four years with the lowest basin yield at the State line in recorded history are all recent: 2012, 2002, 2000, and 2008. *Id.* ¶ 65, Table 5. The only explanation for these losses in river flow per inch of rain is increasing consumptive water use in Georgia's portion of the ACF, and related irrigation impacts on the Upper Floridan aquifer. Hornberger Tr. Test. (vol. 8) 2096:14-21; *id.* at 1970:13-23; Hornberger PFD ¶¶ 3, 64-65.

**6.** There is little dispute that recent river flows have been severely and persistently low, and Georgia's expert hydrologist acknowledged this during trial. FX-D-17 (figure from Georgia expert); *see also* Hornberger PFD ¶¶ 39, 47, 54 & Table 3; FX-D-1; FX-D-2. Georgia's internal documentation and state-funded studies, together with Florida's expert testimony, demonstrate that ACF rainfall patterns cannot account for the frequency and persistence of these recent severe low flows. JX-21 at 22 (Georgia Environmental Protection Division (EPD)); FX-49d-1 at 27 (Georgia-funded study: irrigation, not climate change, is responsible for recent severe low flows); Lettenmaier Tr. Test. (vol. 10) 2446:22-2447:7, 2447:20-2448:4, 2448:17-2450:1; FX-893; Lettenmaier PFD ¶¶ 21-26.

**7.** Comparing severe ACF droughts in recorded history (in 1931 and 1954-55) to recent droughts further demonstrates the effect of increased Georgia consumption. Despite more rainfall and lower temperatures in recent droughts, substantially less water flowed into Florida during recent droughts than flowed during considerably worse historical drought periods. Hornberger PFD ¶¶ 3, 37-54, 63-70; Lettenmaier PFD ¶¶ 26, 30-38, 60; JX-21 at 22 (Georgia analyses: "[D]rought-year low flows are reached sooner and are lower than before irrigation became widespread"); FX-10 at 31; *see* FX-47 at GA00537496-97 (U.S. Fish and Wildlife Service (USFWS) analysis: Georgia's water use, and not climate, is causing record low flows).

**8.** During recent dry periods, the main stem of the Upper Flint River has suffered a 70% decline. FX-285 at 10. Key Georgia tributaries that flow into the Flint or directly into Lake Seminole, such as Spring Creek, have run completely or nearly dry for months at a time. Hornberger PFD ¶¶ 56, 69-70; JX-21 at 22, 51, 67-68. There is no record of this occurring before Georgia adopted current irrigation practices. *See, e.g.*, FX-49f at JWJONES0000549; FX-D-14 (Spring Creek Gage); FX-56 at GA01643082; Hornberger PFD ¶¶ 55-56, 69-70.

**9.** The growth of agricultural irrigation in Georgia also has resulted in pumping increasingly significant amounts of water from the Upper Floridan aquifer, which has impaired and reversed the natural process by which the Upper Floridan supplements river flows and caused river water in Georgia to flow *into* the Upper Floridan to feed the pumping demand, rather than flowing from the aquifer into the rivers and streams. *See* Hornberger PFD ¶¶ 66-70, 102-06; FX-21 at GA00850007-08.

**10.** Georgia's own personnel (and internal analyses) have long acknowledged that irrigation is the principal cause of these recent extreme low flows. "When thousands of irrigation systems are operating during dry weather, . . . one can see a significant reduction in Flint River flows." FX-2 at GA02257045. "[I]n a drought year, a few thousand farmers will still consume more water than six or seven million people in Metro Atlanta will in 2030." FX-15 at GA00181626 (Georgia Dep't of Natural Resources, 2002); *see also* JX-21 at 22 (Georgia EPD, 2006); FX-4 at 3 (1999). "[G]roundwater pumping from the Upper Floridan aquifer has a significant and quantifiable effect on surface water flow in the Flint River and its major tributaries." FX-82 at GA01614062, GA01614063; *see also* FX-49f (2011). These impacts are magnified by heavy irrigation year after year, significantly depleting the Upper Floridan aquifer and worsening flows during multi-year droughts. FX-82 (Georgia hydrologist describing lack of aquifer recovery during 2011-2012 drought as "stunning"); Hornberger PFD ¶¶ 35, 66-70, 98-106 (citing USGS studies).

**11.** Federal agencies have likewise repeatedly warned about the significant negative impacts of Georgia's irrigation. *See* FX-46 at 2-3, 5-6 (2006 USFWS letter); FX-47 (2008 USFWS letter). In 1999, the USFWS and U.S. Environmental Protection Agency (EPA) issued guidelines identifying minimum Apalachicola River flows appropriate to preserve the river and its floodplains. FX-599 at FL-ACF-02545881, FL-ACF-02545894. Actual river flows have fallen dramatically below the USFWS/EPA flow criteria nearly every year since 2000. *Id.* at FL-ACF-02545908; Hornberger PFD ¶¶ 57-62; FX-D-1; FX-D-23.

***Impact of Georgia's Consumption on Apalachicola Bay and River Basin***

**12.** "The facts presented at trial demonstrate the gravity of the dispute between Florida and Georgia. . . . There is little question that Florida has suffered harm from decreased flows in the River." Lancaster Rep. at 31. After centuries of surviving drought, hurricanes, and other weather events, the Apalachicola Bay suffered an "unprecedented collapse of its oyster fisheries in 2012." *Id.* at 31-32 (Berrigan PFD ¶¶ 26-31; Ward PFD ¶¶ 24-29, 42). "[O]yster mortality reached devastating levels, leaving many previously-productive oyster reefs virtually empty." *Id.* (citing Berrigan PFD ¶¶ 30-31). "This was true not only of oyster reefs open to public harvesting, but also oyster reefs subject to private commercial leases." *Id.* (citing Ward PFD ¶¶ 27-29, 32; Kimbro PFD ¶ 34). "As explained by Florida's expert, Dr. David Kimbro, and as the [federal government] concluded when it issued a fishery disaster determination for the Bay in 2013, the oyster collapse came as a result of increased salinity in the Bay caused by low flows in the River," and not overharvesting of oysters. *Id.* at 31-32 (citing Kimbro PFD ¶¶ 4, 101; Sutton PFD ¶ 48; FX-413 at NOAA-22896-97; FX-412 at NOAA-3818; Berrigan PFD ¶¶ 36-49).

**13.** Low fresh water flows transformed the Bay from a unique estuarine environment to a marine (saltwater) system, where saltwater predators decimated estuarine species. Lancaster Rep. at 32; Berrigan PFD ¶¶ 36-45, 62-63 ("In all of my [30 years of] experience, I had never encountered such an abundance of [predators] or the devastation they left behind."); Berrigan Tr. Test. (vol. 4) 1005-1006. "It's almost like a science fiction movie how many conchs [predators] there were out there."[2] Tommy Ward, an Apalachicola oysterman and lease-holder for more than 30 years, testified: "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; *see also* Ward Tr. Test. (vol. 7) 1808: 2-10; Lipcius Tr. Test. (vol. 17) 4414:8-14 (Georgia expert acknowledging impacts of predators).

**14.** The 2012 oyster crash followed a persistent pattern of extremely low flows. FX-413 at NOAA-22895-97; FX-789 at 67; Kimbro PFD ¶ 4; Lancaster Rep. at 32. The evidence shows that even relatively small salinity changes can significantly harm the Bay if prolonged over months or years. *See* Greenblatt PFD ¶¶ 4, 27-30 (modeling salinity changes from the same types of persistent low flows that led to the 2012 crash); Greenblatt Tr. Test. (vol. 7) 1799:2-5 (testimony regarding "persistent low flows"); Kimbro PFD ¶¶ 27-29, 38; Glibert PFD ¶¶ 82, 83. Certain Bay species are highly sensitive to salinities—particularly in East Bay, which is a nursery and refuge. *Id.* ¶¶ 4, 82-83; Glibert Tr. Test. (vol. 7) 1867:24-1870:12 ("In east bay. . . just a couple of parts per thousand may reduce that salt stress by 20, 30 percent"); Kimbro Tr. Test. (vol. 6) 1571:22-1572:2; FX-797 at 10. As the USFWS found, even a 1 ppt [point per thousand] increase in median salinity in East Bay "may exceed salinity thresholds for juvenile Gulf Sturgeon and oysters." JX-122 at 34.

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[2] *See* Fla. Opening Statement Presentation at 42-43 (citing photographic evidence, quoting Berrigan Dep. 161:13-162:1); Berrigan PFD ¶¶ 43-45; Kimbro PFD ¶ 4, Fig. 2; Lancaster Rep. at 31-32.

**15.** Low flows also change nutrient composition in the Bay, reducing the nutrients reaching the Bay from the river and floodplain, disrupting the food chain from the plankton at the base to the fish, oysters, shrimp, crabs, and other key Bay species up the chain. Glibert PFD ¶¶ 4, 16-18 & Figs. 5, 22, 28, 30-31, 39, 54, 64, 68-72, 80-83; Glibert Tr. Test. (vol. 7) 1826:10-13,1831:8-17; FX-379 at 2, 11, 28-33, 54-55; FX-66 at GA00055244.

**16.** The Apalachicola River Basin is inextricably linked to the Bay as a source of key nutrients, but is itself also highly sensitive to low flows. Low flows isolate river and floodplain ecosystems, depriving them of fresh water; over a relatively short period of weeks, aquatic life is stressed and dies. Allan PFD ¶¶ 3, 10, 23, 27-30, 39-60, 93-96; JX-168 (2016 BiOp) at 50; Hoehn PFD ¶¶ 37-56; Hoehn Tr. Test. (vol. 2) 278:25-280:16, 293:23-295:1. Florida's expert Dr. Allan testified to the "importance of the enormous range of aquatic habitats that occur throughout the network of sloughs and the floodplain surrounding the River" and of "microhabitats" (bank margins, pools, submerged wood) which "are very sensitive to even modest changes in water levels." Allan PFD ¶¶ 11, 20, 23-26, 28-30, 43 (identifying harm from persistent low flows, and citing improvements from as little as 300-500 cfs in increased flows); *see, e.g.*, *id.* ¶¶ 27, 45, Fig. 18 (95% loss of endangered mussel population in area where floodplain slough disconnected by low flows); *id.* ¶¶ 53-55 (harm to threatened Gulf sturgeon); *id.* at Fig. 22 (44% reduction in iconic Ogeechee tupelos, and reductions in other species, as irrigation increased upstream).

***Georgia Has Long Recognized its Excessive Consumption in the Flint Basin***

**17.** Georgia officials have recognized the need to address the State's growing consumption of water since the 1990's. FX-205 at 2; FX-1; FX-2 at 2; FX-4 at 3 (Georgia

EPD in 1999: "We've already exceeded the 'safe' upper limit of permitable [irrigation] acreage in the lower Flint."); FX-5 at 1 and FX-4 at 5-6 (Georgia officials: "[T]he state will need to put a cap on water depletions one of these days from the Floridan aquifer to keep water flowing in the lower Flint River in drought years," "[i]t will hurt Georgia's chances in federal court if we let irrigation deplete the river," "[i]n the worst case, state government would have to buy back water rights from farmers," and "[a]ll of these facts have become known over the course of 1998. It is now necessary to act on them.").

**18.** Despite recognizing the need to constrain consumption, "Georgia's upstream agricultural water use has been—and continues to be—largely unrestrained. Agricultural irrigation has increased dramatically in Georgia since 1970. By Florida's count, Georgia's irrigated acreage has increased from under 75,000 acres in 1970 to more than 825,000 acres in 2014." Lancaster Rep. at 32-33; Hornberger PFD ¶ 77. Even Georgia's own estimates show a dramatic growth in consumptive water use for agricultural purposes. Zeng PFD ¶¶ 63-64; Lancaster Rep. at 33. In the face of this sharp increase in water use, "Georgia has taken few measures to limit consumptive water use for agricultural irrigation." Lancaster Rep. at 33. The vast majority of agricultural permits contain "no limitations" on the amount of irrigation water that farmers can use. *Id.*; Cowie Tr. Test. (vol. 9) 2223:19-2224:4; Masters Tr. Test. (vol. 14) 3655:13-21; Sunding PFD ¶¶ 36-37.

**19.** "Even the exceedingly modest measures Georgia has taken have proven remarkably ineffective." Lancaster Rep. at 33. "For instance, although Georgia adopted the Flint River Drought Protection Act ('FRDPA'), Ga. Code Ann. 12-5-540 *et seq.*, in order to permit the State temporarily to 'buy back' agricultural irrigation rights at auction and thereby reduce water use during droughts, Georgia failed to implement the FRDPA's auction in 2011 and 2012 during one of the worst droughts on record." *Id.* (citing Turner PFD ¶¶ 85-95, Cowie Tr. Test. (vol. 9) 2259-60; FX-81; Turner Tr. Test. (vol. 12) at 2999; JX-69).

**20.** "Despite early warnings of oncoming drought, Georgia's [EPD] chose not to declare a drought in 2011, . . . clearly not wishing to incur the cost of preventative action given lack of funding." *Id.* at 33-34 (citing Turner PFD ¶ 87; FX-78; Cowie Tr. Test. (vol. 9) 2258-59). "Then in 2012, the EPD conveniently took the position that implementing the FRDPA would be 'too little, too late'—despite lacking scientific support for that conclusion." *Id.* at 34 (citing Turner PFD ¶ 91; JX-69; Zeng Tr. Test. (vol. 13) 3252-56; Turner Tr. Test. (vol. 12) 3081-82). "Georgia then continued to issue backlogged irrigation permit applications, issuing only a temporary moratorium on new applications." *Id.* (citing Turner Tr. Test. (vol. 12) 3089-90).

**21.** As Special Master Lancaster stated: "Georgia's position—practically, politically and legally—can be summarized as follows: Georgia's agricultural water use should be subject to no limitations, regardless of the long-term consequences for the Basin." *Id.*

***Georgia Could Take Additional Reasonable Steps to Conserve More Water in Atlanta***

**22.** Although certain conservation measures have been implemented in Atlanta, many of these efforts were initiated only after having been threatened by potential adverse litigation results. Lancaster Rep. at 34 n.28 (citing Turner PFD ¶¶ 66-83). State agencies and Georgia task forces proposed multiple other unimplemented conservation actions. *See* JX-40; JX-41; Kirkpatrick Tr. Test. (vol. 13) 3396:15-3397:4, 3397:9-3398:10, 3399:12-3400:19. For example, although Georgia planned to build the new Glades reservoir to alleviate its needs for water during drought, it dropped that initiative in 2016. Turner PFD ¶ 55; GX-829 at GA02451929-30. Although Georgia has policies to reduce outdoor lawn watering during droughts, it failed to do so during the severe 2011-2012 ACF drought. Sunding PFD ¶¶ 16; Kirkpatrick Tr. Test. (vol. 13) 3411:18-3412:3.

***Quantifying Georgia's Total Consumptive Uses***

**23.** Florida and Georgia agree that Georgia's consumption of water has increased significantly over recent decades, but they disagree on the amount (roughly 4000 cfs—peaking over 5000 cfs—according to Florida, and about half that total (at peak) according to Georgia).[3] Florida's experts used multiple modeling and quantitative approaches—most notably rainfall runoff modeling—to assess Georgia's consumptive uses in the Basin. Dr. Hornberger ran the Precipitation Runoff Modeling System (PRMS), and another Florida expert, Dr. Lettenmaier ran a different rainfall runoff model—the Variable Infiltration Capacity (VIC) model—with each reaching the same basic conclusions. *Compare* Hornberger PFD ¶¶ 83-88, 93-95, Table 8; Lettenmaier PFD ¶¶ 39-40. *See also* Hornberger PFD ¶ 91 (describing similar conclusions by other independent researchers).[4]

[3] *See* Hornberger PFD ¶¶ 83-85, Table 8; Lettenmaier PFD ¶¶ 39; Zeng PFD ¶¶ 4 n.1, 22 (Zeng Demo. 3); Bedient PFD ¶ 37 n.4; Bedient Tr. Test. (vol. 15) 3989:12-21, 3992:2-12, 3994:20-3995:4; Zeng Tr. Test. (vol. 13) 3370:14-3371:4.

[4] In addition to rainfall runoff modeling, Florida's experts also performed a "bottom-up accounting" to sum up the various sources of Georgia's consumptive water use in the ACF. Hornberger PFD ¶ 82, Fig. 7. This approach was anticipated to be an under-accounting because Georgia's available water use data is incomplete. *Id.* ¶ 71. However, this "bottom up accounting" approach further demonstrates very significant growth in Georgia consumption since the 1970s and 1980s. *Id.* ¶ 71, Fig. 7.

**24.** Florida's estimates of Georgia's consumptive uses are clearly more persuasive: Georgia relied upon a set of data that had been criticized on multiple technical grounds by experts at Georgia's own Water Resources Institute (GWRI), affiliated with Georgia Institute of Technology. *See* FX-534 at iv-v, 10, 189-94. In 2012, GWRI concluded that Georgia's dataset contains "systematic errors" which require correction, ignores impacts of thousands of farm irrigation ponds, and may undercount the consumption of Georgia agricultural irrigation by "up to 70% of the actual crop water requirement." *Id.*; *see also* Turner Tr. Test. (vol. 12) 2951:13-2956:16; Zeng Tr. Test. (vol. 13) 3366:25-3370:3; FX-883 at 15, 86, 128. GWRI recommended the rainfall runoff modeling approach adopted by Florida experts. FX-534 at 193-94. Georgia opted not to present any rainfall runoff modeling, nor did it attempt to remedy the deficiencies GWRI identified in the dataset it did employ. *See* Bedient Tr. Test (vol. 15) 3970:8-3972:20.

***Remedy***

**25.** "[T]he record suggests that an increase in streamflow of 1,500 to 2,000 cfs is reasonably likely to benefit Florida significantly." *Florida v. Georgia*, 138 S. Ct. at 2520. Even an increase of 1000 cfs would be beneficial, because it would prevent a recurrence of the severe low flows that led to the 2012 crash, improve salinity and nutrient flow to key portions of the Bay, and mitigate harm to multiple sections of the River and floodplains.[5] An appropriate remedy should allow the Bay and River to return to the natural cycles in

[5] *See* Glibert PFD ¶¶ 5(e), 19-21, 32, 49, 57-60, 81-84; Glibert Tr. Test. (vol. 7) 1867:24-1870:12; Kimbro PFD ¶ 7, 81-83; Kimbro Tr. Test. (vol. 6) 1570:23-1572:2; Allan PFD ¶¶ 26, 32, 43, 65-74; Kondolf Tr. Test. (vol. 10) 2629:7-15; Hoehn PFD ¶¶ 43, 50, 53.

which they existed for thousands of years, with healthy periods of drought and recovery. *See* Kimbro PFD ¶ 7; Gilbert PFD ¶¶ 5(e), 81-84; Allan PFD ¶¶ 65-74.

**26.** The historical record identifies prior drought periods with occasional but not persistent flows below 6000 cfs—after which the Bay and River resources recovered. Hornberger PFD ¶ 54; FX-D-1; Ward PFD ¶ 34; Berrigan Tr. Test. (vol. 4) 1012:24-1013:9; Glibert Tr. Test. (vol. 7) 1863:12-:16. For example, in the droughts of 1986-88, flows fell substantially below 6000 cfs in two summer months (August 1986 & August 1988), but ultimately recovered, and there was no fisheries disaster (as occurred in 2011-12). *See* FX-D-1; Sutton PFD ¶¶ 59, 66. Even the severe low flows seen in 1999-2001 did not precipitate a total crash of the fisheries; although low flows occurred for multiple months in 2000, the same pattern was not immediately repeated in 2001-02 (in part because Georgia paid many farmers not to irrigate under the FRDPA during that period, *e.g.*, Reheis PFD ¶¶ 52-56). The difference in 2011-12 was that flows dropped well below 6000 cfs and remained there for many months at a time for multiple years. FX-D-1.

**27.** This historical record of the River and Bay's resiliency when flows were consistently maintained at levels 1000 to 2000 cfs above current minimums is sufficient, by itself, to show that the River and Bay could recover with the help of a decree. But Florida presented more. For example, Florida offered scientific evidence that increases in freshwater flow and corresponding reductions in salinity would boost the oyster population by driving out marine predators and promoting an increase in oyster biomass. *See*, *e.g.*, Kimbro PFD ¶¶ 7, 101; Kimbro Trial Tr. (vol. 6) 1570:23-1572:2; Glibert PFD ¶¶ 83-84; Glibert Tr. Test. (vol. 7) 1867:24-1870:12. Florida provided scientific evidence of the benefits that a decree would have for the River, too. For example, the evidence showed that maintaining river flow levels at 6000 cfs, 7000 cfs, or higher, would ensure that many more Apalachicola floodplain sloughs remain connected and would also keep channel margins inundated, thereby preserving a much greater percentage of the river life and the Apalachicola forests. *See* Allan PFD ¶ 67 ("an increase in flow in the range of 300-500 cfs . . . when flows are 6,000 cfs, would raise water levels in many sloughs by 3 to 5 inches and will connect a number of disconnected sloughs"); *id.* ¶¶ 26-27, 32, 43, 66, 73-74; Kondolf Tr. Test. (vol. 10) 2629:7-15; Hoehn PFD ¶¶ 43, 48-50, 53. Florida thus showed that a remedy that prevents the recent pattern of persistent low flows from recurring is likely to allow both the Bay and the River to more closely approximate their natural function, with healthy periods of drought and recovery, and prevent another devastating crash. *See* Kimbro PFD ¶ 7; Glibert ¶¶ 5(e), 81-84; Allan PFD ¶¶ 65-70.

**28.** If left unchecked, moreover, Georgia's consumption of ACF water will continue to grow substantially. *See, e.g.*, Sunding PFD ¶¶ 40-41, 88. In the Flint Basin, although irrigated acreage has grown more than ten-fold in recent decades already, Lancaster Rep. at 32-33, massive additional growth is possible. Sunding PFD ¶ 40. Under most existing ACF irrigation permits, farmers can use as much water as they can physically pump from the ground. *Id.* ¶ 36; Lancaster Rep. at 33. And Georgia acknowledges that existing permittees can legally irrigate 30% more acres than they currently do. Sunding PFD ¶ 40. This could have additional profound effects further reducing ACF riverflow in the future. *See* Hornberger PFD ¶¶ 3(h), 126. Despite the recent severe low flows, Georgia continues to issue *new irrigation permits*. Lancaster Rep. at 34 (citing Turner Tr. Test. (vol. 12)

3089-90). A percentage of Georgia farmers who do currently have irrigation permits are also illegally irrigating unpermitted acreage—up to 90,000 additional acres in the Flint Basin alone. Sunding PFD ¶ 40. In 2014, Georgia formally amended the FRDPA (which was intended to limit irrigation in drought years) *to be purely discretionary rather than mandatory*. JX-105 at 3-4; Turner Tr. Test. (vol. 12) 2968:1-2969:14; *see supra* ¶¶ 19-20.

**29.** Georgia could offset predicted growth in water use in Atlanta by employing a number of relatively modest measures (including accelerated leak abatement in Atlanta, restrictions on lawn watering, or reduction of certain irrigation practices in other parts of the state).[6] Thus, an equitable apportionment need not threaten Atlanta's growth.

**30.** Florida's expert, Dr. Sunding, also provided multiple examples of how Georgia could achieve specific short and long term consumption reductions of 1000, 1500 or 2000 cfs with a range of measures, almost all of which have either been proposed by Georgia officials internally or utilized successfully in other states, including in Florida. *See, e.g.*, Sunding PFD ¶ 46-47, 49-50, 52, 55-57, 59-61, 67-70, 80, 90, Tables 4-6; FX-784 ¶¶ 161-65, 173-77; Sunding Tr. Test. (vol. 11) 2851:3-22, 2852:5-2853:7, 2853:16-2856:4, 2867:8-17; JX-154 at GA00671254; Turner Tr. Test. ( vol. 12) 2980:18-2981:4, 2974:22-2976:9; Cowie Tr. Test. (vol. 9) 2250:5-19; Cyphers PFD ¶¶ 36-37, 39-40, 53-56.

**31.** Dr. Sunding's examples also addressed row crop irrigation. Row crop agriculture in the Georgia ACF is less than one half of one percent of the Georgia ACF economy, and

[6] *See* JX-41 at 28, Fig. 13, 32; JX-40 at 3, 6, 61, 63; Sunding PFD ¶¶ 73-75; Sunding Tr. Test. (vol. 11), 2871:3-18, Kirkpatrick Tr. Test. (vol. 13) 3396:15-3398:10; GX-829 (GA02452318-26).

only about half of Georgia's row crops are currently irrigated, demonstrating that many Georgia farmers continue to be successful with no irrigation. Sunding PFD ¶¶ 21-22.

**32.** In any event, Florida's proposed remedy does not seek to ban all irrigation; instead Florida itemized the many ways in which Georgia could minimize any economic impact of irrigation reductions on those crops—including by increasing irrigation efficiency, drilling deeper irrigation wells to lower aquifers which do not affect river flow, paying farmers not to irrigate in particular years (as Georgia law already contemplates), or permanently buying back farmers' irrigation rights for some or all of their acreage. Sunding PFD ¶¶ 55-61, 86-87, 90, Table 4; Turner Tr. Test. (vol. 12) 2968:19-2969:14.

**33.** In sum, Florida has demonstrated that a remedy providing 2000 additional cfs in flows in summer months of peak consumption during drought would be reasonable and not unduly costly to Georgia. Sunding PFD ¶¶ 90, 113, Table 4; Hornberger PFD ¶¶ 112, 123.

**34.** Georgia introduced evidence at trial showing that it previously proposed a minimum flow requirement of 6000 cfs at the Florida State line that it believed would be "feasible." Zeng PFD ¶¶ 140-41; Turner Tr. Test. (vol. 12) 3074:18-3076:21. Georgia's proposal included building the Glades and other reservoirs outside Atlanta (at an estimated cost in the hundreds of millions of dollars to the State) and moving a number of Flint Basin irrigation wells to lower aquifers that do not impact river flow (also at additional cost to the State), along with negotiating certain reasonable operational modifications with the Army Corps. *See* Zeng PFD ¶¶ 140-41; JX-154 at GA00671254; Turner PFD ¶¶ 55-56. This prior Georgia proposal provides a yardstick—identifying what even Georgia believed would be an equitable resolution of this dispute. *See* Sunding PFD ¶¶ 88-93 (approximating fiscal cost of peak 2000 cfs remedy at $35 million per year and estimating costs of other remedies).

**35.** Georgia documentation also indicates how much of its irrigation-related consumption the State truly believes is unreasonable. Georgia's own 2011 "sustainability" analysis for the Flint River demonstrates the State's conclusion that Georgia irrigation was withdrawing far too much water from the river—with a 1376 cfs *maximum shortfall* in Flint River flows at the Bainbridge, USGS gage located approximately 15 miles north of Lake Seminole, and other persistent shortfalls. FX-24 at 3-6, 3-9; GX-1247 at ES-4; FX-961 (slides 11, 14) and FX-961a (Caldwell Dep. 35:2-8, 37:15-25), *see also* FX-24 at 6-4 to 6-11, 7-2 to 7-12 (detailing unimplemented "high priority" actions needed to address shortfalls). The 1376 cfs peak shortfall at the Bainbridge gage accounts for much, but not all, of Flint Basin flows to Lake Seminole, and suggests that Georgia's total excessive consumptive use peaks at a total materially higher than 1376 cfs, and likely substantially greater than 1500 cfs for the entire ACF Basin. *See* Sunding PFD ¶¶ 88-90 & Tables 4-6.

**36.** Additionally, although Georgia understood the urgent need to restrict its irrigation by the 1990s (*see supra* ¶ 17), Georgia continued to grant new permits, nearly doubling ACF irrigated acreage since the early 1990s, and increasing it by roughly 40% since 1998. FX-D-16 (itemizing total ACF permitted acres by year). Had Georgia frozen irrigation acreage at 1990s levels, and then taken reasonable steps to limit excess water use on those acres, the State would have saved a *very* significant amount of water. In 2006, Georgia issued a plan to reduce Flint Basin irrigation in predicted drought years, JX-21, although the plan was criticized by federal officials for not being sufficiently protective of the environment. FX-46 at GA537489-91. If Georgia had carried out that 2006 plan—which it did not—it would have capped Flint Basin irrigation at approximately 450,000 acres in drought years. *See* JX-21 at 15. Instead, the total number of 2013 irrigation acres was roughly 800,000. Sunding PFD ¶ 28, Table 1.

***U.S. Army Corps Operations***

**37.** "The United States has made clear that the Corps will work to accommodate any determinations or obligations the Court sets forth if a final decree equitably apportioning the Basin's waters proves justified in this case." *Florida v. Georgia*, 138 S. Ct. at 2526.

**38.** The Corps adopted its recent revisions to its Master Manual in response to Georgia's request (based on Georgia's water use projections through 2050) to supply more water from Lake Lanier for the Atlanta area. FEIS at ES-2-5; JX-126 at 1-2. The Corps concluded that these revisions meet all ACF system needs. *See* Record of Decision adopting Proposed Action Alternative for Implementation of Updated ACF Master Manual (Mar. 30, 2017) ("R. of Decision"), https://bit.ly/2WzrMFX, at 8, 19.

**39.** An equitable apportionment reducing Georgia's consumption will only result in more water flowing through the ACF river system, and therefore could not impede those system needs. *Florida v. Georgia*, 138 S. Ct. at 2526.

**40.** Even assuming the current Master Manual remained in place wholly unchanged, Florida would receive beneficial additional flows as a result of an apportionment in all but extraordinary circumstances. First, the Corps has authority to make discretionary releases (even without a Supreme Court equitable apportionment) to protect the Apalachicola River, as it has done. Lancaster Rep. at 53, 55 ("[t]he evidence supports Florida's contention that the Corps retains the discretion to release more than the required 5,000 cfs minimum" and "Florida is likely correct that the Corps has historically exercised its discretion to" do so); *see also* JX-124 at 2-72 to 2-73 (Draft EIS); FEIS at 2-75.

**41.** Moreover, as the Supreme Court has already recognized, even if the Corps made no discretionary releases during formal "drought operations," releases already anticipated under the existing Manual *would be beneficial to Florida*. *Florida v. Georgia*, 138 S. Ct. at 2523. Under the Master Manual, "drought operations" are not coincident with climatic droughts (low precipitation); drought operations depend instead on specific enumerated water levels in four ACF reservoirs in Georgia. Master Manual at 7-22 (Mar. 2017). History demonstrates that reservoir "drought operations" *did not occur* during the first year of recent climatic droughts, *e.g.* in 2007 or 2011, and were only triggered at a point during the second year of those drought periods. FEIS at 4-18 to 4-20 (2016); R. of Decision at 2; FX-811 at 2; GX-924.

**42.** Moreover, because drought operations are only commenced when conservation storage drops to the designated levels, if the Corps had been able to store (or not release) a mere 40,000 acre-feet more water in the 2011-2012 drought, it could have avoided drought operations entirely. *See* GX-924 (chart of composite storage in 2012, showing storage only dipped briefly into drought operations in April/May and July 2012). The remedy Florida has requested would have produced that water: It would increase streamflow by up to 2000 cfs daily in peak summer months in drought years, *see* Sunding PFD ¶ 89, which amounts to approximately 120,000 acre feet of additional available water over the course of a month. Thus, in the 2011-2012 drought alone, the Corps—following its own manual—could have stored a third of the water saved by a consumption cap in just one month to avoid drought operations entirely, while releasing the additional flows to benefit the Apalachicola.

**43.** Even assuming that drought operations took effect in the second year of a future drought under the new manual and the Corps chose not to make discretionary releases, the additional flow of water from consumption cap reductions could be sufficient to end such operations quickly. Under the new manual, drought operations could be triggered when composite storage falls below reservoir composite storage zone 3. Master Manual at 7-22–7-23. Even assuming the Corps would act to offset consumption cap savings, thousands of cfs in additional flows from a consumption cap could return composite storage to a level where drought operations cease after just a few months. *Id.* at 7-22.

**44.** In addition, the drought year consumption cap proposals by Florida would limit groundwater withdrawals from the Upper Floridan aquifer (and growth of those withdrawals in the future). Limiting aquifer withdrawals could guard against exactly what occurred during the 2011-12 crash, when the aquifer was severely depleted by the second year of drought and severely impacted river flow. *See supra* ¶¶ 9-10.

## CONCLUSIONS

**1.** Georgia's consumption of the waters at issue has been, under equitable principles, unreasonable, wasteful, and inefficient. *Florida v. Georgia*, 138 S. Ct. at 2513.

**2.** Because of Georgia's unreasonable consumption, Florida has suffered an "invasion of rights" of a "serious magnitude," in the form of devastating harm to the ecosystems of the Apalachicola River and Bay and the communities that depend on them. *Id.* at 2514; *New York v. New Jersey*, 256 U.S. 296, 309 (1921).

**3.** A decree capping Georgia's consumption would produce benefits in Florida that would "substantially outweigh the harms that might result" from the decree. *Florida v. Georgia*, 138 S. Ct. at 2527 (citation omitted).

**4.** Any uncertainty about how the Corps would respond to a decree provides no reason for declining to enter a decree. *See id.* at 2514, 2526.

**5.** Considering all relevant factors, therefore, the Special Master determines that Florida is entitled to a decree equitably apportioning the waters at issue.

**6.** The decree shall hold ACF consumption by Georgia at current levels in all years and require an additional reduction in Georgia consumptive uses sufficient to improve ACF flows reaching Lake Seminole by 2000 cfs in summer months of predicted drought years.

**7.** The parties are encouraged, and the United States is invited, to meet and agree upon the best manner of implementing such a decree. If they cannot do so, the Special Master, following additional briefing, will set the terms of the decree.

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Respectfully submitted,

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