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 PRETRIAL BRIEF

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TABLE OF CONTENTS

Page

TABLE OF AUTHORITIES

Page(s)

Cases

Statutes, Rules & Legislative Materials

Other Authorities

INTRODUCTION

As Justice Holmes famously observed, "A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it." *New Jersey v. New York*, 283 U.S. 336, 342 (1931) (apportioning interstate waters to protect, *inter alia*, downstream oyster fisheries). That is an apt description of the river system at issue in this case—the Apalachicola-Chattahoochee-Flint River ("ACF") Basin—which is widely recognized as one of the most unique ecosystems in the United States, and in the world. And what Justice Holmes said immediately following the famous quote above is equally true here: Whereas the upstream State may have "the physical power to cut off all the water within its jurisdiction," "clearly the exercise of such a power to the destruction of the interest of lower States could not be tolerated." *Id.* It can no longer be tolerated as to the waters at issue here.

Since the 1970s, Georgia's upstream water consumption from the Flint and Chattahoochee Rivers has grown drastically. Farmers in southwest Georgia are consuming exponentially more irrigation water from the Flint River Basin, and, according to Georgia's own estimates, consumption in Metro Atlanta, which doubled from the 1970s to the present, may double again by 2050. These dramatic increases are having predictable and undeniable effects on the ecosystem: Florida's Apalachicola River (fed by the Flint and Chattahoochee) has recently experienced the lowest flows in recorded history. These extreme low flows occur for months at a time and are gravely threatening not only a treasured natural resource, but also a way of life for the residents of the Apalachicola Bay region. This harm is worsening with every drought; if the status quo continues, Florida's injuries will be catastrophic and irreversible.

Georgia's own admissions and historical documents confirm that it has long recognized the dire problem its consumption is causing on this interstate water system. Indeed, twenty years ago, Georgia, along with Florida and Alabama, agreed that a multi-state solution was required.

In 1997, the legislatures of these states, along with the U.S. Congress, voted by wide margins for the ACF Basin Compact (the "Compact"), Pub. L. No. 105-104, 111 Stat. 2219 (1997), FX-209. And Georgia's then-Governor acknowledged: "We fully recognize that Florida has a very real and significant interest in the future of Apalachicola Bay and its surrounding environmental ecosystems, and in her other uses of water. . . . [W]e can allocate the waters of these major river systems in a manner that is equitable and fair to all concerned." FX-205, at GA00128575-76. The Compact dissolved in 2003 with the States unable to reach an agreement—and the problem worsened as Georgia's water use grew.

More than a decade ago, Harold Reheis, the then-Director of the Environmental Protection Division ("EPD") of Georgia's Department of Natural Resources, admitted:

> [S]ubstantial population growth in some regions of Georgia have been accompanied by significant increases in demands on our water resources to meet the water consumption desires of that burgeoning population. Advancements in irrigation technology during the 70's and 80's have allowed farmers in predominantly agricultural regions of Georgia to apply larger (and more timely) quantities of supplemental water to their crops to increase crop yields and profits. These increases in demand for water have not been accompanied by corresponding advancements in efforts to conserve; hence the amount of water we are collectively withdrawing and consuming has *dramatically increased*. [FX-7, at GA00014045 (emphasis added).]

And Georgia understands even today the harm wrought by its consumption. As the official overseeing its "Water Supply" programs acknowledged, the Flint River has fallen well below Georgia's own definition of "sustainable flows" in 7 of the past 16 years. Caldwell Dep. 29:14-35:21 (acknowledging unsustainable flows in 2001, 2002, 2006, 2007, 2008, 2011, and 2012). And the principal aquifer feeding that river (the Upper Floridan) has seen losses from agricultural irrigation far beyond Georgia's own sustainability metrics for that aquifer:

> I can only conclude that the estimated current use of ground water 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 ground water

assessment. [Caldwell Dep. 37:20-25.]

See also infra pp. 20-22 (describing Georgia's recent failures to meet federal standards as well).

The impacts of Georgia's consumption are beyond any reasonable debate. Objective data from federal government measuring devices tell the story clearly: dry and drought year flows to the Apalachicola River have been far lower in the past sixteen years than during any prior drought in recorded history. *See infra* pp. 16-21. During their failed Compact negotiations more than a decade ago, Florida and Georgia contemplated that extreme low flows would occur only very rarely (1-2% of the time), but now they are shockingly more frequent—in 2011 for 6 consecutive months, and in 2012 for 8 consecutive months. Without a remedy in this case, Florida will be subject to Georgia's unconstrained growth, not only repeating the devastating events in the Apalachicola of the past decade (including the 2012 Apalachicola oyster crash), but making them far worse. For example, even under *existing* agricultural irrigation permits, Flint River Basin farmers could further increase irrigation by hundreds of thousands of additional acres, reducing Flint River flows to a tiny percentage of their historical levels.

High-ranking Georgia officials admit there is a problem, but acknowledge that they lack any "viable management tool" to fix it. FX-91, at GA00208715 ("There is no doubt that we need a viable management tool to deal with drought in the Flint River Basin . . . ."). The one viable tool Georgia had in the 2000s—an auction process to buy out farmers' irrigation rights during dry years—was abandoned in 2014 as too expensive. Similarly, although Georgia considered in 2009 whether to make infrastructure investments and implement other measures to supply and conserve water for Metro Atlanta's uses, Georgia opted not to pursue many of those options. *See generally* FX-192; FX-190. And while Georgia's EPD has repeatedly initiated studies to try to find solutions (*see infra* pp. 32-34), it appears that Georgia lacks the political will to implement any of them without a court order. Despite more than 20 years of negotiations,

Georgia seems unable to offer (much less agree to) any meaningful or binding obligation to constrain its own upstream consumption *to any extent*.[1] This case is Florida's only opportunity to impose genuine limits on Georgia consumption.

Given Georgia's inability to agree to any genuine constraints on its own conduct, an equitable apportionment of these interstate waters is necessary and entirely justified. Georgia itself previously recognized that before adopting its current litigation posture. Brief of Appellee the State of Georgia, *Georgia v. U.S. Army Corps of Eng'rs*, Nos. 02-10135D, 02-10135DD, 2002 WL 32641401, at *9 (11th Cir. Feb. 8, 2002) ("Whether or not Georgia obtains additional water supply [storage space] from Lake Lanier, . . . Florida will still be entitled to its equitable apportionment of waters flowing from Georgia and could still file an equitable apportionment case in the United States Supreme Court.") (lawsuit filed by Georgia to compel Army Corps of Engineers (the "Corps") to increase water supply available to Atlanta from Lake Lanier).

Under the federal common law of equitable apportionment applicable between riparian states, Georgia must use water from this shared resource reasonably and equitably, and it owes Florida 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 States," including Florida. *Idaho ex rel. Evans v. Oregon*, 462 U.S. 1017, 1025 (1983) (citing *Colorado v. New Mexico*, 459 U.S. 176, 185 (1982) (*Colorado v. New Mexico I*)). The remedy Florida seeks in this case is a consumption cap. The concept of a consumption cap is not entirely new to Georgia; discovery has shown that Georgia has agreed on such caps with South Carolina and Alabama, albeit on a smaller scale. The consumption cap Florida seeks in this case

[1] Florida has always been open to serious substantive discussions about the possibility of a negotiated consumption cap, and remains so to this day.

has two principal elements.

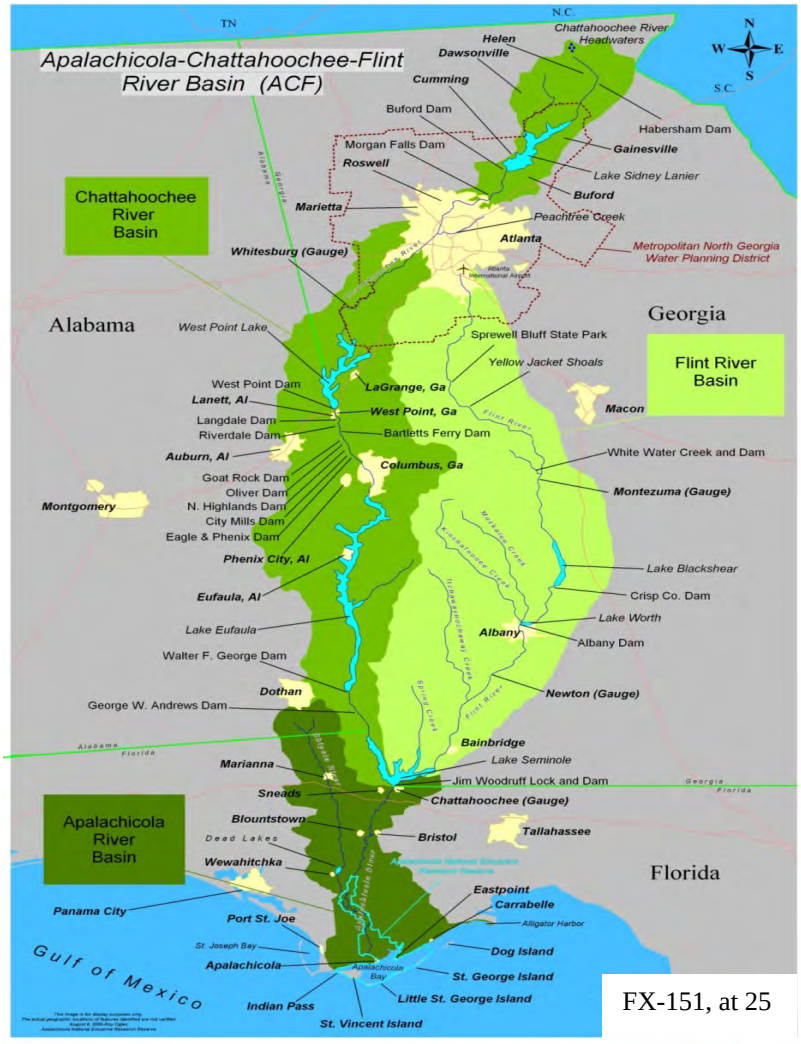
First, Georgia should be required to cap its annual average consumption of water from the ACF watershed. As described below (*see infra* pp. 37-38), this can be accomplished with a combination of reasonable conservation measures in Metro Atlanta and elsewhere in the state. The necessary measures are not novel; Georgia has previously contemplated each, but has either failed to implement or only partially implemented them. None of these measures needs to constrain the future economic growth of the Metro Atlanta region.

Second, additional consumption cutbacks are necessary during drought years, when Florida faces the greatest harm; during those years, Georgia's extreme levels of consumptive water use significantly worsen what are already reduced flows. Equity requires that Georgia share the pain with Florida, not avoid it at Florida's expense. Thus, in drought years, consumption can be reasonably capped so that net depletions of the Flint and Chattahoochee Rivers are reduced in key months, including by 1500 to over 2000 cubic feet per second ("cfs") in peak summer months. Florida will present testimony demonstrating a range of measures that can achieve such reductions, from lawn watering restrictions and leak abatement in Metro Atlanta to specific irrigation programs in the Flint River Basin and the Lower Chattahoochee area. Again, these measures are either actions Georgia has previously considered but never fully implemented, or measures Florida has already undertaken in the Apalachicola Basin.

After providing brief background on the Apalachicola region of Florida, this pretrial brief: (1) identifies the appropriate legal framework applicable here, pp. 10-15; (2) outlines elements of Florida's anticipated trial presentation, pp. 15-37; and (3) explains that, using reasonable conservation measures, Georgia can reasonably comply with Florida's proposed consumption cap, pp. 37-39.

BACKGROUND: THE APALACHICOLA BASIN

The Apalachicola River is fed by Georgia's Chattahoochee and Flint Rivers. The Chattahoochee River originates northeast of Atlanta, eventually forming part of the border between Georgia and Alabama. The Flint River originates just south of Atlanta and is fed largely through hydrologic connections with the Upper Floridan Aquifer and to some extent by other deeper aquifers. These two rivers converge at Lake Seminole north of the Florida-Georgia border and then form the Apalachicola River, which flows, unimpeded by any dam, into the Apalachicola Bay by the Gulf of Mexico. These rivers, their tributaries, and hydrologically connected waters comprise the ACF Basin.



FX-151, at 25

The Apalachicola ecosystem is a protected national treasure. From the Apalachicola River's northernmost point and extending approximately 120 miles south to Apalachicola Bay's barrier islands, the Basin is roughly the size of Delaware. No written words could do justice to the majesty and beauty of the Apalachicola River and Bay. The Apalachicola National Estuarine Research Reserve ("ANERR") has released a 12-minute video presentation, "Apalachicola River & Bay: A Connected Ecosystem," depicting and describing the ecosystem as a whole. FX-675, https://youtu.be/E7v1a9BLXW4. Florida respectfully suggests the Court view this video to gain a better appreciation for the natural beauty and the geography of the Basin.

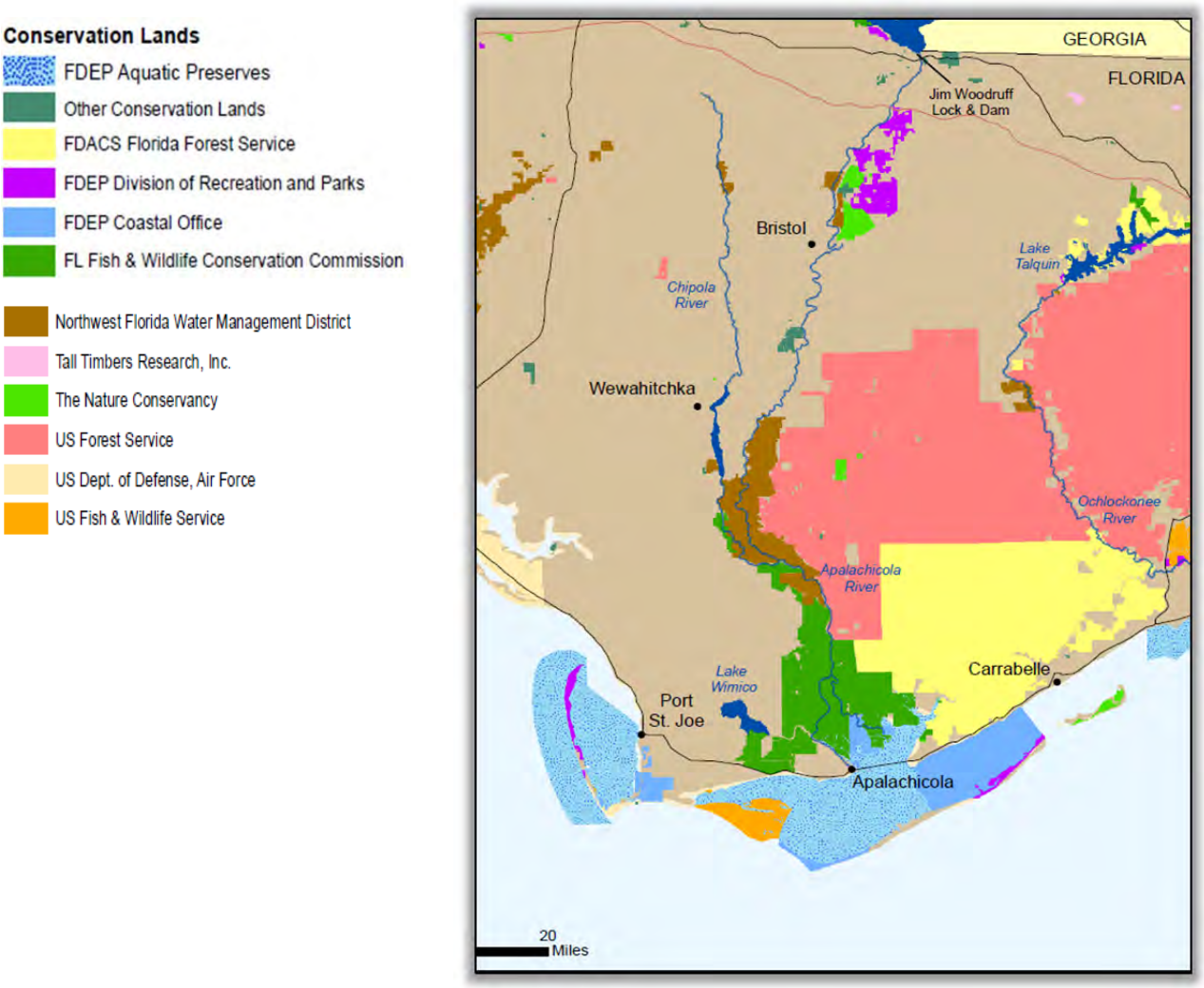
The Apalachicola Basin is uniquely rich in animal and plant life. The United Nations describes it as "one of the most productive estuarine systems in the northern hemisphere" and the place with "the highest species density of amphibians and reptiles in all of North America (north of Mexico)." FX-154, at 1. The Nature Conservancy puts it this way: "The Apalachicola River and Bay region is a biological hotspot, unique to Florida and home to a disproportionate number of imperiled species and habitat." Nature Conservancy, *Florida: Apalachicola Bluffs and Ravines Preserve*, http://tinyurl.com/hprzlfwl (last visited Oct. 9, 2016). Historically, Apalachicola Bay has been considered one of the country's least polluted and most resource rich systems, supporting a complex, productive food web and rich plant habitats that provide refuge and nursery areas for fish and shellfish. The Apalachicola region also is one of the most beautiful places in the country:

Apalachicola River, https://clydebutcher.com/pc/photographs/ (last visited Oct. 10, 2016); FX-324a

Nearly fifty years ago, when Atlanta was a fraction of its current size and very few Georgia farmers irrigated, Florida began protecting the Apalachicola River and Bay through a series of legal actions that heavily restricted development. In 1969, for example, Florida designated the Bay as an Aquatic Preserve under state law, "set aside forever . . . for the benefit of future generations." *See* Fla. Stat. §§ 258.36, 258.39(18). In 1979 and 1984, Florida classified the Bay and Apalachicola River as Outstanding Florida Waters, recognizing their "exceptional recreational [and] ecological significance" and affording them "the highest protection" against the permanent degradation of water quality. *See, e.g.*, Fla. Admin. Code § 62-302.700; FX-376, at 2; FX-137, at 1-2; *see also* 40 C.F.R. § 131.12(a)(3) (Clean Water Act's "anti-degradation rule," which is designed to prevent the degradation of water quality). Similarly, in 1979, the federal government designated the Bay and the lower Apalachicola River a National Estuarine Research Reserve under the federal Coastal Zone Management Act—the nation's second largest such reserve—to preserve the ecosystem for long-term research, water-quality monitoring, education, and coastal stewardship. FX-151, at 1. And in 1984, UNESCO (an arm of the United Nations) selected the River and Bay for designation as an international "Biosphere Reserve" to ensure conservation of the region's unique biological diversity. FX-154.

Florida has also engaged in a systematic effort to protect the region through conservation

land purchases. Since 1965, it has spent approximately $466 million dollars to purchase and preserve over 342,000 acres within the Apalachicola Basin, and millions more to manage these areas and their wildlife, and has accepted land donations valued at an unadjusted cost of $709,487. *See* FX-144. Many of these protected state lands are connected to each other or to lands conserved separately by the federal government or The Nature Conservancy. *See, e.g.*, FX-672. As a result, a substantial portion of the region is now protected state and federal conservation land (FX-143):



In addition, Florida has undertaken extensive efforts to restore and protect areas of the Basin and the hydrologic connectivity between the Apalachicola River and sloughs and lakes, including by

halting dredging by the Corps (which was historically done to benefit upstream ports like Columbus and Bainbridge, Georgia), *see, e.g.*, FX-404; and restoring Tate's Hell State Forest to its natural hydrology and ecology, *see, e.g.*, FX-321b.

The region also contains historic communities, whose social well-being is intrinsically linked with the health and sustainability of the ecosystem and who rely economically upon Apalachicola Bay's oyster, shrimp, and other fisheries, the production of tupelo honey, and tourism. For example, the Bay's famous oyster fishery has been harvested since at least the mid-1800s. Until 2012, when the entire Apalachicola oyster fishery crashed, the Bay produced 90% of the State's oysters and 10% of the nation's harvest. Unlike many other areas in the United States, no automated or mechanical means of oyster harvesting are allowed on public oyster bars in Apalachicola Bay; as has been the case for generations, oystermen harvest on those bars from small boats using handheld devices known as tongs.

LEGAL FRAMEWORK GOVERNING THE PROCEEDINGS

"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. *Colorado v. New Mexico I*, 459 U.S. at 183. The doctrine is "neither dependent on nor bound by existing legal rights to the resource being apportioned," but is "based on broad and flexible equitable concerns rather than precise legal entitlements." *Idaho v. Oregon*, 462 U.S. at 1025. A few considerations warrant further mention here.

"The laws of the contending states concerning intrastate water disputes are an important consideration governing equitable apportionment." *Colorado v. New Mexico I*, 459 U.S. at 183. When all the states subject to an equitable apportionment share a similar body of water common law, those principles guide the Supreme Court's equitable apportionment analysis, subject to any modifications that equity so requires. *Id.* at 183-84 (holding that when "both States recognize

the doctrine of prior appropriation, priority becomes the 'guiding principle' in an allocation between competing States"); *New Jersey v. New York*, 283 U.S. at 342-43 (taking into account the riparian rights doctrine applied in both states); *Wyoming v. Colorado*, 259 U.S. 419, 456-57 (1922) (taking into account the prior appropriation doctrine applied in both states); *Nebraska v. Wyoming*, 325 U.S. 589, 618 (1945) (same); *see also* A. Dan Tarlock, Law of Water Rights & Resources §§ 10:20-21, Westlaw (database updated July 2016).

Both Georgia and Florida are riparian states, and not prior appropriation states where the "relative rights of water users are ranked in order of their seniority," *Colorado v. New Mexico I*, 459 U.S. at 179 n.4. *See 5F, LLC v. Dresing*, 142 So. 3d 936, 939-40 (Fla. Dist. Ct. App. 2014); *Game & Fresh Water Fish Comm'n v. Lake Islands, Ltd.*, 407 So. 2d 189 (Fla. 1981); *Pyle v. Gilbert*, 265 S.E.2d 584, 586 (Ga. 1980) (citing *Hendrick v. Cook*, 4 Ga. 241 (1848)), *overruled in part on other grounds by Tunison v. Harper*, 690 S.E.2d 819, 821 (Ga. 2010); Ga. Code Ann. § 44-8-1. The background principle of the riparian rights doctrine is that a downstream user is entitled to the river's *usual and natural* flow, subject only to diminution by *reasonable* upstream consumptive uses. *See, e.g., Colorado v. New Mexico I*, 459 U.S. at 179 n.4 ("Under the riparian doctrine . . . the owner of land contiguous to a watercourse is entitled to have the stream flow by or through his land undiminished in quantity and unpolluted in quality, except that any riparian proprietor may make whatever use of the water that is reasonable with respect to the needs of other appropriators."); *Stewart v. Bridges*, 292 S.E.2d 702, 704 (Ga. 1982) ("Georgia's water rights law is based on the natural flow theory of the riparian rights doctrine modified by a reasonable use provision. Under this theory every riparian owner is entitled to . . . have the stream pass over his land according to its natural flow subject to the reasonable use of the water by other riparian owners."); *Robertson v. Arnold*, 186 S.E. 806, 809 (Ga. 1936); *5F, LLC*, 142

So. 3d at 940; Tarlock, Law of Water Rights & Resources §§ 3:55-58, 3:60.

Correlatively, *any riparian owner's use of water must be reasonable under the then-present circumstances, and prior use of water does not confer any absolute right to use that water in the future. 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*, 292 S.E.2d at 704; *Roughton v. Thiele Kaolin Co.*, 74 S.E.2d 844, 846 (Ga. 1953); *5F, LLC*, 142 So. 3d at 941; *Florio v. State ex rel. Epperson*, 119 So. 2d 305, 310 (Fla. Dist. Ct. App. 1960). So, for example, a farmer irrigating his or her crops in a particular fashion might be acting reasonably in a relatively wet period, but during a drought or an extended dry period the same type of irrigation method could be wholly unreasonable because of its impact on downstream users. *E.g.*, *Mason v. Hoyle*, 14 A. 786, 794 (Conn. 1888) (holding that mill operator's water withdrawals, while reasonable during most of the year, were unreasonable during three month dry season).

Notably, both Florida and Georgia employ so-called "regulated" riparian regimes, which make clear that the states in their sovereign capacity can and should regulate a riparian's use of water to protect the natural environment and ensure sustainability of the resource.[2] *See, e.g.*, FX-

[2] *See, e.g.*, *Tunison*, 690 S.E.2d at 821 (rejecting lower court's determination that irrigation was a superior water use to aesthetic and environmental interests); *Conservancy, Inc. v. A. Vernon Allen Builder, Inc.*, 580 So. 2d 772, 779 (Fla. Dist. Ct. App. 1991) (reversing permit grant because environmental impact was not properly considered); *Bd. of Trs. of Internal Improvement Trust Fund v. Levy*, 656 So. 2d 1359, 1363-64 (Fla. Dist. Ct. App. 1995); Ga. Code Ann. §§ 12-5-20 to -31 (establishing regulation of surface water resources); *id.* §§ 12-5-90 to -107 (establishing permitting regime for groundwater resources); *id* § 51-9-7 (imposing reasonable use requirement); *id.* § 12-6A-2-4; *id.* § 12-5-31(l)(1) (permitting Georgia to declare emergency when necessary to prevent "serious harm to the water resources of the area"); Ga. Comp. R. & Regs. 305-1-.04; *id.* at 391-3-28-.01 *et seq.*; Cowie Dep. 94:24-95:16 (describing authority to augment river flows and limit permit holder withdrawals in support of wildlife); Fla. Stat. §§ 373.016-373.056 (establishing regulation of water resources); *id* §§ 373.203-373.249 (establishing permitting regime); *id.* § 373.223(1) (imposing reasonable-beneficial use requirement for permits); *id.* § 373.016(3)(g) (declaring state policy to "preserve natural

20, at 43 ("Georgia is a 'regulated riparian[]' state . . . ."). Indeed, Georgia's laws recognize the need to conserve water for the health of the natural ecosystems. *Id.* (explaining that under Ga. Code Ann. § 12-5-96, "[t]he State must consider 'injury to public health, safety, or welfare which would result if…[aquifer] impairment were not prevented or abated', and the extent of any injury or detriment caused or expected to be caused to other water users, including public use" (alterations in original)); *id.* ("[A] maximum level of water withdrawals that caused injury or detriment would expose Georgia and existing users to legal action from the affected parties.").

In determining an equitable apportionment between riparian states, the "guiding principle" is ***reasonable use***. *See New Jersey v. New York*, 283 U.S. at 342-43; *Colorado v. New Mexico I*, 459 U.S. at 183-84. When determining whether Georgia's consumptive use of water is reasonable, the Supreme Court will consider "all relevant factors." *South Carolina v. North Carolina*, 558 U.S. 256, 271 (2010) (quoting *Colorado v. New Mexico I*, 459 U.S. at 183). These factors include, *inter alia*, the physical and climatic conditions, the degree to which Georgia's uses are reasonably efficient, and the effect of those uses on Florida, including its wildlife and environment.[3] *See id.*; *Nebraska v. Wyoming*, 515 U.S. 1, 11-14 (1995); *Colorado v.*

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resources, fish, and wildlife"); *see also* James L. Bross, 4-GA Water and Water Rights § II (Amy K. Kelley ed., 3d ed. 2016) (Riparianism); Joseph W. Dellapenna, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. Ark. Little Rock L. Rev. 9, 31-37 (2002).

[3] Moreover, as a species of the federal common law, an equitable apportionment must be mindful of the long-standing trend in federal law toward increased consideration and protection of environmental interests. *See Textile Workers Union v. Lincoln Mills*, 353 U.S. 448, 456-57 (1957) (noting that federal common law applicable to a labor dispute "must [be] fashion[ed] from the policy of our national labor laws"); *see, e.g.*, Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, Pub. L. No. 109-479,120 Stat. 3575 (2007); National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (1970); Wild and Scenic Rivers Act, Pub. L. No. 90-542, 82 Stat. 906 (1968); Fish and Wildlife Coordination Act, Pub. L. No. 73-121, 48 Stat. 401 (1934); Endangered Species Act of 1973, Pub. L. 93-205, Clean Water Act of 1977, Pub. L. 95-217, 91 Stat. 1566 (1977).

New Mexico I, 459 U.S. at 158. Unlike a prior appropriation regime, a riparian user has no absolute right to use a certain quantity of water in the future regardless of the circumstances. Here, this means Georgia's consumptive uses must at all times be *reasonable* given the then-present climatic circumstances (including drought), as well as the harm Georgia's uses will inflict in the Apalachicola Basin. The Court's ultimate task is to determine a "'just and equitable' allocation" of the interstate water system. 459 U.S. at 183 (quoting *Nebraska v. Wyoming*, 325 U.S. at 618).

In addition, Georgia has 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 Florida. *Idaho v. Oregon*, 462 U.S. at 1025 (citing *Colorado v. New Mexico I*, 459 U.S. at 185). Georgia has a duty to "conserve the common supply." *Wyoming v. Colorado*, 259 U.S. at 484. And Georgia should be required to "employ 'financially and physically feasible' measures "adapted to conserving and equalizing the natural flow." *Colorado v. New Mexico I*, 459 U.S. at 185 (citation omitted).

In an equitable apportionment action, the state seeking to prevent or enjoin a diversion by another state bears the burden of proving by clear and convincing evidence that the diversion has caused or will cause it "'real or substantial injury or damage.'" *Id.* at 187 n.13 (citation omitted). Here, as a downstream riparian state seeking an equitable apportionment, Florida can make this showing by establishing that Georgia is diminishing the usual and natural flow of the Apalachicola River, and that such diminution is or will be injurious to Florida's sovereign interests. *See, e.g.*, *New Jersey v. New York*, 283 U.S. 336, 344-45 (1931); *Wyoming v. Colorado*, 259 U.S. at 457; *Colorado v. New Mexico I*, 459 U.S. at 187 n.13. Florida's sovereign interests include its environment, wildlife, commerce, industry, culture, and similar interests.

See, e.g., *New Jersey v. New York*, 283 U.S. at 344-45; *Nebraska v. Wyoming*, 515 U.S. 1, 12-13 (1995) (holding that "to have a fair opportunity to present its case," a state must be permitted to set forth evidence of environmental injury); *Illinois v. City of Milwaukee*, 406 U.S. 91, 103, 105 & n.7 (1972) (explaining that the injury need not be independently tortious, wrongful, or otherwise improper under federal and state law); *Connecticut v. Massachusetts*, 282 U.S. 660, 672 (1931) (discussing injury to "fish life").

Once Florida establishes that it has been or will be injured, the burden shifts to Georgia to establish by clear and convincing evidence that its diversion is reasonable and equitable. As a matter of first principles and common sense, Georgia is in the best position (and has direct access to the necessary proof) to show that its diversion is necessary or equitable, as it claims, and therefore naturally should bear the burden of proof on that issue. *See 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."); *Nat'l Comm'ns Ass'n v. AT&T Corp.*, 238 F.3d 124, 130 (2d Cir. 2001). Accordingly, the Supreme Court's recent equitable apportionment jurisprudence explicitly assigns the burden to the diverting state once injury has been shown. *Colorado v. New Mexico I*, 459 U.S. at 187 n.13 ("The burden has therefore shifted to Colorado to establish that a diversion should nevertheless be permitted under the principle of equitable apportionment."). Riparian doctrine is generally in accord. *See* Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 Marq. L. Rev. 53, 82 (2011); *Red River Roller Mills v. Wright*, 15 N.W. 167, 168-69 (Minn. 1883). In any event, the evidence will show that Florida should prevail under the principles discussed above regardless of who formally bears the burden.

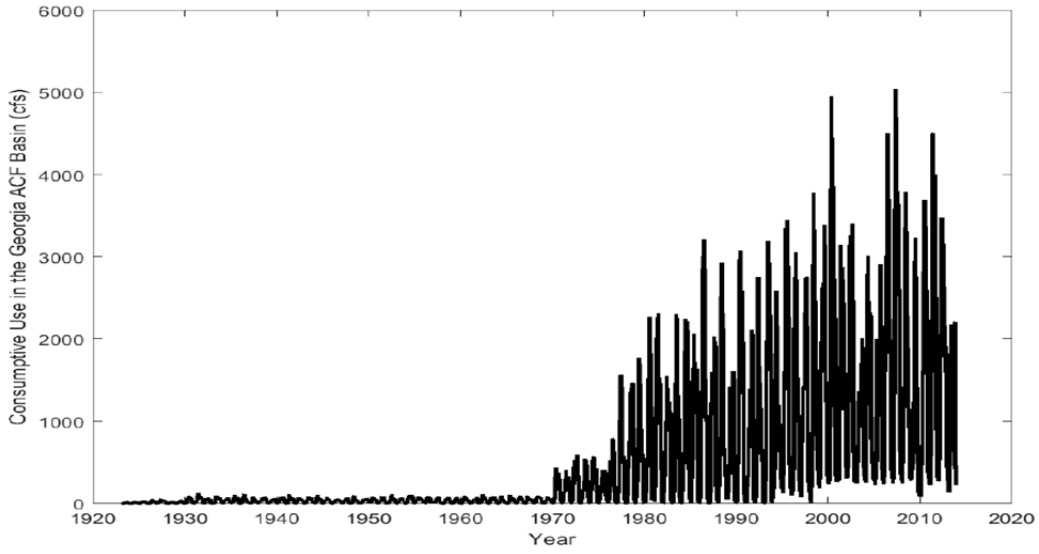
TRIAL PRESENTATION

While the science of hydrology and the like can quickly get complex, Florida's case is

simple: (1) Georgia's water use has increased exponentially over the past few decades; (2) the corresponding reduction in the water reaching Florida is causing serious harm to the Apalachicola region; (3) Georgia itself has recognized this harm, but refused to implement reasonable conservation measures to preserve this important shared resource; and (4) an equitable apportionment will significantly alleviate the present and future harms to Florida. The following is a non-comprehensive roadmap of elements of that presentation, integrating Florida's anticipated evidentiary presentation with a number of specific legal and equitable principles.

I. GEORGIA'S UPSTREAM CONSUMPTION HAS DRAMATICALLY ALTERED THE HYDROLOGY OF THE ACF BASIN, MATERIALLY REDUCING APALACHICOLA RIVER FLOWS AND LEAVING NO DOUBT THAT FLORIDA HAS BEEN INJURED

There is no real doubt that Georgia's upstream consumption of the waters of the Flint and Chattahoochee has increased dramatically since the 1970s even using conservative assumptions—*i.e.*, by *more than 10-fold from 440 cfs to about 5000 cfs during the peak summer periods* that are the most critical for the Apalachicola ecosystem, such as in the drought years of 2007, 2011, or 2012.



Total Consumptive Use in the Georgia ACF Basin From 1923-2013 Using Conservative Assumptions and Excluding Federal Reservoir Incremental Evaporation

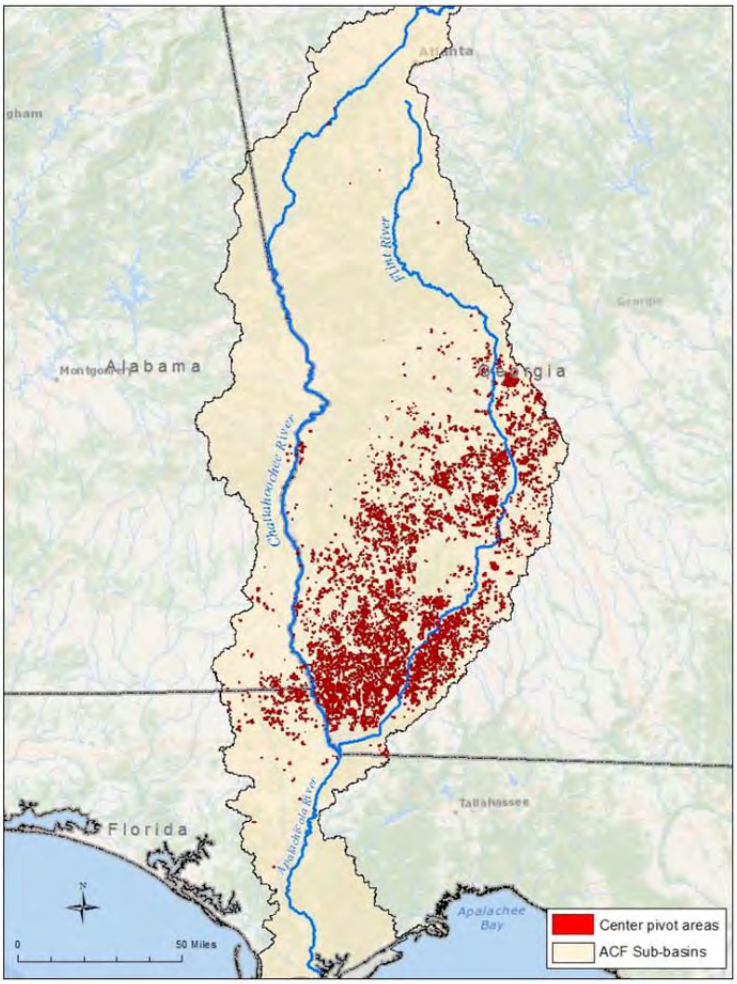
For instance, Georgia's *municipal and industrial* water ("M&I") use has grown as Georgia's population has exploded, particularly in the Metro Atlanta region (going from approximately 1.85 million in 1970 to 5.61 million in 2015, with projected growth up to 8.35 million by 2050). *See, e.g.*, FX-245, at GA02337389; Atlanta Reg. Comm'n, *ARC's 2014 Population Estimates: Steady as She Goes* at 2 (Aug. 2014), http://documents.atlantaregional.com/research/pop_estimates_main2014.pdf. Georgia's own projections demonstrate that its M&I consumption levels will continue to grow significantly, from 369.5 million gallons per day ("mgd") in 2011 to up to 627 mgd by 2050 unless steps are taken to limit future consumption. FX-631, at GA02451997.

Georgia's *agricultural* water use comprises a very large percentage of all of Georgia's water uses. Florida's expert analysis shows that Georgia's agricultural water use has increased significantly, from approximately 200-300 cfs in the early 1970s to about *4000 cfs* in peak summer months in drought years. This has a substantial impact on streamflow: in a summer month of recent drought years, Flint River flows at the Bainbridge gage (the southernmost on the Flint before Lake Seminole) generally varied between *1100 and 3000* cfs. *In other words, in peak drought periods, Georgia removes considerably more water from the Flint than it leaves in the River*. Reduced flows in the Flint are particularly important, because the Flint River can provide an important portion of the flow to the Apalachicola River during dry summer months.[4]

Much of this agricultural water use is attributable to the widespread installation of center

[4] Even Georgia's own experts admit that agricultural irrigation is substantially depleting its Flint River Basin rivers, consuming nearly half their flow. For instance, Georgia's agricultural engineering expert, Dr. Suat Irmak opined that surface and groundwater pumping for Georgia's agricultural irrigation resulted in a peak depletion of 1407 cfs in July 2012 of river flow to Florida. (The remaining mean monthly flow of the Flint River that month was only 1410 cfs at its southernmost gage at Bainbridge.) Florida will show that Georgia's impacts are even higher.

pivot irrigation systems in the ACF Basin, as shown below:[5]



Florida's expert analysis of Georgia's agricultural metering data demonstrates that many Georgia farmers' irrigation practices waste significant amounts of water, because they apply water in amounts far larger than the recommended (or necessary) quantities for productive irrigation.

Consistent with Georgia's unchecked growth in consumption, data maintained by the U.S. Geological Survey ("USGS")[6] demonstrates that Florida is receiving dramatically lower

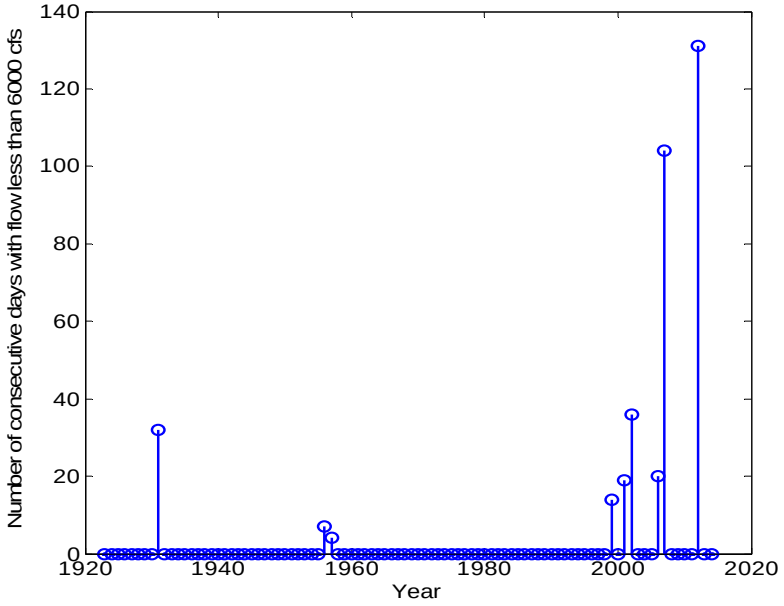
[5] *Effects of Water Flows on Apalachicola Bay: Short and Long Term Perspectives: Hearing Before the S. Comm. on Commerce, Sci. & Transp.*, 113th Cong. (2013) (statement of Jonathan P. Steverson, Exec. Dir. of Nw. Fla. Water Mgmt. Dist.), http://tinyurl.com/SteversonTestimony.

[6] *See Kansas v. Colorado*, 206 U.S. 46, 115-16 (1907) (relying on USGS data).

flows than at any time in a century of recorded history. The historical trend is unmistakable, both on the Flint and Apalachicola Rivers. *See, e.g.*, Attachment 13 to Fla.'s Mot. Motion *in Limine* to Preclude Expert Test. By Dr. Suat Irmak (Dkt. No. 473) ("Irmak Attach. 13") (Bainbridge and Chattahoochee gage data). The average number of days when flows dropped below 6000 cfs (a biologically sensitive flow on the Apalachicola River) increased significantly over the past century. Such low flows were extremely rare before 2000: between 1922 and 1970, the average annually was 5.2 days. But between 1992 and 2013, the average jumped to 50.6 days. This trend has only worsened since 2000. Between 2000 and 2013, the average number of days with flows below 6000 cfs was 74.6. *See id.* Such low flows were rare before 1970, but now occur for months at a time. For example, Florida saw extreme low flows, averaging less than 6000 cfs per month, for an absolutely unprecedented eight *consecutive months* in 2012.

AVERAGE NUMBER OF DAYS WITH FLOW BELOW INDICATED THRESHOLD AT CHATTAHOOCHEE GAGE				
Threshold Discharge	**1921-1970**	**1970-2013**	**1992-2013**	**2003-2013**
6000 cfs	5.2	29.8	50.6	71.0
5500 cfs	2.6	19.0	32.7	54.0

Number of Consecutive Days Below 6000 cfs at Chattahoochee Gage



These phenomena cannot be explained by changes in the amount of precipitation that fell in the ACF Basin. In fact, in recent drought and dry years, far less river flow generally reaches Florida per inch of precipitation than in the past. As just one example: significantly less rain fell in the summer months of 1931 than in 2011 or 2012, yet in 1931 the flow on the Apalachicola River at the Chattahoochee gage was roughly 3700 cfs higher. This is more than 65% of the average Apalachicola River flow at the state-line for June to September in 2011 and 2012. The same is true when 1954 (the driest year in recorded history in the ACF) is compared to either 2011 or 2012. Many other such comparisons show similar changes.

YEAR	1931	1954	2011	2012
June-September Precipitation (Inches) (Livneh Dataset)	12.7	10.4	14.5	16.7
June-September Temperature (Fahrenheit)	80.5	81.0	79.5	77.3
June-September Streamflow (cfs) at the Chattahoochee Gage	9202	8968	5566	5419

Internal Georgia documents evaluating the Flint River recognize this phenomenon. In a November 2012 analysis, Georgia recognized that "[l]ow flows are getting lower [in the Lower Flint River Basin] due, in part, to irrigation withdrawals." FX-56, at GA01643082. Georgia itself compared changes in the lowest daily flow (in cfs) between 1954 and 2011 and 2012 at various upstream gages (*id.*):

	1954	2011	2012
Ichawaynochaway Creek at Milford	120	5	3
Spring Creek at Iron City	9	0	0
Flint River at Albany	645	599	464
Flint River at Bainbridge	1930	1010	1050

Multiple objective measures from related contexts corroborate the extent of Georgia's consumptive increases and their impacts on streamflow and on the ecosystem more broadly. For

example, under the federal Clean Water Act, states must ensure that established water quality standards are met. *See, e.g.*, 33 U.S.C. §§ 1311, 1313. To ensure adequate water quality on key portions of the Flint, Georgia determined a minimum "7Q10"[7] flow of 2500 cfs at Bainbridge is necessary to comply with its Clean Water Act obligations and ensure the protection of aquatic life within the River. FX-20, at 125; *see also* Ga. Comp. R. & Regs. 391-3-6-.03. It is critical that Georgia satisfy that flow requirement, because the legality of the water permits it issues depends upon it. *See* FX-20, at 125; FX-44, at 25-26. Yet in many of the past 16 years, flows at Bainbridge were considerably below that required 2500 cfs level (for instance, in July 2012, average monthly flows at Bainbridge were approximately 1400 cfs). *See, e.g.*, Irmak Attach. 13.

Similarly, because both the extremity and the frequency of low flows impact the ecosystem, the U.S. Environmental Protection Agency ("EPA") and the U.S. Fish and Wildlife Service ("USFWS") developed guidelines in 1999 setting a baseline for appropriate and naturally varying river flows. FX-599; *see also* FX-20, at 123-24. Those guidelines, based on the entire hydrologic record, set 1-day minimum flows for each month that the Apalachicola River at the Chattahoochee gage has failed to meet for months in a row over the past decade—particularly in the summers of the drought years of 2007, 2008, 2011, and 2012. The guidelines also set minimum flows for 2- and 4-year periods (requiring flows to exceed the median flow in half of the years, and the lowest 25th percentile in 3 out of 4 years, respectively, of all 1-day minimum flows for a particular month). The Apalachicola regularly has failed to meet these guidelines since the 1990s.

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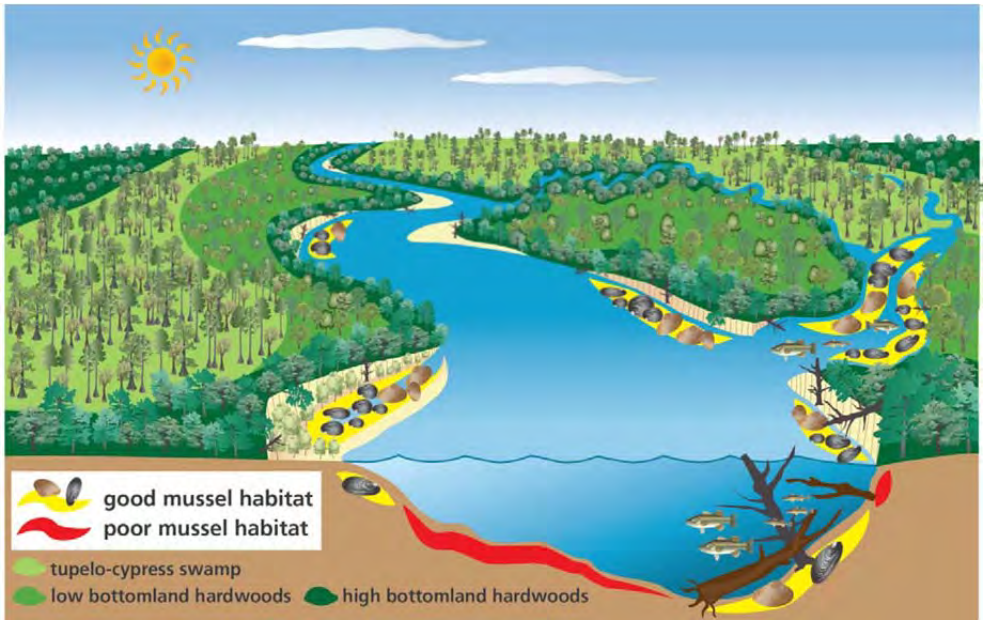
[7] 7Q10 refers to the lowest seven-day average flow in a ten-year period. U.S. Environmental Protection Agency, Definition and Characteristics of Low Flows from DFLOW, https://www.epa.gov/waterdata/definition-and-characteristics-low-flows-dflow#1Q10 (last visited Oct. 10, 2016).

The same pattern is evident on the Flint River, which led Georgia to conclude in 2006:

> Since extensive development of irrigation in the lower Flint River Basin, drought-year low flows are reached sooner and are lower than before irrigation became widespread. Furthermore, low-flow criteria established by the U.S. Fish and Wildlife Service designed to protect aquatic habitats are not met more frequently and for longer periods of time since development of irrigation. *These data provide the clearest evidence that agricultural irrigation compounds the effect of climatic drought on stream flow in the Basin . . . .*

FX-20, at 22. Likewise, Georgia has violated its own 25% Average Annual Discharge ("AAD") requirements (25% of the average annual flow of the stream) repeatedly throughout the Flint River Basin since 2006. *See, e.g.*, FX-24, at 6-7 to 6-8; Attachment 14 to Florida's Motion *in Limine* to Preclude Expert Testimony by Dr. Suat Irmak (25% AAD for three sample USGS gages). Florida's expert hydrologists—including two of the members of the field's prestigious National Academy of Engineers—will explain these phenomena and their causes (*i.e.*, unreasonable upstream consumption by Georgia) in great detail.

The substantial impacts on the Apalachicola River and Bay, and the surrounding ecosystems, are also clear. Hundreds of riverine animal and plant species in Florida depend not only on flow in the main Apalachicola River channel to survive, but also on its channel margins, sloughs, and the floodplain (that is, the area outside of the main channel that receives flow through side-channels or when the river overtops its banks).



Conceptualization of the Apalachicola River, including sloughs (swamps or shallow lake systems, typically side-channels from or feeding the River) and floodplains

The yellow areas pictured above highlight the edges of the river bank (the river margins) and side channels, which are very sensitive to changes in river flow. Even modest decreases in flow can cause disproportionate loss in the extent of suitable habitat. For example, low levels can dry streambeds and cause mussel exposure and desiccation (that is, they dry up and die):

FX-607, FX-606 (showing dried up flats in channel margins with dead mussels)

During low flows, many of the side-channels (sloughs) that are fed by River flow—and in turn carry water to the floodplain—become disconnected. When they do, they can dry up completely or become stagnant and depleted of oxygen, killing the fish and mussels (some of

which may be protected by the federal Endangered Species Act) in the slough. Additionally, the almost complete lack of water in the sloughs and floodplain during extreme low flows has permanent impacts on swamp trees (like tupelo), a material percentage of which have disappeared in recent decades. Finally, when flows are extremely low, salt water from the Bay intrudes further up the River than normal, and significantly reduces the area in which very young sturgeon—which cannot tolerate high salt levels—can forage and grow. In short, reductions in flow affect all life in the Apalachicola riverine ecosystem. Less water in the River means less inundation of critical habitats for fish and mussels. As a result of extremely low flows, there is indisputable evidence of significant increases in harm to various species within Florida that depend on the river. Florida's expert riverine biologist, accompanied by a senior biologist from Florida's Fish and Wildlife Conservation Commission, will describe these issues in detail.

Low flow also causes significant impacts on the Apalachicola Bay. The estuary is a unique environment where salt and fresh water mix, and the plant and animal species in the Bay (including Apalachicola oysters) are adapted to this environment in which freshwater brings in nutrients and mediates salinity. The Bay has reached a point at which the reduced freshwater flows are substantially altering its ecology. For example, water quality changes in the Bay due to decreased flows (i.e., changes in the amount, quality, and proportion of nutrients, and changes in salinity, temperature, and dissolved oxygen) impair the biological production the Bay can support. The microscopic plants in the Bay (phytoplankton) depend on receiving a sufficient amount of the right kind of nutrients that come with freshwater flow; without sufficient flow, the plankton change and the entire food web that lives on these plants changes and becomes less productive—including especially the iconic oysters. Additionally, the increase in salinity that occurs when freshwater flow is low exacerbates this harm: high salinities cause species that

cannot tolerate such levels to disappear in favor of marine species.

These changes are particularly harmful in East Bay, the area nearest the River that normally sees high nutrient and low salinity levels and serves as a nursery for a variety of species, such as shrimp and blue crab. Unless the trend towards increasingly low flows is reversed, Apalachicola Bay will transition from a unique and treasured river-dominated estuary, with high nutrient input, a highly efficient food web, and high productivity, to a system characterized by more frequent, more severe low flows, and less productivity overall—almost just another part of the Gulf of Mexico. Florida's estuarine expert, aided by several other Florida experts, government witnesses, and Apalachicola oystermen, will tell this story.

The environmental harms wrought by Georgia's improper consumptive use are exemplified by the striking 2012 crash of the Apalachicola oyster industry. Until recently, the industry produced 90% of all of Florida's oyster harvest. But higher Bay salinities, along with other impacts of low flows such as changes in plankton, have allowed marine predators such as oyster drills (snails) to move in and dramatically affect the oyster population.

Oyster Drills, FX-751a.

After extreme low flows in recent drought years—including absolutely unprecedented extreme low flows for 6 months in 2011 and 8 months in 2012, the Apalachicola oyster fishery crashed. The federal government, in granting a disaster declaration for the Apalachicola oyster

crash, was required to assess the cause of the crash, and particularly whether it was caused by the extreme drought year low flows or by "overharvesting" of oysters. In a series of analyses over a year-long review period, federal experts reached a comprehensive conclusion that a lack of fresh water from low river flows, rather than oyster overharvesting, was the principal cause. *See, e.g.*, Roy E. Crabtree, Florida Request for Federal Fishery Disaster Relief – DRAFT DECISION MEMORANDUM (Aug. 12, 2013), FX-413, at NOAA-0022898; Laura Petes, NOAA Climate Program Office, Input to Florida Gulf Coast oyster disaster declaration (Sept. 21, 2012), FX-412, at NOAA-0003818. Unlike in prior drought years when impacts quickly dissipated, this time the oyster fishery has not recovered. As Florida's experts will explain, the well-being of the fishery is now in the balance. And lifelong Apalachicola oystermen will supply the Court with a direct and vivid perspective that neither lawyers nor outside observers can fully appreciate.

II. GEORGIA HAS LONG RECOGNIZED THAT ITS EVER-INCREASING CONSUMPTION LEVELS ARE UNREASONABLE AND YET HAS REFUSED TO TAKE GENUINE ACTION TO ADDRESS THE PROBLEM

At trial, Florida will present a timeline spanning from the early 1990s to the present demonstrating that Georgia fully understood that its growing consumption of water was causing significant problems for the ACF system, but did very little to address the issue. Georgia's failure to take meaningful action to redress these harms justifies the issuance of an equitable apportionment decree in this case.

In January **1992**, the then-director of Georgia's EPD, Harold Reheis, admitted to the federal government that "Georgia has [an] area of potential groundwater overdraft . . . in the southwestern corner of the state where there have been large withdrawals made in the last two decades for the irrigation of crops." FX-1, at GA00811963. Even at this early stage, it was becoming obvious that these "large withdrawals" were problematic for both Florida and Georgia. For example, in a **1995** report, USGS warned that "stream-aquifer-flow declines upstream of the

Apalachicola River will reduce flows entering Lake Seminole and, subsequently, cause reductions in flow of the Apalachicola River." FX-13, at 68. At the same time, the Wildlife Resources Division of Georgia's Department of Natural Resources—the agency responsible for protecting the state's wildlife resources—was raising the red flag, warning that Georgia's standard for ensuring adequate flows in its rivers (the "7Q10") was not "scientifically defensible" and could lead to "significant degradation of stream communities." FX-36, at GA00100747.

Evidence of severe problems in the ACF Basin continued to mount. In **1999**, Georgia's Chief of Fisheries concluded there is "clear evidence that groundwater is over-allocated in the lower Flint River basin." FX-6, at FL-ACF-0254447. Director Reheis likewise acknowledged:

> In southwest Georgia there are approximately 3000 wells in the Floridan aquifer which we believe can affect the flow of the Flint River during bad droughts. The big springs on the bottom of the Flint River from Albany on down to Bainbridge, which supply a substantial part of the base flow of the Flint River in this section, are all fed by the Floridan aquifer. When thousands of irrigation systems are operating during dry weather, such as we have been having this year [1999], one can see a significant reduction in Flint River flows. [FX-2, at GA02257045.]

By the late 1990s, the issue reached a crisis point: Georgia had granted so many irrigation permits that its own modeling predicted that the entire Flint River could dry up in a bad drought. In a series of **1999** letters, Director Reheis explained exactly how the problem had developed:

> The sections of the [Georgia] laws that require farmers to have permits (O.C.G.A. 12-5-31 and O.C.G.A. 12-5-105) are the weakest of all Georgia's environmental laws. The original bills were specifically written in a very loose manner to place the minimum amount of requirements on agricultural water uses, because the wisdom at the time was that the General Assembly would not accept more than that in regulating farmers. [FX-2, at GA02257044.]
>
> You asked how it came that the Legislature ordered EPD to regulate agricultural wells 11 years ago, but never gave us money to do the job. First, it is not an unusual circumstance that the General Assembly would give EPD an unfunded mandate. It happens again and again Second, for the first several years of this 11

> year time period, EPD was operating under the belief that we would not run out of water for farmers anywhere in south Georgia, and given that the law is extremely lenient with regard to agricultural permitting and water use, we essentially just issued permits for any farmer that requested them. Since we had so many applications and so few staff to handle them, we made it a simple paper exercise. . . . But we also thought, incorrectly, that since there was so much groundwater, it was no great problem that we were understaffed. [FX-3, at GA02257040-41.]

From an environmental protection perspective, Georgia's permit system supplied no limits at all. The permits did not require users to "measure or report how much they use or when," and "once issued and once use is begun," the "permits never expire." FX-5, at GA01186515. More than that, Director Reheis acknowledged that there was widespread unpermitted drilling of irrigation wells, and that in any event the agency lacked the resources to take any form of enforcement action against permitted and unpermitted irrigators alike. *See generally* FX-2; FX-3. Indeed, in a moment of candor, he 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.

Georgia knew very well that it had to stop issuing irrigation permits and cut back irrigation in drought years. Numerous internal documents demonstrate that the state knew it was digging itself deeper into a hole:

- "[W]e've already exceeded the 'safe' upper limit of permittable acreage in the lower Flint." [FX-4, at GA01419036.]
- "Status quo in issuing new irrigation permits will lead to an over-commitment of water resources, and over-use of the resource." [*Id.*]
- "Over-use will cause severe impacts on fish and other aquatic life in the Flint River and its tributaries." [FX-4, at GA01419037.]
- "If EPD does not limit additional irrigation use soon, Georgia's negotiators in the Apalachicola-Chattahoochee-Flint (ACF) River Basin Compact will not be able to negotiate an allocation formula with Florida and Alabama" and, as a result, "Georgia will end up in court sooner or later." [FX-4, at GA01419037-38.]
- "If new irrigation uses are not limited effectively and soon, it will create a bigger

Achilles' heel than we currently have." [FX-4, at GA01419039.]

- "[I]t is necessary for EPD to impose a temporary moratorium on issuing certain additional irrigation permits in Southwest Georgia." [*Id.*]

At the same time, certain high-ranking Georgia officials began to publicly and privately clamor for Georgia to take other significant proactive action to remedy the problem:

- "I do believe that the 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 . . . ." [FX-5, at GA01186514.]

- "In Kansas v. Colorado [514 U.S. 673 (1995)], the Supreme Court found Colorado liable for violating the . . . River Water Compact because it had permitted so much ground water use for farmers that their usage reduced the river flowage into Kansas. Colorado is forced to buy out farmers' water rights (granted through state permits) . . . . This could happen to Georgia if we cannot deliver on an allocation formula commitment due to over-use by agriculture." [FX-4, at GA01419039]

- "My objective is a good, long-term plan to manage our water resources for *sustainable use.*" [FX-5, at GA01186516 (emphasis added).]

Late in **1999**, Georgia's environmental officials negotiated what Georgia hoped would be a solution with Georgia agricultural groups. The legislation was called the Flint River Drought Protection Act, and it 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. Director Reheis acknowledged that the relevant farming and agribusiness leaders all agreed that "this is good and fair." FX-9, at GA01185040. Even one of Georgia's experts in this case acknowledged that the FRDPA was a "reasonable" measure to deal with droughts. Georgia's legislative history for the Act explains that it was explicitly intended to fend off litigation from Florida:[8]

[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).

> The underlying driving force behind HB 1362 [the FRDPA] was, in large part, the litigation between Georgia, Florida and Alabama over water rights in the region. The litigation actually motivated the Georgia Environmental Protection Division (EPD) to examine the Flint River water flow. In its initial studies, the EPD discovered that high use of irrigation during times of severe drought had the potential of dramatically reducing the flow of the Flint River. . . . Prompted by the discussions between the EPD and Corps of Engineers, members of the Georgia House of Representatives met with the Georgia Farm Bureau, state agribusiness leaders, individual farmers in the region and environmental groups to develop a solution to the water flow problem. That solution took the form of HB 1362, a mechanism to take acreage out of irrigation production during times of severe drought.
>
> HB 1362 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. . . . HB 1362 was also seen as an environmental protection measure to preserve the ecology of the Flint River. [FX-10, at 30-31.]

Director Reheis explained to the public in a press release why it was necessary for Georgia to take these actions:

> [O]ur ACF ground water and surface water computer models indicated that the combined effect of all irrigation in the Flint River Basin could dry up the Flint River above Bainbridge in the summer growing season of a drought year. Thank goodness the Flint did NOT dry up in Year 2000 (the year of record low flows in the Flint Basin), ***but a number of large Flint tributaries did dry up that year over many miles of length.*** [FX-15, at GA00181626.]

Unfortunately, any progress on Georgia's part to deal with its significant irrigation problem soon stalled. Georgia invoked the FRDPA exactly twice—in **2001** and **2002**—after which its auction fund was depleted. 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* FX-20, at 23-24.

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 USFWS:

> [I]t is also unlikely that the mussels and the other aquatic inhabitants of the Flint River Basin will be sustained into the next century if significant changes in water use are not implemented in the near future. . . .
>
> To ignore the dire status of these species is comparable to ignoring the condition of a residence as it falls into disrepair. The 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. Dwindling species are indicative of a declining system. [FX-46, at GA00537492, GA00537494.]

Georgia nonetheless proceeded, rationalizing that it could attempt to offset these impacts by buying farmers' irrigation rights under the FRDPA in drought years. FX-20, at 45. But the FRDPA's irrigation auction was ***never again*** funded by Georgia's legislature. Consequently, although the Flint River Basin suffered severe droughts in **2007** and **2008**, the FRDPA was never implemented in those years.[9] USFWS again admonished Georgia:

> A measure not used was a provision of the Flint River Drought Protection Act to reduce irrigation withdrawals by 20 percent in sub-basins with greatest risks of experiencing low flows due to irrigation. This tool could have been utilized to keep flow in Spring Creek and other parts of the Flint River Basin. . . . The [endangered] mussel populations in Spring Creek appear to be on a steep trajectory to extirpation. [FX-47, at GA00537496-97.]
>
> By **2009**, a Georgia EPD funded study concluded:
>
> Our analysis of 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. This has resulted in some of the lowest flows on record during recent droughts. 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.]

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[9] Georgia officials have described 2007 as "one of the worst droughts in Georgia history." FX-288. Georgia even sought federal disaster assistance for counties in the Flint River Basin. *See generally* FX-96.

By the **2011-12** drought, the need to implement the FRDPA was again critical. 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. . . . NOAA experts feel strongly that the drought will persist perhaps more than one year. Clearly the hydrologic and agricultural impacts on our region of Georgia will very likely be extreme. [FX-49a, at GA01048557.]

Although EPD personnel initially recommended a drought declaration in January **2011**, FX-78, at GA01597629, EPD decided in February not to declare a severe drought, FX-81. Thus, Georgia did not implement the FRDPA irrigation auction, and did not take *any other action* to limit irrigation related-water use in the Flint River Basin.

By June **2011**, FWS 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**, EPD personnel were noting record high depletions of the Upper Floridan Aquifer and identifying record-setting low flows on the Flint River. *See* FX-82, at GA01614062. At this same time, Georgia's Lower Flint-Ochlockonee Regional Water Planning Council released its Regional Water Plan (the "LFO Plan," FX-24). This LFO Plan was 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, guard against a shortage of water within the state, promote the efficient use of the water resource, and be consistent with the public welfare of the state"); *id.* § 12-5-96(e) (noting plans should address "sustainable use"). The LFO Plan 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. FX-24, at 3-6, 3-9 (horizontal row for Bainbridge gage identifying 1376 cfs shortfall).

By early **2012**, the ongoing drought combined with massive levels of 2011 agricultural withdrawals so significantly reduced the levels of the Upper Floridan Aquifer that it ceased to feed the flow of the Flint River or Flint tributaries throughout portions of the Lower Flint River Basin. FX-87, at GA00000368. 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 that even more pumping could not further worsen river flows*. *Id.* On March 1, 2012, Georgia's 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." FX-91, at GA00208715. The death blow to the FRDPA came in **2014**, when Georgia amended it to make the auction process discretionary instead of mandatory. S.B. 213, 2014 Gen. Assemb., 2013-2014 Reg. Sess. (Ga. 2014), FX-236.

Still understanding 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 Plan. The "[i]mpetus" for this action was "[e]xtreme low flows observed in recent years, unlike those observed in previous drought periods." FX-67, at GA00217831. In internal documents, Georgia expressly recognized the "[r]egional and state benefits from increasing low flows in streams that flow into Florida." *Id.*

As part of that study process, in late **2014**, after this case was first filed, 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.*

At that same meeting, Director Turner explained that Georgia had only taken "modest" steps to address the problem in recent state legislation. FX-71, at GA00671253. 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. [*Id.* at GA00671253-54.]

But Georgia did freeze. Although the internal notes then identify a series of possible 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. Thus, like so many of Georgia's past study efforts, no tangible benefits resulted from this study process either, leaving Florida with no relief.

Finally, just in **2016**, it became apparent Georgia does not know, and may not even *care* to 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 completed this year (FX-658,

FX-659) to the data for *permitted acreage* data in Georgia's Agricultural Permitting Database (FX-655), Florida discovered that roughly 90,000 irrigated acres in the Flint River Basin are not even permitted. *See* FX-311, 708. These irrigated acres are *illegal* under Georgia law. *See, e.g.*, FX-312, at 2 (setting forth permit requirements); FX-226; *see also* Ga. Code Ann. § 12-5-105 ("[A]ny modification in the use or capacity conditions contained in the permit . . . shall require the permittee to submit an application for review and approval by the director . . . ."). 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* FX-20, at 24-29 (describing sensitive areas). The evidence will show that Georgia has not taken any obvious, meaningful action to address these unpermitted withdrawals.

III. THROUGHOUT THIS SAME PERIOD, GEORGIA REFUSED TO NEGOTIATE IN GOOD FAITH OVER A MULTI-STATE SOLUTION

In 1992, Georgia initially acknowledged the need for an "equitable allocation of water resources within the ACF Basin," committing in a Memorandum of Agreement to "participate fully" and "support" a Comprehensive Study of hydrologic, biological, and related issues to further that process. FX-195a ¶¶ 3, 6. But that process had begun to unravel by the late 1990s.

In 1997, after nearly five years of the Comprehensive Study, Georgia publicly took the position that it was willing to work cooperatively with Florida to address ACF water issues through an interstate compact (the ACF Compact), which was to be based on the data gathered in the Comprehensive Study. But Georgia was in fact secretly planning to pull a bait-and-switch after the Compact passed, as revealed by its lead technical representative's handwritten notes:

> If we tell Corps what we really want . . . it becomes public early. Fl[orida] and Al[abama] might be scared off, [and the] Compact may get scuttled. Fl[orida] and Al[abama] 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)? [FX-206, at GA02322676.]

True to those handwritten notes, Georgia fundamentally changed its water use demands shortly after the Compact passed. Its demands for upstream consumption ballooned to levels significantly higher than those developed collectively by the parties as part of the Comprehensive Study. Georgia's projected need for future M&I consumption grew ***7-fold***, FX-213, and Georgia's projected need for irrigation in the Flint River Basin, particularly during dry years, also drastically increased, *compare* FX-202 (Comprehensive Study Agricultural Water Demand Executive Summary), *with* FX-211 (May 1, 1998 memorandum detailing Georgia's later water demand estimates). Florida complained strenuously, but Georgia's demands never fell back to the levels identified in the Comprehensive Study.

The former Secretary of Florida's Department of Environmental Protection, David Struhs, will testify in detail about what happened. In short, Georgia was never willing to agree on any restriction on its own consumption. Although it was willing to negotiate with the Corps over how the dams might be run to offset some of the impacts of Georgia's consumption, that provided no real solution to the problem. The concern was that, even with some minimum flow limits (which were initially anticipated to be rare occurrences), future increases in Georgia's consumption would simply make those rare "minimum flows" into an everyday occurrence, destroying the Apalachicola River and Bay ecosystem. Secretary Struhs's concerns from more than a decade ago were indeed prophetic; extreme low flows occurred for nearly 6 months in 2011 and 8 months in 2012, leading to the crash of the Apalachicola oyster fishery.

In addition, in 2002 and into 2003, in the midst of the Compact negotiations, it became clear that Georgia was secretly negotiating a side-deal with the Corps to ensure it would not need to compromise with Florida. A federal judge who had stayed other litigation to allow for good faith negotiations between the ACF States made a specific finding that Georgia's conduct in that

context gave rise to "an inference of bad faith." *Alabama v. U.S. Army Corps of Eng'rs*, 357 F. Supp. 2d 1313, 1318 (N.D. Ala. 2005), *vacated and remanded on other grounds*, 424 F.3d 1117 (11th Cir. 2005). Florida tried on multiple occasions to find a way to resolve the disputes, but Georgia never put a genuine, meaningful, and binding consumption cap on the table in any form.

IV. AN EQUITABLE APPORTIONMENT THROUGH A CONSUMPTION CAP IS A REASONABLE REMEDY THAT CAN REDRESS FLORIDA'S WORSENING INJURIES AND PREVENT CATASTROPHIC HARM

In this action, Florida will seek a cap on consumption consistent with the Special Master's opinion of June 19, 2015. Florida's experts will show how a reduction in Georgia's consumptive use of water through several mechanisms would be a "just and equitable allocation," *Colorado v. New Mexico I*, 459 U.S. at 187 n.13, that would alleviate the past damage caused by Georgia's consumption and mitigate what would otherwise be substantial future harm.

The specific remedy that Florida seeks is straightforward and fair. It consists of two elements. First, Georgia's annual average consumptive use and streamflow depletions in the Basin should be capped. Georgia, like many states, already measures major M&I consumptive uses of water in certain areas, and reasonable methodologies can be employed for agricultural uses as well. Second, in drought years, Georgia should share the pain by making additional consumption cutbacks. In those specific years, consumption should be capped so that depletions of the Flint and Chattahoochee Rivers are reduced in further key months, including by 1500 to over 2000 cfs in peak drought year summer months. Florida's hydrology experts will explain how each element of Florida's proposed cap could be administered, and exactly how Georgia's compliance could be subjected to third-party verification.

Florida's experts will also establish that Georgia can select from among a wide range of reasonable measures that can achieve the required reductions, from lawn watering and other

outdoor water use restrictions in Metro Atlanta (similar to those Georgia required beginning in September 2007, FX-774) to specific Flint River Basin irrigation-related programs. These measures are not novel; they are routinely employed by states dealing with water shortages. They are all measures that Georgia itself has previously imposed or contemplated but failed to fully implement, or that Florida has already taken in its part of the ACF Basin. These measures should not constrain Metro Atlanta's growth in any material way in the future, or severely impact Georgia's farming economy. The burden of any agricultural remedy would fall on the State, not individual farmers, because the State is the entity that *created the problem* by excessively granting irrigation permits and because the State can fund a solution.

Likewise, Florida's hydrological experts will demonstrate that water saved through the consumption cap will reach Florida. The majority of the water savings from potential measures Georgia could implement will involve its agricultural irrigation and will therefore benefit flows in the Flint River. There are no federal dams on the Flint, and Lake Seminole, formed by Woodruff Dam, has minimal storage and is operated by the Corps as a "run-of-the-river" project: water simply runs through the lake and is released rather than stored. Thus, increases in inflows and decreases in consumption directly from the Flint, as well as from the lower Chattahoochee River (the portion of the Basin between W.F. George Reservoir and Lake Seminole) inevitably will augment the amount of water reaching Lake Seminole and thus Florida. Contrary to Georgia's view, Florida's experts' analyses show that it is a physical impossibility to offset or trade significant quantities of water conserved by withholding more water in Lake Lanier (which supplies water to Metro Atlanta).

Indeed, even if this were technically possible (it is not), there is no basis to believe that the Corps would seek to operate their dams in a manner to annul a U.S. Supreme Court equitable

apportionment. *See* U.S. *Amicus Curiae* Opp'n to Mot. to Dismiss at 19 (Dkt. No. 66):

> It is at least plausible that a cap on Georgia's consumption, particularly with respect to the Flint River, which is unregulated by the Corps, would increase the basin inflows and thereby increase the amount of water flowing into Florida. Georgia gives the Flint River short shrift, suggesting in a footnote that the Corps would increase impoundments upstream to offset increased flows from the Flint River. But that speculation is entirely unwarranted, particularly where the current operational protocols provide for matching basin inflows during most flow conditions. It is also plausible that an increased flow during wet times would provide a cushion during low-flow periods, so that it would be possible to maintain a flow rate of greater than 5,000 cfs for a longer period of time without any alteration of the Corps' operations.

The simple fact is that although the Corps operates multiple federal reservoir projects in the ACF Basin, water from 62% of Georgia's ACF watershed area flows into the Flint River and is not controlled by the Corps. Thus, as the United States argued in its opposition to Georgia's motion to dismiss, a "cap on Georgia's *consumption* would not necessarily require implementing action by the Corps" or any alteration to its operations, because the cap "would increase the basin inflows and thereby increase the amount of water flowing into Florida." *Id.* at 11, 14, 19.

Finally, Florida's experts will show that the extra water that would reach Florida through a consumption cap would significantly benefit Florida's ecology, especially compared to a future in which Georgia's consumption would substantially *increase*. Increased flows would in turn increase water levels in the River, connecting more of the ecosystem and reducing the amount of time the system suffers from significant harm. Similarly, increased flows improve salinity, oyster populations, water quality, and the food web in the Bay, allowing it to stabilize and move back to its historical state.

CONCLUSION

For all the reasons identified above, Florida will readily satisfy its burden to show that Georgia's consumption has caused, and will cause, substantial harm. By contrast, Georgia cannot justify its activities as reasonable or equitable as required by Supreme Court case law.

Dated: October 12, 2016

Respectfully submitted,

/s/

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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 PRETRIAL BRIEF and SELECTED ATTACHMENTS TO THE STATE OF FLORIDA'S PRETRIAL BRIEF have been served on this 12th day of October 2016, in the manner specified below:

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October 12, 2016

ATTORNEYS FOR THE STATE OF FLORIDA

The State of Florida understands that the State of Georgia intends to supply the Court with copies of exhibits cited in Georgia's Pretrial Brief. For the Court's convenience, Florida also hereby submits as attachments a selected set of exhibits cited in Florida's Pretrial Brief. Certain exhibits are publicly available; links have been provided. Florida will provide a complete set of its trial exhibits on October 26, 2016.

Florida also understands that Georgia has decided to trim its 1790 exhibits. Therefore, the parties are continuing to finalize the joint exhibit list. For the most part, the FX numbers listed below and cited in Florida's Pretrial Brief will be the final FX numbers at trial, with the exception of some potential joint exhibits. Florida can provide the Court with a corrected version of the Pretrial Brief before trial if any exhibit numbers change.

INDEX OF SELECTED ATTACHMENTS
TO THE STATE OF FLORIDA'S PRETRIAL BRIEF

Tab 1	FX-7 - Statement by Former Georgia Environmental Protection Department ("EPD") Director Harold Reheis
Tab 2	FX-91 – March 2012 Press Release: "Georgia EPD Declines Drought Declaration for Flint River Basin"
Tab 3	FX-192 - Water Contingency Planning Task Force - Appendix III
Tab 4	FX-190 - Water Contingency Planning Task Force Final Report
Tab 5	FX-154 - UNESCO Biosphere Reserve Information
Tab 6	FX-144 - Land Transactions Table
Tab 7	FX-672 - Transactions in Florida - Nature Conservancy
Tab 8	FX-143 - Map of Conservation Lands, Florida ACF
Tab 9	FX-20 - Flint River Basin Regional Water Development and Conservation Plan
Tab 10	Irmak Attachment 13 - Chattahoochee and Bainbridge Gages
Tab 11	FX-56 - Current Conditions - FRDPA Memorandum
Tab 12	FX-24 - Lower Flint-Ochlockonee Regional Water Plan
Tab 13	Irmak Attachment 14 - AAD Gages

Tab 14	FX-1 - Letter to William Westermeyer from Harold Reheis
Tab 15	FX-6 - Fisheries Section Comments on Georgia ACF Allocation Formula - Memo to Harold Reheis from Richard Gennings
Tab 16	FX-2 - Agricultural Wells in the Flint River Basin in Southwest Georgia - Letter to James E. Butler, Jr. from Harold F. Reheis
Tab 17	FX-3 - Response to Letter Regarding Irrigation in South Georgia - Letter to James E. Buter Jr. from Harold F. Reheis
Tab 18	FX-5 - Reheis Statement for Southwest Georgia Summit
Tab 19	FX-4 - Talking Points: Future Agricultural Water Use in Southwest Georgia
Tab 20	FX-9 - Irrigation and the Flint River - Memorandum from Harold Reheis to Governor Roy Barnes
Tab 21	FX-10 – FRDPA Legislative History - Conservation and Natural Resources Legislative Review - GA State University Law Review
Tab 22	FX-15 - Press Release from K. Chambers, re: "Debate Over Water in the Chattahoochee and Flint River Basins"
Tab 23	FX-23 - Letter to Rob McDowell from Dan Forster RE: Review of the Draft Recommendations for the Flint River Basin Regional Water Development and Conservation Plan
Tab 24	FX-46 - Comments on the December 16, 2005 Version of "Recommendations for the Flint River Basin Regional Water Development and Conservation Plan" - Letter to Rob McDowell from Sandra S. Tucker
Tab 25	FX-47 - Concerns Relating to the Lack of Implementation of Water Resource Management in the Flint River Basin as Outlined in Georgia's Environmental Protection Division's (EPD) Flint River Basin Regional Water and Development Plan (Plan) Finalized in March 2006 - Letter to Carol Couch from Sandra S. Tucker
Tab 26	FX-49d1 - Impacts of Agricultural Pumping on Selected Streams in Southwestern Georgia - David Hicks & Stephen Golladay
Tab 27	FX-49a - Email from W. Hicks to R. Royal, M. Masters, D. Wilson re: "Fw: Pending Drought"

Tab 28	FX-48 - Comments re: the Initial Draft Regional Water Plans Released May 9, 2011 - Letter to Amettia Murphy from Sandra S. Tucker
Tab 29	FX-82 - Groundwater Conditions in Southwest Georgia and Low Flow in the Flint River in the Apalachicola-Chattahoochee-Flint River Basin - Memorandum from Wei Zeng to Allen Barnes
Tab 30	FX-87 - Kennedy's Modifications
Tab 31	FX-67 - Flint Studies Work Plan – Email and Draft Agenda for Kickoff Meeting
Tab 32	FX-49b - Water Resources and Security Issues in the Fling River Basin, Georgia EPD Stakeholders Meeting Presentation
Tab 33	FX-71 - Drought Protection in the Lower Flint Basin, Georgia EPD Stakeholders Meeting Summary
Tab 34	FX-206 - Handwritten Notes of ACF Meeting

1. FX-07 - STATEMENT BY FORMER GEORGIA ENVIRONMENTAL PROTECTION DEPARTMENT ("EPD") DIRECTOR HAROLD REHEIS

WATER MESSAGES

Alan Hallum

1. The quality of Georgia's waters is affected by direct discharges of pollutants at the end of pipes, as well as by pollutants contained in runoff from land surfaces. For the past three decades there has been a concentrated effort to reduce "end of pipe" sources of pollution through centralized environmental regulations. A tremendous amount of progress has been documented. If state waters are to ever achieve a fishable/swimable status as is desired, it will be necessary to adopt and implement aggressive programs aimed at controlling the types and quantity of pollutants entering our waters from land surfaces (i.e., non-regulatory approaches).

2. Rapid population growth in some parts of Georgia has lead (or is leading) to rapid changes in land uses. These changes primarily take the form or changes from rural land uses to urban and suburban land uses. These land use changes often result in adverse impacts on our streams (e.g., increased stream velocities after rainfall events, bank erosion, higher nutrient loads, a greater tendency toward bacterial contamination, loss of wetlands). In some of these urban and suburban settings it is estimated that runoff from land surfaces (aka "non-point sources" of pollution) accounts for 50% - 80% of the pollutants in our streams. Land use management is therefore a critical element in any strategy aimed at bringing our stream conditions into compliance with water quality standards.

3. Land use management, with the exception of lands under the ownership of State of Georgia and the federal government, is the domain of local governments. Very few local governments have developed and implemented the institutional means to manage land uses toward the end of protecting our water resources; very few governments are engaged in planning their growth and land uses in a manner that would minimize adverse impacts on the streams within (and downstream of) their jurisdictions. The political will must be built at the local level (and state level) to develop and implement those institutional means. Failure to build this critical political will can result in increasingly impaired waters, and diminished quality of life for current inhabitants, and loss of growth opportunities. The Metropolitan North Georga Water Planning District is the pilot program to deal with watershed and land use planning within and across political jurisdictions.

4. In addition to the needed institutional changes, protecting and preserving the quality of Georgia's streams must be borne by individuals in their daily habits and behaviors.

EXHIBIT
17
Huseby.com 54
1-27-16

5. There are costs (and benefits) associated with developing and implementing the institutional mechanisms required to address pollution derived from land surfaces. The costs implications of land use laws, erosion and sedimentation controls, and stormwater controls could be huge. Funding mechanisms will likely need to be identified to address these costs.

Harold Reheis

1. Over the past two decades substantial population growth in some regions of Georgia have been accompanied by significant increases in demands on our water resources to meet the water consumption desires of that burgeoning population. Advancements in irrigation technology during the '70's and '80's have allowed farmers in predominately agricultural regions of Georgia to apply larger (and more timely) quantities of supplemental water to their crops to increase crop yields and profits. These increases in demand for water have not been accompanied by corresponding advancements in efforts to conserve; hence the amount of water we are collectively withdrawing and consuming has dramatically increased.

2. For a great number of reasons Georgia will likely continue to be a desirable migration destination for individuals and businesses, and current residents will likely continue to procreate. Correspondingly, demands on our water resources are equally likely to continue to grow.

3. Mother Nature gives Georgia a varying, but limited, amount of water each year. With the exception of those years of droughts and/or floods, this amount does not vary widely. Essentially we have a relatively fixed quantity of water supplies from which to satisfy our growing water demands.

TO BE CONTINUED....

2. FX-91 – MARCH 2012 PRESS RELEASE: "GEORGIA EPD DECLINES DROUGHT DECLARATION FOR FLINT RIVER BASIN"

Georgia Department of Natural Resources
2 Martin Luther King Jr., Dr., Suite 1152 East Tower, Atlanta, Georgia 30334
Mark Williams, Commissioner
Judson H. Turner, Director
Environmental Protection Division
(404) 656-4713

For Immediate Release **March 1, 2012**

Georgia EPD Declines Drought Declaration for Flint River Basin

The Georgia Environmental Protection Division (EPD) will not issue a severe drought declaration in the lower Flint River basin this year.

"EPD has analyzed data on stream flows and determined that a reduction in irrigation that might be achievable through operation of the Flint River Drought Protection Act would have a negligible impact on surface water flows this year," said EPD Director Jud Turner. "Southwest Georgia has experienced historically low basin inflow within several areas of the lower Flint River basin for several months, and it's going to take a significant amount of rain to improve conditions."

The Flint River Drought Protection Act (the Act) requires the EPD Director make an announcement regarding severe drought by March 1 of each year. The Act provides the authorization to compensate farmers who voluntarily stop irrigating their crops with surface or ground water after a severe drought declaration, although no funds are currently appropriated for this purpose.

EPD analyzes data on streamflow, rainfall and groundwater levels before making a decision. The only severe drought declarations were made in 2001 and 2002. Over the years, better information has become available on the number of acres under irrigation in the region, the location of irrigated acres that would most likely impact stream flows and the amount of irrigation water expected to be pumped for various crops in dry years. This information, along with critical hydrologic data from the current climatic cycle (2011-present), will form the basis for recommendations regarding changes to the Act to be introduced in the 2013 legislative session.

"There is no doubt that we need a viable management tool to deal with drought in the Flint River Basin," said Turner. "The lessons we have learned over the past decade regarding the basin during times of severely reduced basin inflow will help us craft a tool that increases the effectiveness of the Act and the management of the basin."

(more)

EXHIBIT
Caldwell43

This year's evaluation of streams in the lower Flint River basin shows that some are very likely to go dry during the summer months even without irrigation due to a lack of rainfall and already depleted groundwater levels. For example, in part of the Spring Creek watershed there is already little streamflow from which farmers may withdraw water and the groundwater level in some areas is expected to be so low that further withdrawals will not affect flow in the streams.

EPD, working with the U.S. Fish and Wildlife Service, has launched a project to augment flows in Spring Creek using groundwater. The additional water in Spring Creek will help insure that certain species of endangered mussels survive during periods of drought.

News Media Contact: Kevin Chambers 404-651-7970

3. FX-192 - WATER CONTINGENCY PLANNING TASK FORCE - APPENDIX III

Publicly Available At:

http://sonnyperdue.georgia.gov/vgn/images/portal/cit_1210/0/57/155134868Water%20Contingency%20Planning%20Task%20Force%20Report%20-%20Appendix%20III%20-%20Complete%20set%20of%20options%20evaluated.pdf

4. FX-190 - WATER CONTINGENCY PLANNING TASK FORCE FINAL REPORT

Publicly Available At:

http://sonnyperdue.georgia.gov/vgn/images/portal/cit_1210/59/57/154449884Water%20Contingency%20Planning%20Task%20Force%20Final%20Report.pdf

5. FX-154 - UNESCO BIOSPHERE RESERVE INFORMATION

United Nations Educational, Scientific and Cultural Organization | Sitemap

The MAB Programme

UNESCO - MAB Biosphere Reserves Directory

Biosphere Reserve Information

United States of America

CENTRAL GULF COAST PLAIN

General | Research & Monitoring | Contact | Links | View all

General Description	This biosphere reserve is situated on the coast of the northwestern part of the Florida Peninsula within the Apalachicola River floodplain. It comprises Apalachicola Bay which is one of the most productive estuarine systems in the northern hemisphere. There are typical estuarine and coastal formations with river channels, slough, backwaters, bay islands and swamp hardwood forests. The Apalachicola Basin has the highest species density of amphibians and reptiles in all of North America (north of Mexico). The Apalachicola Reserve, which is part of the biosphere reserve, is involved in various research and monitoring projects. It is also active in resource management, particularly in land acquisition and a prescribed burning program to restore upland areas. Increased demand for water by large upstream cities and agriculture now puts pressure on the floodplain ecosystem. People in the area make their living mainly from fishing industry and tourism.
Major ecosystem type	Temperate broadleaf forest
Major habitats & land cover types	
Location	29°44'N, 84°58'W
Area (hectares)	
Total	16,402
Core area(s)	
Buffer zone(s)	
Transition area(s) when given	
Altitude (metres above sea level)	0 to +5

EXHIBIT 39
WIT: STAVINS
DATE: 7/27/16
REPORTER: J. HARMONSON

Year designated	1983
Administrative authorities	Apalachicola National Estuarine Research Reserve, Florida Department of Environmental Protection, National Oceanographic and Atmospheric Administration

Research and monitoring...

Brief description	Long-term monitoring of physical, chemical and biological parameters Threatened and endangered species Envionmental education activities Management-oriented research

Specific variables...

Abiotic	Abiotic factors, monitoring/methodologies.
Biodiversity	Biology, methodologies, rare/endangered/threatened species.
Socio-economic	*n.a.*
Integrated monitoring	Education and public awareness, management issues.

Contact...

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E-mail	wmiley@gtcom.net
Web site	www.nos.noaa.gov/ocrm/nerr/reserves/ nerrapalachicola.html

Related links...

TOP Search Map Biosphere Reserves

Last updated: 11/03/2005

6. FX-144 - LAND TRANSACTIONS TABLE

APPENDIX: INDIVIDUAL LAND TRANSACTIONS

PROJECT	PARCEL (Seller	CO	Authorized Dat	Closed Date	CLOS_ACR	CLOS_PRICE	DON_VAL	Bates No.
Apalachicola Bay	Elberta Box & Crate	Franklin	9/8/1982	10/14/1982	1,989.00	$547,000.00		FL-ACF-04138098 - FL-ACF-04138113
Apalachicola Bay	Holt	Franklin	9/21/1982	10/14/1982	498.00	$603,500.00		FL-ACF-04138629 - FL-ACF-04138645
Apalachicola Bay	US Homes Corp.	Franklin	2/15/1983	2/28/1983	1,387.00	$335,655.00		FL-ACF-04139095 - FL-ACF-04139151
Apalachicola Bay	Atkinson	Franklin	12/7/1982	4/19/1983	50.00	$10,000.00		FL-ACF-04139299 - FL-ACF-04139313
Apalachicola Bay	Buckeye Cellulose	Franklin	1/11/1983	5/18/1983	100.00	$48,500.00		FL-ACF-04139549 - FL-ACF-04139566
Apalachicola Bay	Elberta Box & Crate	Franklin	9/20/1983	11/9/1983	609.00	$182,700.00		FL-ACF-04139734 - FL-ACF-04139748
Apalachicola Bay	Forman	Franklin	10/18/1983	3/29/1984	748.00	$149,000.00		FL-ACF-04139976 - FL-ACF-04139995
Apalachicola Bay	Parcel 16	Franklin	11/1/1983	3/29/1984	70.00	$37,000.00		FL-ACF-04140261 - FL-ACF-04140276
Apalachicola Bay	Parcel 23	Franklin	11/29/1983	3/30/1984	17.40	$60,000.00		FL-ACF-04137714 - FL-ACF-04137734
Apalachicola Bay	Parcel 22	Franklin	7/29/1986	12/19/1986	497.72	$118,576.81		FL-ACF-04137954 - FL-ACF-04137972
Apalachicola Bay	Millender	Franklin	6/13/1989	8/9/1989	36.05	$757,980.10		FL-ACF-04137973 - FL-ACF-04137986
Apalachicola Bay	St. Joe Paper	Franklin	4/12/1990	9/5/1990	3,595.50	$881,697.50		FL-ACF-04137987 - FL-ACF-04137995
Apalachicola Bay/Little St. George Lighthouse	U.S.A.	Franklin	11/21/03	11/21/03	0.08		$87,187.00	FL-ACF-04137996 - FL-ACF-04138015
Carrabelle Ventures	Carrabelle Ventures	Franklin	08/19/07	08/20/07	17.37		$55,000.00	FL-ACF-04138016 - FL-ACF-04138040
Apalachicola Sanctuary Donation	Apalachicola	Franklin	1/7/1986	1/7/1986	0.37		$12,500.00	FL-ACF-04138041 - FL-ACF-04138048
Florida Public Utilities Donation	Florida Public	Jackson	1/26/1995	8/3/1995	0.14		$2,000.00	FL-ACF-04138049 - FL-ACF-04138064
Cape St. George Lighthouse Donation	U. S. Fish &Wildlife	Franklin	12/17/1997	12/17/1997	6.42		$270,000.00	FL-ACF-04138065 - FL-ACF-04138082
St. George Island Donation	Brown	Franklin	3/25/1998	7/12/1999	11.00		$50,000.00	FL-ACF-04138083 - FL-ACF-04138113
Apalachicola Bay	Lwr. Ap. Teague	Franklin	10/2/1974	5/1/1974	243.34	$58,000.00		FL-ACF-04138114 - FL-ACF-04138131
Apalachicola Bay	Lwr. Ap. Porter	Franklin	10/2/1974	5/1/1975	2,485.91	$808,100.00		FL-ACF-04138132 - FL-ACF-04138144
Apalachicola Bay	Lwr. Ap. Quincy Bank	Franklin	10/2/1974	5/1/1975	1,272.72	$318,000.00		FL-ACF-04138145 - FL-ACF-04138163
Apalachicola Bay	Lwr. Ap. Watts	Franklin	10/2/1974	5/1/1975	560.00	$196,000.00		FL-ACF-04138164 - FL-ACF-04138180
Cape St. George Island	Leisure Properties	Franklin	3/22/1977	4/21/1977	279.76	$2,000,000.00		FL-ACF-04138181 - FL-ACF-04138200
Cape St. George Island	Marshall	Franklin	3/22/1977	5/19/1977	167.06	$568,000.00		FL-ACF-04138201 - FL-ACF-04138210
DRP/St. George Island	Leisure Properties	Franklin	5/1/1973	9/8/1976	1,559.05	$6,459,200.00		FL-ACF-04138211 - FL-ACF-04138228
Apalachicola River WMA	Peddie CE	Liberty		7/12/1995	5.00	Land Exchange		FL-ACF-04138229 - FL-ACF-04138236
Tate's Hell State Forest	USA	Franklin/Liberty	03/17/05	04/05/05	4,000.68	Land Exchange		FL-ACF-04138237 - FL-ACF-04138281; FL-ACF-04138282 - FL-ACF-04138326; FL-ACF-04138327 - FL-ACF-04138371; FL-ACF-04138372 - FL-ACF-04138416; FL-ACF-04138417 - FL-ACF-04138426; FL-ACF-04138427 - FL-ACF-04138616
Dickerson Bay/Bald Point	McDaniel, Pamela	Franklin	01/31/02	06/05/02	0.17	$7,000.00		FL-ACF-04138617 - FL-ACF-04138628
Dickerson Bay/Bald Point	Mathis, Gwendolyn	Franklin	01/31/02	06/20/02	0.31	$7,000.00		FL-ACF-04138646 - FL-ACF-04138658

Dickerson Bay/Bald Point	Ellis, Mary M.	Franklin	01/31/02	06/27/02	0.19	$25,000.00		FL-ACF-04138659 - FL-ACF-04138680
Dickerson Bay/Bald Point	Pratt, Lucy Rachel	Franklin	01/31/02	06/27/02	0.71	$19,950.00		FL-ACF-04138681 - FL-ACF-04138698
Dickerson Bay/Bald Point	Flournoy, John & Phillip	Franklin	02/27/02	10/31/02	0.21	$7,000.00		FL-ACF-04138699 - FL-ACF-04138717
Dickerson Bay/Bald Point	St. Joe Timberland	Franklin	10/08/02	12/02/02	2,852.90	$10,202,000.00		FL-ACF-04138718 - FL-ACF-04138754
FWCC/Apalachicola Wildlife and Environmental Area	McDaniell Parcel	19	6/26/2002	04/17/03	117.84	$380,000.00		FL-ACF-04138755 - FL-ACF-04138781
Tate's Hell State Forest	Profundus	Franklin	04/22/03	06/18/03	37,253.70	$38,000,000.00		FL-ACF-04138782 - FL-ACF-04138826; FL-ACF-04138827 - FL-ACF-04138836; FL-ACF-04138837 - FL-ACF-04138891
St. Joe Timberland	St. Joe	Liberty/Gadsden	04/13/04	06/30/04	1,591.73	$2,364,765.00		FL-ACF-04138892 - FL-ACF-04138927; FL-ACF-04138928 - FL-ACF-04139008; FL-ACF-04139009 - FL-ACF-04139053
Bald Point State Park	Goostree, Mary C.	Franklin	11/17/2008	4/8/2009	0.28	$85,000.00		FL-ACF-04139054 - FL-ACF-04139073
Bald Point State Park	Clark, Loretta D.	Franklin	11/17/2008	4/17/2009	0.84	$135,935.00		FL-ACF-04139074 - FL-ACF-04139094
Bald Point State Park	Michael G. Kennedy	Franklin	5/26/2011	9/6/2011	0.77	$67,500.00		FL-ACF-04139152 - FL-ACF-04139180
DRP/Florida Caverns	Ward & Glass	Jackson	4/25/1975	5/16/1975	25.00	$35,000.00		FL-ACF-04139181 - FL-ACF-04139189
Apalachicola Bay	Bush	Franklin	10/20/1992	3/26/1993	0.28	$6,500.00		FL-ACF-04139190 - FL-ACF-04139199
Apalachicola Bay	Wilder Property	Franklin	7/23/1991	4/23/1993	47.72	$736,000.00		FL-ACF-04139200 - FL-ACF-04139220
Apalachicola Bay	Hunter	Franklin	10/20/1992	5/5/1993	0.14	$3,500.00		FL-ACF-04139221 - FL-ACF-04139229
DRP/Florida Caverns	DuBose	Jackson	12/15/1992	8/25/1993	0.47	$6,500.00		FL-ACF-04139230 - FL-ACF-04139237
DRP/Florida Caverns	Del Vecchio	Jackson	9/13/1994	3/30/1995	5.90	$30,000.00		FL-ACF-04139238 - FL-ACF-04139246
Tate's Hell Carrabelle Tract	New River-Franklin	Franklin	12/13/1994	6/16/1995	42,727.00	$19,537,775.00		FL-ACF-04139247 - FL-ACF-04139279
DRP/Florida Caverns	Pittman	Jackson	9/13/1994	7/18/1995	20.02	$26,000.00		FL-ACF-04139280 - FL-ACF-04139288
DRP/Florida Caverns	Basford	Jackson	2/14/1995	10/30/1995	0.39	$2,100.00		FL-ACF-04139289 - FL-ACF-04139298
Tate's Hell Carrabelle Tract	Coastal Timber/TNC	Franklin	3/28/1996	6/13/1996	17,972.60	$7,800,000.00		FL-ACF-04139314 - FL-ACF-04139337
Tate's Hell Carrabelle Tract	Southern Pine	Franklin	5/29/1996	7/2/1996	14,956.60	$7,651,650.00		FL-ACF-04139338 - FL-ACF-04139367
Apalachicola Bay	Leanora	Franklin	2/27/1996	8/30/1996	5.96	$188,700.00		FL-ACF-04139368 - FL-ACF-04139378
Tate's Hell Carrabelle Tract	Christian/Wooten/TPL	Franklin	5/29/1996	9/16/1996	213.50	$105,000.00		FL-ACF-04139379 - FL-ACF-04139399
Tate's Hell Carrabelle Tract	Christian/Wooten/TPL	Franklin	5/29/1996	9/16/1996	1,316.10	$715,000.00		FL-ACF-04139400 - FL-ACF-04139419
Tate's Hell Carrabelle Tract	Rex Lumber Company	Franklin	5/29/1996	10/28/1996	24,850.00	$24,850,000.00		FL-ACF-04139420 - FL-ACF-04139463
DOF/Tate's Hell State Forest	New River/TNC	Franklin	6/13/1996	11/8/1996	2,629.00	$5,146,111.47		FL-ACF-04139464 - FL-ACF-04139482
FWCC/Apalachicola Wildlife & Environmental	Stone Container	Franklin	1/23/1996	11/21/1996	5,400.00	$5,550,000.00		FL-ACF-04139483 - FL-ACF-04139507
Tate's Hell Carrabelle Tract	TPL/Johnson	Franklin	7/23/1996	12/30/1996	112.60	$195,000.00		FL-ACF-04139508 - FL-ACF-04139523
Tate's Hell Carrabelle Tract	TPL/Corry, et al	Franklin	7/23/1996	12/31/1996	1,030.10	$2,017,630.00		FL-ACF-04139524 - FL-ACF-04139548
Tate's Hell Carrabelle Tract	TPL/Yent Bayou	Franklin	10/8/1996	2/14/1997	363.00	$726,000.00		FL-ACF-04139567 - FL-ACF-04139588

Fl First Magnitude Springs/Blue Springs	FL Public Utilities	Jackson	1/23/1996	9/4/1997	226.40	$ 970,500.00		FL-ACF-04139589 - FL-ACF-04139608
Fl First Magnitude Springs/Blue Springs	Huff	Jackson	10/21/1997	5/21/1998	12.00	$156,000.00		FL-ACF-04139609 - FL-ACF-04139621
Fl First Magnitude Springs/Blue Springs	Mixson	Jackson	10/21/1997	5/21/1998	8.50	$156,000.00		FL-ACF-04139622 - FL-ACF-04139634
Apalachicola Bay	Tidal/10 & 11	Franklin	3/10/1998	6/29/1998	2.33	$174,850.00		FL-ACF-04139635 - FL-ACF-04139647
Apalachicola Bay	Equity/9 & 18	Franklin	3/10/1998	6/30/1998	2.31	$169,850.00		FL-ACF-04139648 - FL-ACF-04139660
Apalachicola Bay	Yonclas/12	Franklin	3/10/1998	7/1/1998	1.23	$79,950.00		FL-ACF-04139661 - FL-ACF-04139673
OGT/Chipola River Greenway	Hinson/1,2&14	Jackson	5/12/1998	10/28/1998	141.36	$176,000.00		FL-ACF-04139674 - FL-ACF-04139691
OGT/Chipola River Greenway	Surgnier/9	Jackson	5/12/1998	11/5/1998	43.43	$50,200.00		FL-ACF-04139692 - FL-ACF-04139717
OGT/Chipola River Greenway	FPU/10 & 11	Jackson	5/28/1998	4/30/1999	148.73	$155,000.00		FL-ACF-04139718 - FL-ACF-04139733
FWCC/Apalachicola River Wildlife & E A	New Forestry	Franklin	10/27/1998	6/18/1999	6,759.00	$7,023,735.00		FL-ACF-04139749 - FL-ACF-04139782
OGT/Chipola River Greenway	Manor/13	Jackson	5/28/1998	8/2/1999	99.91	$181,000.00		FL-ACF-04139783 - FL-ACF-04139809
DOF/Tate's Hell/Carrabelle Tract	Wachovia (timber)	Franklin	6/22/1999	8/12/1999	10,251.00	$5,870,000.00		FL-ACF-04139810 - FL-ACF-04139834
Middle Chipola River	Manor Addition	Jackson	8/9/1999	9/28/1999	1.60	$58,000.00		FL-ACF-04139835 - FL-ACF-04139848
Apalachicola Bay	Church of God	Franklin	6/8/1999	10/13/1999	7.20	$215,000.00		FL-ACF-04139849 - FL-ACF-04139865
Apalachicola River	Hatcher (Sweetwater Creek) Cosv Esmnt	Liberty	11/29/2000	12/15/2000	637.10	$ 912,000.00		FL-ACF-04139866 - FL-ACF-04139899
Pierce Mound Complex	Gaidry Option	Franklin	12/12/2000	2/5/2001	1.37	$810,000.00		FL-ACF-04139900 - FL-ACF-04139921
OGT/Chipola River Greenway	Hinson, Jr.	Jackson	9/25/2000	4/2/2001	87.96	$168,192.71		FL-ACF-04139922 - FL-ACF-04139939
Apalachicola Bay	Designs of Tallahassee	Franklin	6/12/2001	7/26/2001	1.00	$76,000.00		FL-ACF-04139940 - FL-ACF-04139957
Apalachicola Bay	Equity	Franklin	6/12/2001	7/26/2001	1.00	$85,500.00		FL-ACF-04139958 - FL-ACF-04139975
Apalachicola Bay	Tidal Investments/17	Franklin	6/12/2001	7/26/2001	2.00	$ 242,250.00		FL-ACF-04139996 - FL-ACF-04140017
DOF/Tate's Hell State Forest	St. Joe/TNC	Franklin	6/12/2001	9/26/2001	3,413.97	$6,401,028.00		FL-ACF-04140018 - FL-ACF-04140045
Chipola River WMA	Gaskin etal CE	Gulf	2/27/2000	6/6/2003	809.50	$436,500.00		FL-ACF-04140046 - FL-ACF-04140067
Tate's Hell	Bienville Forest/NWF	Franklin	10/26/1993	2/2/1994	28,156.00	$8,781,272.38		FL-ACF-04140068 - FL-ACF-04140105
St. Joe Timberland	St. Joe	Franklin	11/25/03	12/26/03	13,260.10	$14,466,769.00		FL-ACF-04140106 - FL-ACF-04140139
Tate's Hell Carrabelle Tract	Bienville Forest/TPL	Franklin	12/13/1994	1/31/1995	1,308.90	$697,742		FL-ACF-04140140 - FL-ACF-04140151
Apalachicola River	The Nature Conservancy	Liberty	04/13/04	12/20/04	278.20	$847,074.40		FL-ACF-04140152 - FL-ACF-04140172
Torreya State Park Addition	Plum Creek	Liberty	5/11/2010	9/30/2010	553.23	$1,418,000.00		FL-ACF-04140173 - FL-ACF-04140201
Apalachicola River	Corbin/Tucker	Gadsden	10/26/2004	4/4/2005	2,122.00	$2,124,500.00		FL-ACF-04140202 - FL-ACF-04140260
St. Joe Timberland	St. Joe	Franklin/Gulf	12/19/06	03/23/07	2,819.40	$ 3,957,423.00		FL-ACF-04140277 - FL-ACF-04140365
St. George Island	Barbara H. Benda	Franklin	2/24/2010	8/17/2010	0.81	$ -	$232,800.00	FL-ACF-04140366 - FL-ACF-04140385

Apalachicola Bay	Millender	Franklin	1/23/2001	7/17/2001	2.93	$ 460,000.00		FL-ACF-04140386 - FL-ACF-04140403
DRP/Florida Caverns	McGowen	Jackson	2/2/1965	7/31/1965	30.90	$ 6,000.00		FL-ACF-04140404 - FL-ACF-04140405
St. Joe Timberland	The Nature Conservancy Charitable Trust	Liberty	12/18/2001	3/29/2002	7,016.87	$7,241,004.90		FL-ACF-04140406 - FL-ACF-04140491
Apalachicola Bay	Rodrique	Franklin	1/23/1990	4/10/1990	58.88	$748,953.00		FL-ACF-04140513 - FL-ACF-04140534
St. Joe Timberland (DEP)	Box R Ranch	Franklin	11/12/03	12/10/03	3,798.40	$7,463,856.00		FL-ACF-04140535 - FL-ACF-04140576
St. Joe Timberland (FWCC)	Box R Ranch	Franklin	11/12/03	12/10/03	3,798.40	$ 7,463,856.00		FL-ACF-04140535 - FL-ACF-04140576
Apalachicola Bay	M. K. Ranch	Gulf	12/13/1983	5/17/1985	9,951.00	$2,923,153.00		FL-ACF-04140577 - FL-ACF-04140619; FL-ACF-04140620 - FL-ACF-04140669; FL-ACF-04140670 - FL-ACF-04140677; FL-ACF-04140678 - FL-ACF-04140685; FL-ACF-04140686 - FL-ACF-04140693; FL-ACF-04140694 - FL-ACF-04140701; FL-ACF-04140702 - FL-ACF-04140711; FL-ACF-04140712 - FL-ACF-04140720; FL-ACF-04140721 - FL-ACF-04140729
Apalachicola Bay	M. K. Ranch	Gulf	10/2/1974	5/1/1975	7,315.16	$1,713,000.00		FL-ACF-04137735 - FL-ACF-04137759; FL-ACF-04137760 - FL-ACF-04137772; FL-ACF-04137773 - FL-ACF-04137786
St. George Island	Unit 4	Franklin	9/8/1982	9/8/1982	74.68	$1,076,912.00		FL-ACF-04137787 - FL-ACF-04137803; FL-ACF-04137804 - FL-ACF-04137819
Apalachicola Bay	Lwr. Ap. Sundin	Franklin	10/2/1974	5/1/1975	3,376.07	$1,022,150.00		FL-ACF-04137820 - FL-ACF-04137836; FL-ACF-04137837 - FL-ACF-04137849
Apalachicola Bay	Lwr. Ap. International Paper	Franklin	12/7/1976	1/7/1977	12,869.00	$3,500,000.00		FL-ACF-04137850 - FL-ACF-04137872; FL-ACF-04137873 - FL-ACF-04137887
Apalachicola Bay	High Tide	Franklin	2/27/1996	8/30/1996	2.97	$210,000.00		FL-ACF-04137888 - FL-ACF-04137901; FL-ACF-04137902 - FL-ACF-04137905
Apalachicola Bay	Mahr	Franklin	11/27/2001	1/29/2002	5.53	$678,200.00		FL-ACF-04137906 - FL-ACF-04137925; FL-ACF-04137926 - FL-ACF-04137930
Cape St. George Island	Manson	Franklin	3/22/1977	5/19/1977	1,847.77	$6,270,000.00		FL-ACF-04137931 - FL-ACF-04137939; FL-ACF-04137940 - FL-ACF-04137953
Apalachicola River WMA	Peddie	Liberty	5/25/1995	7/12/1995	19.00	Land Exchange		FL-ACF-04010217 - FL-ACF-04010219
Apalachicola River WMA	Trammell CE	Calhoun		12/21/2007	1,544.00	$2,985,107.84		FL-ACF-04010220; FL-ACF-04010221; FL-ACF-04010222; FL-ACF-04010223 - FL-ACF-04010250
Chipola River WMA	Belamy-IP	Jackson		3/31/2009	338.70	$297,000.00		FL-ACF-04010160 - FL-ACF-04010180
Chipola River WMA	Chipola Timberlands	Calhoun		12/23/2009	1,375.16	$5,225,608.00		FL-ACF-04010292 - FL-ACF-04010306; FL-ACF-04010283; FL-ACF-04010284 - FL-ACF-04010291
Apalachicola River WMA	Neal	Liberty		5/19/2011	1,316.70	$3,565,426.09		FL-ACF-04010307; FL-ACF-04010308 - FL-ACF-04010322
Upper Chipola Water Mgmt Area	Mutual Life of New York	Jackson		7/31/1992	7,375.80	$2,237,493.00		FL-ACF-04010323 - FL-ACF-04010402; FL-ACF-04137621 - FL-ACF-04137626
Apalachicola River Water Mgmt Area	Southwest Forest Industries	Gulf/Liberty		12/2/1985	35,524.00	$10,297,610.00		FL-ACF-04010251 - FL-ACF-04010282; FL-ACF-04137601; FL-ACF-04137602 - FL-ACF-04137620
Totals					**342,489.26**	**$263,014,192.20**	**$709,487.00**	

7. FX-672 - TRANSACTIONS IN FLORIDA - NATURE CONSERVANCY

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Calhoun	Apalachicola River (Corbin & Tucker Conservation Easement)	3/31/2005	Assist	Corbin, David Finley; Tucker, John Kendrick; Tucker, Thomas Michael	Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	EAS	2,124.50	$ 2,124,500.00
FL	Calhoun	GENTIAN PINKROOT PRESERVE (ST. JOE COMPANY)	9/9/2002	IN	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	TNC	FEE, EAS	32.50	$ 48,750.00
FL	Calhoun, Franklin, Gulf, Liberty, Washington	PANHANDLE RIVERS (SOUTHWEST FOREST INDUSTRIES)	11/30/1985	Assist	SOUTHWEST FOREST INDUSTRIES	NWFWMD - NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT	FEE	70,707.00	$ 20,505,030.00
FL	Franklin	APALACHICOLA BAY GRANT ACQUISITION PROJECT - HOLT	8/1/2001	IN	HOLT, ROBERT G.	TNC	FEE	45.00	$ 212,500.00
FL	Franklin	APALACHICOLA RIVER AND BAY (BOX R RANCH/ST. JOE TIMBERLAND)	12/15/2003	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, L.L.C.	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	7,596.80	$ 14,927,712.00
FL	Franklin	APALACHICOLA RIVER/ST. JOE TIMBERLAND (EAST BAY)	9/27/2001	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	3,413.97	$ 6,401,028.00
FL	Franklin	APALCHICOLA RIVER/ST. GEORGE ISLAND/NICK'S HOLE(MAHR DEVELOPMENT)	2/15/2002	Assist	MAHR DEVELOPMENT CORPORATION OF FLORIDA; MAHR, GEORGE	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	5.52	$ 650,000.00
FL	Franklin	BRADY ADDITION DOG ISLAND, FLORIDA	8/24/1981	IN	BRADY, B.A.	TNC	FEE	0.40	$ -
FL	Franklin	DICKERSON BAY/BALD POINT (ST. JOE TIMBERLAND COMPANY)	12/2/2002	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	2,852.90	$ 10,202,000.00
FL	Franklin	DOG ISLAND (ALTHOLZ)	12/30/2004	IN	ALTHOLZ, TED	TNC	FEE	0.50	$ -
FL	Franklin	DOG ISLAND (BURNETTE)	7/6/1983	IN	BURNETTE, JAMES V. & EMILY	TNC	FEE	0.80	$ 10,546.00
FL	Franklin	DOG ISLAND (HUGGINS)	6/7/1984	IN	HUGGINS, NORMAN P. AND MARY JUNE	TNC	FEE	0.50	$ 50,000.00

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Franklin	DOG ISLAND (HUGGINS)	7/26/1984	OUT	TNC	CUYAHOGA TRUST (ROUSH TRUST)	FEE	0.50	$ -
FL	Franklin	DOG ISLAND (NATIONAL CITY BANK TRACTS) AMENDMENT	1/17/1992	IN	CITY NATIONAL BANK	TNC	FEE	1,019.57	$ 1,000,000.00
FL	Franklin	DOG ISLAND (NATIONAL CITY BANK TRACTS) AMENDMENT	4/27/1992	OUT	TNC	BARRIER ISLAND TRUST	FEE	6.00	$ -
FL	Franklin	Dog Island (Roush, et al)	12/30/2014	IN	Roush, Thomas W.; JPMorgan Chase Bank, N.A., as Ancillary Successor Trustee per Order 7/10/96 U/A made by Ruth C. Roush for Caitlin W. Roush; JPMorgan Chase Bank, N.A., as Ancillary Successor Trustee per Order 7/10/96 U/A made by Ruth C. Roush for Jevon W.	TNC	FEE	16.00	$ -
FL	Franklin	Dog Island Amendment 2 (Wood Swap)	8/25/2004	IN	WOOD, THOMAS P., REVOCABLE TRUST	TNC	FEE	3.30	$ 735,000.00
FL	Franklin	Dog Island Amendment 2 (Wood Swap)	8/25/2004	OUT	TNC	WOOD, THOMAS P., REVOCABLE TRUST	FEE	5.22	$ 779,000.00
FL	Franklin	DOG ISLAND LOT SWAMP - AMENDMENT	8/29/2000	IN	TEAF, CHRISTOPHER & PATRICIA /JONES, LAURIE & WILLIAM	TNC	FEE	0.21	$ 60,000.00
FL	Franklin	DOG ISLAND LOT SWAMP - AMENDMENT	8/29/2000	OUT	TNC	TEAF, CHRISTOPHER & PATRICIA /JONES, LAURIE & WILLIAM	FEE	0.21	$ 60,000.00
FL	Franklin	DOG ISLAND(DOG ISLAND CO.(1DIV))	12/20/1996	IN	DOG ISLAND COMPANY	TNC	FEE	8.00	$ -
FL	Franklin	DOG ISLAND, FLORIDA	1/16/1980	IN	LEWIS, WILLIAM C.; LEWIS, JEFFERSON D.	TNC	FEE	2.00	$ 10,000.00
FL	Franklin	DOG ISLAND, FLORIDA	7/29/1981	OUT	TNC	LEWIS, WILLIAM C.; LEWIS, JEFFERSON D.	FEE	2.00	$ -

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Franklin	DOG ISLAND, FLORIDA	10/13/1983	IN	DOG ISLAND COMPANY	TNC	FEE	1,058.37	$ -
FL	Franklin	DOG ISLAND, FLORIDA AMENDMENT	10/13/1983	OUT	TNC	CUYAHOGA TRUST (ROUSH TRUST)	FEE	1,059.17	$ 1,350,000.00
FL	Franklin	DOG ISLAND, FLORIDA AMENDMENT	1/30/1986	IN	CUYAHOGA TRUST (ROUSH TRUST)	TNC	FEE	10.10	$ -
FL	Franklin	DOG ISLAND, FLORIDA AMENDMENT	1/26/1987	IN	CUYAHOGA TRUST (ROUSH TRUST)	TNC	FEE	30.00	$ -
FL	Franklin	DOG ISLAND, FLORIDA BICKERS ADDITION	12/13/1982	IN	BICKERS, DONALD S.	TNC	FEE	0.31	$ -
FL	Franklin	DOG ISLAND, FLORIDA ENGELHARD ADDITION	12/16/1982	IN	ENGELHARD, GEORGE & JANE	TNC	FEE	0.15	$ -
FL	Franklin	JOHN S. PHIPPS PRESERVE, FLORIDA	12/27/1977	IN	PHIPPS, JOHN H. & ELINOR K.	TNC	FEE	40.00	$ -
FL	Franklin	ST. VINCENTS ISLAND, FLORIDA	1/16/1968	IN	ST. VINCENTS ISLAND COMPANY, NOT INCORPORATED	TNC	FEE	12,358.20	$ 2,200,000.00
FL	Franklin	ST. VINCENTS ISLAND, FLORIDA	7/9/1968	OUT	TNC	USFWS FL - REGION #4 (SOUTHEAST)	FEE	12,358.20	$ 2,035,000.00
FL	Franklin	TATE'S HELL SWAMP (COASTAL TIMBER RESOURCES, LLC - ESW)	6/13/1996	Assist	COASTAL TIMBER RESOURCES, L.L.C.	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	17,972.60	$ 7,800,000.00
FL	Franklin	TATE'S HELL SWAMP (NEW RIVER FRANKLIN, LTD./CARL)	6/16/1995	Assist	NEW RIVER FRANKLIN, LTD.	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	42,727.00	$ 19,537,775.29
FL	Franklin	TATE'S HELL SWAMP (NEW RIVER-FRANKLIN, LTD.)	6/27/1995	IN	NEW RIVER FRANKLIN, LTD.	TNC	FEE	2,068.00	$ 2,451,589.00

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Franklin	TATE'S HELL SWAMP (NEW RIVER-FRANKLIN, LTD.)	6/27/1995	OUT	TNC	USFS FL - REGION 8 SOUTHERN REGION	FEE	2,068.00	$ 2,547,800.00
FL	Franklin	Tate's Hell/Carrabelle Tract (Crooked River/St. Joe Timberlands)	12/24/2003	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	13,260.10	$ 14,466,769.10
FL	Franklin, Gulf	ST. VINCENT SOUND-TO-LAKE WIMICO (ST. JOE TIMBERLAND CO.-WIMICO PRESERVE)	3/23/2007	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, L.L.C.	Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	FEE	2,843.80	$ 4,905,756.00
FL	Franklin, Liberty	TATE'S HELL SWAMP (NEW RIVER FRANKLIN, LTD.) AMENDMENT	11/8/1996	IN	NEW RIVER FRANKLIN, LTD.	TNC	FEE	2,629.00	$ 5,119,111.47
FL	Franklin, Liberty	TATE'S HELL SWAMP (NEW RIVER FRANKLIN, LTD.) AMENDMENT	11/8/1996	OUT	TNC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	2,629.00	$ 5,119,111.47
FL	Franklin, Liberty	TATE'S HELL SWAMP (NEW RIVER-FRANKLIN, LTD.)	9/1/1994	IN	NEW RIVER FRANKLIN, LTD.	TNC	FEE	1,985.00	$ 2,281,610.00
FL	Franklin, Liberty	TATE'S HELL SWAMP (NEW RIVER-FRANKLIN, LTD.)	9/29/1994	OUT	TNC	USFS FL - REGION 8 SOUTHERN REGION	FEE	1,985.00	$ 2,281,610.00
FL	Franklin, Liberty	TATE'S HELL SWAMP (SO. PINE PLANTATIONS OF GEORGIA, INC.-ENW)	7/2/1996	Assist	SOUTHERN PINE PLANTATIONS OF GEORGIA, INC.	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	14,956.60	$ 7,651,650.00
FL	Franklin, Liberty	TATE'S HELL(ST. JOE TIMBERLAND COMPANY)	7/20/1999	Assist	ST. JOE TIMBERLAND COMPANY, INC.	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	13,252.45	$ 9,867,125.00
FL	Gulf	ST. JOSEPH BAY BUFFER (MONEY BAYOU/TREASURE SHORES, LTD.)	3/4/2002	Assist	TREASURE SHORES LIMITED	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	3,440.00	$ 4,873,000.00
FL	Jackson	MARIANNA BAT CAVE (JUDGES CAVE)	10/29/1982	IN	MYERS, RONNIE G. & KITTIE	TNC	FEE	37.33	$ 50,000.00
FL	Jackson	MARIANNA BAT CAVE (JUDGES CAVE)	1/11/1983	OUT	TNC	Florida Fish and Wildlife Conservation Commission (FFWCC)	FEE	37.33	$ 50,000.00

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Liberty	APALACHICOLA BLUFFS & RAVINES (SMITH)	4/14/1993	IN	SMITH, TIMOTHY M. AND BONNIE B.	TNC	FEE	14.99	$ 10,000.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (DUPUIS ESTATE), FL	11/2/1989	IN	DUPUIS ESTATE	TNC	FEE	357.21	$ 340,728.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (TRAVELER'S INSURANCE COMPANY)	12/9/1988	IN	TRAVELER'S INSURANCE COMPANY	TNC	FEE	1,445.00	$ 1,264,450.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (TRAVELER'S INSURANCE COMPANY)	9/18/1994	OUT	TNC	HALL, HENRY & NAOMI	FEE	11.39	$ -
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (TRAVELER'S INSURANCE COMPANY)	10/10/1994	IN	HALL, HENRY & NAOMI	TNC	FEE	6.98	$ -
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (WHITFIELD)	10/17/1990	IN	WHITFIELD, NORMAN E.	TNC	FEE	13.69	$ 30,000.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES (WHITFIELD)	10/19/1990	IN	WHITFIELD, STEPHEN & PATRICIA	TNC	FEE	1.00	$ 75,400.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (BEAVERDAM AND SWEETWATER CREEK ADDITION)	6/11/1984	IN	KENNER, HAMILTON G.	TNC	FEE	3,226.78	$ 1,226,908.50
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (BEAVERDAM AND SWEETWATER CREEK ADDITION)	6/11/1984	IN	ST. JOE PAPER COMPANY	TNC	FEE	3,213.86	$ 1,226,908.50
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (BEAVERDAM AND SWEETWATER CREEK ADDITION)	6/11/1984	OUT	TNC	ST. JOE PAPER COMPANY	FEE	3,226.78	$ 1,226,908.50
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (BRISTOL)	4/7/1995	IN	BRISTOL, CLIFFORD S. AND LISA G.	TNC	FEE, RFR	75.60	$ 10,000.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (DUNN)	6/9/1995	IN	DUNN, ELIZABETH O., ESTATE OF	TNC	FEE	25.00	$ 40,000.00

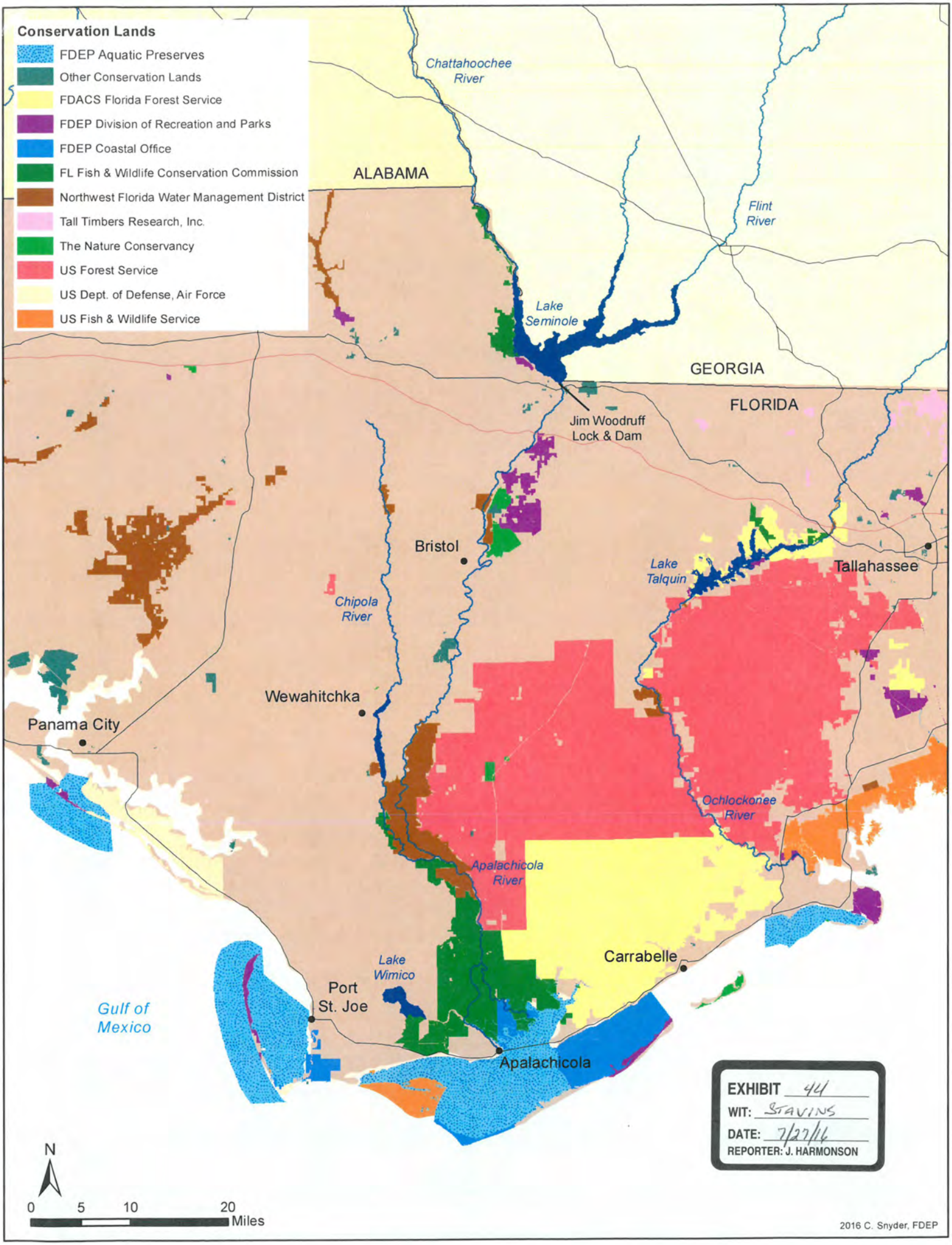
THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE (SWEETWATER DOWNS/ST. JOE)	9/27/2002	IN	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	TNC	FEE	46.42	$ 102,124.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES PRESERVE, LIBERTY COUNTY, FLORIDA	6/11/1982	IN	SHAW, FRANK S., JR.,SKELTON, BENSON L., JR.	TNC	FEE	1,157.97	$ 687,500.00
FL	Liberty	APALACHICOLA BLUFFS AND RAVINES SHULER ADDITION	12/7/1983	IN	SHULER, JOSEPH S. & MARLENE P.	TNC	FEE	9.90	$ 24,850.00
FL	Liberty	Apalachicola National Forest/Tate's Hell (St. Joe Timberlands/Wilma)	10/23/2008	IN	St. Joe Timberland Company of Delaware, LLC	TNC	FEE	1,365.35	$ 3,278,792.45
FL	Liberty	Apalachicola National Forest/Tate's Hell (St. Joe Timberlands/Wilma)	12/12/2008	IN	St. Joe Timberland Company of Delaware, LLC	TNC	FEE	12.09	$ 29,033.29
FL	Liberty	Apalachicola National Forest/Tate's Hell (St. Joe Timberlands/Wilma)	6/22/2012	OUT	TNC	USFS FL - REGION 8 SOUTHERN REGION	FEE	186.45	$ 391,545.00
FL	Liberty	Apalachicola National Forest/Tate's Hell (St. Joe Timberlands/Wilma)	10/3/2013	OUT	TNC	USFS FL - REGION 8 SOUTHERN REGION	FEE	1,190.99	$ 2,025,000.00
FL	Liberty	APALACHICOLA RIVER & BAY/TORREYA STATE PARK (NEAL LAND AND TIMBER CO)	3/5/2003	IN	PDO, Inc.	TNC	FEE	285.00	$ 819,000.00
FL	Liberty	APALACHICOLA RIVER & BAY/TORREYA STATE PARK (NEAL LAND AND TIMBER CO)	12/20/2004	OUT	TNC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	285.00	$ 819,000.00
FL	Liberty	Apalachicola River & Bay/Torreya State Park (St. Joe/Crooked & Short Creek)	6/30/2004	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	1,591.73	$ 2,364,765.00
FL	Liberty	ROCK CREEK (HAISEAL)	10/27/1989	IN	HAISEAL TIMBER, INC.	TNC	FEE	1,415.00	$ 950,181.23
FL	Liberty	ROCK CREEK (HAISEAL)	6/19/1990	OUT	TNC	FL DNR - FLORIDA DEPARTMENT OF NATURAL RESOURCES	FEE	1,415.00	$ 1,074,531.04

THE NATURE CONSERVANCY - FLORIDA
ACF BASIN TRANSACTIONS

STATE	COUNTY	PROJECT	CLOSING DATE	TYPE	ALL GRANTORS	ALL GRANTEES	INTEREST	TOTAL ACRES	TOTAL PRICE
FL	Liberty	TORREYA STATE PARK (ST. JOE TIMBERLANDS)	6/6/2001	Assist	ST. JOE TIMBERLANDS	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	371.70	$ 652,000.00
FL	Liberty	TORREYA STATE PARK/SWEETWATER CREEK (ST. JOE TIMBERLAND)	3/28/2002	Assist	ST. JOE TIMBERLAND COMPANY OF DELAWARE, LLC	BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND OF THE STATE OF FLORIDA	FEE	7,008.49	$ 7,253,787.15
FL	Liberty	UPPER APALACHICOLA (BRISTOL EASEMENT)	12/29/2005	IN	BRISTOL, CLIFFORD S. AND LISA G.	TNC	EAS	67.11	$ 142,000.00

8. FX-143 - MAP OF CONSERVATION LANDS, FLORIDA ACF


Conservation Lands
FDEP Aquatic Preserves
Other Conservation Lands
FDACS Florida Forest Service
FDEP Division of Recreation and Parks
FDEP Coastal Office
FL Fish & Wildlife Conservation Commission
Northwest Florida Water Management District
Tall Timbers Research, Inc.
The Nature Conservancy
US Forest Service
US Dept. of Defense, Air Force
US Fish & Wildlife Service
Chattahoochee River
ALABAMA
Flint River
Lake Seminole
GEORGIA
FLORIDA
Jim Woodruff Lock & Dam
Bristol
Lake Talquin
Tallahassee
Chipola River
Wewahitchka
Panama City
Ochlockonee River
Apalachicola River
Carrabelle
Lake Wimico
Port St. Joe
Gulf of Mexico
Apalachicola
N
0 5 10 20
Miles
EXHIBIT 44
WIT: STAVINS
DATE: 7/27/16
REPORTER: J. HARMONSON
2016 C. Snyder, FDEP

9. FX-20 - FLINT RIVER BASIN REGIONAL WATER DEVELOPMENT AND CONSERVATION PLAN

Publicly Available At:

http://www1.gadnr.org/frbp/Assets/Documents/Plan22.pdf

10. IRMAK ATTACHMENT 13 - CHATTAHOOCHEE AND BAINBRIDGE GAGES

ATTACHMENT 13

Attachment 13 contains two historical gage records from the U.S. Geological Survey for monthly mean flows at:

(1) The Apalachicola River at Chattahoochee, Florida

(2) The Flint River at Bainbridge, Georgia

For the first set of readings for the Apalachicola River, we have marked each monthly mean with less than 6,000 cfs extreme low flow with yellow highlighting. A distinct historical pattern can be seen, culminating in the lowest flows on record for the longest period in 2012.

For the second set of readings for the Flint River, the same historical pattern is evident: we have highlighted extreme low flows at less than 2,500 cfs on those pages.

The gage data are available at
http://waterdata.usgs.gov/fl/nwis/inventory/?site_no=02358000&agency_cd=USGS and
http://waterdata.usgs.gov/nwis/inventory/?site_no=02356000&agency_cd=USGS.

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: Florida | GO

Click to hide News Bulletins

- Try our new Mobile-friendly water data site from your mobile device!
- New improved user interface.
- Full News

USGS Surface-Water Monthly Statistics for Florida

Click to hide state-specific text

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA

Available data for this site | Time-series: Monthly statistics | GO

Gadsden County, Florida
Hydrologic Unit Code 03130011
Latitude 30°42'03", Longitude 84°51'33" NAD27
Drainage area 17,200.00 square miles
Gage datum 00.00 feet above NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

00060, Discharge, cubic feet per second,												
YEAR	Monthly mean in ft3/s (Calculation Period: 1928-10-01 -> 2016-01-31) Calculation period restricted by USGS staff due to special conditions at/near site											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1928										19,550	13,800	14,170
1929	22,810	38,370	171,600	37,240	36,240	23,850	19,440	15,820	13,790	37,510	28,200	28,150
1930	27,170	35,040	38,620	31,420	18,560	14,340	11,280	11,790	14,910	11,560	28,990	23,420
1931	23,430	19,990	20,210	21,800	19,580	8,898	9,010	11,590	7,235	5,980	5,524	14,870
1932	29,050	28,660	23,490	18,980	15,750	15,470	14,670	17,530	9,827	12,390	15,370	27,350
1933	37,090	43,010	41,050	37,990	21,400	13,810	14,360	12,190	11,380	8,111	7,888	8,906
1934	10,750	11,230	31,040	17,740	17,490	21,200	14,730	13,440	10,030	14,200	8,658	10,580

1935	12,020	13,850	27,450	20,690	14,500	8,905	11,030	11,690	12,670	7,056	9,299	9,688
1936	62,470	64,920	32,760	72,170	20,080	12,860	14,030	24,600	11,710	20,850	12,160	24,790
1937	40,600	41,100	37,350	44,220	34,550	16,500	15,760	15,360	17,630	15,380	17,820	16,890
1938	17,360	14,190	19,220	51,150	17,670	15,280	19,150	16,090	9,610	8,180	7,714	8,670
1939	11,770	27,200	47,610	31,250	20,970	21,810	16,840	26,560	17,520	12,370	9,127	10,170
1940	19,360	36,480	30,250	26,530	15,400	13,060	32,050	14,660	10,370	7,184	9,716	13,400
1941	16,750	14,510	19,060	16,750	9,840	7,148	13,980	11,120	7,562	6,973	6,387	18,740
1942	31,810	31,360	53,100	31,960	16,600	19,660	16,370	18,000	12,920	12,170	10,950	16,470
1943	45,080	32,800	62,780	35,250	24,250	17,060	17,280	15,180	9,753	8,413	9,960	11,010
1944	20,220	23,850	55,540	80,700	42,550	17,380	15,630	15,350	15,550	10,570	9,647	13,430
1945	15,670	29,970	26,660	19,360	27,710	12,490	15,590	14,980	14,580	12,350	13,950	26,680
1946	58,510	38,470	36,370	40,920	38,120	27,670	20,640	24,120	15,080	13,020	13,200	11,930
1947	33,060	22,530	44,650	45,220	28,640	24,880	20,030	17,230	12,000	10,370	26,450	40,840
1948	29,550	47,330	64,940	61,140	20,320	17,540	37,850	29,250	17,100	18,250	28,230	70,390
1949	45,700	53,200	37,870	36,310	39,200	23,040	31,170	23,640	19,720	14,170	13,280	15,230
1950	16,050	17,950	27,040	21,610	15,510	16,090	12,010	11,360	14,390	8,985	8,788	11,730
1951	14,280	13,210	16,260	24,280	13,570	9,547	9,921	8,129	7,304	7,225	11,160	20,540
1952	19,030	29,250	58,860	31,780	19,940	16,930	9,268	9,862	9,708	7,205	7,230	11,600
1953	24,340	28,020	31,830	29,700	44,980	15,630	22,660	14,190	13,430	16,970	11,210	42,900
1954	34,660	23,260	24,390	21,500	13,250	10,860	10,700	8,188	6,092	5,319	5,990	8,798
1955	14,050	19,430	12,780	19,330	12,210	7,892	12,450	10,920	6,850	5,499	5,909	7,991
1956	7,262	20,800	27,680	24,110	13,560	8,594	10,150	7,721	10,540	11,270	7,682	16,370
1957	14,470	13,350	22,720	39,860	23,980	12,630	10,230	7,008	8,567	14,610	19,000	23,970
1958	19,730	29,320	46,220	39,410	18,560	14,360	19,850	15,160	10,580	9,589	9,011	11,310
1959	17,020	37,460	44,010	30,810	18,860	31,900	15,770	12,720	12,330	15,590	16,560	16,970
1960	26,700	48,460	39,770	65,570	20,480	13,790	13,110	13,580	11,980	13,190	10,160	11,600
1961	12,690	32,800	47,440	57,160	29,450	20,030	20,340	16,250	14,100	8,345	8,707	29,270
1962	32,430	30,900	42,050	50,490	17,750	14,920	12,620	10,290	9,514	9,228	10,480	12,560
1963	28,170	30,790	23,860	20,910	20,410	17,890	17,660	12,210	8,841	9,217	9,152	18,900
1964	51,990	48,720	64,920	71,310	53,260	16,820	26,010	27,880	17,680	38,500	21,600	41,330
1965	38,940	52,420	50,700	39,250	17,280	26,320	20,290	14,310	13,100	17,310	13,080	16,030
1966	33,440	57,780	72,670	24,010	27,750	20,980	13,540	16,120	11,570	12,820	20,140	17,280
1967	45,630	35,730	23,920	14,280	13,420	15,960	20,630	16,390	18,390	12,440	16,660	29,880
1968	29,770	17,080	30,310	18,960	13,390	11,960	11,240	10,740	9,125	7,773	8,860	12,860
1969	15,740	18,940	24,330	30,240	21,140	13,420	10,990	12,870	13,980	12,660	11,230	13,410
1970	17,950	23,520	40,300	37,550	13,040	17,700	13,260	17,080	12,970	10,390	15,530	14,890
1971	31,000	38,500	67,350	34,600	30,500	16,070	20,730	25,340	14,280	12,920	12,150	31,410
1972	43,100	41,640	32,140	19,690	14,680	17,280	17,010	13,190	10,410	9,757	10,420	33,670
1973	46,530	59,330	44,480	70,500	38,150	39,460	18,100	18,340	13,670	11,730	12,690	17,020
1974	42,740	58,880	25,820	41,730	18,450	15,790	11,920	14,810	14,760	10,550	10,430	20,270
1975	37,700	53,890	65,070	69,540	26,700	27,620	26,990	29,100	16,590	27,470	23,190	21,920
1976	31,850	33,580	38,920	28,970	36,340	28,700	20,190	13,870	12,480	15,000	18,030	42,260
1977	39,770	22,150	53,120	37,910	14,530	11,890	9,815	12,020	11,240	10,110	25,580	18,580

1978	49,090	42,730	46,070	25,480	36,170	17,840	11,530	19,150	11,610	9,527	8,570	9,401
1979	20,660	41,280	45,030	55,480	26,430	14,950	13,460	12,140	13,490	14,210	16,540	15,820
1980	19,990	25,840	64,040	62,500	33,270	17,440	14,060	11,790	9,669	9,110	9,050	9,096
1981	9,065	28,660	16,030	23,920	10,410	10,210	9,658	9,265	9,066	7,104	5,614	7,614
1982	28,380	48,740	22,190	24,460	18,200	14,020	15,950	21,140	13,380	12,400	12,720	35,630
1983	37,210	50,480	58,760	58,340	22,480	19,620	17,130	13,310	13,130	12,640	14,560	47,220
1984	40,870	37,870	51,160	37,170	32,390	17,490	15,610	30,150	15,060	10,840	11,010	13,650
1985	13,160	32,570	21,360	15,080	12,130	9,877	9,476	13,940	12,430	9,864	11,010	21,760
1986	19,370	29,700	29,460	13,980	9,530	8,779	7,441	5,259	6,421	5,978	12,210	20,850
1987	36,850	36,600	46,000	27,550	15,390	18,900	19,070	11,860	10,640	8,826	7,137	9,250
1988	19,930	24,160	23,570	19,440	15,340	9,377	6,510	4,750	9,477	11,330	11,020	10,530
1989	11,400	10,420	17,420	28,970	14,550	25,080	33,540	15,680	14,270	20,790	18,900	33,180
1990	50,900	53,640	66,920	27,770	17,090	16,380	9,618	8,677	7,912	7,885	9,127	9,733
1991	18,120	30,650	45,400	25,380	38,170	22,540	26,190	21,870	17,530	12,770	9,976	14,860
1992	23,300	39,120	37,700	20,920	12,840	13,170	12,640	12,910	13,740	13,500	31,790	43,530
1993	47,710	33,640	52,080	39,770	21,100	12,890	11,810	11,050	9,566	9,720	13,270	15,220
1994	17,920	33,200	34,750	27,340	15,860	14,630	87,780	31,950	25,440	30,370	21,870	33,930
1995	27,860	57,610	44,600	20,750	15,320	14,430	11,590	11,580	10,140	15,300	20,950	19,950
1996	25,920	48,680	52,220	29,000	19,360	14,450	12,670	10,780	11,020	13,350	11,420	15,720
1997	26,930	39,130	32,780	17,910	22,140	18,950	17,290	14,310	11,180	11,480	19,660	51,660
1998	49,810	67,310	90,330	44,750	28,840	13,010	13,200	12,450	14,560	18,640	15,900	11,510
1999	15,880	22,680	17,280	10,880	8,807	11,040	12,040	10,870	6,548	5,727	6,246	7,576
2000	11,550	16,650	14,570	17,330	8,413	4,826	5,117	5,806	5,889	5,659	6,361	10,300
2001	14,690	11,990	57,190	30,860	11,560	18,600	11,150	9,585	7,173	6,130	5,975	7,337
2002	9,036	13,770	14,770	13,890	8,326	6,578	6,084	5,735	6,991	8,206	17,300	20,130
2003	15,860	23,760	48,700	32,950	43,040	37,120	35,360	25,700	13,970	12,050	13,310	16,790
2004	17,680	30,020	16,390	11,510	9,885	9,458	12,740	9,998	28,410	16,400	20,490	24,730
2005	21,100	24,350	41,760	71,790	21,740	25,520	56,320	32,350	15,090	10,360	11,840	18,430
2006	25,040	23,450	26,530	16,120	13,770	6,953	5,773	5,738	6,969	6,169	12,120	9,153
2007	21,310	18,940	19,490	13,540	6,869	5,153	5,351	5,154	5,343	5,133	4,976	5,981
2008	14,770	28,410	24,020	18,240	9,048	5,405	5,863	13,520	8,945	7,415	10,630	29,420
2009	17,650	11,400	37,120	66,960	22,220	14,520	8,245	8,641	21,890	22,640	36,440	74,950
2010	54,220	61,170	41,840	19,460	29,570	14,130	9,203	8,097	5,977	7,158	7,724	9,836
2011	10,820	20,050	21,960	19,640	7,521	4,781	6,244	5,484	5,734	5,346	5,651	5,196
2012	11,310	11,050	16,240	9,513	5,352	5,525	5,498	5,438	5,212	5,381	5,316	5,418
2013	8,890	45,380	38,270	22,010	21,270	15,220	37,090	32,960	14,870	10,090	9,465	26,760
2014	32,740	35,710	30,270	61,730	29,560	13,490	11,280	8,968	8,759	9,992	10,230	16,630
2015	25,190	20,350	24,850	28,190	16,070	13,080	9,486	8,474	8,723	10,330	28,280	49,810
2016	67,800											
Mean of monthly Discharge	27,100	32,600	39,200	33,400	21,000	15,900	16,500	14,600	12,000	12,000	13,300	20,500

** No Incomplete data have been used for statistical calculation

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USGS 02356000 FLINT RIVER AT BAINBRIDGE, GA

Available data for this site Time-series: Monthly statistics | GO

Decatur County, Georgia
Hydrologic Unit Code 03130008
Latitude 30°54'41", Longitude 84°34'48" NAD27
Drainage area 7,570 square miles
Gage datum 57.7 feet above NAVD88

Output formats

HTML table of all data
Tab-separated data
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00060, Discharge, cubic feet per second,												
YEAR	Monthly mean in ft3/s (Calculation Period: 1907-10-01 -> 2015-03-31)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1907										7,821	6,075	17,670
1908	22,450	25,870	18,610	19,260	20,980	8,319	7,865	7,026	6,972	4,995	5,294	5,889
1909	6,254	11,820	19,580	10,510	10,080	6,521	6,316	6,219	4,219	3,795	3,670	4,277
1910	4,580	7,308	10,030	7,203	5,256	5,372	7,040	5,052	4,369	3,307	3,233	3,762

1911	5,323	4,701	4,033	5,727	3,896	3,203	3,905	4,077	3,142	3,304	4,173	10,390
1912	23,840	17,690	31,680	30,650	20,290	12,650	12,290	10,440	7,644	9,330	9,348	9,784
1913	10,580	13,320	34,380	18,380	8,340	7,800	6,786	7,501	6,436	5,175	5,004	5,102
1928										10,210	6,486	6,787
1929	10,660	17,940	59,990	16,920	14,710	9,943	8,150	6,362	5,217	17,330	9,530	10,880
1930	11,360	15,230	15,590	14,450	7,445	5,920	4,836	5,775	6,080	4,706	12,960	10,350
1931	10,590	8,415	8,463	8,034	8,259	3,625	3,700	5,123	3,039	2,809	2,593	4,034
1932	10,400	8,856	9,333	6,734	4,879	6,198	6,179	7,726	3,916	4,532	4,867	7,141
1933	12,160	16,400	16,390	13,050	8,108	5,616	5,465	4,591	4,598	3,645	2,991	3,879
1934	4,081	4,700	11,650	7,111	7,084	8,840	5,799	4,731	3,867	4,106	2,933	4,093
1935	4,627	5,165	9,326	7,338	4,507	2,893	4,031	4,364	5,495	3,111	3,180	3,532
1936	19,530	23,140	11,340	26,840	7,201	4,781	4,988	10,570	4,729	7,184	4,767	10,490
1937	12,920	15,680	14,190	16,560	12,090	5,898	6,577	5,855	5,982	5,626	6,467	6,517
1938	6,611	5,626	5,900	16,760	6,408	6,035	6,211	5,416	3,320	3,157	3,335	4,139
1939	5,071	9,496	20,540	12,580	8,183	7,649	6,839	8,162	6,204	4,908	3,565	4,259
1940	7,957	15,560	11,340	10,620	6,367	5,170	10,910	5,881	3,958	3,114	4,702	5,792
1941	7,458	6,585	8,071	7,489	4,357	3,332	5,708	4,237	3,128	4,167	3,406	8,976
1942	16,620	13,280	22,020	12,870	6,410	6,995	6,863	7,631	5,375	5,397	5,177	6,927
1943	17,880	13,830	22,750	14,330	9,863	7,438	6,479	5,533	4,122	3,704	4,080	5,065
1944	7,919	8,212	22,240	33,700	18,340	7,570	6,922	6,153	6,243	4,472	4,619	5,968
1945	6,480	9,647	10,930	7,362	12,280	5,709	7,242	7,106	6,037	5,110	5,744	9,903
1946	23,240	15,000	14,180	16,480	14,950	11,400	9,116	9,067	6,526	5,762	6,006	5,251
1947	10,810	8,701	18,780	18,130	11,470	9,878	8,016	8,427	5,512	5,067	12,180	19,320
1948	14,850	21,010	28,660	28,660	8,958	7,232	11,350	9,763	6,053	7,979	7,611	27,100
1949	18,740	20,500	15,250	13,990	14,310	8,381	10,520	9,443	6,611	5,282	4,792	5,635
1950	5,521	6,258	9,716	8,079	5,759	5,835	4,252	3,984	5,203	3,311	3,338	4,519
1951	5,917	5,014	5,990	8,709	4,859	3,182	3,738	3,289	2,764	3,021	4,639	6,744
1952	7,470	11,920	21,750	12,610	7,239	6,046	3,509	3,938	3,976	3,227	3,165	4,205
1953	8,166	10,650	13,530	11,670	16,890	6,264	9,999	6,116	6,653	9,120	4,930	17,270
1954	14,630	8,852	8,714	7,903	5,293	3,739	3,337	3,052	2,409	2,217	2,424	3,627
1955	4,833	5,895	4,585	8,124	4,297	3,123	4,177	4,100	3,167	2,348	2,600	3,226
1956	3,161	8,371	11,030	10,330	4,713	3,263	4,148	3,452	2,970	5,278	3,582	5,641
1957	8,256	7,049	8,586	15,210	11,040	6,119	4,408	4,250	4,433	7,086	8,049	14,330
1958	10,930	14,380	21,960	19,440	10,090	7,650	9,262	6,871	3,873	3,920	4,095	5,003
1959	6,755	15,890	19,490	14,690	8,653	13,110	6,669	5,563	5,100	6,187	7,210	7,214
1960	9,289	20,030	17,130	26,580	8,697	5,900	5,610	5,583	4,170	5,226	3,768	4,113
1961	4,711	8,123	18,800	23,940	12,890	8,302	7,545	5,831	5,052	3,023	3,315	8,509
1962	11,220	10,350	16,470	20,000	6,604	4,634	4,098	3,468	3,538	4,162	4,499	4,561
1963	10,820	13,020	11,640	7,105	7,059	6,891	7,887	5,027	3,107	4,353	3,203	6,628
1964	21,050	19,980	24,520	22,270	18,630	6,545	11,190	11,580	7,073	13,460	7,680	14,490
1965	16,200	21,290	19,920	15,280	7,204	10,640	9,926	7,384	5,638	7,291	4,971	6,358
1966	13,180	21,340	30,610	10,940	11,390	9,776	5,474	6,564	4,176	4,936	7,318	6,713
1967	18,220	15,420	9,887	6,240	5,149	5,300	6,780	5,527	5,988	3,805	4,975	8,236

1968	9,547	6,175	9,303	5,783	4,582	3,702	3,596	3,339	2,488	2,932	3,865	4,809
1969	5,197	6,191	8,465	8,967	7,435	4,620	3,886	4,661	4,274	3,727	3,025	4,494
1970	6,381	8,360	12,720	17,170	5,717	8,534	5,113	6,812	4,401	3,561	4,896	5,727
1971	11,610	13,870	24,260	15,160	13,800	6,979	8,328	9,418	5,558			
2001								2,865	2,726	2,098	1,897	2,989
2002	3,355	4,934	6,175	5,757	3,314	2,066	2,241	1,839	2,091	3,707	6,643	6,011
2003	6,825	8,449	17,980	13,000	14,550	12,920	10,790	10,460	5,660	4,326	4,506	5,134
2004	5,136	11,500	7,371	4,429	4,454	4,616	4,646	3,534	12,390	8,107	7,015	8,226
2005	7,419	9,742	13,330	29,610	9,127	12,530	20,480	10,930	5,852	4,524	4,259	6,877
2006	9,619	9,178	10,960	5,959	4,400	2,479	2,030	2,331	2,555	2,242	3,797	3,469
2007	7,745	7,796	7,528	5,245	2,545	2,032	2,145	1,807	2,149	1,853	1,694	3,008
2008	7,240	10,300	10,070	7,147	3,712	2,196	2,225	4,218	4,013	3,125	3,634	10,820
2009	6,829	4,988	10,780	29,030	9,774	6,085	3,229	3,485	5,399	6,540	10,960	24,110
2010	20,710	24,030	15,700	9,289	11,220	6,980	4,219	3,459	2,930	2,602	3,689	3,562
2011	4,662	8,605	7,407	6,916	2,746	1,739	2,297	1,836	1,422	1,643	1,672	2,592
2012	3,906	4,510	5,073	3,134	2,170	2,043	1,410	1,658	1,683	1,875	1,655	2,091
2013	3,463	13,660	16,610	9,371	7,373	5,800	10,650	11,870	5,749	3,362	3,318	7,532
2014	13,450	14,180	13,150	24,070	13,450	6,203	4,262	2,696	3,083	3,751	4,043	6,818
2015	11,160	9,256	11,910									
Mean of monthly Discharge	10,100	11,800	15,200	13,700	8,740	6,330	6,350	5,790	4,640	4,860	4,890	7,380

** No Incomplete data have been used for statistical calculation

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11. FX-56 - CURRENT CONDITIONS - FRDPA MEMORANDUM

I. Current Conditions

A. Streamflows in Lower Flint River Basin

- Low flows are getting lower due, in part, to irrigation withdrawals. Lowest daily flow in each year (cubic feet per second):

	1954	2011	2012
Ichawaynochaway Creek at Milford	120	5	3
Spring Creek at Iron City	9	0	0
Flint River at Albany	645	599	464
Flint River at Bainbridge	1930	1010	1050

B. Flint Basin Agricultural Withdrawals

- See map on page 2

EXHIBIT
26
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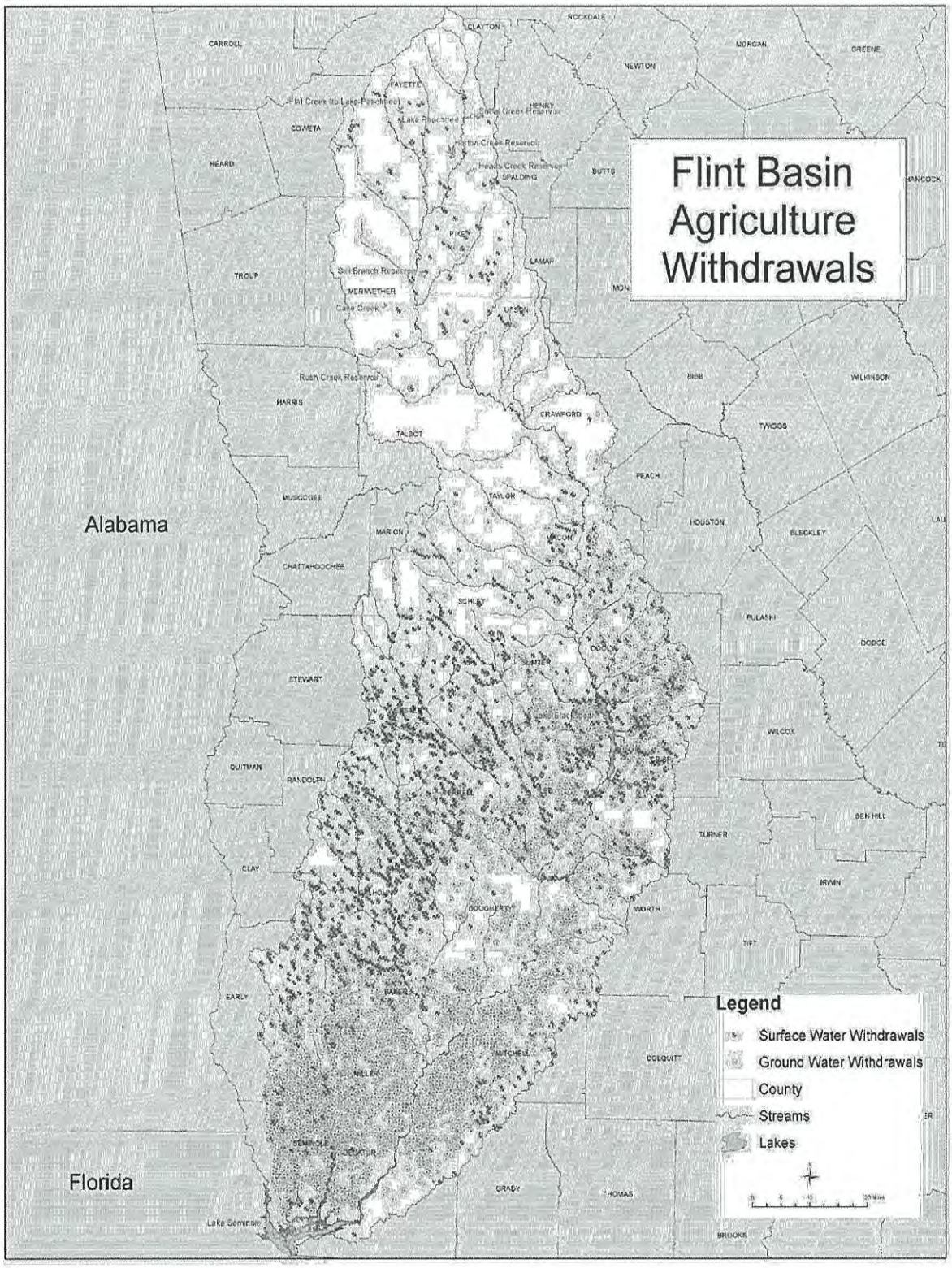
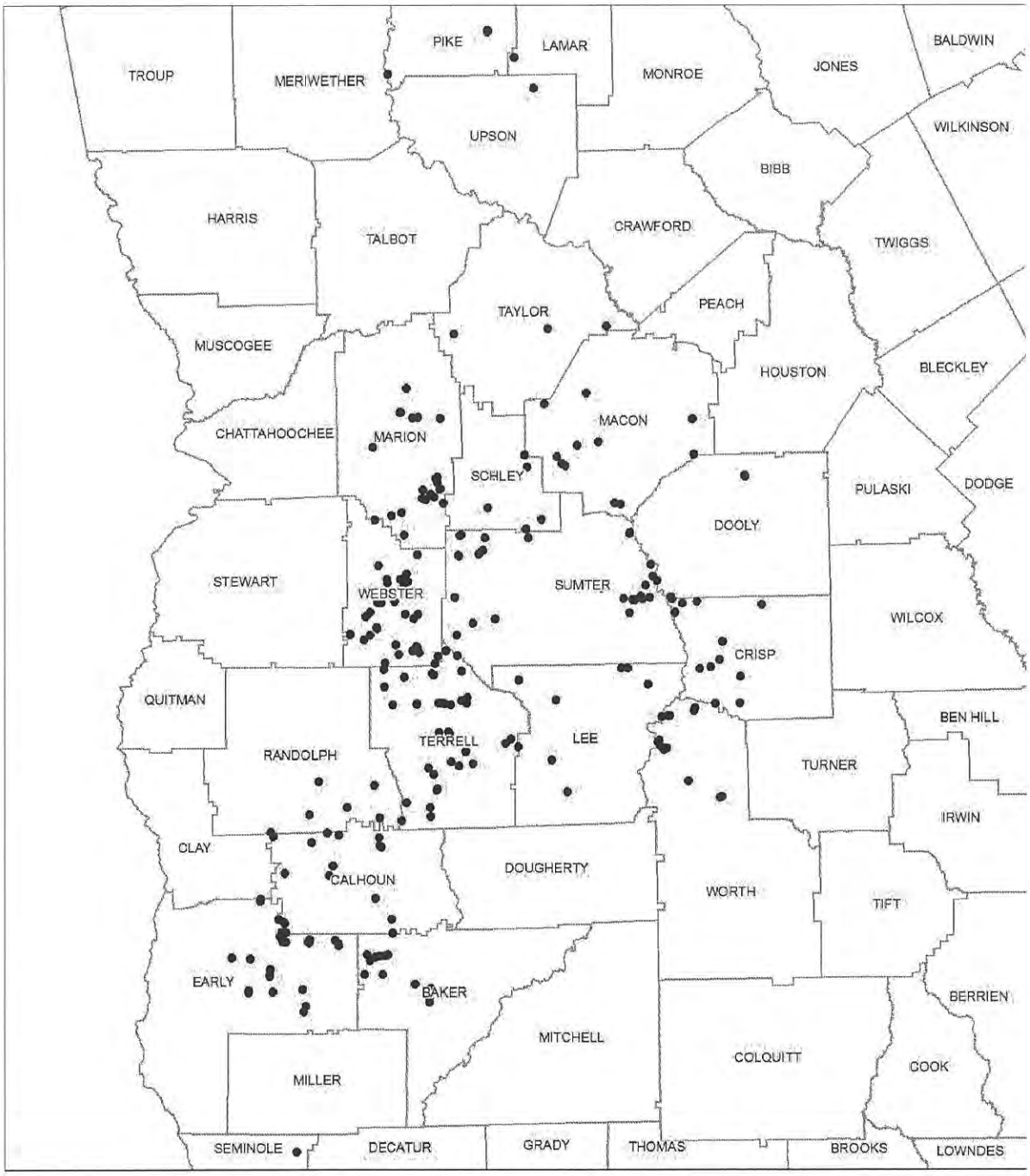

Flint Basin
Agriculture
Withdrawals
Alabama
Florida
Legend
Surface Water Withdrawals
Ground Water Withdrawals
County
Streams
Lakes
CLAYTON
ROCKDALE
NEWTON
MORGAN
GREENE
CARROLL
FAYETTE
HENRY
COWETA
HEARD
SPALDING
BUTTS
PIKE
LAMAR
TROUP
MERIWETHER
UPSON
BIBB
WILKINSON
HARRIS
CRAWFORD
TWIGGS
TALBOT
PEACH
TAYLOR
MUSCOGEE
HOUSTON
BLECKLEY
MARION
CHATTAHOOCHEE
SCHLEY
PULASKI
DODGE
STEWART
SUMTER
WILCOX
QUITMAN
RANDOLPH
BEN HILL
TURNER
CLAY
IRWIN
DOUGHERTY
WORTH
TIFT
EARLY
MITCHELL
COLQUITT
GRADY
THOMAS
BROOKS
Lake Seminole

II. Current Provisions of Flint River Drought Protection Act

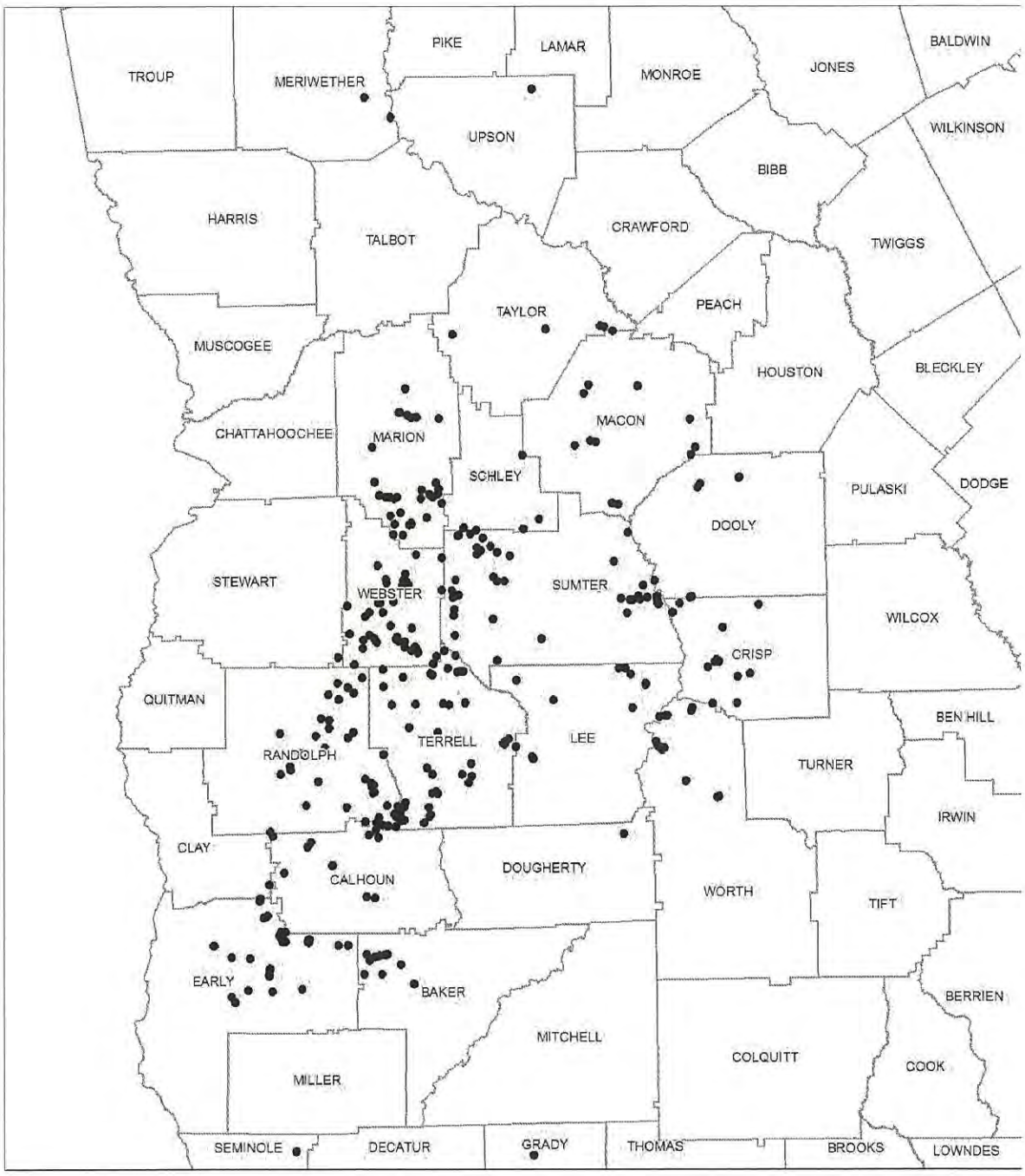
- The Act authorizes an auction to temporarily retire land from irrigation in order to mitigate drought impacts
- The only auctions held to date were in 2001 and 2002

	2001	2002
Acres retired*	33,101	40,894
Average bid per acre	$136	$128
Total funds paid	$4.5 million	$5.2 million
Payees (see maps on p. 4-5)*	208	276

*Auction limited by statute to surface water withdrawals only



Flint River Basin Auction Payees 2001



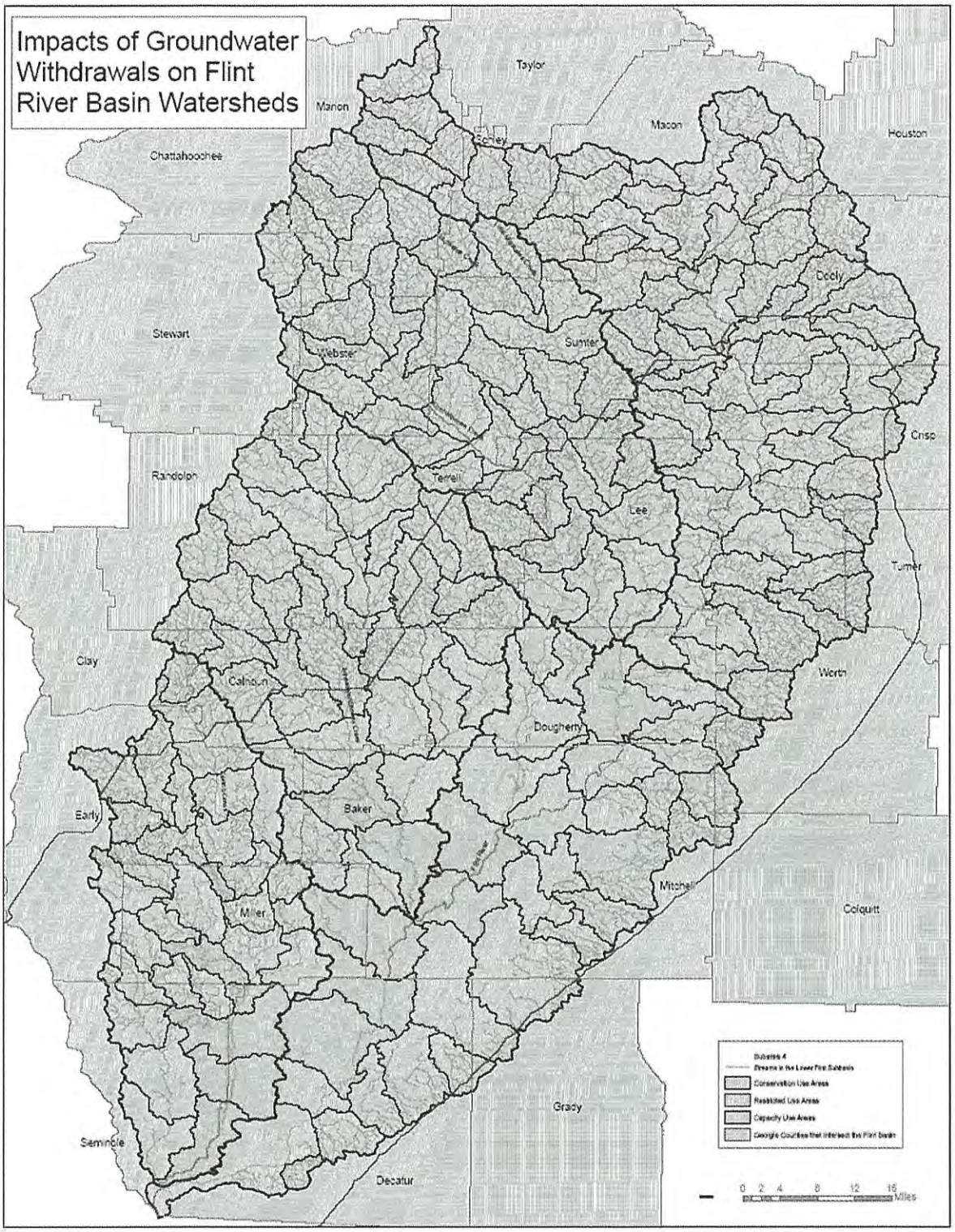
Flint River Basin Auction Payees 2002

- Potential economic impacts of limitations on irrigation in Ichawaynochoway and Spring Creek sub-basins (based on 2007 conditions):

	Reduction in irrigated acres	Impact on economic output	Impact on employment
Ichawaynochaway sub-basin	20%	- $26.2 million	- 348
	30%	- $50.3 million	- 632
	40%	- $70.9 million	- 886
Spring Creek	20%	- $32.5 million	- 351
	30%	- $78.9 million	- 1,001
	40%	- $111.5 million	- 1,408

- Act amended in 2006 to allow targeting within the southern half of the basin, reflecting scientific studies conducted for EPD's 2006 Flint River Basin Plan
    - See map on p. 7 for red and yellow zones identified by the 2006 Plan.
    - Red and yellow zones are sub-basins with evidence of decreases in stream baseflows beyond certain thresholds due, in part, to groundwater withdrawals. Green zones are sub-basins where we do not have similar evidence of decreased baseflow.
    - 2006 amendments also made groundwater withdrawals eligible for the auction.
    - Acres and permits that could be affected by the Act as currently written:

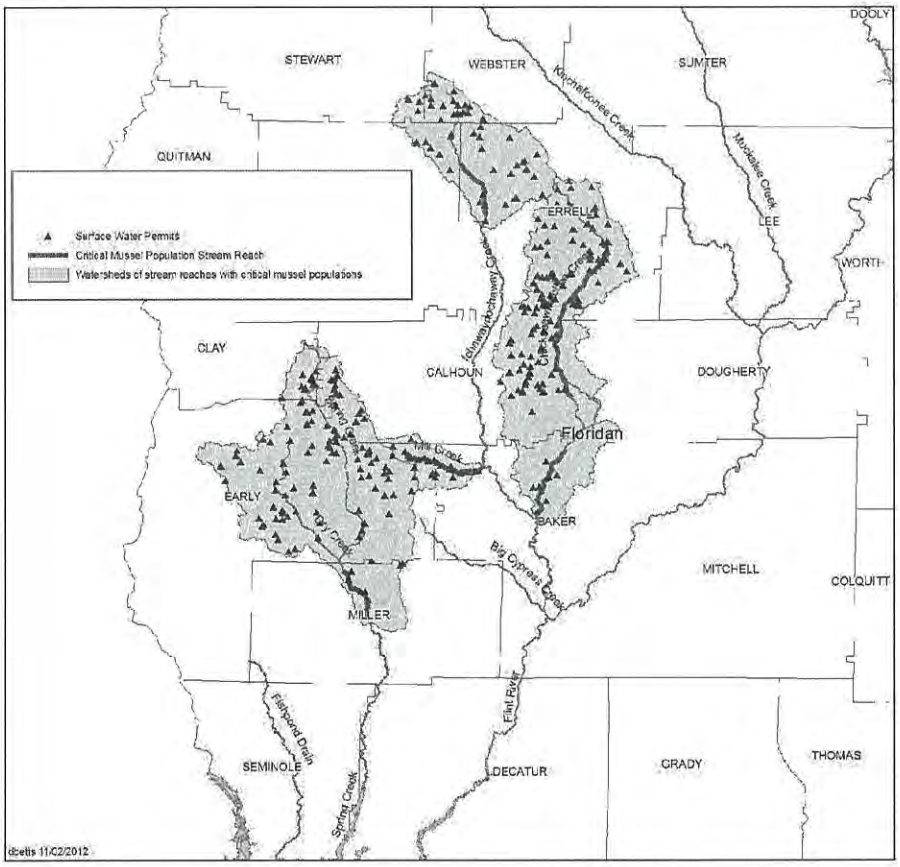
	Groundwater irrigated acres	Surface water irrigated acres	Total irrigated acres	Permits
Red/yellow zones	150,157	10,923	161,080	1609
Green zones	241,103	126,347	367,450	4957
Total	391,260	137,269	528,530	6566


Impacts of Groundwater Withdrawals on Flint River Basin Watersheds
Taylor
Marion
Macon
Houston
Schley
Chattahoochee
Stewart
Webster
Sumter
Dooly
Crisp
Randolph
Terrell
Lee
Turner
Clay
Calhoun
Worth
Dougherty
Early
Baker
Mitchell
Miller
Colquitt
Grady
Seminole
Decatur
Subbasin 4
Streams in the Lower Flint Subbasin
Conservation Use Areas
Restricted Use Areas
Capacity Use Areas
Georgia Counties that Intersect the Flint Basin
0 2 4 8 12 16
Miles

III. Proposed Revisions

Option 1: Actions to support flows for endangered species

- Remove surface water withdrawals in watersheds with WRD-designated critical mussel populations



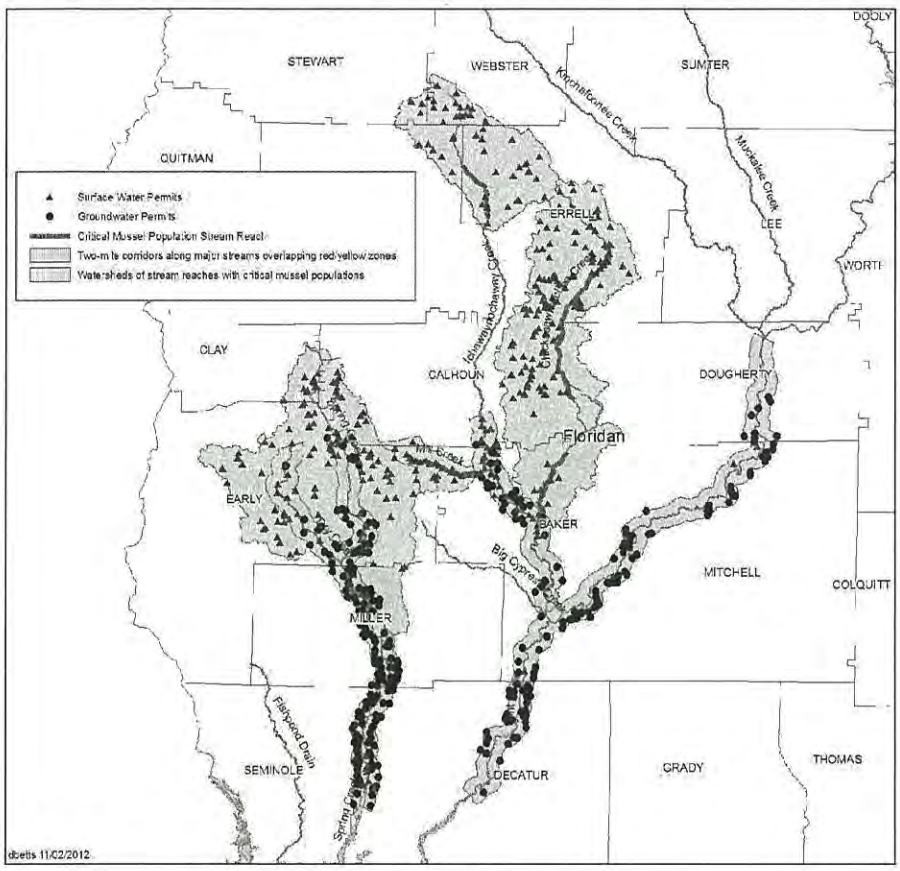
Growing season streamflow benefits (cfs)	
April	14
May	60
Jun	72
Jul	72
Aug	77
Sept	37
Oct	8
Impacts	
Irrigated acres	23,882
Permits	212
Permit holders	160
Acres removed to get each cfs of flow benefit	
During peak irrigation use (June-Aug)	323

Growing season streamflow benefits are roughly equivalent to:

- 0.57 feet of storage in Lake Lanier or 0.74 times the usable storage in Glades reservoir

Option 2A: Actions to support flows for endangered species and basin contributions to state-line flows

- Add removal of ground and surface water withdrawals in two-mile corridors through red/yellow zones along Spring Creek, Ichawaynochaway Creek, and Lower Flint River (one-mile on each side)



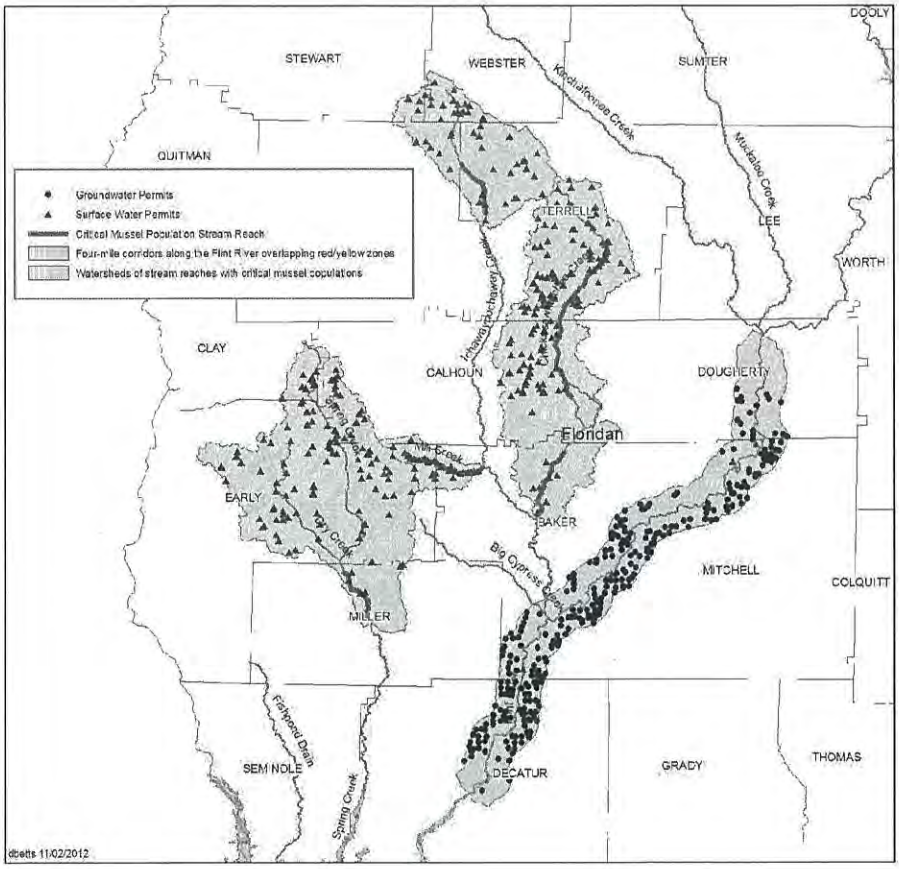
Growing season streamflow benefits (cfs)	
April	30
May	114
Jun	137
Jul	135
Aug	134
Sep	82
October	28
Impacts	
Irrigated acres	53,538
Permits	558
Permit holders	361
Acres removed to get each cfs of flow benefit	
During peak irrigation use (June-Aug)	361

Growing season streamflow benefits are roughly equivalent to:

- 1.1 feet of storage in Lake Lanier or 1.4 times the usable storage in Glades reservoir

Option 2B: Actions to support flows for endangered species and basin contributions to state-line flows

- Add removal ground and surface water withdrawals in four-mile corridor through red/yellow zones along Lower Flint River alone (two-miles on each side)



Growing season streamflow benefits (cfs)	
April	32
May	120
Jun	149
Jul	150
Aug	148
Sep	98
October	43
Impacts	
Irrigated acres	53,319
Permits	511
Permit holders	307
Acres removed to get each cfs of flow benefit	
During peak irrigation use (June-Aug)	357

Growing season streamflow benefits are roughly equivalent to:

- 1.2 feet of storage in Lake Lanier or 1.6 times the usable storage in Glades reservoir

IV. Proposed Drought Mitigation Actions

- Two types of actions are recommended to help maintain streamflows: 1) shifting users to alternate sources as a long-term mitigation measure and 2) temporarily removing land from irrigation as an interim measure
- Shifting withdrawals from surface water or from the Floridan aquifer to alternate groundwater sources would provide long-term mitigation of irrigation impacts on streamflows
    - Claiborne, Clayton, and Cretaceous aquifers are generally available as alternate sources throughout the proposed drought management area, with the following caveats:
        - More is known about productivity in northern and middle counties
        - Productivity is variable in some areas (e.g., where the aquifers outcrop in the northern counties)
        - Cretaceous aquifer is unavailable in Seminole, Decatur, and Mitchell counties due to salinity and/or clay levels
    - With these caveats, available information indicates that the deeper aquifers can provide alternate water sources for surface water and Floridan users throughout the area.
- Expenses of shifting users would be one-time costs, unlike the periodic cost to compensate growers for temporarily removing land from production during drought
    - Costs could be covered by mix of funding sources (e.g., well owners and other growers in region, federal cost-share, state funds)
- The following tables show estimated costs of drought mitigation actions separately for each of the geographic areas described above: watersheds with critical mussel populations; two-mile corridors through red/yellow zones along Spring Creek, Ichawaynochaway Creek, and Lower Flint; and four-mile corridors through red/yellow zones along the Lower Flint
    - Actions to shift users to alternate sources or temporarily remove land from irrigation could be targeted toward individual areas rather than the entire area defined as a drought management area
        - Well costs can vary substantially with depth and a program to shift users to alternate sources could initially be targeted toward areas where replacement well costs are lower
        - Overall, targeting could be determined by availability of funds and/or by climactic conditions

Surface water withdrawals in watersheds with critical mussel populations			
Estimated cost of replacement wells			
	Number of withdrawals	Individual well cost	Total replacement cost (million dollars)
Ichawaynochaway Creek	56	$85,475	4.8
Spring Creek	56	$385,125	21.6
Chickasawhatchee (Baker Co.)	60	$276,250	16.6
Chickasawhatchee (Dougherty Co.)	61	$186,875	11.4
Mill Creek	22	$272,350	6.0
			Total: 60.3
Estimated cost of full compensation for removing land from irrigation for the current growing season			
	Irrigated acres	Per acre compensation	Total per annual removal
	23,882	$550 - $975	$12.5 - 23.2 million

Ground and surface water withdrawals in in two-mile corridors along Spring, Ichawaynochaway, Lower Flint			
Estimated cost of replacement wells			
	Number of withdrawals	Individual well cost	Total replacement cost (million dollars)
Baker	67	$365,625	24.5
Calhoun	13	$217,750	2.8
Decatur	64	$405,000	25.9
Dougherty	9	$289,250	2.6
Early	31	$289,250	9.0
Miller	62	$190,125	11.8
Mitchell	48	$414,375	19.9
Seminole	28	$261,625	7.3
			Total: 103.8
Estimated cost of full compensation for removing land from irrigation for current growing season			
	Irrigated acres	Per acre compensation	Total per annual removal
	53,538	$550 - $975	$16.9 - 29.0 million

Ground and surface water withdrawals in in four-mile corridors along Lower Flint			
Estimated cost of replacement wells			
County	Number of withdrawals	Individual well cost	Total replacement cost (million dollars)
Baker	62	$365,625	22.7
Decatur	78	$326,625	25.5
Dougherty	16	$289,250	4.6
Mitchell	138	$414,375	57.2
			Total: 110.0
Estimated cost of full compensation for removing land from irrigation for current growing season			
	Irrigated acres	Per acre	Total per annual removal

		compensation	
	53,319	$550 - $975	$16.8 - 28.8 million

12. FX-24 - LOWER FLINT-OCHLOCKONEE REGIONAL WATER PLAN

Publicly Available At:

http://www.flintochlockonee.org/documents/LFO_Adopted_RWP.pdf

13. IRMAK ATTACHMENT 14 - AAD GAGES

ATTACHMENT 14

Monthly mean flows as recorded by the USGS on the following gages: Ichawaynochaway Creek at Milford, Georgia; Spring Creek near Iron City, Georgia; and Ichawaynochaway Creek below Newton, Georgia. Yellow highlights demonstrate monthly mean flows violating Georgia's 25% AAD requirements. The gage data are available at http://waterdata.usgs.gov/ga/nwis/inventory/?site_no=02353500&agency_cd=USGS; http://waterdata.usgs.gov/nwis/inventory/?site_no=02357000&agency_cd=USGS; and http://waterdata.usgs.gov/ga/nwis/inventory/site_no=02355350&agency_cd=USGS.

USGS 02353500 ICHAWAYNOCHAWAY CREEK AT MILFORD, GA

Available data for this site: Time-series: Monthly statistics GO

Baker County, Georgia
Hydrologic Unit Code 03130009
Latitude 31°22'58", Longitude 84°32'47" NAD83
Drainage area 620 square miles
Gage datum 150.30 feet above NGVD29

Output formats: HTML table of all data | Tab-separated data | Reselect output format

00060, Discharge, cubic feet per second,
Monthly mean in ft3/s (Calculation Period: 2006-01-01 -> 2015-10-31)
Period-of-record for statistical calculation restricted by user

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	819.9	836.1	735.7	341.9	316.7	134.3	97.3	142.0	234.1	215.3	341.7	538.7
2007	805.5	830.2	475.9	602.5	96.0	77.3	96.6	58.5	103.0	123.8	156.6	380.0
2008	843.6	1,179	910.5	613.5	180.0	62.2	127.8	1,163	468.6	378.4	381.4	2,030
2009	749.3	476.2	952.7	2,461	806.5	411.2	339.8	572.0	544.5	533.0	591.3	2,548
2010	2,219	2,249	975.6	650.3	901.2	561.3	297.4	236.0	156.9	197.1	288.7	370.0
2011	515.3	814.2	589.5	401.6	71.5	24.8	210.7	93.8	80.5	115.1	168.1	292.4
2012	332.9	380.1	369.2	243.5	93.5	96.5	16.6	71.5	142.9	138.8	115.7	282.1
2013	247.0	1,839	1,237	660.3	272.2	327.3	1,146	1,058	380.7	314.9	370.0	840.5
2014	1,032	1,327	964.5	2,578	1,218	418.0	350.9	196.2	283.2	403.8	429.3	873.9
2015	925.5	768.2	854.9	947.1	446.5	347.0	292.5	202.3	260.4	309.7		

USGS 02357000 SPRING CREEK NEAR IRON CITY, GA

Available data for this site: Time-series: Monthly statistics GO

Decatur County, Georgia
Hydrologic Unit Code 03130010
Latitude 31°02'25", Longitude 84°44'24" NAD83
Drainage area 490 square miles
Gage datum 85.70 feet above NGVD29

Output formats: HTML table of all data | Tab-separated data | Reselect output format

00060, Discharge, cubic feet per second,
Monthly mean in ft3/s (Calculation Period: 2006-01-01 -> 2015-10-31)
Period-of-record for statistical calculation restricted by user

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	866.0	699.8	482.4	148.4	252.8	43.7	5.64	7.02	139.3	71.3	161.5	239.3
2007	791.3	915.3	630.0	316.4	40.2	2.30	0.153	0.000	0.000	0.000	0.000	27.1
2008	445.4	1,236	996.3	442.7	73.0	8.08	4.79	897.6	423.5	120.5	109.3	1,542
2009	539.5	463.5	1,600	3,578	496.8	303.3	197.0	189.3	140.5	116.4	141.2	936.6
2010	1,518	1,828	856.5	453.3	670.5	201.3	47.9	12.4	8.72	5.58	8.77	13.5
2011	35.9	226.7	248.6	219.9	20.6	0.861	31.7	5.49	0.000	0.000	0.000	2.94
2012	21.7	88.6	466.8	225.7	47.0	54.1	2.42	0.338	5.50	8.63	0.021	20.6
2013	55.2	2,442	1,407	530.5	205.7	68.3	2,201	2,161	724.9	255.0	153.8	396.0
2014	796.4	1,140	1,179	2,368	1,495	185.6	65.1	18.2	27.9	46.1	69.0	428.1
2015	751.0	572.2	584.7	586.3	323.6	143.7	98.5	35.0	27.4	40.6		

USGS 02355350 ICHAWAYNOCHAWAY CREEK BELOW NEWTON, GA

Available data for this site: Time-series: Monthly statistics GO

Baker County, Georgia
Hydrologic Unit Code 03130009
Latitude 31°13'03", Longitude 84°28'15" NAD83
Drainage area 1,040 square miles
Gage datum 98.67 feet above NGVD29

Output formats: HTML table of all data | Tab-separated data | Reselect output format

00060, Discharge, cubic feet per second,
Monthly mean in ft3/s (Calculation Period: 2006-01-01 -> 2015-10-31)
Period-of-record for statistical calculation restricted by user

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	1,468	1,394	1,300	528.7	462.3	218.6	156.6	188.9	283.1	245.2	394.4	648.5
2007	1,332	1,524	960.8	968.4	193.8	125.2	134.8	96.5	138.8	153.7	179.0	401.2
2008	1,130		1,724	1,022	248.1	104.1	177.1		865.4	485.6	504.4	
2009	1,197	823.5			1,431	956.6	449.0	700.9	934.8	735.8	803.0	
2010			1,945	1,144		790.7	425.5	288.1	200.7	207.5	286.1	390.9
2011	591.6	1,080	857.9	605.9	138.6	54.7	227.7	133.4	98.7	128.3	169.5	292.0
2012	366.6	439.3	580.5	375.6	163.9	144.7	44.2	96.6	158.9	156.6	122.1	285.4
2013	296.1			1,288	587.3	446.8	1,623		796.6	508.6	504.8	1,164
2014	1,741		1,847			770.1	498.7	281.5	353.3	504.2	508.2	
2015	1,671	1,325	1,533		744.0	429.9	385.1	237.6	279.2	328.1		

14. FX-1 - LETTER TO WILLIAM WESTERMEYER FROM HAROLD REHEIS

Georgia Department of Natural Resources
205 Butler Street, S.E., East Floyd Tower, Atlanta, Georgia 30334
Joe D. Tanner, Commissioner
Harold F. Reheis, Director
Environmental Protection Division

May 25, 1992

Mr. William E. Westermeyer
Senior Analyst
Office of Technology Assessment
Congress of the United States
Washington, D.C. 20510-8025

Dear Mr. Westermeyer:

Your letter of April 27, 1992 to Joe Tanner, Commissioner of the Department of Natural Resources, has been referred to me for a reply.

You asked that we: (1) identify regions of our state which, in the current climate, are susceptible to a variety of water-related problems; (2) provide information about innovative programs we have to relieve the stresses, and (3) share with you any thoughts we have regarding planning for climate change in Georgia.

First, we do have a few areas with specific water susceptibilities. In the counties of Georgia along our Atlantic coast, we have had some significant drawdowns of the water level in the Floridan aquifer as the result of heavy industrial and municipal water withdrawals. These water withdrawals, combined with others in the coastal area of South Carolina, have created a potential for saltwater encroachment into the aquifer in the vicinity of Hilton Head Island, South Carolina and Savannah, Georgia. The two states are jointly working on solutions to the saltwater encroachment issue. It is possible that if global climate change occurs, causing a sea level rise, this saltwater intrusion problem could be exacerbated.

Georgia has another area of potential groundwater overdraft and that is in the southwestern corner of the state where there have been large withdrawals made in the last two decades for the irrigation of crops.

Georgia is not particularly susceptible to droughts, having an average annual rainfall of about 50 inches per year. However, there are high growth areas of the state where surface water resources must be carefully managed to assure adequate supplies during times of dry weather for the municipal and industrial needs in our urbanized areas, as well as for other environmental and economic needs downstream.

EXHIBIT
3

1-28-16

We have a strong and comprehensive set of environmental laws in the state and have worked diligently to enforce them for water resource management for a number of years; therefore, the other types of problems listed in your letter are not so significant as to justify discussion or consideration herein.

Second, Georgia has undertaken several innovative programs to better steward our water resources and move toward the goal of sustainability. The Georgia Environmental Protection Division regulates all water withdrawals from ground or surface sources that exceed 100,000 gallons a day through the process of issuing permits. We require large users to develop water conservation plans which can be initiated during times of water shortage or drought. This program has been particularly successful in helping Georgia get through droughts that occurred in the southeast in 1986 and 1988. In addition to that, we have a statewide statute which requires water conserving plumbing devices to be installed in all newly constructed buildings or reconstructed existing buildings. That law has been on the books for over a dozen years and has recently been strengthened. We expect it can help to reduce domestic water use by at least 10 percent.

Again, through our water withdrawal permitting programs, we assure adequate water for downstream uses. We do not approve new surface water intakes nor expansions of existing surface water intakes unless a certain statistical flow (the 7-day, 10-year minimum flow) plus flow for any downstream water intakes is provided past the new or expanded water intake. We call this non-depletable flow. It is achieved by the construction of storage reservoirs either on-stream or off-stream by the proposing water withdrawer.

We are particularly proud of another aspect of water management and that is our strong emphasis on land disposal of treated wastewater and wastewater sludges in Georgia. For more than a decade, we have interpreted the requirements of the federal Clean Water Act (which call for best available treatment for industrial and private water sources) to mean "no discharge to streams." Therefore, for all new industrial facilities that want to have their own wastewater treatment plant, all private facilities, such as subdivisions or mobile home parks or resort developments, and all municipalities which do not already have sewers, we require that the owner install a land application system for the treated wastewater. As a result, Georgia has more than a 140 cities, industries and private developments disposing almost all of their wastewater on land after

appropriate treatment. This has kept about 90 million gallons per day of treated wastewater out of streams and has recycled that water back to the land. We believe that no state east of the Mississippi River has more land application systems for wastewater and sludge. We believe this is pollution prevention at its highest and best.

Finally, we have not given any thought to a plan for dealing with climate change within Georgia. More water conservation, more reuse of water, and an improved management of water withdrawal and discharges through our laws and permitting systems will help in this regard, but we do not have a specific plan for responding to or anticipating the impacts of global climate change.

If we can be of further assistance, please contact me. I would appreciate the opportunity of receiving a copy of your report when it has been completed.

Sincerely,

Harold F. Reheis
Director

HFR:ypf

cc: Joe D. Tanner
David Word
Nolton Johnson

15. FX-6 - Fisheries Section Comments on Georgia ACF Allocation Formula - Memo to Harold Reheis from Richard Gennings

Lonice C. Barrett, Commissioner
David Waller, Director

Georgia Department of Natural Resources
Wildlife Resources Division
Fisheries Management Section
2070 U.S. Highway 278, S.E., Social Circle, Georgia 30025
(770) 918-6406

April 16, 1999

MEMORANDUM

TO: Harold Reheis
Bob Kerr

FROM: Richard M. Gennings, Chief of Fisheries

SUBJECT: Fisheries Section Comments on Georgia's ACF Allocation Formula

The following comments are based on input from our field biologists, including their review of the Georgia Proposal dated December 18, 1998, and the IHA material provided by Steve Whitlock and Jerry Ziewitz through April 7, 1999. Additional information provided by Roy Burke as a result of his Chattahoochee River Model (CRM) runs was also most helpful. Our comments are presented as they relate to the following six areas of concern.

Flows and Water Quality Between Buford Dam and West Point Reservoir.

The most striking thing about the CRM runs is the revelation that the Georgia Proposal cannot meet current volumetric demands in the river between Buford Dam and West Point Reservoir. The CRM also reveals the hydraulic infeasibility of the 300-400 cfs off-peak minimum flows (with no peak weekend releases) specified in the Georgia Proposal. As Table 3 in Roy's 2/12/99 memo to you shows, the Chattahoochee River could potentially go dry at the Atlanta Intake with a 400 cfs flow from Buford Dam. While it is no surprise to the Georgia Team that the Proposal needs to be modified, the CRM clarifies that it needs to be changed to protect *Georgia's* own instream dissolved oxygen and temperature standards, as well as flows, under drought conditions.

The IHA analysis of the Georgia Proposal indicates zero flow occurrences and relatively high numbers of low flow pulses at Whitesburg. While we understand that zero flow for one day is probably an artifact of the model, it is nevertheless an indicator of extreme low flow and further indicates over-allocation of water resources. Such conditions need to be avoided, to protect not only instream aquatic habitat, but water quality in West Point Reservoir as well.

Since water withdrawal permits are based on monthly averages, and permittees have sufficient pumping capacity to withdraw at higher than permitted rates, it is reasonable to assume that daily pumping rates could easily exceed average permit limits. Since demand would be highest during drought conditions, it seems quite likely that the downstream conditions on any given day could be worse than those average conditions predicted by the CRM. Also, it is not clear whether Roy considered the impact of currently permitted withdrawals upstream of Buford Dam, since such intakes were not listed in his memo. If these were not considered in the analysis, the predicted impacts on Lake Lanier would be even greater than those Roy defined for the 1987-89 drought period.

The CRM runs also make it clear that the existing water supply between Buford Dam and Peachtree Creek is already significantly over-allocated at 7Q10 conditions, based on currently permitted withdrawal limits. As Roy pointed out in his 2/12/99 memo, it takes three hours of generation every day, 550 cfs otherwise (average daily discharge of 1,730 cfs), from Buford Dam to maintain a minimum 750 cfs flow at Peachtree Creek and to protect dissolved oxygen standards at Dog River when tributary inflows are at 7Q10 conditions. A flow of 1,730 cfs from Buford is approximately 83% of the average annual discharge from Lake Lanier; it is not reasonable to assume that such a flow could be sustained during extended droughts such as occurred in the 1980s, especially if the reservoir was below full pool when the drought commenced.

Reservoir Hypolimnetic Conditions and Water Levels

We are concerned about the potential for depletion of the hypolimnion of Lake Lanier during extended draw-down periods. If this cold layer shrinks too much, it would have severe consequences for the lake's striped bass population, which we depend upon for most of our broodstock needs for restocking waters across the state. We are looking into the possibility of using the CE-QUAL-W2 Eutrophication Model developed by Limno-Tech, Inc., for evaluating these concerns. Depletion of the hypolimnion is of equal concern from the standpoint of maintaining adequate cold water at the Buford Hatchery intake and to maintain the trout population in the tailwater.

Reservoirs on the Chattahoochee River below Atlanta appear to fare well under the Georgia Proposal in terms of water level stability and maintenance of near-full pool conditions. Minimum water levels appear to be higher and vary less in West Point, Walter F. George, and Seminole, compared to historic conditions. Such conditions are likely to have more positive than negative impacts, but there remains a need for flexibility within the system to provide for short-term drawdowns for fisheries management purposes. Optimum drawdowns for fisheries management are down to as much as half surface area of the reservoir for two-to-three months during the winter. Drawdowns would be needed no more frequently than once in a five-to-ten year period depending on fish population or aquatic plant conditions within the reservoir and could be delayed if the threat of drought made the action unwise. This is one of the few management tools powerful enough to stimulate fish populations like those expected in new reservoirs and which have a dramatic effect on local economics.

The provision in the Georgia Proposal for restoring reservoir levels following a drought should be revised to allow pool restoration in a proportional manner. Requiring Lake Lanier to reach its rule curve before downstream impoundments begin refilling could unnecessarily exacerbate fisheries problems in these lower reservoirs and their tailwaters that already exist to some degree.

Protection of the Trout Fishery Between Buford Dam and Peachtree Creek.

The trout fishery immediately below Buford Dam is a major concern. Based on the information provided by the CRM, water allocation is also over-extended in terms of maintaining sufficiently cold temperature for trout during certain conditions. Roy's modeling of 2,000 cfs from Buford with tributary inflows at 7Q10 show marginal conditions for trout at Peachtree Creek. Storm water inflow from tributary watersheds below Buford Dam will make it increasingly difficult to protect trout temperature needs when water

intakes reach permitted capacity if only minimum cold water volumes are being released from the dam during the summer and early fall months.

We would like to continue working with Roy Burke to further evaluate past tailwater temperature conditions against the protection criteria we have previously recommended. Roy indicated that he has data for 1994 and 1995 that could be modeled to show actual temperature conditions, and we believe it would be helpful to look at such data in a little more detail. We simply cannot afford to jeopardize this extremely popular and valuable trout fishery.

Flint River Flows and Water Quality.

We continue to have great concern about the projected low flows in the Flint River under the Georgia Proposal. According to the IHA analysis, even the upper Flint River (at Montezuma) would be subject to near-zero flow conditions at times. Such low flow in the upper Flint apparently would be due to municipal and industrial demand (since agricultural use is minimal), and raises the question as to whether the upper Flint River will also be over-allocated.

You are already aware of our concerns about threats to the quality of aquatic habitat in the lower Flint. We need to protect flows for protected species and the fishery as well as cold spring refuges for the unique striped bass population. Based on the IHA analysis, annual 7-day minimum flow at Newton is about 600 cfs, about half the historical level. Such flow predictions provide clear evidence that groundwater is over-allocated in the lower Flint River basin.

Proliferation of Water Supply Reservoirs.

As we more fully understand the relentlessly increasing demand for water, we must look more closely at the impacts of the many water supply reservoirs springing up across the state. Many of these have been planned and/or built without a review of the likely long-range *cumulative* impacts on protected species, and without consideration of other viable alternatives. A thorough analysis of the cumulative impacts of future reservoirs is absolutely essential to avoid further fragmentation of critical habitat for threatened species.

A number of tributaries to the lower Chattahoochee and Flint rivers provide vital habitat for rare or threatened fish species that were once common in the main river but have been diminished there by impoundment or degraded water quality. The Chattahoochee tributaries Snake, Whooping, Centralhatchee and Hillabahatchee creeks in Carrroll and Heard counties retain high biotic integrity and function as refugia for river fauna, some of which are state protected species. In the Flint basin, Kinchafoonee and Muckalee creeks support populations of mussels that have disappeared from the mainstem, and Potato, Lazer, Auchumpkee and Ulcohatchee creeks also represent potential faunal refugia (Riverine Resources Final Report for the Comprehensive Study).

We understand that reservoirs may already be planned for Snake and Whooping creeks. It seems clear that a moratorium is needed on the construction of such reservoirs until eco-region-wide environmental impact

assessments are prepared. Considering the potential for over-allocation of resources, other alternatives to impoundment of major tributary streams must be found if we are to protect sensitive aquatic systems.

Consultation with Federal Agencies.

I remain concerned that we should consult with the U.S. Fish and Wildlife Service on how to ensure that Endangered Species Act concerns do not cause major problems for a compact agreement late in the process. The document "Endangered Species, A Summary of the ESA and Implementation Activities, Prepared for the ACT and ACF Water Allocation Committees" has been helpful to me in understanding what a federal agency such as the Corps of Engineers must do in order to comply with the Act. I specifically recommend review of the "Consultation" section on pages 7 through 10. You will find attached a copy of a preliminary programmatic biological opinion from an unrelated project which Jerry Ziewitz provided as an example. It might also be important to include consultation with other federal agencies as well. I have recently heard that EPA might be anxious about ensuring that some of their concerns are addressed. This should also cover some of Florida's concerns about the public process.

Please consider this the beginning of what I consider a continuing process of providing comments on the proposals of the various parties. We will be glad to try to answer questions on your request.

RMG/pw

Attachment

cc: David Waller

16. FX-2 - Agricultural Wells in the Flint River Basin in Southwest Georgia - Letter to James E. Butler, Jr. from Harold F. Reheis

bc: Alan Hallum
Nolton Johnson
Bob Kerr
David Word
NAPC, B. Frederick

EXHIBIT
4
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1-28-16

Georgia Department of Natural Resources
205 Butler St. S.E. , East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
404/656-4713

June 1, 1999

Mr. James E. Butler, Jr.
Butler, Wooten, Overby, Pearson, Fryhofer
and Daughtery
Post Office Box 2766
Columbus, Georgia 31902

Dear Jim:

I apologize for the tardy reply to your letter of May 18, 1999 to me regarding agricultural wells in the Flint River Basin in southwest Georgia. The following is some general information. After that, I'll try to answer your specific questions.

In general, there are something on the order of 19,000 irrigation systems using groundwater or surface water in Georgia. About two-thirds of these were for irrigation systems that were in place as of July 1, 1988, so they were grandfathered. That was the effective date of the amendments to Georgia's environmental laws that required agricultural water users to get permits if they have, or want, the capacity to use more than 100,000 gallons a day. The sections of the laws that require farmers to have permits (O.C.G.A. 12-5-31 and O.C.G.A. 12-5-105) are the weakest of all Georgia's environmental laws. The original bills were specifically written in a very loose manner to place the minimum amount of requirements on agricultural water users, because the wisdom at that time was that the General Assembly would not accept more than that in regulating farmers.

EPD was given no new money or personnel with which to operate the permit program, so we have done it on a shoestring for years. We basically have had one professional assigned to review applications and issue permits.

It took EPD several years just to issue the backlog of grandfathered permits, but subsequent to that, we have only rarely denied permits for agricultural use anywhere in Georgia. For years, we thought there was plenty of water for agriculture. We have now found that is no longer the case in southwest Georgia, from technical tools that have been developed under the comprehensive studies conducted jointly over the last seven years by Alabama, Florida, Georgia, and the Corps of Engineers.

In the Flint River Basin, there are about 4500 irrigation systems that have permits. We are also aware that there are still a few hundred irrigation systems that do not have permits. In addition, there is some indeterminant number of situations where a farmer applied for and received a permit, but never drilled a well. Since we have historically only had one person assigned to this program, we have not had the ability to go out and field-verify the applications and the permits to see what was actually happening.

In southwest Georgia there are approximately 3000 wells in the Floridan aquifer which we believe can affect the flow of the Flint River during bad droughts. The big springs on the bottom of the Flint River from Albany on down to Bainbridge which supply a substantial part of the base flow of the Flint River in this section, are all fed by the Floridan aquifer. When thousands of irrigation systems are operating during dry weather, such as we have been having this year, one can see a significant reduction in Flint River flows. Our computer models that predict what will happen under bad droughts (like those of 1986 and 1988) indicate that if EPD continues to issue permits to new applicants who desire them, we will soon over-allocate the aquifer. In a bad drought the model indicates that the Flint River could dry up. Obviously we do not want this to happen, so we are developing a strategy to see that it does not. I will be bringing proposed strategies to the Board in this regard when we get them firmed up. I do believe that some of the actions we need to take must be done after, and as a result of, a rule-making.

Now, let me answer your specific questions in the order in which you asked them.

Since when are permits required? Since July 1, 1988.

How has that worked? It has worked well for the farmers. I don't think it has worked very well for the water resources, at least in southwest Georgia. The farmers don't have to report or measure their usage and the law is written so vaguely so as to imply that virtually no farmer can be denied a permit.

Are all those drilling wells getting their required permits? No.

What is being done to catch those who don't?

Nothing at this point. We are developing our strategy under a law that really doesn't work very well, and our meager resources are being spent on that, and on measuring the impacts of the current drought, as opposed to trying to catch folks who may be drilling without permits.

What enforcement capacity does EPD really have in terms of who is available to go into the field and act? I have about two and a quarter work years of effort assigned to this right now, not counting the time of Dr. Bill McLemore, and managers Napoleon Caldwell, Nolton Johnson and myself who also work on these issues. We definitely do not have the bodies to go out into the field and take enforcement action and at this point, none is being done. Again, all of that will be firmed up and as many of the holes as we can fill will be filled by the strategy that we are developing. I will keep you posted as it goes forward.

Amendments to the law are definitely needed and I will be working with some key legislators to put something together during the interim for action in the Year 2000 General Assembly session. Please contact me if you have other questions.

Sincerely,

Harold F. Reheis
Director

HFR:ypf

cc: Lonice Barrett
DNR Board Members

** Transmit Conf. Report **

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Georgia Department of Natural Resources

205 Butler St. S.E., East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
404/656-4713

June 1, 1999

Mr. James E. Butler, Jr.
Butler, Wooten, Overby, Pearson, Fryhofer
and Daughtery
Post Office Box 2766
Columbus, Georgia 31902

Dear Jim:

I apologize for the tardy reply to your letter of May 18, 1999 to me regarding agricultural wells in the Flint River Basin in southwest Georgia. The following is some general information. After that, I'll try to answer your specific questions.

In general, there are something on the order of 19,000 irrigation systems using groundwater or surface water in Georgia. About two-thirds of these were for irrigation systems that were in place as of July 1, 1988, so they were grandfathered. That was the effective date of the amendments to Georgia's environmental laws that required agricultural water users to get permits if they have, or want, the capacity to use more than 100,000 gallons a day. The sections of the laws that require farmers to have permits (O.C.G.A. 12-5-31 and O.C.G.A. 12-5-105) are the weakest of all Georgia's environmental laws. The original bills were specifically written in a very loose manner to place the minimum amount of requirements on agricultural water users, because the wisdom at that time was that the General Assembly would not accept more than that in regulating farmers.

EPD was given no new money or personnel with which to operate the permit program, so we have done it on a shoestring for years. We basically have had one professional assigned to review applications and issue permits.

It took EPD several years just to issue the backlog of grandfathered permits, but subsequent to that, we have only rarely denied [illegible]

Butler, Wooten, Overby, Pearson, Fryhofer & Daughtery

Trial Lawyers

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Albert M. Pearson, III*
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Reply To:

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ATTENTION: Harold Reheis and Allan Hallum

FAX #: 404-651-5778

DIRECT DIAL #:

FROM: Jim Butler

DATE: May 18, 1999

Total Pages (including cover sheet): 3 Sent By: Susie

SUBJECT: DNR

MESSAGE:

Butler, Wooten, Overby, Pearson, Fryhofer & Daughtery
Trial Lawyers

James E. Butler, Jr. *
Joel O. Wooten, Jr.
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Reply To:
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May 18, 1999

Mr. Harold F. Reheis
Mr. Allan Hallum
Georgia Department of
Natural Resources
Environmental Protection Division
205 Butler Street, SW
East Floyd Tower
Atlanta, GA 30334

Dear Harold and Allan:

Either by letter or in conversation Harold has noted the anticipated need to put some limits on farm wells in the Flint River basin in Southwest Georgia. I'd like more information on that issue, generally. I understand that permits are required now. Since when? How has that worked? Are all those drilling wells getting the required permits? What's being done to "catch" those who don't? I've heard that some folks are drilling deep wells and then capping them off, and that well drillers in the area (Dooly County was mentioned in particular) are real busy drilling as many wells as possible, in anticipation or pursuant to some EPD directive. I'm curious about that.

That segues into the long-term issue about enforcement generally. What enforcement capacity does EPD really have (in terms of who is available to go into the field and act)? What's been done in terms of enforcement, if anything, of limits or permitting requirements for agricultural wells?

Sincerely,

BUTLER, WOOTEN, OVERBY, PEARSON,
FRYHOFER & DAUGHTERY

James E. Butler, Jr.

JEB:shw

cc: Tom Wheeler
Sara Clark

17. FX-3 - Response to Letter Regarding Irrigation in South Georgia - Letter to James E. Buter Jr. from Harold F. Reheis

bc: David Word

Georgia Department of Natural Resources

205 Butler St. S.E. , East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
404/656-4713

June 16, 1999

Mr. James E. Butler, Jr.
Butler, Wooten, Overby, Pearson, Fryhofer
and Daughtery
Post Office Box 2766
Columbus, Georgia 31902

Dear Jim:

This is in response to your letter of June 8 regarding issues of irrigation in south Georgia. I appreciate your offer for the Board to help us attain stronger legislation regarding agricultural water use. That is needed and I will take advantage of your offer. I will be working with my staff and the Law Department to draft appropriate changes to our water laws in the coming weeks and will keep the Board advised of what we intend in that regard.

Yes, EPD has a number of unfunded mandates and as we prepare our budget requests for FY 2001, we will be listing unfunded mandates and discussing what the needs are, relative to those and how we propose to fill those needs.

We hear that farmers are having wells drilled without permits, and that a lot of that is happening. We have done very little to check it out because of the crush of other business EPD's water resources staff have had this year. Rumor is that well drilling has accelerated during this drought year.

You asked whether EPD monitors well drillers at all. We do somewhat. We have a very modest program of regulating well drillers; it is mainly a licensing function. I agree with you that there are a lot fewer drillers than there are farmers, probably on the order of 300 licensed drilling companies in the state. I will discuss with staff whether EPD can get a better handle on the drilling of agricultural wells by taking some different approach with well drillers.

You asked how it came that the Legislature ordered EPD to regulate agricultural wells 11 years ago, but never gave us money to do the job. First, it is not an unusual circumstance that the General Assembly would give EPD an unfunded mandate. It happens again and again. Second, for the first several years of this 11-year time period, EPD was operating under the belief that we would not run out of water for farmers anywhere in south Georgia, and given that the law is extremely lenient with regard to agricultural permitting and water use, we essentially just issued permits for any farmer that requested them. Since we had so many applications and so few staff to handle them, we made it a simple paper exercise. We had no resources to go to the

field and verify what the farmer claimed in his application, was so. But we also thought, incorrectly, that since there was so much groundwater, it was no great problem that we were understaffed.

Third, during much of this time period, my predecessor, Leonard Ledbetter and subsequently myself, were operating under the philosophy of trying to keep EPD lean and frugal. We did not make budget requests for significant growth in personnel. Our growth mainly has occurred in fee-funded programs, such as the Underground Storage Tank Program, Hazardous Site Response (State Superfund) Program, Scrap Tire Program, and under air quality permit fees and federal grants. In retrospect, we should have been asking for and making a case for more people out of the state appropriated budget, but we didn't. Further, as you are aware, in each of the last four years, state agencies have been directed to reduce our budgets by up to five percent each year, and EPD has done its part of reducing the DNR budget. We can no longer afford to do that, and, as I pointed out before, we know now that we were wrong in assuming that we would never run out of water. We, in fact, can run out of water in some areas, and we need more budget and more people to manage agricultural water use activities in a much more thorough and better manner, going forward from here.

You asked since farmers don't have to report or measure their usage, and we are not certain that we are catching all farmers that drill wells in our data base, how do we know how many wells there are, how much water is being used, and how are we able to predict that the Flint River could dry up? Those are perfectly good questions, and a lot of study has been done on them in southwest Georgia over the last several years. As part of the Comprehensive Study conducted by Georgia, Alabama, Florida and the Corps of Engineers, we knew that agricultural water use in southwest Georgia could affect the flows in the Flint River. We contracted with the U.S. Department of Agriculture (USDA) to provide best estimates or measurements in Georgia, Alabama and Florida of the amounts of irrigation being done.

We know about how many acres are being irrigated in Georgia, but that figure is probably plus or minus ten percent. We are doing some very accurate updating of those figures this year, through a contract with the Geography Department of the University of Georgia. The weak link in the chain is how much water farmers are using. Irrigation experts from the University of Georgia, from the Cooperative Extension Service, and from USDA, have estimated that the long-term average use of irrigation by an irrigated farm, considering all crop types that are done, is about 9 inches a year per acre, and that this can go up as high as 18 inches a year during a severe drought year such as we are experiencing now. In our computer models, we assume average cases as well as worst cases. We know approximately when the growing season starts and ends and how water use changes during the growing season. Our geologic studies

have shown us how groundwater and surface water in the Flint River interrelate. All of that is put into the model, and we come up with our best estimates.

Obviously, this can be improved, and we have several programs underway to reduce the uncertainties of our estimates of how much water is being used, how many acres are actually being irrigated, other internal uncertainties, and how geohydrology is represented by our computer models. We have reasonable confidence in the models now, but I want to have much better confidence so that we are able to manage the water resource to keep the Flint River or any other surface stream from running dry. Additional studies in science are needed for us to make our model better, and I will be making requests in our FY 2001 budget request to do some of this additional work.

Thanks again for your interest in these subjects.

Sincerely,

Harold F. Reheis
Director

HFR:ypf

cc: DNR Board Members
Lonice Barrett

18. FX-5 - REHEIS STATEMENT FOR SOUTHWEST GEORGIA SUMMIT

Rev. 4-15-99

REHEIS STATEMENT FOR SOUTHWEST GEORGIA SUMMIT
APRIL 16, 1999

Rumor has it there is going to be a moratorium on ag permits.

Bob Kerr and I are the ones who started it last week.

We met with some Southwest Georgia agribusiness representatives, who we had been talking with for months. We left them with the impression that it was time for EPD to declare a moratorium on issuing new ag permits in portions of the Floridan aquifer that affect the Flint River downstream of Lake Blackshear. That was our thinking, subject to working out details. After much additional thought, and discussions with numerous people including our legal advisors, we decided to keep looking at the issue. It is probably more appropriate to institute a cap through a formal rulemaking process, rather than as an administrative decision by EPD Director.

I do believe that the 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, but EPD will continue to evaluate options for the best way to limit aquifer depletions, and we will not institute a moratorium at this time.

Here is why we are concerned:

- Ag permits issued/acres/ estimated average and dry year consumptive use in 35 counties /lower Flint.
- M & I permits issued/average consumption in 35 counties/lower Flint.
- Important water resource management principles:
  - plan for drought - not average conditions
  - human consumption first, ag second, but don't forget environment (fish and wildlife, water quality)
  - don't run out of water

This applies everywhere - not just the Flint but all 5(?) basins in these 35 counties. Flint, Chattahoochee, Ochlocknee, Withlacoochee, Alapaha. Applies not only in these 5, but all over Georgia.

EPD must do responsible water management - it's our job, it's the right thing to do.

EXHIBIT 7
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The job is easier with surface water and with M & I - we can see it and measure it; and M & I users must measure and report usage. We can periodically adjust their permits if there is good cause - permits expire and have to be renewed.

The job is harder with ground water and with agricultural users. Can't see ground water; can measure ground water levels but very difficult to measure flow. Ag users have different requirements under Georgia law: Don't have to measure or report how much they use or when. Their permits never expire once issued and once use is begun.

The law can be interpreted to mean that if there's not enough water to support permits for farmers who want new irrigation permits, EPD must reduce permits of existing farmers to "make room" in the available resource for the new farmers.

EPD has never exercised that power of the law. It would be very difficult if we had to do it: If a farmer wants a new 1000 gpm pump and pivot, and EPD has determined there's not enough water for him or her, do we take 100 gpm off the permits of each of the 10 nearest other farmers so we can give him a total of 1000 gpm? That seems to be what our law says. If so, it doesn't match one original intent of the law, which was to protect farmers' water rights.

We have to deal with several uncertainties:

- How many acres are actually irrigated? (We've taken applications at face value - there are so many of them, and we have so few people, we never have gone to field for ground truthing).

- How much water is actually used in an average year? In a dry year? Nobody has to report, so we must estimate - how good are our estimates?

- How good is our computer model of ground water and its effect on surface water streams in dry years? It's the best we have, we had good objective scientists develop it on best available data. But it can always be made better, more accurate, with more data, and for the lower Flint Basin, we need high confidence that it is right. We need to ground-truth that model, but can't do it until next bad drought, and can't even do that right without more accurate estimates of actual water use by farmers.

EPD is working on reducing these uncertainties, but that will take some time.

We will get to point that EPD is no longer comfortable issuing new irrigation permits in some parts of Southwest Georgia, bearing in mind that:

  - we have to plan for drought

- we have to take care of human consumption first, but we can't forget about fish and wildlife and water quality.
- we don't want to run any resource - aquifers or surface streams and rivers - out of water.

We have been holding, and not processing permit applications for new irrigation systems in the lower Flint basin since the middle of 1998, while we gathered facts and pondered all this.

EPD will now, rather than declare a moratorium, start working on that backlog of permit applications. We will make a field inspection at each applicant's site before we make a decision on that application. We will be able to issue some permits; I expect we will need to deny some applications. We will do our best with what we have and what we know.

The Southwest Georgia Summit is important. This region of Georgia needs a good, long-term plan so the resources can be managed for sustainable water use.

EPD and DNR want to participate with everybody who is interested to figure out how best to get there.

I encourage you all to think and talk about how best to get there, in the workshops today, and beyond this meeting. We need a plan that is workable and realistic and on solid ground technically. I know EPD needs more facts, and more time and money to get those facts. Do we also need changes in our water law? What would work best?

My objective is a good, long-term plan to manage our water resources for sustainable use. Getting that plan and implementing it, will put us all on the side of the angels.

19. FX-4 - Talking Points: Future Agricultural Water Use in Southwest Georgia

- TALKING POINTS -
FUTURE AGRICULTURAL WATER USE IN SOUTHWEST GEORGIA

(Georgia Environmental Protection Division - 3/22/99)

I. UNCERTAINTIES

A. **How many acres in Southwest Georgia are actually being irrigated?**

1. We know how many acres for which we've issued permits, but we don't know if all those systems were actually installed (our best estimate is approximately 470,000 acres are under irrigation in the lower Flint basin).

2. We don't know how many acres are being irrigated that are not covered by water withdrawal permits. More than 50% of the applications currently on file at EPD (covering some 13,617 acres) are from farmers who have already installed and are using wells, but did not previously apply for or receive withdrawal permits.

B. **How much water is actually used by irrigators?**

1. Farmers aren't required to meter water usage (although some do) or to report it, so EPD has to depend upon best estimates. These estimates could be high or low by a wide range.

2. The General Assembly is funding a 5-year study whereby EPD contracts with the Cooperative Extension Service to meter irrigation use of volunteer farmers, then produces better estimates of irrigation water use statewide. We are only one year into that study.

C. **How accurate are EPD's computer models which predict the effects on the Flint River of ground water use in Southwest Georgia?**

1. The models are the best thing we have, but there are differences of opinion among the geologists and engineers of Georgia and Florida as to accuracy.

2. It is very difficult to verify the models given the present uncertainties associated with questions A and B above.

3. EPD thinks the models are conservative in favor of the Flint River, but they may not be.

D. **What are the true effects of surface water withdrawals?**

1. More than 20% of the irrigation permits in Southwest Georgia claim surface water as the source. EPD does not know how many irrigation systems pump directly out of a flowing stream, and how many pump from runoff ponds.

2. EPD does not know how much effect the use of runoff ponds has on reducing stream flows, especially during droughts.

E. **Are all current irrigation permit applications actually needed, or are some applicants trying to speculatively tie up water rights?**

1. Based on the large increase in applications received by EPD in the last two months, it appears that a water grab is in progress.

2. If a water grab is happening, or is likely to happen, EPD must determine which applications are legitimate and how to fairly allocate the limited water resources.

II. WHY FOCUS ON AGRICULTURAL WATER USE?

A. **Agriculture is permitted to use much more water than all other users.**

1. In the Flint River basin south of Lake Blackshear, farmers hold permits for more than **800** million gallons per day (mgd) of surface and ground water withdrawal; municipalities hold 17 permits for ~ **42** mgd (City of Albany is 52% of this); and industries hold 14 permits for ~ **27** mgd (Merck and Proctor & Gamble combined are 69% of this).

2. While agricultural use is not constant year round, like most municipal and industrial water use is, EPD's best estimates are that lower Flint River basin farmers use approximately **600** mgd of groundwater on an annual average; and **1200** mgd of groundwater during the April - September growing season of any hot, dry year.

B. **Agriculture's consumption of water is much more than all other users.**

1. Consumption is water which is withdrawn from a source and not returned. In Georgia, agricultural experts contend that irrigation water use is 100% consumptive (i.e., whatever is pumped from ground water or surface water to irrigate crops is essentially all used by the crops). Some water may pass the root zone and trickle back to the ground water, but that takes weeks or months and does not return to the source as usable water during the growing season.

2. Municipal and industrial water use is much less consumptive than agricultural water use, because much water will return to a river or stream as properly treated sewage or industrial wastewater. Municipal water consumption is primarily lawn watering and wastewater that goes into septic tanks instead of city sewers. As an example, the Miller Brewing Company in Albany consumes almost **1.4** mgd (~ 40%) of the approximately **3.4** mgd of the water it uses. That is less water than a single **215 acre** field will consume when irrigated on a hot, dry summer day during a drought.

3. Total current municipal and industrial water consumption from the lower Flint River basin is estimated about **25** mgd. Total current permitted agriculture consumption during the growing season of a hot, dry year is an estimated **1600** mgd of groundwater and surface water.

III. CONSEQUENCES OF WATER OVER-USE

A. **Status quo in issuing new irrigation permits will lead to an over-commitment of water resources, and over-use of the resource.**

1. Agricultural experts have projected that up to **69,000** additional acres could go into irrigation in lower Flint basin in Southwest Georgia between now and 2050, assuming there is sufficient water.

2. EPD has received 230 plus applications from July 1998 through March 1 1999, for more than **24,000** acres of additional irrigation permits.

3. EPD's ground and surface water models predict that (*nothing yet from Dave Hawkins on this quantity; none of his modelers recall having generated this information; from information provided by Steve Whitlock, we've already exceeded the "safe" upper limit of permitable acreage in the lower Flint*) acres of additional irrigation, beyond what is presently permitted, will cause the Flint River to go dry upstream of Bainbridge in droughts comparable to those experienced in 1986 and 1988.

B. **Over-use could hurt many existing farmers who already have irrigation permits.**

1. While EPD's models predict reduced flows in the Flint River with more acreage under irrigation, the models were not developed to determine the maximum amount of additional water that can be withdrawn without hurting other groundwater users.

2. If too much additional groundwater is withdrawn, farmers who have been safely using the Floridan aquifer for years may not have sufficient water in their wells for use during a severe drought.

C. **Over-use will cause severe impacts on fish and other aquatic life in the Flint River and its tributaries.**

1. Striped bass use the big springs on the Flint River and its tributaries as refuges from the heat of summer. Over-use of the aquifer can cause the springs to stop flowing, which could decimate the striped bass population.

2. If the river itself dries up, virtually all fish and other aquatic species may die. Recovery of various species after such an event could take years. Rare or endangered species may never recover. This will almost certainly lead to actions against Georgia by the US Fish and Wildlife Service (USFWS) under the Endangered Species Act.

3. EPD needs to avoid issuing so many permits that these things could occur.

D. **If EPD does not limit additional irrigation use soon, Georgia's negotiators in the Apalachicola-Chattahoochee-Flint (ACF) River Basin Compact will not be able to negotiate an allocation formula with Florida and Alabama.**

1. Without limiting additional permits soon, Georgia's negotiators will not be able to commit Georgia to deliver any Flint River flow to the state line during droughts.

2. Zero flow in the Flint River during droughts will not be any more acceptable to

Florida or Alabama than it will be to Georgia EPD or to Georgia stakeholders like fishermen, conservationists, boaters, users of barge navigation, and others. The compact will dissolve.

3. The federal Compact Commissioner, who is advised by federal agencies like USEPA and USFWS will never concur with a plan that dries up a major river. Again, the compact will dissolve.

E. **Federal overview of all water use in the entire Flint River basin will be severe, causing difficulties for users far from Southwest Georgia.**

1. If they perceive that Georgia will allow the Flint River to dry up in droughts, and allow low flows to occur more frequently due to over-use, Federal agencies will exert their authorities any way they can.

2. Cities and industries seeking additional water for growth will face a long, arduous road for permits. This is already happening in Griffin-Spalding County. It will also affect high growth areas in the basin like Fayette and Coweta counties. Expect Section 404 permits for reservoirs and water intakes to be vetoed.

3. In the worst case of federal overview, expect USFWS or USEPA to take EPD to federal court to prohibit issuance of additional irrigation permits.

F. **Higher wastewater treatment costs will result in Southwest Georgia.**

1. Over-use of the aquifer will cause lower river and tributary flows more frequently. Water quality will suffer if there is less natural flow of water to assimilate treated wastewater.

2. Cities like Albany, Bainbridge, Camilla, and Leesburg, and industries like Miller Brewing and Merck can expect to have to upgrade wastewater treatment, costing millions of dollars.

G. **It will hurt Georgia's chances in federal court if we let irrigation deplete the river.**

1. If the three states do not agree on a water allocation formula this year, Georgia will end up in court sooner or later.

2. While Georgia's overall case is strong, our weakest element is the fact that farmers do not have to report water use, and basically can use any amount of water they want, and the state has no effective enforcement capability for agricultural water

use.

3. If new irrigation uses are not limited effectively and soon, it will create a bigger Achilles' heel than we currently have.

H. **In the worst case, state government would have to buy back water rights from farmers.**

1. In Kansas vs. Colorado, the Supreme Court found Colorado liable for violating the _____ River Water Compact because it had permitted so much ground water use for farmers that their usage reduced the river flowage into Kansas. Colorado is forced to buy out farmers' water rights (granted through state permits) in order to comply with its state line delivery commitments in the Compact, at a cost of $_____ million. This could happen to Georgia if we cannot deliver on an allocation formula commitment due to over-use by agriculture.

2. Presumably, if Georgia users dry up the Flint in droughts, then Florida, or federal agencies, or other Georgia stakeholders could also take the state to court and perhaps compel the buy-back of farmers' water permits.

IV. INTERIM SOUTHWEST GEORGIA WATER MANAGEMENT PROCEDURES

A. **Because of the uncertainties, the need to focus on agriculture, and the adverse consequences of over-using water as described above, it is necessary for EPD to impose a temporary moratorium on issuing certain additional irrigation permits in Southwest Georgia.**

All of these facts have become known over the course of 1998. It is now necessary to act on them.

B. **EPD will temporarily suspend issuance of any additional agricultural water withdrawal permits, as follows:**

1. Given the concerns described above, EPD will temporarily suspend the issuance of any additional agricultural groundwater withdrawal permits which use the Floridan aquifer in the all or part of the following 14 (or 17) counties:

a) All of the area of the following counties:
Baker, Calhoun, Dougherty, Early, Lee, Miller, Seminole, Sumter and Terrell

b) and in portions of the following counties:
Crisp, Decatur, Dooly, Mitchell, and Worth (and potentially portions of Grady, Colquitt and Turner counties).

2. Water sources affected are from the Floridan aquifer and any flowing surface water streams (rivers and creeks) in the designated area. Sources not affected are the groundwater users in the Providence aquifer, the Claiborne aquifer and any surface ponds not on flowing streams that only catch surface runoff.

3. No application received after February 28, 1999 will be processed until EPD's field verification and model verification work has been completed. Applications received prior to March 1, 1999 will be processed. Permits will also be issued for irrigation systems which were installed and in use as the 1998 growing season, subject to EPD receiving applications for such systems and verifying them. ***(Harold, we need to further discuss this bullet before we finalize the document. It could very well be that we have to say we can't issue ANY MORE PERMITS, REGARDLESS OF WHEN THE APPLICATIONS WERE SUBMITTED.)***

4. Land owners having wells drilled or having irrigation systems installed who have not received a permit or letter of concurrence from EPD will be subject to enforcement action under the Groundwater Use Act or the Water Quality Control Act.

5. This suspension will remain in place until EPD can scientifically determine whether natural water resources of the Floridan aquifer and surface streams in the affected counties can safely accommodate additional irrigation withdrawals, while protecting minimum flows in the Flint River and preventing unreasonable impacts on existing ground water users.

C. **Field verification of withdrawal permit data will be done by EPD to minimize uncertainties.**

1. EPD will coordinate with existing entities to verify the numbers, types, and locations of irrigation systems, the capacities of pumps, and the acres of irrigated by a combination of direct inspection, interviews of irrigation system owners, use of aerial photography, and any other appropriate means.

2. EPD will put as many people as it can on this task and it will continue until it is completed. A time schedule and budget will be developed by June 30, 1999.

D. **Verification of the ground water and surface water models for Southwest Georgia will be done by EPD to minimize uncertainties.**

1. EPD staff will work with other experts from U.S. Geological Survey and elsewhere to verify the models.

2. EPD will put as many people as it can on this task and it will continue until it is completed. A time schedule and budget will be developed by June 30, 1999.

E. **The project currently underway by EPD and CES to estimate reliably the amounts of water being used by farmers for irrigation must be completed to minimize uncertainties.**

1. The results of this project and of the field verification of Task C above are essential inputs to Task D above.

2. If funding continues as planned, this project will be completed by September 30, 2003.

F. **Once Tasks C, D, and E above are completed, EPD will collaborate with the farming community and other stakeholders to develop a long-term sustainable water management plan for Southwest Georgia.**

1. All future permitting will follow that plan.

NOTE ONLY TO GEORGIA TEAM: The following information is confidential and not to be discussed outside the Team until notified by Reheis. Blanks need to be filled in by the Team, and Reheis and Kerr must brief key individuals before final release (Commissioners of DNR and Agriculture, Governor, Lt. Governor, Speaker, DNR Board and Chairs of Natural Resources and Ag. Committees in Senate and House).

20. FX-9 - Irrigation and the Flint River - Memorandum from Harold Reheis to Governor Roy Barnes

Georgia Department of Natural Resources
205 Butler St. S.E. , East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
404/656-4713

MEMO

To: Governor Roy Barnes
From: Harold F. Reheis Harold F Reheis
Subject: Irrigation and the Flint River
Date: October 1, 1999

Bob Kerr and I had a very productive meeting yesterday in Camilla with Richard Royal and about 20 farmers and agribusiness leaders. The rather public announcement we made at the ACF negotiation meeting last week has helped them understand we're serious. Here is how we agreed to proceed from this point forward.

We will draft a bill called the Flint River Drought Protection Act. It will affect all or parts of a dozen or so counties. A fund will be established, from which payments can be made to farmers with permits in the affected area, in lieu of them irrigating during extreme drought years. If the fund does not have enough money or if farmers do not offer enough acres at auction to idle the necessary 100,000 acres or so during a severe drought, then EPD can require additional acres to be idled, calling on the last permits issued to be idled first. If someone is idled by EPD, that person can still receive a payment per acre equal to the average of the auctioned prices. EPD will not issue permits to any backlogged applications until after the 2000 legislative session. If the bill passes and is funded, EPD will issue the backlogged permits with no interruptible conditions. If the bill is not passed and funded, EPD will issue the backlogged permits to be interruptible.

Either way, we can keep the Flint from drying up, and we can make some kind of flow commitment to Florida and the feds in the ACF Compact. It will work.

Everyone present thinks this is good and fair. We told the group that you are supportive of a bill to set up the fund, and supportive of funding it this year. Richard is happy and will work to fast track the bill and get it passed very early in the 2000 session. The farmers and agribusiness leaders are happy and will spread the word.

Thanks for your help and support. We'll keep you posted.

HFR:ypf

cc: Joe Young
Bobby Kahn
Lonice Barrett
Bob Kerr

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54 EXHIBIT 20

12-3-15

Georgia Department of Natural Resources
205 Butler St. S.E. , East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
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Thanks for your help and support. We'll keep you posted.

HFR:ypf

cc: Joe Young
Bobby Kahn
Lonice Barrett
Bob Kerr

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FAXED
10-20-99

Southwest Georgia Farm Credit, ACA

Administrative Office
P.O. Box 796
Bainbridge, Georgia 31718-0796
117 S. Donalson Street
Bainbridge, Georgia 31717
Telephone (912) 246-8032
FAX (912) 246-4229

October 13, 1999

MEMORANDUM

To: **Harold Reheis** OK as noted. Thanks HReheis
Bob Kerr

From: **Willis J. Berry** Willis/lg

Re: **Water Policy Initiative Meeting**

Attached are my notes from the above referenced meeting. Mr. T. E. Akridge and Mr. Ralph Powell have asked me to send these notes to you. If you do not think this is what you said, please let me know what you thought you said. On a serious note, let me know if you have changes that you feel should be made.

Thank you.

WJB:lg

WATER POLICY INITIATIVE MEETING
MITCHELL COUNTY FARM BUREAU
CAMILLA, GEORGIA
SEPTEMBER 30, 1999 1:15 P.M.

PERSONS ATTENDING: Roster attached. Also attending Representative Richard Royal, Harold Reheis and Bob Kerr

Richard Royal opened the meeting and gave some background remarks. He reminded those present that some of the issues published in the Water Policy Initiative developed by this group are not popular with all legislators including some representing the agricultural committees in this area; therefore we will have some work to do in this area. Representative Royal introduced Bob Kerr and Harold Reheis who led the discussion for the remainder of the meeting.

Harold Reheis made general remarks and specifically addressed the Southwest Georgia Agricultural Water Policy Initiative. He said he agreed with the bulk of the paper but needed to discuss and perhaps take issue with parts of it. Specifically, Requested Agency Action, II: A. He suggested that he and his department did intend to issue permits by the end of the year but would be limited (interruptible) permits. He then asked how important is the limited issue if the legislators and governor approve a Flint River Drought Protection Trust Fund?

The Governor appears to be in favor of a drought protection fund and suggest that he can find funds for it. He then discussed a handout paper entitled, " Re-analysis of Flint River Basin Options" dated September 30, 1999. Handout is attached for reference. Of the six options discussed he allowed that option 1 is not feasible and the rest had feasibility to some degree depending on what is agreeable to this group, the Governor, the legislators, and the Tri-State Water Agreement negotiators. He placed some emphasis on option 3 but did acknowledge that there may be alternatives.

W. F. Griffin and Jim Hook discussed the agriculture irrigation acreage discrepancy in the records. Point: There are more acres permitted than used. The records suggest there are 800,000 acres irrigated and that there are approximately 1,200 applications involving 120,000 acres more but there may be a 100,000 acre discrepancy in the 800,000; therefore we may have up to the additional amount available from those already permitted which would be a positive affect on the amount of water actually used.

Then in the case of a drought emergency, the state could open an auction via the Flint River Drought Protection Trust Fund to retire enough acres to limit water use goals to address the emergency. If adequate acres were not offered, the manager of the EPD could force retirement of the desired amount using" last in first out" (LIFO) permit dates as a basis for LIFO.

Bob Kerr asked: Is this group in favor of sharing the pain by limiting all permit holders to acre feet and inches of water which would require monitoring and reporting or is the group more in favor of limiting acres and let the grandfathered permits pump all they need or want? This caused the group to entertain possible scenarios but there was a consensus to use LIFO for water use curtailment in the event we need to address a water use emergency.

When asked if the EPD was going to place a moratorium on irrigated well drilling, Reheis said, "We ought to."

During the session there was much discussion on the search for alternatives to treat all stakeholders as fairly as possible and to employ as few restrictions as possible.

There was a strong appetite to develop and fund a Flint River Drought Protection Fund and it appeared to many that an equitable water use solution in drought periods could be obtained through it. The EPD was encouraged to complete the study for water availability and use as soon as possible. It appeared to be a consensus by the group that a moratorium on agricultural irrigation pumping permits and well drilling could be set provided advance notices and dates were published.

BREAK

Immediately after break Harold Reheis said that he, Bob Kerr and Richard Royal had talked during the break and reported that they could write legislation which Richard Royal will introduce to accomplish what was discussed this date. He felt that it could be written in such a way that it would not require the constitutional amendments discussed earlier in Mr. Reheis' September 30th Flint River Basin Options.

Bob Kerr discussed water accounted for in the Tri-State Agreement today and stated that the flow to Florida was calculated to come from the Chattahoochee River not the Flint River, which is contrary to popular belief. He may need to come up with more flow for drought periods that he could this additional flow would be reviewed positively by the Tri-State Water Compact negotiators and the wildlife people. If the Year 2000 legislation does not pass in regard to the drought protection trust fund, he will have no choice but to require interruptible permits to insure that water does remain in the Flint River during drought emergency.

EPD

Following the conversation this date and the concept that the Drought Protection Trust Fund would protect the water necessary to maintain a reasonable and adequate flow in the Flint River, the question surfaced as to whether this group was going to demand that the backlog of application for permits be acted on prior to December 31, 1999. If so, they would have to be interruptible permits. Or would it be more desirable to wait until sometime in the first quarter of the Year 2000 to determine what the legislators do in regard to the Drought Protection Trust Fund and what Bob Kerr is required to commit downstream in the Tri-State Water Negotiations in hopes of issuing regular permits versus restricted permits?

There was a consensus that the farmer owners and operators would be better off to wait for the aforementioned actions with the belief that they will get non-interruptible permits and have a stronger position to bid into the drought reserve fund in the case of a future drought emergency.

Harold Reheis agreed that he would issue a press release by the end of October identifying the last day that applications for irrigation water permits and well drilling that would be accepted by his office. He suggested that they will be establishing an irrigation well drilling standard, which will state that an well driller cannot drill over a 4" well unless the owner/operator has a pumping permit in hand.

There was a question concerning the need to establish a "commission" as described in the September 21, 1999 draft of the Southwest Georgia Agricultural Water Policy Initiative if the above is consummated in a timely fashion. The group acknowledged that the commission might not be as important as originally thought if the drought plan is accepted and funded but the consensus was wait and see. Let's write and pass the bill, determine the funding, study the language, and then let' see.

The meeting adjourned with thank-yous to Bob Kerr, Harold Reheis and Representative Royal.

GDNR/EPD DIRECTOR Fax:4046515778

** Transmit Conf. Report **

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Southwest Georgia Farm Credit, ACA

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Bainbridge, Georgia 31718-0796
117 S. Donalson Street
Bainbridge, Georgia 31717
Telephone (912) 246-8032
FAX (912) 246-4229

October 13, 1999

MEMORANDUM

To: **Harold Reheis** OK as noted. Thanks Hal
Bob Kerr

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Thank you.

WJB:lg

WATER POLICY INITIATIVE MEETING
ROSTER
CAMILLA, GA.
9/30/99

Wills Berry
REDACTED

T. E. Moye
REDACTED

Charlie Burch
REDACTED

W. F. Griffin
REDACTED

Jerry Torbert
REDACTED

Hal Haddock
REDACTED

John Bridges
REDACTED

Greg Murray
REDACTED

Thomas Daniels
REDACTED

Eddie McGriff
REDACTED

Jim Hook
REDACTED

Cader Cox
REDACTED

John B. Johnson
REDACTED

Murray Campbell
REDACTED

David Sapp
REDACTED

Joe Cook
REDACTED

Ralph Powell
REDACTED

T. E. Akridge, III
REDACTED

T. E. Allen, III
REDACTED

Dan Bollinger
REDACTED

21. FX-10 – FRDPA LEGISLATIVE HISTORY - CONSERVATION AND NATURAL RESOURCES LEGISLATIVE REVIEW - GA STATE UNIVERSITY LAW REVIEW

Water Resources: Enact Flint River Drought Protection Act; Create Drought Protection Program; Require the Board of Natural Resources To Establish a Drought Protection Program; Require Cooperation with the Georgia Environmental Facilities Authority

CODE SECTIONS:	O.C.G.A. §§ 12-5-134 (amended), 12-5-540 to -550 (new), 50-23-5 (amended)
BILL NUMBER:	HB 1362
ACT NUMBER:	650
GEORGIA LAWS:	2000 Ga. Laws 458
SUMMARY:	The Act, known as the "Flint River Drought Protection Act," adds several sections to the Code to identify the importance of Georgia's water resources, define certain terms, and authorize the Board of Natural Resources and the Director of the Environmental Protection Division (EPD) of the Department of Natural Resources to create and enforce a drought protection program and administer funds. The Board is also required to implement such measures as are necessary to prevent future droughts in the Flint River basin, including the use of irrigation auctions as a water conservation technique. The Act provides compensation for nonirrigated acres either under a voluntary irrigation reduction plan or under an involuntary reduction order issued by the Director of the EPD. The Act gives the EPD authority to conduct reasonably necessary investigations and inspections of irrigated land. The Act provides enforcement measures and penalties. It encourages the

Georgia Environmental Facilities Authority to work with the Director of the EPD to assist in the implementation and funding management of the drought protection program. Finally, the Act changes certain irrigation well water standards and permitting requirements.

EFFECTIVE DATE: April 19, 2000[1]

History

The Flint River is a 349-mile long river that runs from Atlanta into South Georgia.[2] There, it joins the Chattahoochee River to form the Apalachicola River, which flows across the Florida panhandle and into the Gulf of Mexico.[3]

Georgia's Flint River basin is predominantly an agricultural region of the state,[4] and agriculture is the largest industry in Georgia.[5] The eighteen counties in Georgia that produce 43.5 % of the state's total agricultural income depend on the waters of the Flint River for irrigation.[6] The importance of agriculture to the state, combined with the growing concerns about the effects of severe drought on Georgia and its neighboring states, led many agricultural, business, and environmental groups to come together to balance the state's agricultural needs with the water rights of neighboring states in times of drought.[7]

The underlying driving force behind HB 1362 was, in large part, the litigation between Georgia, Florida, and Alabama over water rights in the region.[8] The litigation actually motivated the Georgia Environmental Protection Division (EPD) to examine

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1. *See* 2000 Ga. Laws 458, §§ 4-5, at 468. The Act took effect upon approval by the Governor. *See id.*
2. *See* Charles Seabrook, *The Flint River System: Water Worries Tri-State Flap Could Mean Irrigation Limits for Farmers*, ATLANTA J. & CONST., Apr. 10, 2000, at D1.
3. *See id.*
4. *See* Audio Recording of House Proceedings, Feb. 16, 2000 (remarks by Rep. Richard Royal) <http://www.ganet.org/services/leg/audio/2000archive.html> [hereinafter House Audio].
5. *See id.*; *see also* Telephone Interview with Rep. Richard Royal, House District No. 164 (June 7, 2000) [hereinafter Royal Interview].
6. *See* House Audio, *supra* note 4.
7. *See id.*
8. *See id.*

the Flint River water flow.[9] In its initial studies, the EPD discovered that high use of irrigation during times of severe drought had the potential of dramatically reducing the flow of the Flint River.[10] This finding led the EPD to discuss the problem with the U.S. Army Corps of Engineers.[11] In addition to the interstate water rights concerns, the Corps of Engineers was also concerned about the environmental implications of reduced water flow in the Flint.[12] Prompted by the discussions between the EPD and the Corps of Engineers, members of the Georgia House of Representatives met with the Georgia Farm Bureau, state agribusiness leaders, individual farmers in the region, and environmental groups to develop a solution to the water flow problem.[13] That solution took the form of HB 1362, a mechanism to take acreage out of irrigation production during times of severe drought.[14]

HB 1362 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.[15] If Florida and Georgia enter into an agreement that guarantees Florida a minimum water flow amount from the Flint, HB 1362 will have the additional purpose of ensuring compliance with that legal obligation.[16]

In addition to the legal impact of the bill, HB 1362 was also seen as an environmental protection measure to preserve the ecology of the Flint River.[17] The Flint River is home to many endangered species.[18] If the river's ecology cannot be protected by the state, the federal Environmental Protection Agency (EPA) may institute even more severe water restrictions on the region.[19] The Corps of Engineers and the EPA could force

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9. *See* Royal Interview, *supra* note 5.
10. *See id.*
11. *See id.*
12. *See id.*
13. *See id.*; *see also* Telephone Interview with Rep. Bob Hanner, House District No. 159 (July 7, 2000) [hereinafter Hanner Interview].
14. *See* Royal Interview, *supra* note 5.
15. *See* House Audio, *supra* note 4.
16. *See Bill Pays Farmers Who Don't Irrigate During Droughts*, AP NEWSWIRES, Apr. 19, 2000, *available in* WESTLAW, GANEWS.
17. *See* House Audio, *supra* note 4.
18. *See id.*
19. *See id.* (remarks by Rep. Bob Hanner).

farmers to cease irrigating their lands completely.[20] In order to preserve the water flow of the Flint, it is estimated that farmers will need to cease irrigation on approximately 100,000 acres of land during severe drought periods.[21]

HB 1362

Representatives Richard Royal, Bob Hanner, Tom McCall, Henry Reaves, Thomas Murphy, and Newt Hudson of the 164th, 159th, 90th, 178th, 18th and 156th Districts, respectively, sponsored HB 1362.[22] HB 1362 was introduced on February 7, 2000.[23] The House assigned the bill to its Committee on Natural Resources & Environment, which favorably reported the bill, as substituted, on February 10, 2000.[24] The Committee substitute changed a provision of the bill to authorize the Georgia Environmental Facilities Authority to contract with the Director of the EPD to implement and execute a drought protection program for the Flint River basin.[25]

On the House floor, Representative Bobby Franklin of the 39th District offered a floor amendment that would have changed how the General Assembly would review the rules and regulations promulgated by the Board of Natural Resources.[26]

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20. *See* Royal Interview, *supra* note 5.
21. *See* House Audio, *supra* note 4.
22. *See* HB 1362, as introduced, 2000 Ga. Gen. Assem.
23. *See* State of Georgia Final Composite Status Sheet, Mar. 22, 2000.
24. *See id.*
25. *Compare* HB 1362, as introduced, 2000 Ga. Gen. Assem., *with* HB 1362 (HCS), 2000 Ga. Gen. Assem. The original version of the bill specified that the Georgia Environmental Facilities Authority should contract with the Board of Natural Resources, rather than the Director of the EPD. *See* HB 1362, as introduced, 2000 Ga. Gen. Assem. This change was made, upon recommendation of the Governor's Office, for purely logistical reasons so that all of the state agencies could work most effectively with each other. *See* Hanner Interview, *supra* note 13.
26. *See* Failed House Floor Amendment to HB 1362, introduced by Rep. Bobby Franklin, Feb. 16, 2000. Even without the amendment, the General Assembly will still have oversight of the promulgation of agency rules and regulations. *See* Hanner Interview, *supra* note 13. If the General Assembly disagrees with a regulation, it can strike it down by law during the next legislative session. *See id.* The General Assembly must ensure that the EPD and Board of Natural Resources comply with the Administrative Procedures Act. *See id.*

This floor amendment failed (27-136), and the House passed the bill, as substituted, on February 16, 2000.[27]

The Senate assigned HB 1362 to its Natural Resources Committee, which favorably reported the bill on March 3, 2000.[28] The Senate passed the bill, without any additional changes,[29] on March 13, 2000.[30] Governor Roy Barnes signed HB 1362 into law on April 19, 2000.[31]

The Act

Section 1 of the Act, entitled the "Flint River Drought Protection Act," amends Chapter 5 of Title 12 of the Georgia Code by adding several Code sections relating to water resource preservation in Georgia's Flint River basin.[32]

The Act adds Code section 12-5-541, which states that the policy of the Act is to protect Georgia's public health, safety, and welfare by preserving the state's water in times of drought.[33] Section 12-5-542 defines certain terms to be used throughout the Act.[34]

The Act adds Code section 12-5-543, which authorizes the Board of Natural Resources to establish and implement a drought abatement program for the Flint River basin.[35] The Board may adopt any rules that are necessary to implement the policy goals of the state.[36] This Code section prescribes suggested rules for the Board to implement, including an irrigation abatement program, water withdrawal permits, and an irrigation auction.[37] Finally, this Code section provides that any

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27. *See* Georgia House of Representatives Voting Record, HB 1362 (Feb. 16, 2000); House Audio, *supra* note 4 (vote on amendments).

28. *See* State of Georgia Final Composite Status Sheet, Mar. 22, 2000.

29. *Compare* HB 1362 (HCS), 2000 Ga. Gen. Assem., *with* HB 1362, as passed, 2000 Ga. Gen. Assem.

30. *See* Georgia Senate Voting Record, HB 1362 (Mar. 13, 2000).

31. *See* 2000 Ga. Laws 458, § 5, at 468.

32. *See id.* § 1, at 459-67; *see also* O.C.G.A. § 12-5-140 (Supp. 2000).

33. *See* O.C.G.A. § 12-5-541 (Supp. 2000).

34. *See id.* § 12-5-542.

35. *See id.* § 12-5-543(a).

36. *See id.* § 12-5-543(b).

37. *See id.* To benefit from the drought abatement program and payments, a permittee must demonstrate actual prior irrigation usage and must have applied for a surface-water or ground-water withdrawal permit before December 1, 1999, and received that permit prior to December 1, 2000. *See id.*

rules promulgated by the Board will be submitted to the Georgia General Assembly and will automatically become effective unless they are specifically disapproved by the General Assembly.[38]

The Act also gives additional power to the Director of the EPD by adding Code section 12-5-544.[39] The Director is given the authority to implement and enforce the provisions of the Act, including the establishment of acceptable Flint River stream flow levels, identification of affected regions, prediction of drought conditions, investigation and inspection of irrigated land, collection of fines and payments, and cooperation with the affected state and local agencies.[40] The Act adds Code section 12-5-545, which identifies the power of the Georgia Environmental Facilities Authority to administer drought protection funds.[41] The Act provides that the drought protection funds must be earmarked as drought protection funds and not allocated to the general fund.[42]

The Act adds Code section 12-5-546 to require the EPD to issue a prediction every March as to whether a drought is expected that year.[43] If a drought is predicted, the Act requires that the Division conduct an irrigation reduction auction where, in exchange for monetary compensation, irrigation system permittees in the Flint River basin will agree to abate irrigation of their land for the remainder of the year.[44] Under Code section 12-5-547, if the auction is unsuccessful in significantly reducing the basin's drought problem, the Director has the authority to implement forced irrigation abatement.[45] Again, the Act provides for compensation to those persons who are forced to cease irrigation of their land.[46]

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38. *See id.* § 12-5-543(c). This provision was the subject of Representative Franklin's failed floor amendment. *See* House Audio, *supra* note 4 (remarks by Rep. Bobby Franklin).
39. *See* O.C.G.A. § 12-5-544 (Supp. 2000).
40. *See id.*
41. *See id.* § 12-5-545.
42. *See id.*
43. *See id.* § 12-5-546(a).
44. *See id.* § 12-5-546(b); *see also id.* § 12-5-546(c)-(e).
45. *See id.* § 12-5-547.
46. *See id.*

The Director is authorized to investigate and inspect irrigated lands under Code section 12-5-548.[47] Furthermore, the Act prohibits landowners from interfering with lawful inspections by authorized personnel.[48] When the Director has reason to believe that a landowner or permittee has violated the Act or the DNR's rules, Code section 12-5-549 gives the Director authority to take certain steps to ensure compliance.[49] First, the Director can confer with the landowner, and if that approach is unsuccessful, he or she may issue an order of compliance.[50] Within thirty days of receipt of the order, the individual may request a hearing.[51] The Director has the power to have the order enforced in the superior court of the county in which the violation occurred.[52] Finally, this Code section establishes a prima facie case for an irrigation restriction violation.[53]

Code section 12-5-550 establishes a repayment penalty for irrigation violators.[54] The Director is required to give written notice to the violator.[55] If the violator refuses to pay or fails to challenge the notice, then the violation is deemed admitted and the Director will issue a final, unappealable order.[56]

Section 2 of the Act amends Code section 12-5-134 by adding a provision requiring permits for large wells (capable of producing 100,000 gallons or more of water each day).[57] Such wells can only be constructed after the EPD issues the landowner a letter of concurrence or a permit.[58] Finally, section 3 of the Act amends Code section 50-23-5 by adding subsection 31.[59] This subsection requires the Georgia

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47. *See id.* § 12-5-548(a).
48. *See id.* § 12-5-548(b).
49. *See id.* § 12-5-549(a).
50. *See id.*
51. *See id.* § 12-5-549(b).
52. *See id.* § 12-5-549(d).
53. *See id.* § 12-5-549(e).
54. *See id.* § 12-5-550(a). If a person irrigates in violation of his irrigation reduction agreement or a compliance order issued against him, he must pay a penalty of three times the dollar amount of payments he received from drought protection funds. *See id.*
55. *See id.* § 12-5-550(b).
56. *See id.* § 12-5-550(c)-(d).
57. *Compare* 1985 Ga. Laws 1192, § 1, at 1209 (formerly found at O.C.G.A. § 12-5-134(3) (1996)), *with* O.C.G.A. § 12-5-134(3) (Supp. 2000).
58. *Compare* 1985 Ga. Laws 1192, § 1, at 1209 (formerly found at O.C.G.A. § 12-5-134(3) (1996)), *with* O.C.G.A. § 12-5-134(3) (Supp. 2000).
59. *Compare* 1994 Ga. Laws 1108, § 6, at 1110-27 (formerly found at O.C.G.A. § 50-23-5

Environmental Facilities Authority to work with the Director of the EPD to implement the drought protection program.[60]

Opposition to HB 1362

HB 1362 met some opposition in both houses of the Georgia General Assembly. Representative Jeff Brown of the 130th District expressed concern that the bill was premature because the bill attempted to solve the water usage problem before the results of a $750,000 study of the Flint River were finalized.[61] In addition, the bill might be premature because the tri-state compact between Georgia, Florida, and Alabama was not yet resolved.[62] Despite these objections, HB 1362 passed both houses by a strong majority vote.[63]

Laura D. Windsor

(1998)), *with* O.C.G.A. § 50-23-5(31) (Supp. 2000).

60. *See* O.C.G.A. § 50-23-5(31) (Supp. 2000).

61. *See* House Audio, *supra* note 4 (remarks by Rep. Jeff Brown). *But see* Royal Interview, *supra* note 5 (asserting that farmers would not be able to survive if they were forced to wait for the completion of the five year study).

62. *See* House Audio, *supra* note 4 (remarks by Rep. Jeff Brown).

63. *See* Georgia House of Representatives Voting Record, HB 1362 (Feb. 16, 2000); Georgia Senate Voting Record, HB 1362 (Mar. 13, 2000).

22. FX-15 - PRESS RELEASE FROM K. CHAMBERS, RE: "DEBATE OVER WATER IN THE CHATTAHOOCHEE AND FLINT RIVER BASINS"

Noel Holcomb, Commissioner
Dan Forster, Director

Georgia Department of Natural Resources
Wildlife Resources Division
2070 U.S. Highway 278, S.E., Social Circle, Georgia 30025
(770) 918-6400

January 17, 2006

Rob McDowell
2 Martin Luther King, Jr. Drive, S.E.
Suite 1152, East Tower
Atlanta, Georgia 30334

The Wildlife Resources Division (WRD) appreciates the opportunity to review the Draft Recommendations for the Flint River Basin Regional Water Development and Conservation Plan. After reviewing the stakeholder advisory committee's recommendations the WRD has several concerns about the effect of the proposed plan on aquatic resources in the Flint River Basin. As stated in the recommendations for permitting strategies, a 20% decrease in water use in the Ichawaynochaway Creek and Lower Flint River sub-basins would likely result in the critical low flow criteria being met. However, this is not true in the Spring Creek sub-basin. A 40% reduction in water use would still result in violations of in the U1B criteria nearly every month, indicating that this 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. Although reasonable use may not be denied, backlogged permit applications as well as future applications received should only be granted by permitting withdrawals from sources other than surface water and the Upper Floridian Aquifer

Any revisions to the Flint River Drought Protection Act should empower EPD to select locations included in the land auction with the highest conservation priority. This could be achieved by using the best available data to determine locations where sensitive species are located and where water withdrawals most negatively impact streams.

While it may be feasible to supplement stream flows by pumping water directly into streams from deeper aquifers, this strategy may only provide a short-term solution to the problem, as the long-term sustainability of these aquifers is uncertain and recharge rates of these aquifers are much slower than that of the Upper Floridian Aquifer. Furthermore, this recommendation does not address conservation of water resources in the basin and provides no incentives to utilize responsible water conservation practices.

We thank you for the opportunity to provide comments on this extremely important issue. Our staff is always available to discuss these comments, please contact Nongame Biologist Jason Wisniewski at 770-918-6411 or Fisheries Management Regional Supervisor Rob Weller at 229-430-4256 if you have any questions.

Sincerely,

Dan Forster
Director

EXHIBIT
Wisniewski #18

23. FX-23 - LETTER TO ROB MCDOWELL FROM DAN FORSTER RE: REVIEW OF THE DRAFT RECOMMENDATIONS FOR THE FLINT RIVER BASIN REGIONAL WATER DEVELOPMENT AND CONSERVATION PLAN

Noel Holcomb, Commissioner
Dan Forster, Director

Georgia Department of Natural Resources
Wildlife Resources Division
2070 U.S. Highway 278, S.E., Social Circle, Georgia 30025
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January 17, 2006

Rob McDowell
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Any revisions to the Flint River Drought Protection Act should empower EPD to select locations included in the land auction with the highest conservation priority. This could be achieved by using the best available data to determine locations where sensitive species are located and where water withdrawals most negatively impact streams.

While it may be feasible to supplement stream flows by pumping water directly into streams from deeper aquifers, this strategy may only provide a short-term solution to the problem, as the long-term sustainability of these aquifers is uncertain and recharge rates of these aquifers are much slower than that of the Upper Floridian Aquifer. Furthermore, this recommendation does not address conservation of water resources in the basin and provides no incentives to utilize responsible water conservation practices.

We thank you for the opportunity to provide comments on this extremely important issue. Our staff is always available to discuss these comments, please contact Nongame Biologist Jason Wisniewski at 770-918-6411 or Fisheries Management Regional Supervisor Rob Weller at 229-430-4256 if you have any questions.

Sincerely,

Dan Forster
Director

EXHIBIT
Wisniewski #18

24. FX-46 - COMMENTS ON THE DECEMBER 16, 2005 VERSION OF "RECOMMENDATIONS FOR THE FLINT RIVER BASIN REGIONAL WATER DEVELOPMENT AND CONSERVATION PLAN" - LETTER TO ROB MCDOWELL FROM SANDRA S. TUCKER

United States Department of the Interior

Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606

West Georgia Sub Office
P.O. Box 52560
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Coastal Sub Office
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Brunswick, Georgia 31520

JAN 13 2006

Mr. Rob McDowell
Flint River Basin Plan
Georgia Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Mr. McDowell:

The Georgia Environmental Protection Division (EPD) recently made available for public review a December 16, 2005, version of the document entitled "Recommendations for the Flint River Basin Regional Water Development and Conservation Plan." The Georgia Ecological Services Field Office of the U.S. Fish and Wildlife Service (Service) has reviewed the document and is providing comments as outlined below. We commend EPD for taking on the challenge of crafting a water plan that will promote conservation of water resources and the aquatic life within those water resources.

General Comments

The Service's interest in the Flint River Basin and its aquatic resources is derived from our agency mandate as the Federal advocate for the Nation's fish and wildlife resources. Additionally, the Federal Endangered Species Act (ESA) prompts us to pay attention to ongoing and proposed activities that may impact those species that are in danger of extinction. As your report indicates, the Flint River Basin is home to several freshwater mussels that have been listed under the ESA. Species listed under the ESA are at a point where their continued existence is at peril. There are other aquatic species at risk, as well; e.g., bluestripe shiner, bluenose shiner, redeye chub and a number of other native mussels. All of these species are barometers for the health of the system in which they live which makes the effort to manage for a sustainable Flint system a timely one. Conservation, especially during low-flow years, can preclude the extinction and/or listing of additional Flint River Basin species.

The Service is currently preparing a proposal to designate critical habitat for the mussels listed in the Flint River Basin and other rivers in the Apalachicolan Region. This designation characterizes specific geographic areas, in this case reaches of rivers and streams, as essential for the conservation of the listed mussels. The designation process began October 2005 but is not due for completion until 2007. Once in place, Federal agency actions that may affect the critical habitat will have to be scrutinized to determine the level of impacts, if any, that might occur. This scrutiny would extend to Federal

actions that fund or license activities carried out by other entities; e.g., State agencies or private landowners. Thus, this pending designation will prompt additional Service involvement with activities in the Flint River Basin, and will facilitate identification of priority conservation actions that would benefit listed species and designated critical habitat.

The December draft Plan is a good start for an overall conservation plan in that it brings focus to the need for conservation and suggests strategies for managing water resources for sustainability. However, there is a schism in the information presented. Part of the text states that the agricultural use of water "can" affect mussels while another part clearly states that agricultural use of water "has" adversely impacted mussels. The agricultural use data included in the report indicate a current use (e.g., see page 61) that has at times dried up stream reaches; yet, the strategies for management of water do not include a reduction in currently permitted withdrawals. When the concept of the "reasonable use doctrine" is taken into account, even a casual reader comes to the 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. The current over-allocation of water, as it is enacted in low-flow years, does not appear to protect current downstream agricultural users or other water users; it also is not protecting future users. Consequently, current permits need to be assessed for reasonable use by current and future users, including the use of the water by the very aquatic system that the water is taken from. The Flint River Basin has enough rainfall to restrict the greatest resource-use conflicts to drought years but all water-users should share the pain of an over-used system.

The EPD report revealed a startling fact that highlights another factor contributing to the decline of the Flint River Basin systems; NPDES-associated flows are based on pre-1970 flow data. It is clear that some stream reaches have poor water quality and that water quality will continue to decline where discharge concentrations are based on water quantities that on longer occur.

The Service's review of the draft Plan focuses on the magnitude of flow alterations that have occurred and would be expected to occur in the future. Our concern is adverse impacts that result in take of listed mussels. The definition of "take" includes efforts to harass, harm, hunt, wound, kill, capture or collect listed animals. Take can include alteration of habitat (i.e., harm) such that an animal is killed or injured, including significantly impairing essential behavioral patterns of breeding, feeding or sheltering. When critical habitat is designated, the Service's review includes a determination of whether the designated units are so modified as to preclude their function in providing habitat essential to the conservation of the listed species for which they were designated (the regulatory phrase is "adverse modification"). In the case of mussels, habitat alteration would include direct and indirect impacts of flow alteration, including degradation of water quality.

Where take of listed mussels could be expected as a result of implementation of a Flint River Basin water development and conservation plan, EPD and those involved with

implementing the Plan would need specific authorization under the ESA via a section 10a1B permit. The permit, issued by the Service, would address the expected take and include an analysis to determine whether the level of take anticipated could jeopardize the continued existence of the species. The proposed permit would have to be accompanied by a habitat conservation plan (HCP) that outlines the conservation measures EPD would institute to mitigate for the expected impacts.

Specific Comments – not necessarily in order as presented in the document

Factors limiting conservation (p. 35): The need to change existing law is given as a factor limiting conservation. Currently, "reasonable use" of water has been implemented with few limits; however, the Georgia Water Quality Act and the Georgia Ground-water Use Act indicate State-produced mandates to conserve water such that water development and conservation plans "guard against a shortage of water…promote the efficient use of the water resource, and be consistent with the public welfare", and include "…sustainable use…". Thus, it would appear managing the Flint River Basin to provide for sustainable flow and reasonable use do not require a statute change. This flexibility is clearly outlined on page 69 of the draft Plan.

Conclusions about safe yield (p. 42): The conclusions do not reflect the information presented in other parts of the draft Plan that clearly indicate that some reaches of the Flint River Basin have already been allocated beyond safe yield. Current permits must be re-evaluated if reasonable use and sustainable flows are to be achieved.

Strategies for management (p. 43-45): The recommendations for permitting strategies are not protective of current or future water users, including the aquatic species that live within the Flint River Basin. Requiring conservation and/or reduced water withdrawals only for new or modified permits fails to recognize the magnitude of degradation that has occurred in some reaches of the Flint River Basin. We have lost, for example, what was once a large and viable mussel population in the middle reaches of Spring Creek. This loss occurred despite having a moratorium on new water withdrawal permits.

The final Plan should include a provision for periodic review to ensure that the Plan's overarching goals are being met. Such provision may be particularly important if the agriculture climate changes as some have predicted to more vegetable crop production as compared to current production of corn, cotton and peanuts. Additionally, given the significant impact of ground-water use on stream flows, surface- and ground-water use should be coordinated during drought years.

The strategy to reduce irrigation by 20% during a drought year will be beneficial but may not avoid take of listed mussels in certain stream reaches. The minimum low flows will continue to be significantly lower during certain months of drought years.

It is not clear how the strategy of revoking duplicate permits would reap benefits because the projected scenarios in the Plan are based in part on water that is actually used rather than water that is permitted for withdrawal. A step towards conservation would be to re-

assess current permit allocations to determine where water withdrawal has been permitted but has not been used. We recognize the sensitive nature of such a recommendation; however, it is our view that the status quo; i.e., maintenance of the current level of water withdrawals, will not bring the Flint River Basin to a state of sustainable water use that protects agricultural water users or aquatic species.

Application evaluation – surface-water withdrawal permits: EPD needs to have the option of requiring low-flow protection plans on any permits, new or old, in order to provide for reasonable use and downstream flows. EPD should re-look at the 1.0 cfs cutoff because drought year scenarios could make even small flows important. Additionally, relief for large withdrawals might be gained by reducing permit limits to 50,000 or 75,000 MGD instead of 100,000 MGD so that more water use is controlled.

Using a 7Q10 flow as a "protective" flow does not conserve aquatic resources especially when those flows are based on pre-1970 data. A more protective flow pattern needs to be the basis for permit evaluations. Adding to the network of gauge stations is another concrete strategy for managing water. The additional information could inform EPD's modeling efforts.

Recommendations for regulatory reform (p. 45-47):

1. Fees need to be at a level that reduces speculative applications.
2. Whether or not water is taken from current permittees to provide for future users, current permits must be modified to eliminate over-allocation of water that leads to take of mussels.
3. Modifying the Flint River Protection Act to allow EPD to focus buy-outs on sensitive reaches will move towards the goal of sustainable systems, including restoration of some areas and avoidance of degradation in others.

4 and 5. These recommendations represent good steps towards water conservation.

6. EPD needs to retain oversight and intervention over any regional water management district in order to confirm conservation across districts.

Economic analysis: The projected income losses are large but they should be placed in an overall context to give stakeholders an understanding of their significance. Also, it is not clear whether the figures are per year, whether they are for drought years only, and/or for how long the losses are prolonged. Additionally, the analysis does not appear to take into account the statement in the Plan that employment projections for agriculture-based employment will decline up to 14% from 2002 to 2012.

A more complete economic picture would be to include an analysis of the cost of degraded waterways. For example, the expected costs associated with increased pollution, increased sediment in streams and over-allocation of water. The economic analysis prepared for the draft Plan appears to assume only negative economic impacts would be derived from water conservation.

Stream Impacts (p. 111-118): The data provided in the draft Plan indicate that the streams of the Flint River Basin have, and continue, to feel the effects of the many surface- and

ground-water withdrawals currently permitted. Figure 6.2 (p. 93) shows that 23 to 55% of the stream flows of the lower Flint River Basin were intercepted by irrigation from March 2001 to February 2002. Tables 6.1 (a) - (f) are also illuminating regarding the streamflow reductions that were modeled for drought years. In Ichawaynochaway Creek during June, July and August of 2000, the streamflow was reduced to 54.7 %, 30.1 % and 43.7% of the observed flows. In Spring Creek, the modeled streamflow reductions were greater than the water observed at the Iron City gauge. Figures I.3-4 to I.3-12 provide modeled scenarios of future irrigation that indicate flows in drought years would fall lower than those recorded to date. Even given the limits of the models, these reductions appear significant. The Service, Georgia Department of Natural Resources-Wildlife Division, University of Georgia researchers and others have data to indicate that the native mussel populations of the Flint River Basin have significantly declined in the last five years. It is unlikely that agricultural irrigation is the sole reason that mussels are declining but it is also unlikely that the mussels and the other aquatic inhabitants of the Flint River Basin will be sustained into the next century if significant changes in water use are not implemented in the near future.

The instream flow guidelines developed by the Service, Environmental Protection Agency and U.S. Geological Survey are basic in premise. Their fundamental principle is that aquatic organisms evolved in systems exposed to natural climatic patterns with certain geologic and hydrologic characteristics. The flow regime in the Flint River Basin for the thousands of years before southwest Georgia was settled included drought years and flood years. The flow regime, through time, was a dynamic system that varied in timing, frequency and duration from year to year and within any given year. Given this natural setting, arriving at one number that would represent "the" volume of water needed to sustain the aquatic system is not possible. The instream flow guidelines use the natural history of a stream, as described by the nearest gauge data, as criteria to judge how close a manipulated flow would be to that natural regime. The preparers of the guidelines used in the EPD analysis took dozens of flow characteristics and created a simple assessment tool based on two of the most stressful points in an aquatic animal's life; single day low flows and prolonged low flows (i.e., criteria for monthly 1-day minima and annual low-flow duration).

The guidelines recommend using the entire period of record for gauge stations to compare future flow regimes against. In systems that have not been significantly altered, such analysis would provide an acceptable assessment of future impacts. However, where systems have been highly altered, such as parts of the lower Flint River Basin, using the entire period of record skews the comparison to future scenarios. In other words, the guidelines' premise of comparing manipulated flows to natural flows is violated because the current flows no longer are of the timing, frequency and duration of natural flows. Therefore, the informative comparisons in the draft Plan are those that compare flows based on "pre-irrigation" data to flows based on current and future irrigation scenarios.

--Ichawaynochaway Creek at Milford -- in comparing the 1939-1975 data to the 1953-2003 data, it appears that irrigation has already increased the occurrence of the monthly

1-day minimum; e.g., from 15.4% pre-1975 to 28% in September for the 25 percentile and from 38.5% to 56.0% in September for the 50 percentile. The duration of low flows has also increased. The model results indicate that more water withdrawals would prolong the low flows and cause them to be even lower.
--Spring Creek at Iron City -- the alteration of the natural flows in Spring Creek have been so significant that comparing a future scenario to the current flow conditions is problematic. Spring Creek has peculiarities such as early low flows and a karstic nature, but these characteristics were present historically such that Spring Creek's natural flow regime would reflect them. As such the instream flow guidelines would apply to Spring Creek as they do to any stream. The complication in their use for Spring Creek is caused by the magnitude that flows have already been altered. The extreme difference between the percentage of times the 1-day minima are exceeded highlights the over-allocation status of Spring Creek; e.g., 11.8 % to 36.0% in September (25 percentile) and 23.5% to 62.0% in September (50 percentile). Sorting out a future scenario regarding low flow duration is skewed because parts of Spring Creek stopped flowing and because low flows lasted for most of a year (272 days).
--Lower Flint River -- the large volume of water in the Flint River cushions the impacts of withdrawals; however, the data reflect a doubling of the frequency of low flows and a significant increase in low-flow duration based on current water use.

The volume of water removed from streams during low flow times represents conditions that would in certain reaches for certain years rise to the level of taking listed mussels that inhabit those stream reaches. In other words, the mussels would be stressed such that they die (e.g., dessication because there is no water or very little) or their feeding would be impaired because the flows would be significantly reduced. Additionally, mussel reproduction would be impaired because host fish could not get to them; because concentrated pollutants or higher water temperatures impaired the mussels' ability to develop glochidia, and/or because low flows did not adequately support mussel conglutinate such that glochidia survived or fish were attracted to them. Unnaturally extreme changes in the volume of flow such as is created when irrigation pumps are turned on and off can also create stressful conditions for mussels and other aquatic organisms. Where stream reaches are designated as critical habitat, such loss of flows could constitute adverse modification of mussel habitat.

Water Quality Issues (p. 118): As you know, water quality and water quantity issues are integrally tied. The impact of outdated 7Q10 flow assumptions on current and future NPDES discharges needs further analysis to better understand the status of Flint River Basin streams. EPD's plan to manage water use in the Flint River Basin could be sound but still fail to meet its goal of conservation and sustainability if maintaining and improving water quality is not a key part of water management. Depending on the scope of the difference between actual flows and those assumed for specific discharge permits, poor water quality may be farther-reaching, geographically and temporally, than low flow concerns.

Water Conservation in the Flint River Basin (p.145-148); Proposed Strategies:
Conservation Education and Outreach – Part of the education of stakeholders should include information regarding how aquatic systems function. Stakeholders need to understand that listed aquatic species are not regulated except where they are at severe risk. Where species are at severe risk is generally where their habitat is at risk. To ignore the dire status of these species is comparable to ignoring the condition of a residence as it falls into disrepair. The 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. Dwindling species are indicative of a declining system.

Funding for Conservation Practices – Federal funds can not be used without ESA review whether the funds arrive directly from a Federal agency (e.g., NRCS) or are directed to a quasi-government agency such as Georgia Soil and Water Conservation Commission. Proposed actions that would take listed species cannot be funded with Federal funds unless the action is reviewed to ensure that species are not jeopardized and critical habitat is not adversely modified.

Permit Conditions – Current permits should also be required to have a conservation plan. There are relatively few permits in the backlog of permits and predictions within the draft Plan indicate that irrigation is not expected to increase much. Consequently, management of current permits is where water conservation will have to be achieved.

Water Withdrawal during Drought – Surface- and ground-water users need to be included in efforts to coordinate use where sensitive species occur. Data collected for the Plan clearly indicate the connectedness of ground-water use to certain stream reaches.

Interpretation of Model Results (p. 185): The closing paragraph is not reflective of the general message provided by the data within the draft Plan. We recognize that all models have limitations and sorting out the complete picture for the Flint River Basin is made difficult by the limited gauge data. However, the data paint a grim picture. Comparing current use to the backlog or other future scenario does not indicate a large difference but comparing those scenarios to the pre-irrigation scenario should help EPD to understand the true current state of the Flint River Basin.

Summary Comments
Currently, there are streams in the Flint River Basin that provide habitat for listed mussels. The populations continue to dwindle; the drought exacerbated the declines but the data presented in the draft Plan indicate that the current level of agricultural water withdrawals made the drought significantly deeper. Allowing even more withdrawals where mussel populations occur, particularly in drought years, will hasten the decline of the species. Where those declines amount to actual loss of animals and/or habitat, the ESA requires explicit authorization. Because of the magnitude of flow deviations from natural flows, those ongoing and projected, it is our recommendation that, prior to implementation of the Flint River Water Development and Conservation Plan, EPD acquire the appropriate permit from the Service. To do otherwise places EPD and those

implementing the Plan at peril for violation of the ESA. More fundamentally however, it is our belief that water conservation to provide for sustainable flow and reasonable use will not be achieved in certain stream reaches without significant changes to current water use. The Service stands ready to assist EPD with developing the incidental take permit and its associated habitat conservation plan.

Sincerely,

Sandra S. Tucker

Sandra S. Tucker
Field Supervisor

cc: file
GDNR-WRD (Attn: Mike Harris)
USFWS, Panama City (Attn: Jerry Ziewitz)
USFWS, Columbus (Attn: Steve Parris)

25. FX-47 - CONCERNS RELATING TO THE LACK OF IMPLEMENTATION OF WATER RESOURCE MANAGEMENT IN THE FLINT RIVER BASIN AS OUTLINED IN GEORGIA'S ENVIRONMENTAL PROTECTION DIVISION'S (EPD) FLINT RIVER BASIN REGIONAL WATER AND DEVELOPMENT PLAN (PLAN) FINALIZED IN MARCH 2006 - LETTER TO CAROL COUCH FROM SANDRA S. TUCKER

United States Department of the Interior

Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560

Coastal Sub Office
4270 Norwich Street
Brunswick, Georgia 31520

December 8, 2008

Dr. Carol Couch
Georgia Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch:

The Fish and Wildlife Service (Service) has concerns relating to the lack of implementation of water resource management in the Flint River Basin as outlined in Georgia's Environmental Protection Division's (EPD) Flint River Basin Regional Water and Development Plan (Plan) finalized in March 2006. As you know, the drought continued into 2007 and 2008 with record low flows throughout Georgia and the Southeast. In portions of the Flint River Basin, especially Spring Creek, the effects of natural low flows were exacerbated by water withdrawals for agricultural irrigation. Despite the occurrence of extreme low flows, key measures included in the Basin Plan and associated Flint River Drought Protection Act (Chapter 391-3-28) to reduce water withdrawals have not been put into place. We applaud the measures that have been enacted such as end-gun shut offs, leak detection and repair, and retrofitting or irrigation systems. It is unknown how much water this will keep in the creeks, although this is an effort that should be continued. A measure not used was a provision of the Flint River Drought Protection Act to reduce irrigation withdrawals by 20 percent in sub-basins with greatest risks of experiencing low flows due to irrigation. This tool could have been utilized to keep flow in Spring Creek and other parts of the Flint River Basin.

A report by Hicks and Golladay (2006) looked at the impacts of agricultural pumping on streams, including Spring Creek in southwestern Georgia. The impact of groundwater pumping on streamflow is significantly greater in the Spring Creek watershed because the Floridan Aquifer has a more direct hydraulic connection to Spring Creek. Since the advent of center-pivot irrigation, by early summer, many of the tributary streams to Spring Creek cease to flow, even during years of normal rainfall. The Plan shows calculated reductions in streamflow caused by reduced ground-water discharge to HUC-8 sub-basins (McDowell 2006). In drought years, for certain months, the simulated reduction is actually greater than the observed flows during a drought year. This happened only in Spring Creek.

The Hicks and Golladay (2006) analysis of streamflow data shows consistent and substantial declines in minimum and seasonal streamflow associated with the development and implementation of agricultural irrigation in the Flint River area of southwestern Georgia.

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These declines resulted in some of the lowest flows on record during recent droughts. There is no climatologic indication that recent droughts were more severe or persistent than those in the past (e.g., 1930's or 1950's). Thus, Hicks and Golladay conclude that water use is the primary factor causing record low streamflow and other alterations in regional hydrology.

The mussel fauna in Spring Creek has been drastically impacted in the last eight years due to low flows. A high diversity of mussels, as many as 14 species in one survey, has been recorded from Spring Creek prior to and including the summer of 2000. Two federally-listed mussel species, the shinyrayed pocketbook (*Hamiota subangulata*) and oval pigtoe (*Pleurobema pyriforme*), are among the mussels in Spring Creek. Long stretches of Spring Creek dried up for the first time, according to local landowners, in Miller County, Georgia, during mid-June of 2000. According to USGS gage data (2000), the flows at the Spring Creek near Iron City gage were as low as 0 cfs from mid-August to October 1. Service personnel collected 113 fresh dead shinyrayed pocketbooks and 86 fresh dead oval pigtoes from several locations in mid-June 2000 (see attached photograph #1). Numerous native non-listed mussel species (in the thousand's) also perished. Flow did not return in this portion of Spring Creek until October of 2000. Spring Creek went dry again in these same areas in early June 2007 (see enclosed photograph #2). Service personnel collected 94 fresh dead shinyrayed pocketbooks and two fresh dead oval pigtoes from the same locations as in the summer of 2000. The number of native non-listed mussels observed was drastically reduced from the number seen in 2000. Flow did not return back to these areas until November 2007. Service personnel conducted several surveys in these same locations during the summer of 2008. Only one shinyrayed pocketbook and 21 other native mussels total (six species) were found. The mussel populations in Spring Creek appear to be on a steep trajectory to extirpation.

Although few mussels were found in these stretches in 2008, in 2007, there were more individuals than we expected to be present based on the deaths that occurred in 2000 and a survey done in 2004 (a high flow year). Thus, in 2007, the mussel population seemed to have undergone some recovery from the impacts of 2000. Nevertheless, as the dwindling numbers indicate, repeated and successive low flow years incrementally reduce the remaining population. Mussels observed in these stretches were in the thousands (14 species) in 2000, while in 2008, only 21 (six species) mussels total were found during several surveys. No flow not only causes direct mortality of mussels, no flow and extreme low flows prevent fish host from gaining access to gravid mussels ready to release mature glochidia. We have also observed mussels expelling glochidia under stress of declining water levels and increasing water temperature. This is a direct impact to the mussels' ability to persist in Spring Creek.

Spring Creek was designated on November 15, 2007, as critical habitat for the endangered shinyrayed pocketbook, oval pigtoe, and the Gulf moccasinshell (not found in recent surveys). Critical habitat is a term defined in the Endangered Species Act. It refers to specific geographic areas that are essential for the conservation of a threatened or endangered species and that may require special management consideration or protection. When designating critical habitat, the Service identifies the physical and biological habitat features that each life stage (adult, juvenile, glochidia) must have for normal behavior, growth, survival, and what each species needs for

normal reproductive success and dispersal rates. These essential habitat features are called primary constituent elements (PCE). There are five PCE's in this critical habitat listing. Three of the five are either not met consistently or compromised during these no flow or extreme low flow events, and include permanently flowing water, water quality, and fish hosts. Mussels cannot live without permanently flowing water and during these extreme low flow events, water quality declines with increased water temperatures, decreased dissolved oxygen, and increased concentration of waste water discharges in some rivers and creeks including Spring Creek. Areas with no flow also act as barriers to allow fish host to move up and down stream to areas that may still contain mussel populations. Fish hosts also become trapped in isolated pools as the stream dries up and eventually die as water temperatures increase and dissolved oxygen decreases.

In our letter to EPD and Mr. Rob McDowell, dated January 13, 2006, relating to the draft Plan, we stated "Because of the magnitude of flow deviations from natural flows, those ongoing and projected, it is our recommendation that prior to implementation of the Flint River Water Development and Conservation Plan, EPD acquire the appropriate permit from the Service. To do otherwise places EPD and those implementing the Plan at peril for violation of the ESA. More fundamentally however, it is our belief that water conservation to provide for sustainable flow and reasonable use will not be achieved in certain stream reaches without significant changes to current water use." We cannot see that any change in circumstances has occurred that would prompt us to alter this position. We would like to work with you on conservation of endangered species in Spring Creek and other portions of the Flint River Basin and therefore request that you advise us on your intent regarding future actions.

If you have any questions, please contact me at (706) 613-9493 ext. 230.

Sincerely,

Sandra S. Tucker

Sandra S. Tucker
Field Supervisor

cc: file
GDNR-WRD, Social Circle
USFWS, Ft. Benning
USFWS, RO, Atlanta

Enclosure

Photograph #1

Mussel salvage effort, Spring Creek at Old Mill Acres site, June 20, 2000

Photograph #2

Spring Creek at Old Mill Acres site, June 21, 2007

References

Hicks, David W. and S.W. Golladay. 2006. Impacts of agricultural pumping on selected streams in southwestern Georgia. J.W. Jones Ecological Research Center, Newton, Georgia, 30 pp. (Unpublished)

McDowell, R. 2006. Flint River Basin Regional Water Development and Conservation Plan. Georgia Department of Natural Resources, Environmental Protection Division, Atlanta, Georgia. http://www1.gadnr.org/frbp/

26. FX-49D1 - IMPACTS OF AGRICULTURAL PUMPING ON SELECTED STREAMS IN SOUTHWESTERN GEORGIA - DAVID HICKS & STEPHEN GOLLADAY

EXHIBIT D1

IMPACTS OF AGRICULTURAL PUMPING ON SELECTED STREAMS IN SOUTHWESTERN GEORGIA

David W. Hicks and Stephen W. Golladay

J.W. Jones Ecological Research Center
Rte 2 Box 2324
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October 29, 2009

Historically perennial, this section of Spring Creek near Colquitt dried during the summer of 2000.

IMPACTS OF AGRICULTURAL PUMPING ON SELECTED STREAMS IN SOUTHWESTERN GEORGIA

David W. Hicks and Stephen W. Golladay

ABSTRACT

Agricultural water use expanded rapidly during the 1970's in the lower Flint River Basin resulting from the introduction of center-pivot irrigation technology. Presently, water use reportedly exceeds 1 billion gallons per day during the 6-month growing season of April-September with peak use occurring during June, July, and August. The rapid expansion in irrigation and corresponding increase in water use has raised concerns about impacts on regional streamflow essential to support aquatic fauna, particularly during periods of moderate to severe drought. Using long-term streamflow records from U.S. Geological Survey stream-gaging stations and climate data, trends in streamflow were analyzed in two major watersheds (Spring Creek and Ichawaynochaway Creek) relative to regional rainfall from 1940 through 2004. Annual rainfall showed no trend during this time interval; however, seasonal patterns of rainfall were slightly different with winters (January – March) being slightly wetter, and late spring and early summer (April – June) slightly drier from 1975 through 2004. Average 1-day minimum streamflow declined from 40-46% in the post-irrigation development period of 1975 to 2004, compared to the pre-irrigation development period of 1940 to 1974. Greatest declines in monthly mean daily streamflow were observed from April-August. Average 1-day maximum streamflow showed no change, or increased over the same time interval. The altered streamflow is attributed to increased regional water demand; however, the demand for water is also exacerbated by long-term and seasonal variations in rainfall distribution.

INTRODUCTION

In southwestern Georgia, the 1970's were a time of rapid change in farming practices. Prior to 1970, very little cropland was irrigated within southwestern Georgia. The introduction of the center-pivot irrigation system to this region enabled farmers to "drought proof" their farming operations and their capital investments. Between 1976 and the fall of 1977, irrigated cropland increased by more than 100 percent (Pierce, et al, 1984). The transition into large-scale irrigation was not instantaneous, thus, 1975 was selected as the pivotal year. Land- and water-use activities that occurred prior to 1975 are characterized as "pre-irrigation development" and those occurring after, as "post-irrigation development".

Currently, more water is withdrawn from the streams and aquifers within southwestern Georgia than in any other part of the state (Hook, et. al., 2005). The rapid and large increases in agricultural irrigation that occurred during the late 1970's drastically changed the pattern of water use in the area, significantly affected Georgia's strategy of water management, and brought about a need to more carefully evaluate potential impacts on Georgia's water resources. In 1988, the Georgia General Assembly enacted law requiring that a withdrawal permit be obtained for each irrigation water source that pumps more than 100,000 gals/day on a monthly average. The Georgia Department of Natural Resources, Environmental Protection Division, (GaEPD), Water Resources Management Branch, was responsible for issuing and monitoring permits. Although agricultural water users are required by law to obtain a withdrawal permit, they are not required to meter or report water used for irrigation (Fanning, et. al, 2001). As a result, monitoring of irrigation water use historically has not been a high priority for GaEPD.

However, during the mid 1990's, results of USGS investigations and proposed resource reallocations, heightened water-availability concerns and created conflicts among the States of Alabama, Florida, Georgia, and the U.S. Army Corps of Engineers (Torak, et. al, 1996). As a result of these concerns, the States of Alabama and Florida brought legal action against Georgia in an effort to limit development of the water resources within the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River Basins. This action motivated the GaEPD to more closely evaluate the allocation of water resources for all uses, including agriculture. Because of concerns over the potential loss of aquatic habitat in southwestern Georgia streams, the Flint River Drought Protection Act was adopted and applied during 2001 and 2002. The intent of the act was to provide GaEPD with a mechanism and authority to remove cropland from surface-water irrigation within the Flint River Basin during periods of severe drought. In addition, this act enabled GaEPD to compensate farmers for lost revenue as a result of the inability to irrigate.

The heightened awareness of water-resource allocations in southwestern Georgia has also brought about efforts to more accurately estimate agricultural water use in this region (Dr. Jim Hook, NESPAL, oral commun., 2005), and an effort to develop a better understanding of the potential impacts of water use on the sustainability of the regional water resources. Over permitting of withdrawals from streams and the Upper Floridan aquifer has probably occurred in some areas that further exacerbate the impact of periods of drought. Consequently, in late 1999 GaEPD placed a 5-year moratorium on additional

agricultural water development within the Flint River Drought Protection (FRDP) area to allow time for additional hydrologic and water-use data to be collected and analyzed, and for water-management strategies to be developed.

To prepare effective water-management strategies, it is important that the potential effects of water use be estimated within the lower Flint River Basin. In an effort to clarify understanding of irrigation water use in southwestern Georgia and its potential impacts on area streams, this study was conducted by the Joseph W. Jones Ecological Research Center in cooperation with the GaEPD.

Purpose and Scope

The objectives of this report are to (1) evaluate the effects of current permitted irrigation pumping on streamflow in selected streams in southwestern Georgia; (2) develop estimates of long-term seasonal and instantaneous streamflow losses resulting from irrigation pumping; and (3) correlate the observed changes in streamflow with climate change and increases in irrigation pumping.

This report discusses the distribution of permitted irrigation withdrawals from groundwater and surface-water sources in two watersheds in the lower Flint River Basin. It describes the changes in patterns and long-term trends in rainfall in this region resulting from climate change.

DESCRIPTION OF STUDY AREA AND DATA ANALYSIS

Study Area

This study was conducted in two watersheds of the lower Flint River Basin: Spring Creek and Ichawaynochaway Creek. These streams flow through parts of Stewart, Webster, Randolph, Terrell, Clay, Early, Calhoun, Dougherty, Miller, Baker, Seminole, and Decatur Counties in southwestern Georgia (Figure 1).

Geographic Setting

The FRDP area includes all, or parts of Marion, Schley, Chattahoochee, Stewart, Macon, Webster, Sumter, Dooly, Crisp, Lee, Terrell, Randolph, Calhoun, Clay, Dougherty, Worth, Turner, Mitchell, Baker, Early, Miller, Seminole, Decatur, and Grady Counties in southwestern Georgia. The area is located in the Dougherty Plain district, the western part of the Tifton Upland district, and the southern part of the Fall Line Hills district of the Coastal Plain physiographic province (Clarke and Zisa, 1976). The crest of the Solution Escarpment forms the topographic high and surface-water divide between the Flint River Basin and the Suwannee and Ochlockonee Basins to the east (Hicks, et. al, 1981).

The Dougherty Plain is an inner lowland (cuesta) that was formed by the stripping away of sediments and by solution of the underlying carbonate sediments. It is bounded on the west by the Chattahoochee River surface-water divide, the north and northwest by the Fall Line Hills, and on the east by the crest of the Solution Escarpment on the western limb of the Pelham Escarpment. The Dougherty Plain is nearly level and relief seldom

exceeds 20 ft, except along the stream margins where erosion has lowered the base of the streams and created high bluffs where the sediments are more resistant to weathering. It is characterized by karst topography that is marked by numerous shallow, flat-bottomed or rounded sinkholes. Many of the depressions are filled with low-permeability material and hold water much of the year (Hicks, et. al, 1987). Throughout much of the area the sinkholes have developed over geologic time into limesink depressional wetlands, which are ecologically important to this region.

The Flint River and its tributary streams drain the FRDP area. Together, they form five major sub watersheds: (1) middle Flint; (2) Kinchafoonee and Muckalee; (3) Ichawaynochaway; (4) Spring; and (5) lower Flint (Figure 1). Active solution of the limestone in the Dougherty Plain has transferred most of the drainage from the surface to underground channels. Many of the smaller tributary streams are not perennial. The major streams are the Flint River and its primary tributaries: Muckalee Creek, Kinchafoonee Creek, Cooleewahee Creek, Ichawaynochaway Creek, and Spring Creek. The major tributary streams enter the Flint River from the western part of the Dougherty Plain. Abrams, Mill, Piney Woods, Dry, and Raccoon Creeks drain the northeastern and eastern parts of the Dougherty Plain. These streams generally flow westward to the Flint River. Because of the karst nature of the landscape in the Dougherty Plain and the Solution Escarpment areas on the eastern side of the Flint River, these streams also cease to flow during most summer and fall seasons when reduced rainfall drains to the subsurface and overland runoff is limited. Runoff from these streams seldom discharges into the Flint River, but disappears into wetlands at the base of the Solution Escarpment. Cooleewahee Creek is the only stream that discharges directly into the Flint River that originates within the Dougherty Plain, and because of its limited drainage basin and the internal drainage characteristics of this region, it often ceases to flow during periods of minor drought.

The Fall Line Hills is characterized by a gently rolling landscape with relatively flat interstream divides and steeply dipping valley walls. The landscape gradient, combined with the easily eroded, sandy soils of this district, has resulted in the development of a somewhat dendritic drainage pattern. This district is highly dissected by streams and has little level land, which is primarily limited to the interstream divides. The boundary between the Dougherty Plain and the Fall Line Hills districts is marked by the 250-foot contour line on topographic maps (Clarke and Zisa, 1976). The northeastern part of the Fall Line Hills is separated from the Tifton Upland district by the northern extension of the Pelham Escarpment on the eastern side of the Flint River. Pachitla, Spring, Ichawaynochaway, and Chickasawhatchee Creeks are tributary to the lower Flint River basin and drain this area. These streams originate in the Fall Line Hills district as springs or seeps that emerge from the Lisbon Formation or the Tallahatta Formation.

Although the western part of the Tifton Upland district is within the FRDP area, the streams that originate in this physiographic district are not tributary to the Flint River. The crest of the Solution Escarpment forms the topographic and surface-water divide between the Flint River Basin and the Ochlockonee and Withlacoochee River Basins to the east. Many small streams carry surface runoff westward down the slopes of the Solution Escarpment and become intermittent or go underground in swampy areas after traveling a short distance across the Dougherty Plain. In the western part of the Tifton Upland district, streams generally emerge from swampy areas near the crest of the

Solution Escarpment and drain to the south and southeast through Little River and Ochlockonee River (McNeil, 1947).

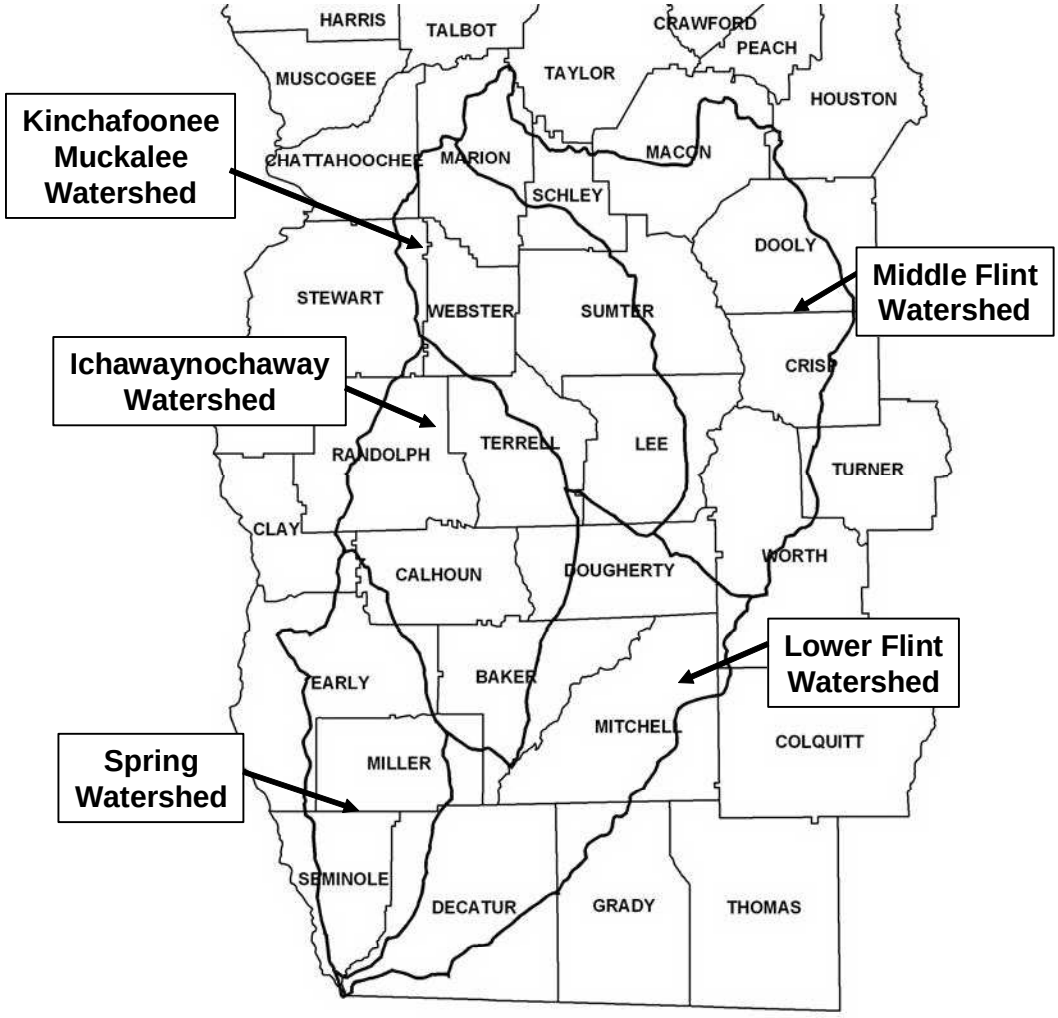


Figure 1. Counties included in the Flint River Drought Protect Area in Southwestern Georgia.

Data Analysis

Information was obtained on more than 6,000 irrigation water use permits in the FRDP area from the GaEPD files for 1999, 2000, and 2001. An ArcView Geographic Information System (GIS) database was developed using these data to analyze and display pertinent irrigation system information such as location, source, acreage, and maximum pumping rate.

Long-term trends in rainfall and streamflow were assessed with the lower Flint River Basin. Rainfall data were obtained from the National Climate Data Center Drought Series Database (http://lwf.ncdc.noaa.gov/oa/climate/onlineprod/drought/xmgr.html#gr, last accessed December 2005). Rainfall data were obtained from Region 7 of southwest Georgia, which encompasses a majority of the FRDP area (Figure 2). Monthly rainfall data were obtained for the period 1940 through 2004. Annual total rainfall was determined and compared for the period of 1940 through 1974 (Pre-irrigation development) and 1975-2004 (Post- irrigation development). Seasonal rainfall data were calculated from monthly data (winter, Jan-Mar; spring, Apr-Jun; summer, Jul-Sep; and fall, Oct-Dec). Seasonal mean rainfall and ranges were compared for the pre- and post-irrigation development period. In addition, long-term trends in seasonal rainfall were determined using 10-year running averages for the period of record (1940-2004).

Streamflow data were reviewed for 19 continuous monitoring stations that are operated by the U.S. Geological Survey (USGS) in the FRDP area. Of these 19 stations, continuous data adequate to assess long-term trends were only available for two stations: Spring Creek near Iron City (02357000) and Ichawaynochaway Creek at Milford (02353500). Many of the USGS gaging stations within the FRDP area were not in operation prior to the onset of intensive irrigation. Other stations were not usable for the statistical analyses because of back-water conditions, power generation regulation, or

Figure 2. Climatic zones of Georgia as defined by the National Climate Data Center.

intermittent periods of record. Streamflow statistics used in the analyses contained within this paper were developed using the data obtained from the USGS.

GEOLOGY

The Coastal Plain physiographic province extends from the Fall Line at its northernmost edge toward the southeast. Sedimentary rocks, dipping gently to the southeast, underlie the Coastal Plain. The oldest exposed sediments of Late Cretaceous to early Tertiary age are composed of sand, clay, and gravel, and occur in a band just south of the Fall Line. These sediments are overlain by sand and limestone of Paleocene, early Eocene, and middle Eocene ages. The next younger deposits are carbonate rocks, primarily limestone, of late Eocene and Oligocene age (Pollard, et. al, 1978). The sediments of the Coastal Plain extend to a depth of at least 5,000 ft and dip to the southeast by as much as 25 ft/mi in the study area, and progressively thicken in that direction (Hicks, et. al, 1981).

The sedimentary units show lateral variations in lithology and thickness that represent changing environments throughout the depositional history of the area. Transgressions and regressions of the sea caused the depositional environment at any given locality to change from one depositional cycle to the next. Where changes in sea level were rapid, a transitional sequence may be missing from the sedimentary record. This report provides a general description of the sedimentary sequences within Eocene Series and the Ocala Formation that form the Claiborne and Upper Floridan aquifers in the study area and are of hydrologic importance to this study. The reader is referred to the referenced literature, herein cited, for a more in-depth and detailed description of the geology of this region.

Eocene Series

Eocene sediments of the Hatchetigbee, Tallahatta, and Lisbon sequence represent the entire Claiborne Group and the upper part of the Wilcox Group, and unconformably overlie the Paleocene sediments (Hicks, et al, 1981). The Eocene sediments exhibit areally variable lithologic characteristics and can be informally divided into an up dip clastic section, a down dip shallow marine sequence, and a deeper marine sequence.

The sediments are near land surface in much of Early, Calhoun, Terrell, Stewart, Webster, Sumter, and Dooly Counties. In this part of the FRDP area the sediments of the Lisbon Formation are less easily eroded and are primarily limited to exposures on ridges and interstream areas. The Tallahatta Formation is a relatively thin bed of clean, well-sorted quartz sand. Its extent is also limited to the interstream areas. The Hatchetigbee Formation is characterized by a significant increase in clay and a decrease in permeability and often forms the lower confining layer for the Claiborne aquifer.

Down dip where the shallow marine sequence is prevalent, the Eocene Series is very difficult to subdivide because it consists of lithologically similar alternating layers of thin- to medium-bedded sands, sandy clays, and siltstones, all of which are highly glauconitic and commonly calcareous. The part of the Series most commonly used as an aquifer is the Tallahatta Formation that consists of sand, limestone, and coquina throughout much of this area and it is this part of the formation that discharges

groundwater to Spring Creek in Clay and Calhoun Counties, and into Ichawaynochaway Creek in Stewart, Webster, Randolph, Terrell, and Calhoun Counties where these streams originate.

The Eocene sediments range in thickness from less than 10 ft in Webster County and extreme northwestern Sumter County, to more than 400 ft in Baker and Mitchell Counties. The sediments are continuous throughout much of the remainder of the Coastal Plain, but are difficult to map because of very sparse geologic data and the absence of any definite lithologic or faunal breaks. In the northeastern part of the FRDP area in Dooly County, the Tallahatta Formation may be as much as 200-ft thick. The Tallahatta thins in the western part of the FRDP area in Randolph, Calhoun, Clay, and Early Counties where the clay content increases and the permeability decreases.

Ocala Limestone

The Ocala Limestone of late Eocene age overlies the Lisbon Formation and the Clinchfield Sand, where it is present in the northeastern part of the FRDP area. The Ocala Limestone thins in the study area and cannot be mapped northwest of a line extending southwest to northeast from eastern Early County through Calhoun, Terrell, northwestern Lee, and southern Sumter Counties. Throughout much of the northern part of the FRDP area, where present, the Ocala Limestone can be subdivided into lower, middle, and upper lithologic units. In southern Lee and eastern Terrell Counties, and northern Dougherty County, the lower unit, which generally is highly fractured, consists of alternating layers of sandy limestone and medium-brown, recrystallized dolomitic limestone. The lower unit has well-developed secondary permeability along solution enlarged joints, and fractures (Hicks, et. al, 1987). In the remainder of the FRDP area south of Dougherty County, the Ocala is not clearly separated into different lithologic units, but more closely resembles the sediments and the permeability characteristics of the lower lithologic unit.

HYDROLOGY

Water resources in the 21-county FRDP area are obtained from the many streams that drain the area and from four groundwater reservoirs, or aquifers. From deepest to shallowest the aquifers are: the Providence, Clayton, Claiborne, and Upper Floridan. Although groundwater is available from the deeper aquifers, the Upper Floridan is the major water supply for this region. The deeper aquifers are used primarily for municipal and industrial supply, and to a lesser extent as a supply for agricultural irrigation.

Eocene Aquifer

The Claiborne aquifer extends over much of the northern part of the 21-county FRDP area. It is relatively thin in the areas where it occurs near land surface and is recharged in parts of Early, Calhoun, Randolph, Terrell, Sumter, and Dooly Counties, but progressively thickens in a down gradient direction to the east and southeast from the recharge areas.

Generally, the Claiborne aquifer progressively thins and becomes less productive in a west-northwesterly direction toward the recharge areas. In the eastern Calhoun County, eastern Randolph County, central Terrell County, northwest Sumter County, and northwest Dooly County areas, the aquifer is very thin and generally is not capable of producing large water supplies. Here wells tapping the Claiborne aquifer do not produce an adequate water supply for irrigation directly and usually must be pumped into storage ponds to be used for supplemental irrigation. The up gradient area is where the aquifer is recharged, and is thus, very sensitive to climate variability. It is dynamic in nature, and responds rapidly to periods of below normal, or above normal rainfall. In the northern Baker and northwestern Mitchell County area, the Claiborne aquifer is much deeper and thicker, and less sensitive to climatic variability; however, it is practically unused in this area because of the relative ease of accessibility of the high yielding Upper Floridan aquifer.

Upper Floridan Aquifer

In the Dougherty Plain district and adjacent areas of southwestern Georgia, the Upper Floridan aquifer is used extensively for supplemental agricultural irrigation and as an essential source of municipal, industrial, and domestic water supplies. The Upper Floridan thins to the northwest and generally thickens to the south and southeast. In western Early, Calhoun, Terrell, and Sumter Counties the Upper Floridan aquifer is not a viable water source because the limestone of the Ocala formation is thin and has very low storage capacity. In the remainder of the FRDP area, it is the chief source of water for large withdrawals.

The Upper Floridan aquifer is the shallowest major groundwater reservoir in the FRDP area, and is generally covered by only 20 to 80 ft of overburden (Hicks, et. al, 1987). It is preferentially recharged throughout the Dougherty Plain and the Solution Escarpment. Maximum recharge occurs from rainfall during the period December through March in areas where the overburden is thin and permeable. The myriad wetlands present in the karst landscape can play a significant role in the recharge and sustainability of the Upper Floridan aquifer.

The ability of the Upper Floridan to store and transmit water is controlled by its thickness and hydraulic conductivity. Where the aquifer is thin in the up gradient areas in the west-northwest, its capacity to store and transmit water is limited. The hydraulic conductivity, which is a measure of the ease with which water can move through the aquifer, varies significantly throughout the FRDP area. Because of the extreme variability of each of these factors, there is a wide range of aquifer performance. Because of well-developed secondary permeability, mainly in the basal part of the Ocala Limestone, the aquifer is capable of storing and transmitting large volumes of groundwater. However, in the northwestern part of the study area, often the aquifer barely will produce a sufficient supply of water for ancillary uses.

Groundwater and Surface-Water Relation

Where Spring Creek and Ichawaynochaway Creek are incised into the Upper Floridan aquifer, a close relation exists between the groundwater and surface-water systems (Hicks, et. al, 1987). Because of this relation, climatic and anthropogenic changes that affect one system also affect the other. Under pre-irrigation development conditions, the hydraulic head in the aquifer system, almost always exceeded the stream head, and groundwater discharged from the Upper Floridan aquifer into the streams. The rate of discharge is variable and is primarily a function of the hydraulic conductivity of the boundary layer separating the aquifer and the stream (streambed conductance) and the difference in hydraulic head between the two water bodies. During early spring, the altitude of the potentiometric surface of the Upper Floridan is generally high and the aquifer discharges maximum quantities of water into the streams. During late spring and early summer, heavy agricultural pumping, high evapotranspiration, and reduced rainfall (groundwater recharge) result in a gradual lowering of the potentiometric surface and a corresponding decrease in aquifer discharge to the streams (Hicks, et. al, 1987). The hydraulic relation is much more sensitive to climate and anthropogenic variability in the Spring Creek drainage than in Ichawaynochaway (Torak, et. al, in review, 2006).

Heavy pumping has the potential to not only lower the potentiometric surface, but also to alter the hydraulic head relation between the streams and the Upper Floridan aquifer. When the potentiometric surface of the Upper Floridan aquifer becomes lower than the stream hydraulic head, flow reversal occurs. Studies in the lower Flint River Basin have documented that in the stream reach between Albany and Newton, the flow between the Flint River and Upper Floridan aquifer reverses frequently (Opsahl, et. al, in review, 2006).

Streamflow

In southwestern Georgia, practically all streams originate as groundwater seeps or springs. Along their flow paths, stream flow is primarily sustained by precipitation for the principle part of the year; however, the stream flow is augmented by variable rates of groundwater discharge, which during the low-flow periods (September-November) can account for a substantial part of the total stream flow. Typically, the rate of groundwater discharge to streams is at a maximum during late winter and early spring when the aquifer systems are generally fully recharged, groundwater levels are at their annual highs, and evapotranspiration rates are low. However, the rate of groundwater discharge is progressively diminished through the spring and summer months in response to declines in regional groundwater levels resulting from pumping stresses on the Upper Floridan aquifer, increases in evapotranspiration rates, and declines in seasonal rainfall. During late summer and fall, when rainfall historically is sparse in the FRDP area, the baseflow of many streams is maintained almost solely by groundwater discharging directly into the streams through springs and seeps in the stream channels, or groundwater discharging from off-channel springs and flowing into the streams. In the lower Flint River Basin, the Upper Floridan aquifer is dynamically connected to many of the streams in the FRDP area. In particular, the Upper Floridan aquifer discharges large volumes of groundwater into the Flint River and Spring Creek through natural springs and through myriad fractures and fissures within the Ocala Limestone in the streambeds.

Groundwater discharge from the Upper Floridan aquifer into Ichawaynochaway Creek occurs primarily through the streambed, and observable springs are not prevalent.

Ichawaynochaway Creek Watershed -- Ichawaynochaway Creek originates in southeastern Webster County and southern Stewart County as seepage and springflow from the Claiborne aquifer. From the headwater area, it flows through Terrell and Calhoun Counties and skirts along the boundary between the Fall Line Hills and the Dougherty Plain physiographic districts until it flows onto the Dougherty Plain in southeastern Calhoun County. Throughout most of its up gradient flow path, Ichawaynochaway Creek flows through the Claiborne aquifer hydrogeologic province. Only in its southern reach in Baker County does the Ichawaynochaway flow across the Dougherty Plain and interact with the Upper Floridan aquifer.

Major tributaries to the Ichawaynochaway Creek are Pachitla Creek in Randolph and Calhoun Counties, and Chickasawhatchee Creek in Terrell, Dougherty, Calhoun, and Baker Counties. The USGS operates several streamflow gaging stations in the Ichawaynochaway watershed including: Pachitla Creek near Edison (02353400); Chickasawhatchee Creek near Leary (02354410); Chickasawhatchee Creek at Elmodel (02354500); Ichawaynochaway Creek at Milford (02353500); Ichawaynochaway Creek below Newton (02355350); and Ichawaynochaway Creek at GA 37 near Morgan (02353265). The streamflow gaging station on Ichawaynochaway Creek near Milford has been operated continuously for more than 62 years, and is the only station in the Ichawaynochaway watershed with sufficient record to allow long-term trend analysis.

Spring Creek Watershed -- Spring Creek forms in Clay, Calhoun, and Early Counties in the Fall Line Hills physiographic district as groundwater discharge from spring fed wetlands. Diffuse springflow from the sands of the Claiborne aquifer supply the numerous wetlands in the upland area. Spring Creek flows onto the Dougherty Plain in Early County where its flow is augmented by groundwater discharge from many in-channel and off-channel springs in Early and northern Miller Counties. The stream flows south-southeasterly through Miller, Seminole, and Decatur Counties and terminates in Lake Seminole in southwestern Georgia. In Seminole and Decatur Counties, north of Lake Seminole, numerous large springs emerge from the Upper Floridan aquifer and contribute significant volumes of groundwater to the stream. Aycock Creek in southern Miller County is the major tributary stream to Spring Creek. Spring Creek is a direct tributary to Lake Seminole, and as a result, its streamflow characteristics are strongly affected by the level of the lake in much of Seminole and Decatur Counties.

The USGS operates only two continuous streamflow gaging stations in the Spring Creek watershed; both in the southern part of the basin in the Dougherty Plain district. A gaging station on Spring Creek near Iron City (02357000) has been operated since 1938. However, operation of the station has been somewhat intermittent: 1938-71, 1977-78, and continuously since 1982. A station is also operated on Spring Creek near Reynoldsville (02357150) and has provided continuous streamflow record since 1998. However, this station is located in an area affected by backwater conditions created by Lake Seminole.

Only the streamflow data collected at the Spring Creek near Iron City station meets the appropriate criteria for long-term trend analysis.

AGRICULTURAL WATER USE

Between 1970 and 1980, the southwestern Georgia area experienced an enormous increase in the agricultural use of water resources. Irrigated acres increased from 130,000 in 1976, to 261,000 in 1977 (Pollard, et. al, 1978). By 1980, irrigated farmland had increased to more than 452,000 acres, and the combined surface water and groundwater annualized use in the Dougherty Plain was estimated to be more than 290 million gallons per day (Mgals/day) (Pierce, et. al, 1984). Statewide, more than 580 Mgals/day were withdrawn during 1980 for agricultural use (Pierce, et. al, 1984). During 1995, an annualized average of 722 Mgals/day of water was withdrawn to irrigate about 1.1 million acres of cropland, statewide (Fanning, et. al, 2001). By 1999, about 85% of the agricultural lands in the FRDP area were irrigated, mostly by withdrawals from the Upper Floridan aquifer (Litts et. al. 2001). Currently, agricultural irrigation is estimated to be about 10 in/yr, or approximately 20% of long-term average annual precipitation of 50 in. (Harrison 2001, Thomas et. al. 2001). The rapid and large increases in agricultural irrigation that began in the mid 1970's drastically changed the pattern of water and land use throughout southwestern Georgia.

The dramatic increase in irrigation water use in this region was the result, primarily, of the introduction of large-acreage, self-propelled, center-pivot irrigation systems. In the Dougherty Plain district, the land is flat to gently rolling, has few streams and, therefore, is highly adaptable to the operation of large center-pivot irrigation systems. The flat landscape, coupled with an abundant water supply, and a climate suitable for multi-cropping, are the necessary ingredients for a highly productive agricultural environment.

In the north and northwestern part of the FRDP area, the Fall Line Hills district is highly dissected by streams and has little level land; thus, the landscape is not adaptable to large-acreage, center-pivot irrigation systems. In addition, water supply in this district is not as prolific as in the Dougherty Plain. For these reasons, the agricultural growth observed in the Dougherty Plain district and the density of development is not apparent in the Fall Line Hills.

Groundwater Agricultural Water Use

According to the 2000 Georgia EPD permit database, there are about 4,746 groundwater permits issued to agricultural water users in the FRDP area and approximately 664,000 acres are irrigated by groundwater. Mitchell County has the largest irrigated acreage (92,731 acres), and Decatur County has the largest permitted withdrawal in the FRDP area. As a result of the hydraulic connection between the Upper Floridan aquifer and area streams, groundwater typically is discharged from the aquifer into the streams. The rate and volume of discharge are highly variable both geographically and temporally. Factors such as hydraulic gradient between the stream

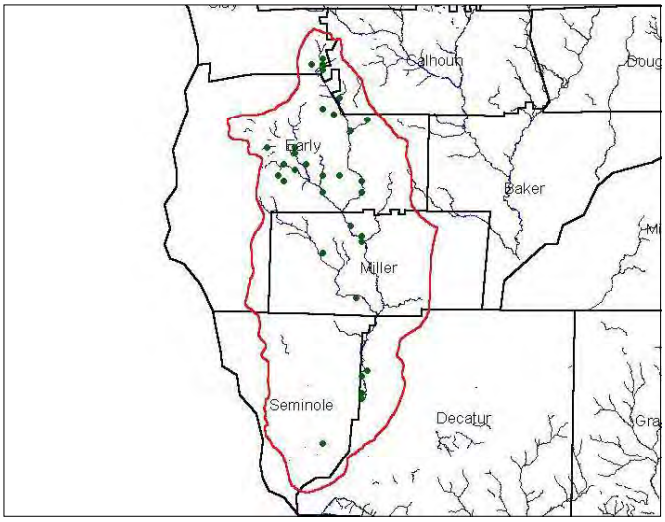
and aquifer; and the hydraulic conductivity of the stream and aquifer boundary vary considerably within the two studied stream basins. However, only the hydraulic gradient varies with time and location as it is influenced by fluctuations in stream and aquifer hydraulic head resulting from climatic conditions and pumping. As a result of these factors, the rate and volume of groundwater that is discharged to the streams varies throughout the growing season primarily as a function of rainfall and pumping. Groundwater pumped from the Upper Floridan aquifer reduces the rate of groundwater that is discharged into the steams. The impact of groundwater pumping on streamflow is significantly greater in the Spring Creek watershed than in the Ichawaynochaway Creek watershed because the aquifer has a more direct hydraulic connection to Spring Creek (Elliott Jones, oral commun., U.S. Geological Survey, 2006).

Ichawaynochaway Creek Watershed – In Webster, Stewart, Randolph, western Terrell, and northern Calhoun Counties, groundwater is not available from the Upper Floridan aquifer in sufficient quantities to support crop irrigation. In addition, because of low yields the Claiborne aquifer generally is not a viable alternate source. Thus, groundwater withdrawals from this part of the watershed are primarily from the Clayton aquifer which underlies the Claiborne. The Clayton aquifer was not included in this study. In the southern part of the watershed, in southeastern Calhoun and Baker Counties, the Upper Floridan aquifer is a productive source for irrigation supplies and it is in this part of the watershed that the major part of the irrigation water is withdrawn from groundwater sources (Figure 3). Approximately 74,000 acres of cropland are irrigated by groundwater in the Ichawaynochaway sub watershed.

Total permitted groundwater withdrawal in this watershed is about 412.7 Mgals/day (GaEPD, written commun., permit files). Actual groundwater use is substantially less, even during drought years and averages about 90 Mgals/day from the Upper Floridan aquifer during the 6-month growing season.

Spring Creek Watershed – In the headwater area of the Spring Creek watershed, in southeastern Clay, western Calhoun, and northern Early Counties, the Upper Floridan aquifer does not provide a viable irrigation water source. In this area, most groundwater for irrigation use is provided by the Clayton aquifer. The Claiborne aquifer is not capable of providing an adequate supply to use as a direct irrigation source, but is used at a few sites to supply irrigation ponds. In southeastern Early, Miller, Seminole, and Decatur Counties, the Upper Floridan aquifer is heavily used for irrigation supply (Figure 3). Total permitted groundwater withdrawal in this watershed is about 1.34 Bgals/day; however, actual groundwater use averages about 177 Mgals/day on 147,000 acres of cropland.

Spring Creek Watershed



Ichawaynochaway Creek Watershed

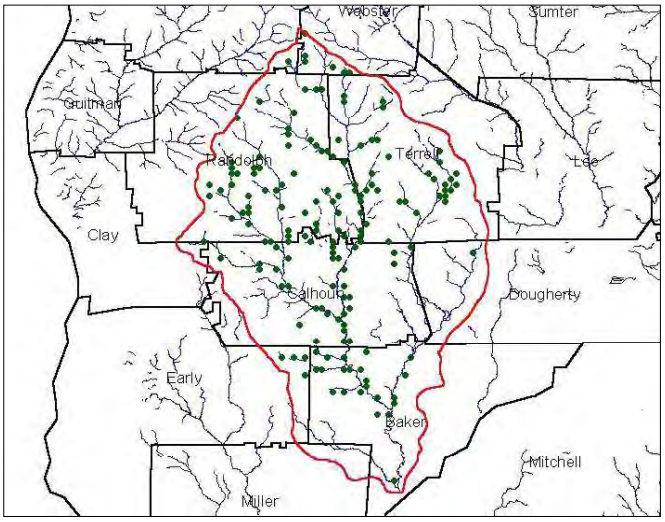


Figure 3. Location of surface water permits in Spring Creek and Ichawaynochaway Creek watersheds. GaEPD permit files.

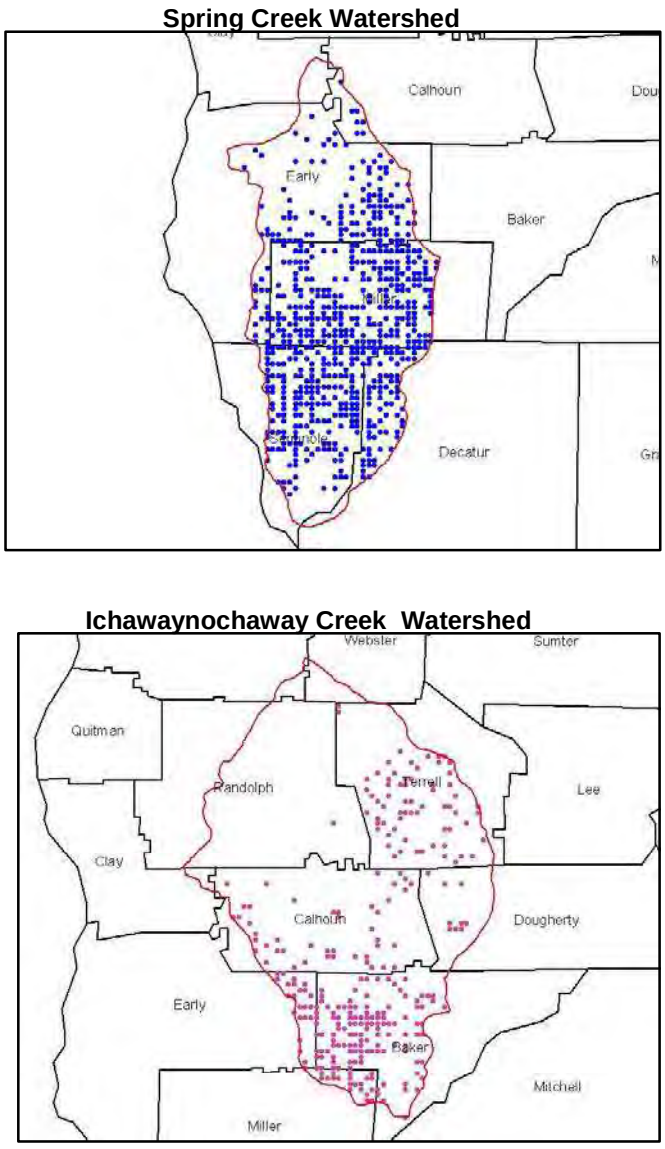


Figure 4. Location of groundwater permits in Spring Creek and Ichawaynochaway Creek watersheds. GaEPD permit files.

Surface Water Agricultural Water Use

Based on 50 years of continuous streamflow records, average daily streamflow has declined during the 6-month growing season since the development of irrigation in the 1970s (Stamey, 1996). A simulation study conducted by the USGS predicted that groundwater withdrawals from the Upper Floridan aquifer during droughts could diminish aquifer to stream discharge resulting in the drying of some reaches in the lower Flint River Basin (Albertson and Torak, 2002). Water use from both groundwater and stream sources during extended droughts contributes to stream drying, although the extent has not been quantified

During 1980, estimated surface-water use in the FRDP area from all sources was about 80.8 Mgals/day. According to the GaEPD permit files more than 190,800 acres of farmland are currently being irrigated in the FRDP area using surface-water sources. Using estimates of irrigation application developed by the University of Georgia, National Environmentally Sound Production Agriculture Laboratory (NESPAL) for this region, water use estimates range from about 141 Mgals/day during a normal rainfall year, to more than 253 Mgals/day during a drought year (Hook and Harrison, 2005).

Spring Creek Watershed -- The Spring Creek watershed supports the fewest permits of the watersheds in the FRDP area; however, the Spring Creek watershed also is the most densely farmed (Figure 4). It is estimated that about 40% of the total watershed landscape is irrigated. More than 154,000 acres of farmland are irrigated in the Spring Creek watershed, but only about 7,400 of those acres are irrigated directly from the streams. By early summer, many of the tributary streams to Spring Creek cease to flow, even during years of normal rainfall and, thus, limit the surface-water supplied irrigation acreage.

Ichawaynochaway Creek Watershed -- The potential impact on streamflow within the Ichawaynochaway Creek watershed is much greater than that in the other watersheds in the FRDP area. According to the GaEPD permit files, farmers are permitted to withdraw more that 368 Mgals/day from streams in this basin. However, actual water use is significantly less and averages about 48 Mgals/day during the 6-month growing season. Thus, if actual irrigation pumping were to increase to the permitted rate, Ichawaynochaway Creek could not sustain the withdrawal.

REGIONAL HYDROLOGIC ALTERATION

Trends in Rainfall

Average annual rainfall for Region 7 of southwestern Georgia is 51.8 inches (1940-2004). Lowest annual rainfall was recorded in 1954 (29.6 inches) and greatest rainfall was recorded in 1964 (77.2 inches). No differences were observed in annual rainfall in the pre- and post-irrigation development periods (Table 1, Figure 5). Slight differences in the seasonal distribution of rainfall were apparent. Winter rainfall tended to be greater in the post-irrigation development period while spring rainfall tended to be lower (Table 1). Summer and fall rainfall were similar across periods. Several long-term trends in rainfall were observed. Winter rainfall generally increased from the late 1950's through the mid 1990's (Figure 5). Spring rainfall generally declined throughout the

period of record. Summer rainfall declined from 1950 through the early 1990's; summer rainfall recovered in the late 1990's largely due to the effect of very high rainfall in 1994-95 on 10-year running averages. Fall rainfall did not show a long-term trend. Within the period of record the driest climate period appears to have been in the mid to late 1950's, a period when fall and winter rainfall were substantially below the long-term average (Figure 5).

Table 1. Annual and seasonal rainfall totals for Region 7 in southwestern Georgia. Values are means and standard deviations.

	Annual (in.)	Winter (in.)	Spring (in.)	Summer (in.)	Fall (in.)
Pre-irrigation development (1940-1974)	51.6 (9.4)	14.6 (4.4)	13.2 (3.1)	14.8 (3.0)	9.3 (4.0)
Post-irrigation development (1975-2004)	52.0 (8.7)	15.4 (3.6)	11.7 (3.6)	14.3 (4.7)	10.1 (4.4)

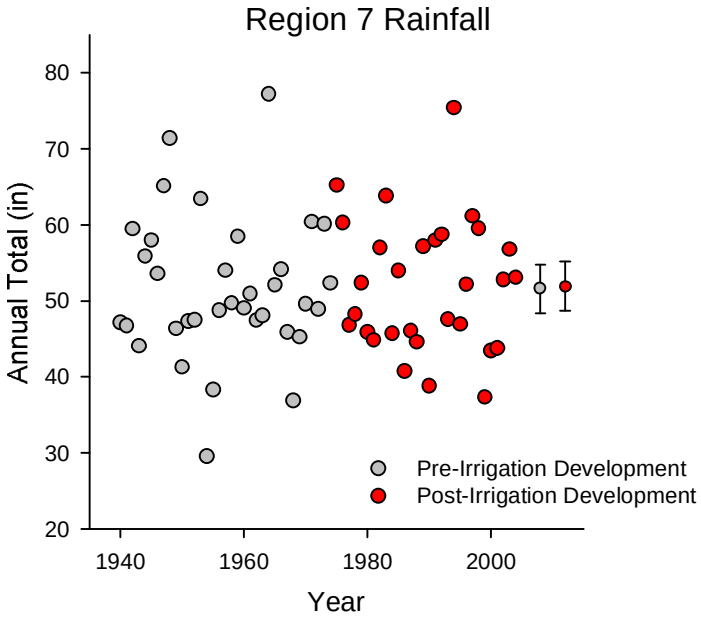


Figure 5. Annual rainfall in southwestern Georgia. Data from the National Climate Data Center. Values indicated by dots are annual totals. Dots with error bars are means and standard deviations.

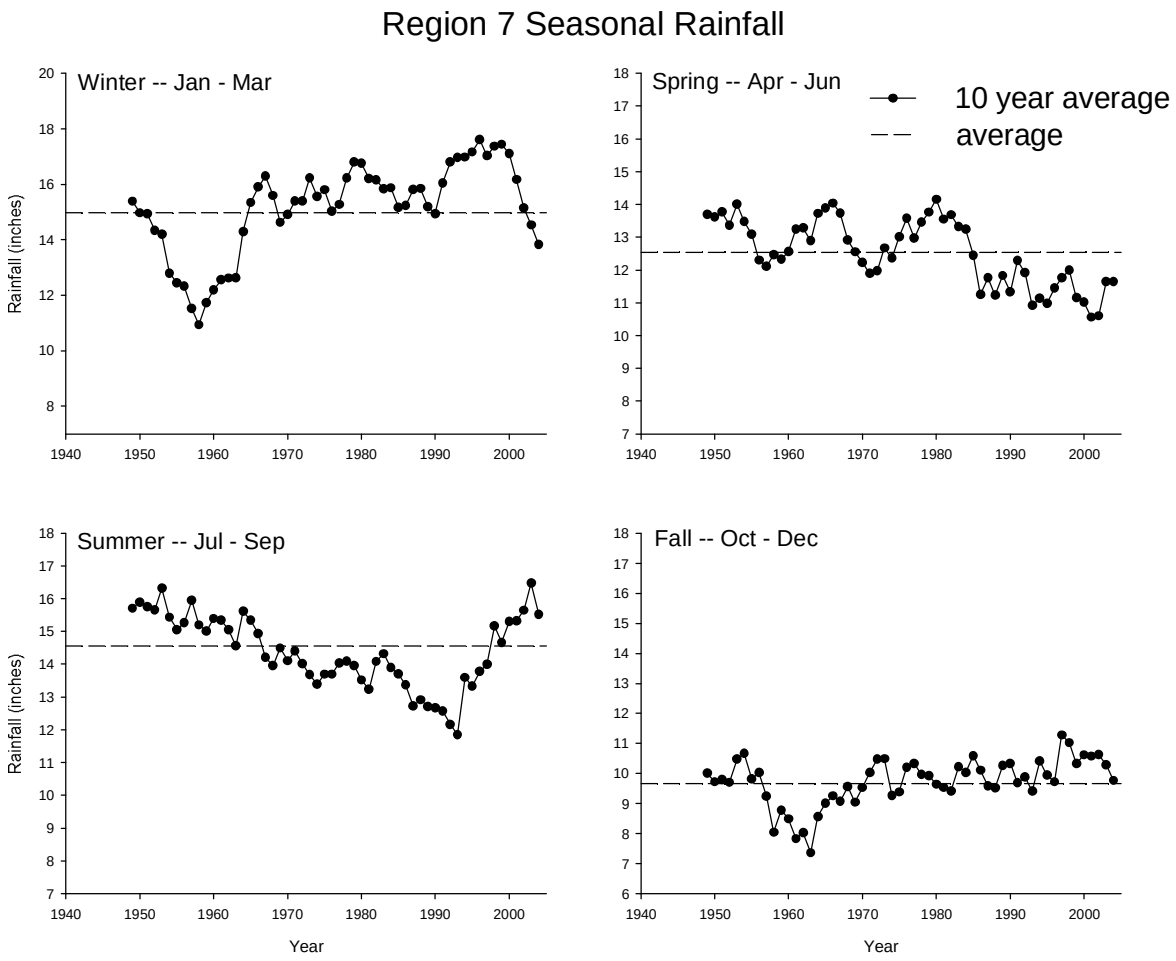


Figure 6. Seasonal rainfall in southwestern Georgia. Data from the National Climate Data Center.

Trends in Streamflow in Ichawaynochaway Creek

Minimum daily streamflow has declined substantially in Ichawaynochaway Creek in the post-irrigation development period (Figure 7). One-day minimum streamflow has declined by 40% from 211 to 128 cubic feet per second (cfs) (Mann-Whitney Rank Sum Test, $p< 0.001$). Seven-day minimum streamflow has declined by about 31% from 219 to 151 cfs (Mann-Whitney Rank Sum Test, $p<0.001$). Thirty-day minimum streamflow has declined about 9% from 239 to 217 cfs (Mann-Whitney Rank Sum Test, $p<0.01$). No changes were observed in 1-day maximum daily streamflow (Mann-Whitney Rank Sum Test, $p=0.76$).

Declines in streamflow are also reflected in percentile flows. Declines in monthly streamflow has been recorded throughout the year for 10, 25, and 75 percentiles (Figure 8). For 50- percentile streamflow, post-irrigation development flow equaled or exceeded pre-irrigation development flow for the months of January through March. Irrigation season median monthly streamflow also showed a declining trend during May-August (Figure 9). Declines were weakly significant for May ($p=0.066$) and July ($p=0.085$) and highly significant for August ($p=0.002$). There was no significant difference in the pre-irrigation development and post-irrigation development June streamflow in Ichawaynochaway Creek.

Ichawaynochaway Creek at Milford

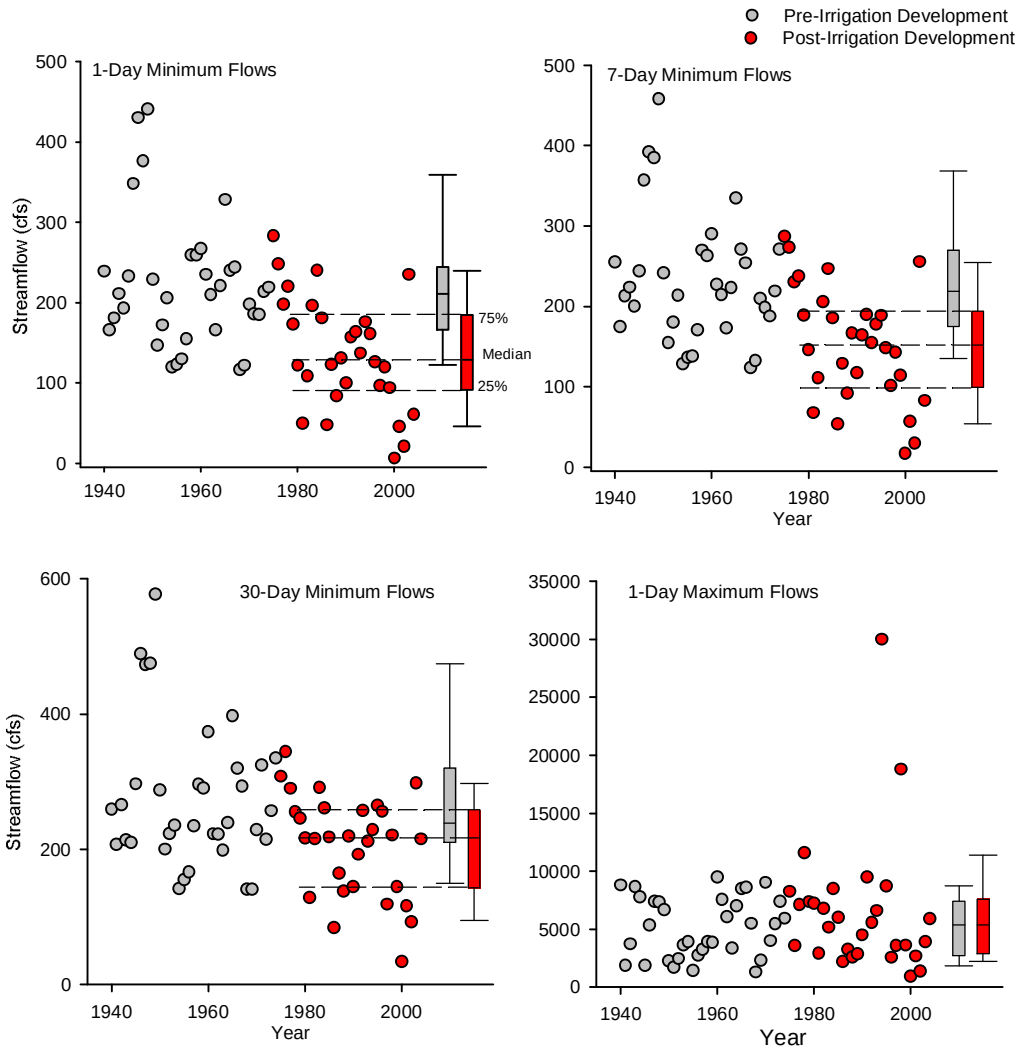


Figure 7. Minimum and maximum daily streamflow in Ichawaynochaway Creek. Values with dots indicate annual minimum and maximum flows. Bars indicate median values, interquartile ranges, and 10% and 90% values.

Ichawaynochaway Creek at Milford

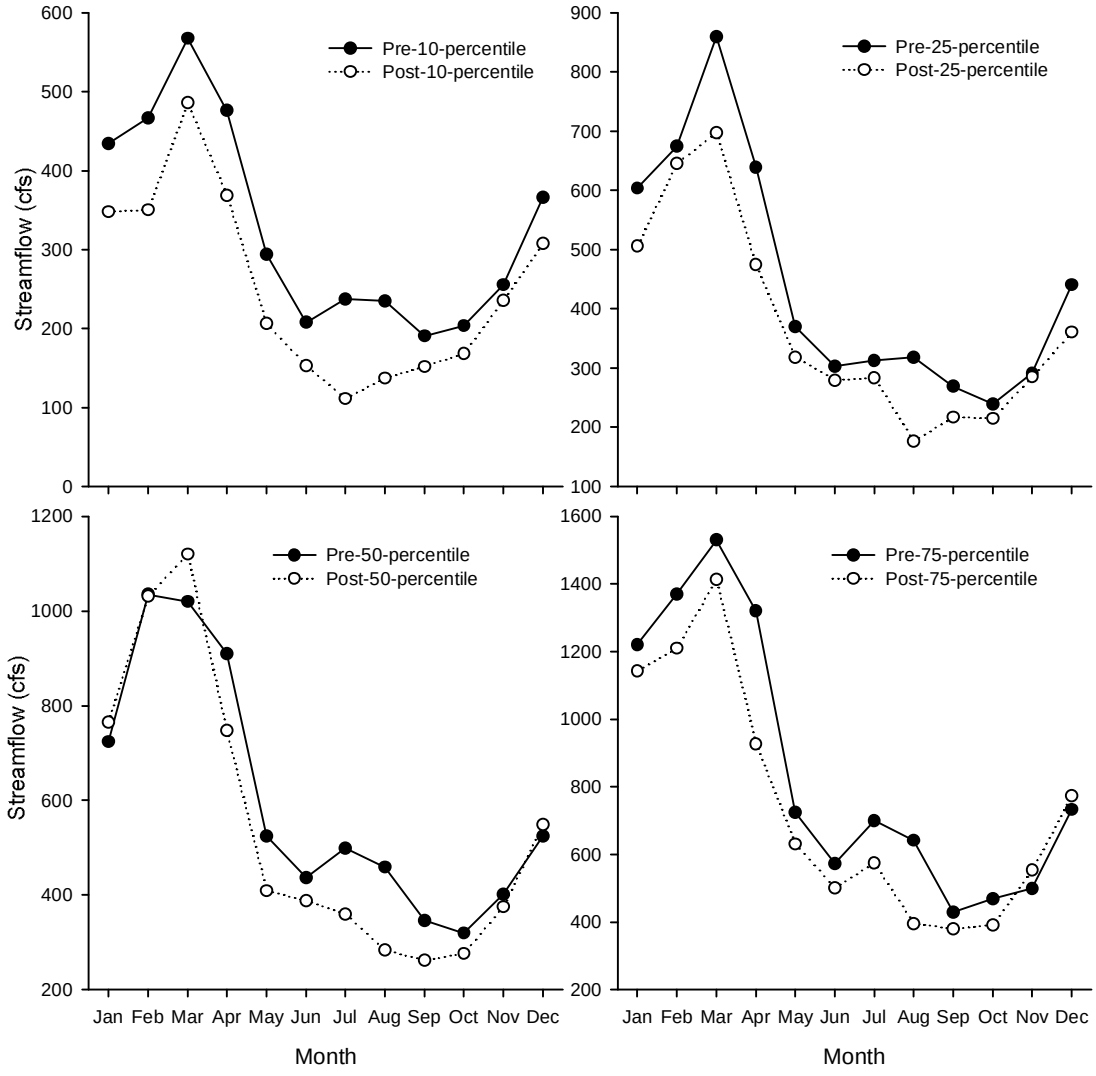


Figure 8. Monthly pre- and post-irrigation development percentile streamflow in Ichawaynochaway Creek. Percentiles are the percent of time that a specified streamflow is not exceeded during the indicated time period.

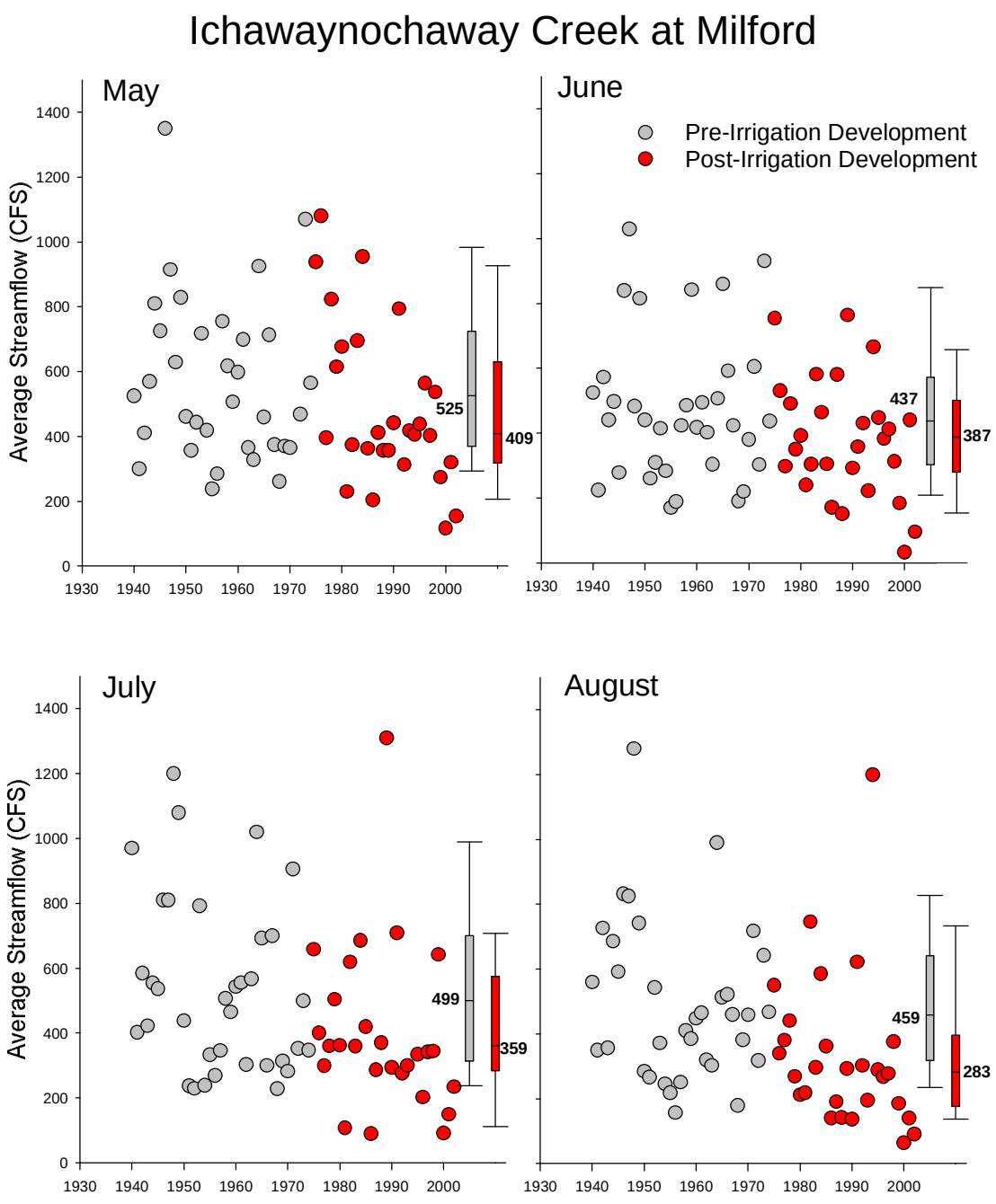


Figure 9. Peak irrigation season monthly minimum flows in Ichawaynochaway Creek.

Trends in Streamflow in Spring Creek

Minimum daily streamflow has also declined substantially in Spring Creek in comparisons of the pre- and post-irrigation development periods (Figure 10). One- day minimum daily streamflow has declined by about 46% from 43 to 23 cfs (Mann-Whitney Rank Sum Test, p=0.013). Seven-day minimum streamflow has declined by about 39% from 45 to 27 cfs (Mann-Whitney Rank Sum Test, p=0.016). Thirty-day minimum streamflow declined by about 42% from 58 to 33 CFS (Mann-Whitney Rank Sum Test, p=0.035). One-day maximum daily streamflow increased substantially in Spring Creek from 3,040 cfs in the pre-irrigation development period to 5,665 cfs in the post-irrigation development period (Mann-Whitney Rank Sum Test, p=0.05).

Trends in minimum and maximum streamflow are also reflected in percentile flows. For all percentiles, growing season streamflow tended to be lower for all percentiles in the post-irrigation development period (Figure 11). Interestingly, percentiles of winter streamflow tended to be higher, in some cases substantially higher, in the post-irrigation development period. While some of this difference may be attributable to seasonal changes in precipitation, it also suggests that the hydrologic response of the watershed has quickened as landscape development has occurred. This could be explained by greater runoff from fallow fields during the winter or perhaps breaching of riparian buffers by field runoff (Stephen W. Golladay, J.W. Jones Center, personal observation, 2005). Declines in irrigation season mean monthly streamflow has also been observed in May (Mann-Whitney Rank Sum Test, p=0.09) and August (p=0.037) (Figure 12). There were no differences between pre- and post-irrigation development streamflow for June and July.

Spring Creek at Iron City

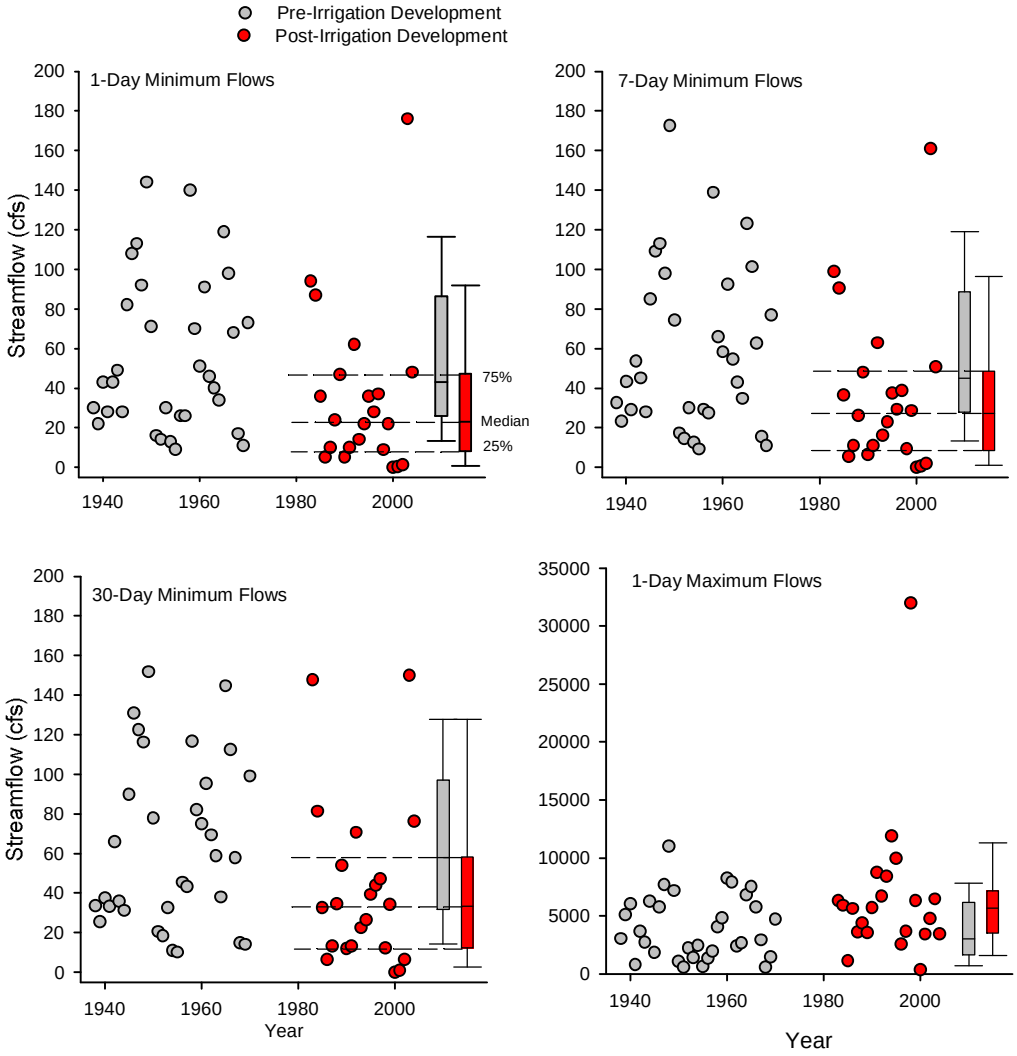


Figure 10. Minimum and maximum daily streamflow in Spring Creek. Values with dots indicate annual minimum and maximum flows. Bars indicate median values, interquartile ranges, and 10% and 90% values.

Spring Creek at Iron City

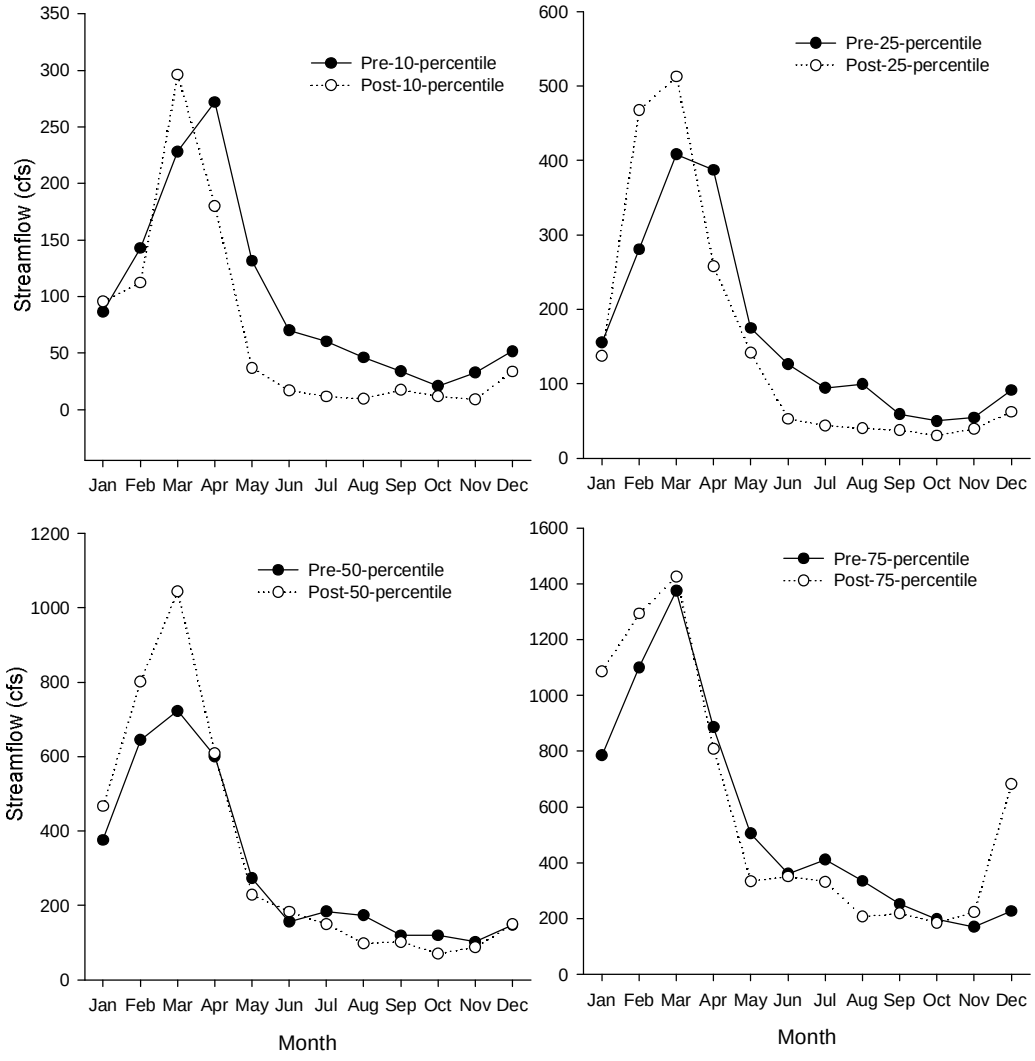


Figure 11. Monthly percentile streamflow for Spring Creek. Percentiles are the percent of time that a specified streamflow is not exceeded during the indicated time period.

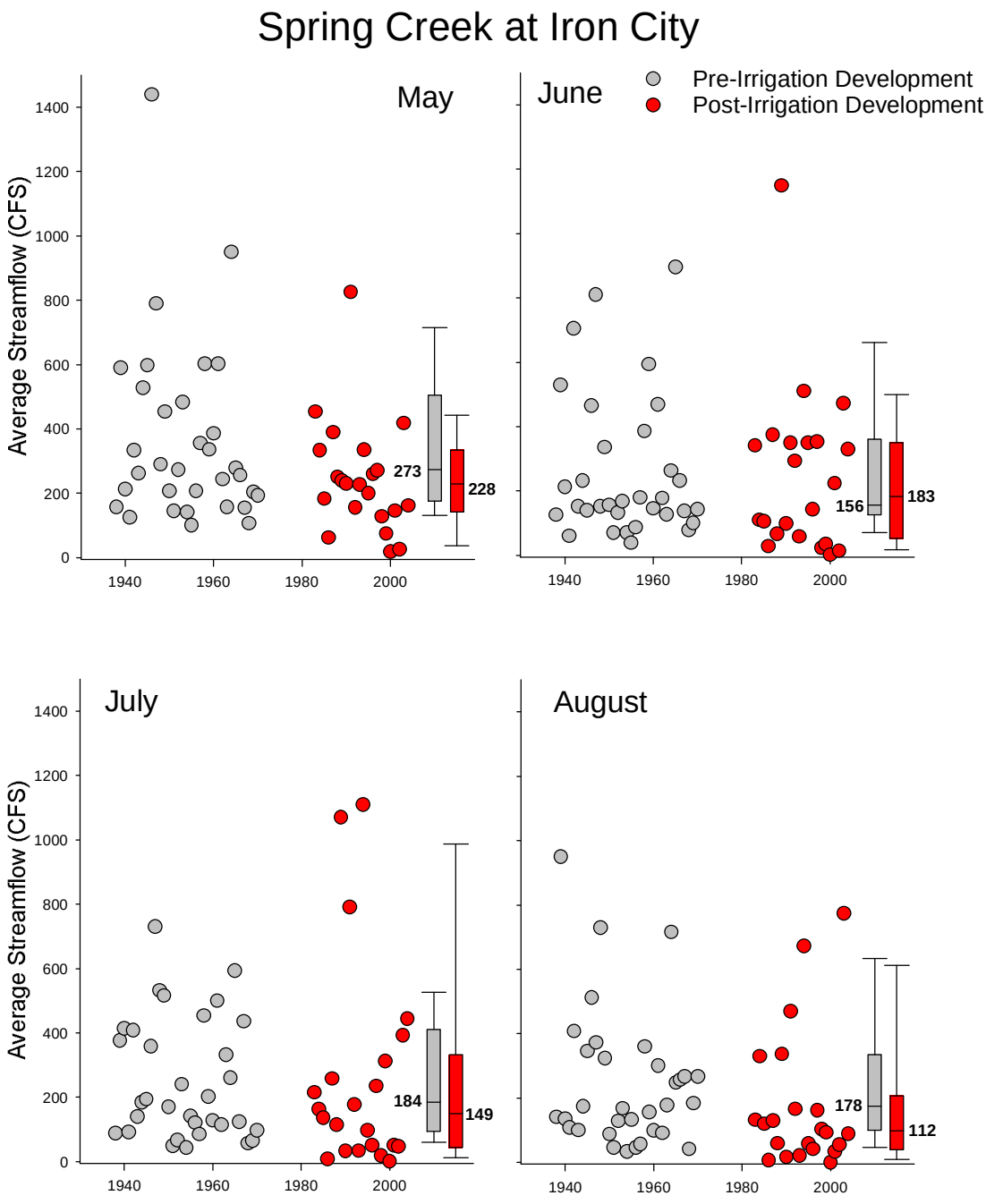


Figure 12. Peak irrigation season monthly minimum flows in Spring Creek.

DISCUSSION AND CONCLUSIONS

Annual rainfall in Georgia is influenced by a number of factors. Southwest Georgia generally receives abundant precipitation averaging almost 52 inches; however, large annual variability occurs and most recording stations report two-fold differences between annual minimum and maximum rainfall during the 20th century (Golden and Hess, 1991). The region is also prone to extreme hydrologic events. Frontal or tropical weather systems circulate humid air from the Gulf of Mexico and can produce heavy rainfall and extended flooding throughout the year (Golden and Hess, 1991). Major floods in the southwest portion of the state occurred in 1925, 1948, 1994, and 1998. Extended droughts result from persistent high-pressure systems, which prevent influx of moisture from the Gulf of Mexico (Golden and Hess, 1991). Extended droughts occurred during the 1930's, 1950's, 1980's, and late 1990's through 2002. Longer term patterns of precipitation are associated with the Atlantic multidecadal oscillation (AMO), acyclical warming and cooling of the Atlantic Ocean. During warm phases Georgia (and most of North America) tends to have below average rainfall. During cool phases, rainfall tends to be above normal. In the last 60 years warm phases occurred from 1940-60 and from 1995 to present. While not occurring every year, periods of below average precipitation were observed in southwestern Georgia during warm phases, including the severe drought of the 1950's and the most recent drought (1999-2002). A cool phase occurred from 1970-90 and years of above normal precipitation were observed.

Our analysis of climate data does not suggest long-term changes or trends in annual rainfall in southwestern Georgia. While seasonality of rainfall has shifted slightly there is no consistent change in annual total rainfall over the past 60 years. Our analysis of 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. This has resulted in some of the lowest flows on record during recent droughts. 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.

Record low streamflow raises concerns about the sustainability of stream health in the FRDP area. The region is noted for its diversity of freshwater mussels, stream fishes, and other aquatic life. Substantial declines in mussel diversity and abundance, including several rare and endangered species, were associated with stream drying during the most recent drought (1999-2002) (Golladay et al. 2003). Drying of major springs, a summer refuge for striped bass, has caused concerns about the long-term viability of the Flint River population. Declining streamflow also reduces the assimilative capacity for waste discharges, an important ecological service provided by streams and rivers. In the development of water management plans, provisions for the maintenance of stream flows are clearly a critical priority.

ACKNOWLEDGEMENTS

Funding for this project was provided by the Georgia Environmental Protection Division and the J.W. Jones Ecological Research Center. Dr J. Hook, of NESPAL, provided estimates of agricultural water use in the study area. T. Stamey and H. Light provided thoughtful comments on an earlier version of this report.

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27. FX-49A - EMAIL FROM W. HICKS TO R. ROYAL, M. MASTERS, D. WILSON RE: "FW: PENDING DROUGHT"

EXHIBIT A

From: richard royal <richardroyal@yahoo.com>
Sent: Monday, January 24, 2011 4:33 PM
To: Barnes, Allen
Subject: Fw: Pending Drought

Director Barnes,
Many of my friends in agriculture are getting mighty nervous! The Flint River Drought Protection Act was funded previously out of Tobacco Settlement dollars. Has anyone considered a possible drought declaration?
RR

--- On **Mon, 1/24/11, Woody Hicks <*whicks@jonesctr.org*>** wrote:

From: Woody Hicks <whicks@jonesctr.org>
Subject: Pending Drought
To: "Richard Royal" <richardroyal@yahoo.com>, "Mark Masters" <mmasters@h2opolicycenter.org>, "Doug Wilson" <dougwilsonh2o@gmail.com>
Date: Monday, January 24, 2011, 10:54 AM

NOAA has released their climate forecasts for Winter-Spring 2011 (see link below). To say that it reflects "gloom and doom" for the SE Region may be an understatement.

http://www.noaanews.noaa.gov/stories2011/images/seasonal_drought.jpg

Streams in Southwest Georgia are currently flowing at about 50% or less of the long-term median. Presently our streams are flowing at the normal rate we would expect for early June in a normal year. Groundwater levels are at near record lows for this time of year. Levels have not recovered at all from Summer 2010 water use impacts. Some observation wells tapping the Upper Floridan aquifer are presently 25-30 feet below normal. The combination of below normal stream levels and aquifer levels will result in many connected streams being impacted much earlier than in previous drought years.

I am concerned that we are not hearing any discussion from GaEPD regarding pre-drought planning. If the present climate and hydrologic trends continue, we could see a more severe drought than our region has seen during modern time.

It appears from the NOAA climate predictor that much of Georgia will be engaged in severe drought through Spring. NOAA experts feel strongly that the drought will persist perhaps more than one year. Clearly, the hydrologic and agricultural impacts on our region of Georgia very likely will be extreme. How do we get the proverbial ball moving regarding pre-drought planning? What can agriculture do regarding pre-drought planning?

I'm trying not to do my "Chicken Little" imitation, but I am worried about the sky falling.

Woody

--
Woody Hicks, Scientist

Joseph W. Jones Ecological Res Ctr
3988 Jones Center Drive
Newton, GA 39870

phone: (229) 734-4706

28. FX-48 - Comments re: the Initial Draft Regional Water Plans Released May 9, 2011 - Letter to Amettia Murphy from Sandra S. Tucker

United States Department of the Interior
Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606
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June 23, 2011

Ms. Arnettia Murphy
Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1152, East Tower
Atlanta, Georgia 30334

Dear Ms. Murphy:

The U.S. Fish and Wildlife Service (Service) is herein providing comments regarding the initial draft regional water plans released May 9, 2011. The 2004 Comprehensive State-wide Water Management Planning Act authorized the development of the State Water Plan. The State Water Plan in turn, calls for state-wide regional water planning to provide the necessary local and regional perspectives to ensure each of Georgia's ten water planning region's water resources are sustainably managed through at least 2050. We appreciate the effort of the basin councils and the hours of deliberation and thought that the 10 regional water plans represent.

We consider the basin plans an important first step in managing for sustainable water resources. As our review of the plans progressed, common themes emerged in the plans and in our concerns about the plans. Rather than provide detailed review of each plan, we are providing general comments and recommendations. As each basin plan is revised, we are available and eager to provide technical assistance to the councils regarding our concerns and how our recommendations could be implemented.

The State of Georgia includes an abundance of river systems that have vistas and species unlike any other. Unfortunately, Georgia also has one of the highest numbers of imperiled species, especially those that live in aquatic environments. As the human population grows and development spreads, the conflicts between the needs of citizens and aquatic systems will increase in number and intensity; conflict will be exacerbated during times of drought. We have already observed dramatic declines in the numbers of native freshwater mussels and shoal-dependent fishes, which were some of the first to feel the effects of low stream flows. Low flows contribute to degraded water quality, for people and for animals, which translates as additional costs to the tax-payers for lost services such as pollution treatment. The citizens of Georgia and those that visit Georgia will not continue to reap the benefits of the natural aquatic systems without a significant change in the current practices that affect them.

GENERAL CONCERNS

1. The regional water plans do not meet a basic goal of the 2004 Comprehensive State-wide Water Management Planning Act – protecting natural systems.

   The 2004 Comprehensive State-wide Water Management Planning Act mandated the development of a state-wide water plan that, in a sustainable manner, would (1) support the State's economy, (2) protect public health **and natural systems**, and (3) enhance the quality of life for all citizens. The State defines natural systems as "biological, ecological, and physical systems that arise and persist through mechanisms of nature as opposed to having been designed, constructed, and operated by mankind".

   The March 2010 Surface Water Resource Availability Assessment, which the regional water councils used extensively to evaluate water supply in the regional water plans, was based, in unregulated streams, on a monthly 7Q10 flow or natural inflow, whichever was lower. The monthly 7Q10 is the lowest seven-day running average of a stream's flow for each calendar month with a 10-year recurrence frequency; basically, the 7Q10 provides extreme seasonal low flow conditions in a stream over a given time period. The 7Q10 considers one factor only -- water quality – and fails to consider either the effect of long term exposure to extreme low flows or the natural flow of rivers necessary for the protection of fish and other aquatic resources.

   The University of Georgia's Carl Vinson Institute of Government, in a 2006 report to the Georgia Environmental Protection Division identified mimicking the natural flow regime, to the greatest extent possible, as one of seven major principles of instream flow protection. Natural flows include both high and low flows; the magnitude and frequency of these high and low flows regulate numerous ecological processes and provide different benefits to the stream's overall health. High flows flush silt from the crevices between gravel and cobble where many fish lay eggs, facilitate reproduction of aquatic species that mate and feed in the floodplain, stir up organic materials on which benthic macroinvertebrates forage, and import large woody debris that increases habitat complexity and diversity. Regularly occurring high flows determine the geomorphology of the river, including the location of pools and shoals/riffles that provide diverse aquatic habitats. Periods of lower flows and water velocities allow germination and growth of riparian plant species in floodplains and on streambanks, movement of fish and other aquatic organisms to upstream areas, and development of eggs and juveniles without being flushed from suitable habitats.

   Sustained inadequate low flow, in contrast, may result in long-term changes in fish, mussel, and other aquatic species distribution and abundance. During extreme low flows, the width of the wetted stream channel is greatly reduced, and fine sediment that degrades aquatic habitats is not flushed from the stream bottom. Fish become crowded into smaller areas and are more vulnerable to over-harvest, intra-specific competition and predation. Water temperatures may become too high for some species, interfering with their physiology and reproduction. Side channels used by the early-life stages of many aquatic species may be dewatered, and movement upstream through riffle and shoal areas may be blocked. Lowering the water table

and/or reducing overbank flooding may result in changes in the density, productivity, and species composition of wetland and riparian vegetation. Streamflow reduction may cause changes in the relative abundance of food resources, which can influence the abundance and distribution of benthic macroinvertebrates.

In a related matter, we understand that the metrics used in the assessments of surface water availability were based on specific State policies. However, we note that the assessment focused solely on the monthly 7Q10 from the Georgia Department of Natural Resources 2001 interim instream flow white paper and did not consider the broad range of options that protect water quality, human uses and habitat. Instream flow guidelines developed by the Environmental Protection Agency and Service in 1999 for the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) basins water allocation formula also were not considered in the assessment.

Another fundamental problem with the basin plans is that the planning nodes used to assess needs and shortages around the State provide a coarse overview of water supply. The nodes are few and far between so that, from a problem-solving perspective, the information provided is on too large a scale to find specific solutions. We do not understand how nodes were selected for study (other than for long-term data), and how (or if) node data was extrapolated to evaluate future water supply gaps in areas upstream of the nodes or on a county basis.

Additionally, because a low flow standard was used to portray a shortfall for water needs, unregulated streams are specifically singled out. This bias is evident in the Coosa/Tallapoosa analysis; there are no gaps in the Coosa because the planning nodes are all downstream of regulated systems that meet low flow requirements. However, meeting minimum flows is not an indication that water is plentiful or, as addressed above, that the aquatic system is being sustained.

We recommend that the plans fully explain what data were used to calculate permitted municipal water withdrawal limits vs. forecasted municipal water demands by county, explain how the node data are/will be used, explain why some gages with long-term data records were not included in the node evaluations, clarify that node data are limited to the locations where such flow data have been compiled, and stipulate that plan calculations do not address stream flows in smaller rivers and streams.

We recommend that each plan be modified to clearly state that the monthly 7Q10 was used merely for planning purposes, and that minimum-allowable flows in most of Georgia's rivers and streams will be determined on a case-by-case basis, with assistance from Federal and State agencies and other interested stakeholders, to ensure protection of aquatic resources and stream habitats. Basin plans should be revised to incorporate an estimate of actual demands and shortfalls based on a local scale and flow levels that sustain water quality, quantity, instream and floodplain habitat, and the broad array of goods and services that Georgia's water bodies provide.

2. The regional water plans fail to ensure that management practices are incorporated in water planning that will protect species listed under the Endangered Species Act, or those addressed in the Georgia State Wildlife Action Plan or State Wildlife Protection Act. Imperiled species are barometers of the health of the systems within which they live. Sustaining the natural assemblage of aquatic species will ensure that the water quality in which they live is also sustained. Federally-listed aquatic species under the Service's purview are listed by basin below. There are other listed species that might be affected by regional water plans to the extent that upland habitats are impacted. You can find a current list of threatened and endangered species on our office web site at http://athens.fws.gov and specific information about listed species in a given geographic areas of the State at http://ecos.fws.gov/ipac.

Altamaha:	Altamaha spinymussel (*Elliptio spinosa*)	Proposed Endangered
	West Indian manatee *(Trichechus manatus)*	Endangered
Chattahoochee:	Fat three-ridge mussel *(Amblema neislerii)*	Endangered
	Purple bankclimber *(Elliptoideus sloatianus)*	Threatened
	Chipola slabshell *(Elliptio chipolaensis)*	Threatened
	Shinyrayed pocketbook *(Hamiota subangulata)*	Endangered
	Gulf moccasinshell *(Medionidus penicillatus)*	Endangered
	Oval pigtoe *(Pleurobema pyriforme)*	Endangered
	Gulf sturgeon *(Acipenser oxyrinchus desotoi)*	Threatened
Conasauga:	Blue shiner (*Cyprinella caerulea*)	Threatened
	Amber darter (*Percina antesella*)	Endangered
	Conasauga logperch (*Percina jenkinsi*)	Endangered
	Fine-lined pocketbook (*Hamiota altilis*)	Threatened
	Alabama moccasinshell (*Medionidus acutissimus*)	Threatened
	Coosa moccasinshell (*Medionidus parvulus*)	Endangered
	Georgia pigtoe (*Pleurobema hanleyianum*)	Endangered
	Southern clubshell (*Pleurobema decisum*)	Endangered
	Southern pigtoe (*Pleurobema georgianum*)	Endangered
	Rayed kidneyshell (*Ptychobranchus formanianus/greeni*)	Endangered
Coosawattee:	Goldline darter (*Percina aurolineata*)	Threatened
	Southern clubshell (*Pleurobema decisum*)	Endangered
	Rayed kidneyshell (*Ptychobranchus formanianus/greeni*)	Endangered
Etowah:	Etowah darter (*Etheostoma etowahae*)	Endangered
	Cherokee darter (*Etheostoma scotti*)	Threatened
	Amber darter (*Percina antesella*)	Endangered
	Fine-lined pocketbook (*Hamiota altilis*)	Threatened
Flint:	Oval pigtoe *(Pleurobema pyriforme)*	Endangered
	Shinyrayed pocketbook *(Hamiota subangulata)*	Endangered
	Gulf moccasinshell *(Medionidus penicillatus)*	Endangered
	Fat threeridge *(Amblema neislerii)*	Endangered
	Purple bankclimber *(Elliptoideus sloatianus)*	Threatened
Ochlockonee:	Ochlockonee moccasinshell *(Medionidus simpsonianus)*	Endangered

	Purple bankclimber (*Elliptoideus sloatianus)*	Threatened
	Shinyrayed pocketbook *(Hamiota subangulata)*	Endangered
	Oval pigtoe *(Pleurobema pyriforme)*	Endangered
Ogeechee:	West Indian manatee *(Trichechus manatus)*	Endangered
Oostanaula:	Southern clubshell (*Pleurobema decisum*)	Endangered
Savannah:	Robust redhorse *(Moxostoma robustom)*	Candidate
Tallapoosa:	Fine-lined pocketbook (*Hamiota altilis*)	Threatened

The Endangered Species Act prohibits "take" of a listed species of fish or wildlife, where take is defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species and/or to degrade habitat such that the action kills or injures a listed species by significantly impairing essential behavioral patterns, such as breeding, feeding or sheltering." The Service identified critical habitat for listed mussels in the ACF and ACT basins, and for listed fish in the Conasauga basin. Critical habitat is a legally-designated geographic area crucial to continued species survival and recovery. Under the Act, it is unlawful for a Federal agency, such as the Corps of Engineers, to authorize, fund, or carry out an action that will result in the destruction or adverse modification of critical habitat.

Another useful resource for water planning is the Georgia State Wildlife Action Plan (SWAP), a comprehensive wildlife conservation strategy and one that has undergone extensive public review. It can be viewed in its entirety at http://www.georgiawildlife.com/node1703.
We recommend that the Council incorporate appropriate Conservation Actions from the SWAP in this Plan. For instance, on page 174, the SWAP states that "Establishment and maintenance of vegetated riparian buffers is one of the most important and cost-effective conservation measures for protection of water quality and aquatic ecosystem health". It identifies concrete strategies to implement this recommendation. The SWAP also outlines recommendations to protect wetlands and headwater streams, which are significant not only to protect wildlife and aquatic resources but also to protect downstream water quantity and quality. These actions would complement actions already identified in some of the plans.

We recommend that the councils meet with scientists such as those within the Service, Georgia Department of Natural Resource – Nongame, University of Georgia, and US Geological Survey who work in these basins to develop water management practices that will protect natural resources.

3. The regional water plans do not include conservation savings in calculations of future water demands (with the exception of two plumbing code changes which mandate new water saving lavatory fixtures). Georgia's State-wide Water Management Plan recognizes water conservation as a priority water quantity management practice that can help manage the consumptive use of Georgia's rivers, streams and aquifers. Compared to other types of tools for managing water resources, conservation is cost-effective and can preserve water for recreation and environmental needs. Though the regional water plans generally encourage

water conservation, they do not require it; especially, where the greatest shortfalls occur, such as agriculture irrigation.

The 2010 Surface Water Availability Assessment focuses on water supply and storage in the large Federal and Georgia Power reservoirs in the State, but we are unable to determine how municipal reservoir storage was incorporated into evaluations of gaps in supply. To our knowledge, local governments and water authorities have constructed13 new reservoirs, mostly in north Georgia, over the past 20 years to supply local jurisdictions in rapidly-growing parts of the state with drinking water. Seven proposed reservoirs currently are in the Federal permitting process but the regional water plans do not appear to consider these sources in evaluating gaps in supply. For example, the Surface Water Availability Assessment specifically states that "Three dams are located within the Georgia portion of the Coosa River basin, while a fourth, Weiss Dam in Alabama, has an impoundment that extends into Georgia." The three dams within Georgia are Allatoona Dam on the Etowah, and Carters Dam and Carters Rereg on the Coosawattee. No mention is made about Cherokee County's Hollis Latham Reservoir or Canton-Cobb County-Marietta's Hickory Log Creek Reservoir, or the future storage capacity in Dawson and Paulding Counties proposed reservoirs (Russell and Richland), which are awaiting Corps of Engineers authorization.

We recommend that the plans clearly identify the reservoirs considered in the water supply/gap analysis and how storage in these facilities was considered in these analyses. Additionally, we recommend the regional water plans include a calculation of water savings from conservation measure implementation and use these data, rather than pre-water conservation estimates, to identify gaps in water availability and the timing/frequency of such gaps.

4. The regional water plans do not evaluate the effects of large-scale interbasin transfer on water resources in the donor basin. Currently, we are aware of three large-scale interbasin transfer projects that have been suggested to meet the metro-Atlanta area's water supply needs -- the proposed Glades Reservoir (Hall County), Shoal Creek Reservoir (Dawson County), and Calhoun Creek Reservoir (Lumpkin County). Interbasin transfer can significantly reduce water supply in downstream reaches of the donor basin.

   We recommend that the Upper Coosa and other regional water plans considering large-scale interbasin transfers fully evaluate the impact that withdrawal of millions of gallons of waters would have on downstream users and ecosystems.

5. The regional water plans focus on water supply and conservation, but do not emphasize minimizing impacts of upstream activities that increase sediment-loads in the river and reduce water storage capacity in existing and future reservoirs.

   All rivers move sediment, but when a river is dammed, the sediments it carries are trapped in the reservoir. As these sediments accumulate, the dam gradually loses capacity to store water. Every reservoir loses storage to sedimentation, although the rate at which this happens varies widely. Large reservoirs in the US lose storage capacity at an average rate of around 2% per

year, with regional variations ranging from 5% per year in the Pacific states to 1% in the Northeast. Sediment-filled rivers also abrade turbines and other dam components. The efficiency of a dam's turbine is largely dependent upon the hydraulic properties of its blades --erosion and cracking of turbine blade tips by water–borne sand and silt considerably reduces generating efficiency and can require expensive repairs.

We recommend that regional water plans incorporate management practices to reduce the amount of sediment transported into drinking water reservoirs. Such measures would include stronger sediment and erosion requirements and enforcement for construction sites, grading restrictions on steep slopes and large developments, more extensive riparian buffer protection requirements for residential, agriculture, and forestry activities, and post-construction stormwater management to reduce channel scour and streambank erosion.

6. The language for many of the goals and management practices needs to be stronger and more proactive. Many actions are deferred to other agencies. While it is understandable that local communities must have funding and support from State and Federal entities, the councils represent those persons and organizations that strongly influence local trends and behavior; the members would not be on the councils if they were not people of influence. State law requires minimal conservation but local people can recognize the imperative nature of conservation and voluntarily take action on stricter measures to ensure the systems they depend on are, in fact, sustained for the good of current and future generations.

   We recommend that goals and management practices in each category be mandated to the greatest extent possible and be prioritized, so that communities can focus their resources and efforts on the highest priority actions first.

7. Georgia's water doctrine is one of reasonable use meaning that water users must not use water to the extent downstream users cannot also make reasonable use of the water. The focus of the water plans on minimum low flows does not give full consideration to downstream users. Downstream users not only include municipal water treatment facilities, but also include estuary commercial fishermen, recreational fishermen and recreational boaters, all of which require instream flow volumes above 7Q10 to sustain their activities.

   We recommend the basin plans include evaluation of the effects of upstream activities on downstream water users.

8. The basin plans contemplate a wealth of monitoring and research studies, and we applaud the councils for recognizing that monitoring and other adaptive measures are essential. Communities and regulators need to know how much water is being used, where specific shortfalls are occurring, how well conservation is working, and many other pieces of information. However, the desire for additional information should not delay immediate concrete actions to reduce water use.

We recommend the basin plans prioritize those management practices that will achieve water conservation as soon as possible.

9. Drought contingency plans should be developed that go into effect during low flow years and seasons. For example, during droughts most wastewater treatment plants are hydraulically under-loaded which gives them some operating latitude. A community could increase its level of treatment (e.g., added aeration, longer retention, higher recycling rates) when the plant is under-loaded. Such efforts would minimize degradation of local water quality during low flow times. Additionally, a drought contingency plan could invoke deeper water conservation measures so that stream reaches are not dewatered or are dewatered to a lesser degree during drought times.

We recommend the basin plans include drought contingency planning and water demands be adjusted based on occasional drought conditions.

10. All the basin plans include a management practice that would evaluate development or enhancement of reservoirs to augment water supply. Reservoir construction, including construction of farm ponds, is not a simple solution for water supply shortfalls. The cost of a new reservoir is considerable. Land must be purchased, sometimes from unwilling sellers. Houses, vegetation and other obstacles must be removed. Powerlines and other essential facilities must be relocated. Federal law also requires reservoir builders to compensate for the loss of wetlands and free-flowing streams by protecting similar wetlands and streams, in the same watershed if possible. Reservoirs also reduce the amount of water available to downstream communities. On a hot summer day, millions of gallons of water evaporate off Lake Lanier. In addition, dams significantly impact aquatic communities and can negatively impact downstream property. They isolate populations of fish and other aquatic species, cutting them off from their historic ranges. Dams alter the natural river flows, often causing severe streambank erosion for downstream homeowners and degrading water quality.

    When a new drinking water reservoir is proposed, the U.S. Army Corps of Engineers consults with the Service on expected impacts to wetlands, aquatic species, federally-protected species and other fish and wildlife that depend on free-flowing streams. Before new reservoirs are seriously considered, we recommend (1) water conservation options be maximized (e.g., repairing leaks in water supply lines, implementing conservation pricing, recycling gray water, developing rebate programs for installing low flush toilets and water-saving faucets, educating consumers about water conservation in the home); (2) maintaining or increasing storage capacity in existing reservoirs by enforcing/enhancing laws to minimize sediment entering reservoirs from upland sites, dredging and removing sediment that has built up in reservoirs over time, and/or raising dam heights or authorized reservoir water levels to impound more water, and (3) utilizing water in existing amenity and flood management lakes, deep quarries, and other impoundments.

We recommend the basin plans incorporate the realities of new reservoir construction and base needs on local information rather than the coarse overview of water supply shortfalls utilized for the draft plans. If further review indicates only extra storage will

meet needs, we recommend, in priority order, evaluation of (1) existing farm ponds, amenity lakes, quarries or other impoundments as a water resource for smaller, infrequent shortages; (2) expansion of existing impoundments; and, as a last resort, (3) construction of new reservoirs.

11. A key water conservation practice recognized by a number of the basin plans is an education program. This practice is essential to the success of water conservation. Many good programs already exist, including the Georgia Environmental Protection Division's Project Wet and Adopt-a-Stream programs. These programs include measures to reduce use but also information regarding the value of rivers and streams and how human behaviors and practices affect them.

    We recommend the basin plans require implementation of education programs to inform the public of the need for water conservation in their communities and how they can be a part of that conservation.

12. Many of the basin plans include goals of providing for balanced growth while protecting natural environments but for some there is an apparent lack of understanding regarding the connectivity among groundwater, surface water and water quality. The assessment reports provided to the councils did not promote a balanced approach to managing available water resources, since groundwater, surface water and water quality were treated in separate reports and as if the three components are independent of each other. One cannot manage one of these components without affecting the other because they are physically connected. The lower Flint basin is a clear example of how tightly bound ground and surface water sources can be.

    We recommend all the basin plans be modified to incorporate an awareness of the interrelationship of surface water, ground water and water quality.

SPECIFIC CONCERNS

For those basins most affected by ACF water management, there is an ongoing misunderstanding regarding the minimum flows released by the Corps of Engineers at Woodruff Dam. The 5000 cfs minimum flow is not scientifically-based; it was determined by the Corps as a parameter associated with management of the reservoir system dating back to the 1950's. When the Corps advised the Service how they would operate the reservoir system, we produced for the Corps, under the Endangered Species Act, a biological opinion regarding the affects of a 5000 cfs minimum flow on the listed fat threeridge, purple bankclimber, Chipola slabshell and Gulf sturgeon. The minimum 5000 cfs flow is not the amount of water that these aquatic species need but rather the minimum amount of water that these species receive given the current reservoir operations. The amount, however, is not likely to jeopardize these species continued survival; in other words, they will not be pushed to extinction faster due to the operations.

Over-allocation of the ground water aquifer in the lower Flint and other areas needs immediate attention. Implementing 80% efficiency for irrigation systems is admirable but low flow years

between now and 2020 will continue to injure listed mussels and potentially jeopardize their continued survival in the basin. We are pleased to see the intent to develop a habitat conservation plan (HCP) or similar tool to minimize the negative effects of agricultural irrigation on listed freshwater mussels of the lower Flint. In addition to reach-specific tools such as a HCP, the Flint River Drought Protection Act should be modified to allow even closer focus on problem areas within the basin. Although capacity use areas have been identified, the Act should allow Georgia EPD to provide funds for not irrigating in those areas where agricultural irrigation is dewatering streams with remaining listed mussel populations.

We commend the basin councils on their attention to the critical issue of water use. However, the initial draft plans need significant revision to guide water management decisions of the local communities and the Georgia EPD. We appreciate the opportunity to provide input on the regional water plans and look forward to involvement in the plans as they are revised. Please refer any questions or comments to me at telephone 706-613-9493 ext. 230 or email me at sandy_tucker@fws.gov.

Sincerely,

Sandra S. Tucker

Sandra S. Tucker
Field Supervisor

cc: file
USFWS, Panama City, Florida
USFWS, Fort Benning, Georgia
USFWS, Townsend, Georgia

29. FX-82 - Groundwater Conditions in Southwest Georgia and Low Flow in the Flint River in the Apalachicola-Chattahoochee-Flint River Basin - Memorandum from Wei Zeng to Allen Barnes

Memorandum

EXHIBIT

Caldwell 35

Huseby.com

To: Allen Barnes

From: Wei Zeng

Date: September 6, 2011

Subject: Groundwater conditions in southwest Georgia and low flow in the Flint River in the Apalachicola-Chattahoochee-Flint River Basin

The purpose of this memorandum is to give you an update on recent groundwater conditions and relevant surface water flow conditions in southwest Georgia. On both groundwater and surface water conditions, we made a comparison between the most recent period and the 2007 through 2008 period. The current conditions are similar or slightly worse than what we have experienced in the last drought.

Groundwater Conditions

We used daily averaged ground water levels at nine USGS observation wells in southwest Georgia. These wells are all located inside the so-called "Dougherty Plain" or "Sub-area 4," which corresponds to the area where groundwater pumping from the Upper Floridan Aquifer has a significant and quantifiable effect on surface water flow in the Flint River and its major tributaries. The locations of these wells as well as the boundary of the Floridan Aquifer can be seen in Figure 1 of Appendix A.

For each of the nine wells, we overlaid the 2010-2011 (so far in 2011) observation (in blue color) on top of 2007-2008 observation (in yellow color). We also drew a horizontal line in red to emphasize the initial conditions of 2011, or the end effect at the conclusion of 2010. The magnitude of recharge (or the lack of it) can be seen more clearly with the red line.

In short summary, groundwater conditions up to this point in 2011 bear the following two troubling features:

1. There was a clear lack of recharge and replenishment of groundwater storage after the conclusion of the 2010 growing season. This was probably caused by the La Nina phenomenon in the winter of 2010 resulting in weaker precipitation in the region. Even when compared to 2007 and 2008 (the last year with a strong La Nina), the two previous drought years, the lack of groundwater recovery in this year was stunning.
2. For all nine wells, the current groundwater levels are worse than at the same time in 2008. Most of these wells have similar or worse levels in comparison to at the same time in 2007. This observation is across the board, which indicates lower groundwater storage across the region.

The groundwater levels can be seen in Figures 2 through 10 in Appendix A.

Stream Flow in the Flint River

In drier times when there is the lack of normal precipitation, a large portion of the flow in the lower Flint River is the result of groundwater discharge into the river channel. When groundwater levels are low, the hydraulic head driving this discharge is low, which will in turn result in lower discharge and lower flow in the channel.

This is what we have observed in the Flint River this year. Figures 11 and 12 show monthly average flow in the Flint River at Bainbridge and Newton gages respectively. We overlaid 2011 conditions with those of 2006, 2007, and 2008. Stream flows in the Flint River in the past four months at both locations are very similar to what were observed back in 2007, which was associated with some of the worst conditions ever recorded. In fact, the cumulative flow at Bainbridge this year is lower than that of the same period in 2007.

It is also very troubling to observe the daily low flow record being broken in the past few days. Before this past week, the lowest daily average flow ever recorded in the Flint River at Bainbridge was 1190 cfs on September 13, 2002. Flow at Bainbridge in the past four days has tied this record once and broken it twice. The low groundwater level and discharge has shown its effects on stream flow.

Projections of Potential Future Conditions

In meetings and conference calls that took place in the past few weeks, climatologists from both federal and state levels pointed to the possibility of a second year of La Nina, which would likely cause another winter and spring (in 2012) to be drier and warmer than normal. If this prediction materializes, then we will be faced with much depleted storage in both groundwater aquifers and surface water reservoirs and another underperforming recharge season.

If this comes to fruition, then the major resources supporting both the Chattahoochee River and the Flint River will be under enormous amount of pressure both to provide for economic activities inside Georgia and to support ecological flows in the Apalachicola River.

We will continue to update you on conditions in both the Chattahoochee and the Flint Rivers.

Appendix A

Recorded Groundwater Levels and Flint River Flow

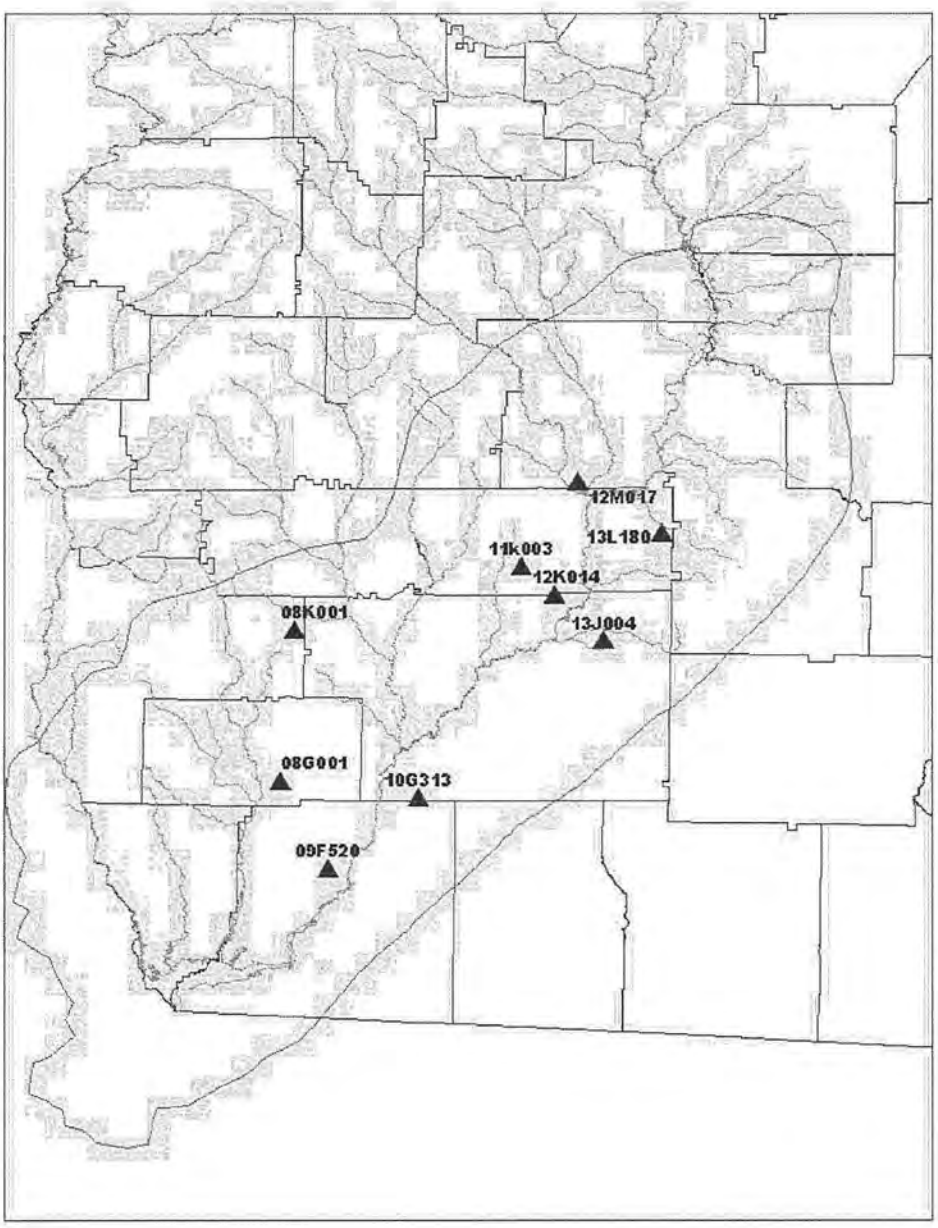

Figure 1 Locations of groundwater observation wells in southwest Georgia

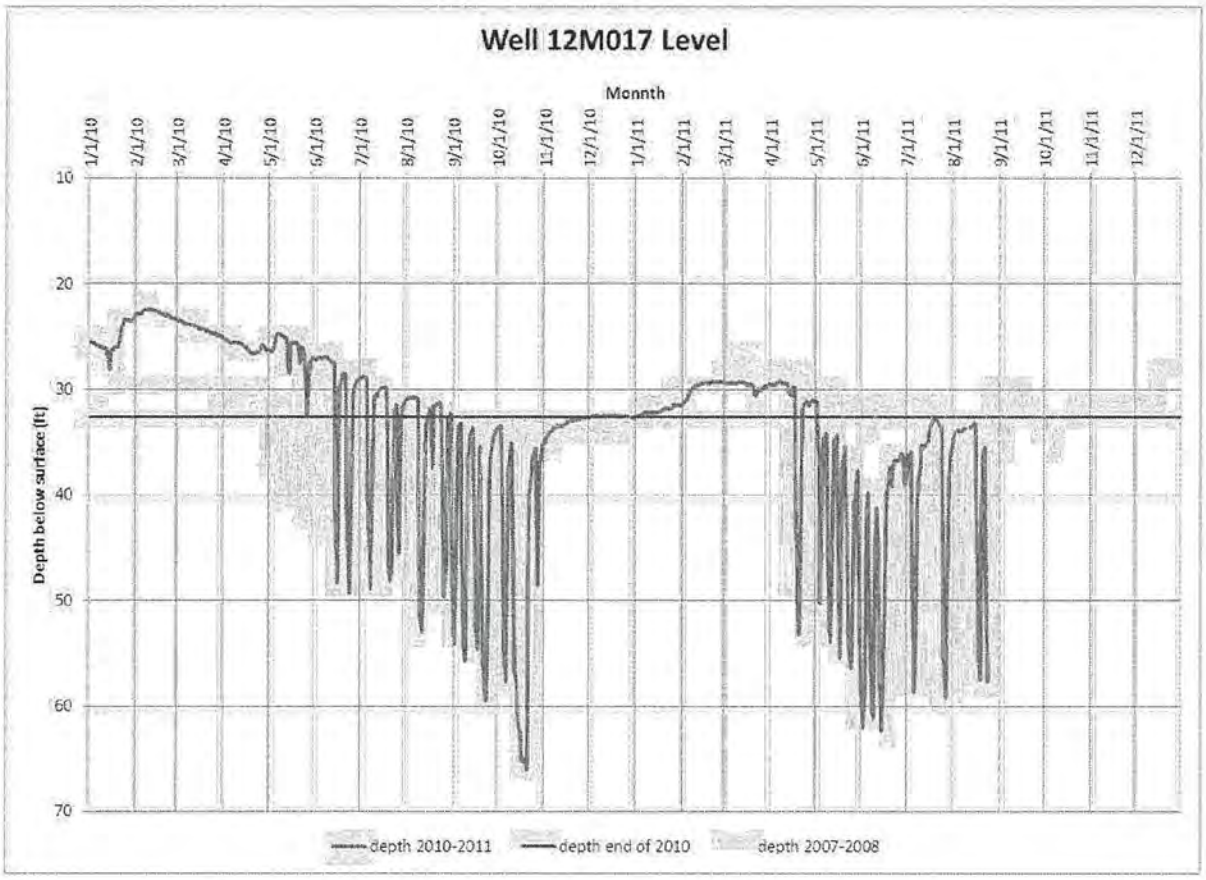

Figure 2 Well 12M017 in south Lee County (close to Albany, GA)

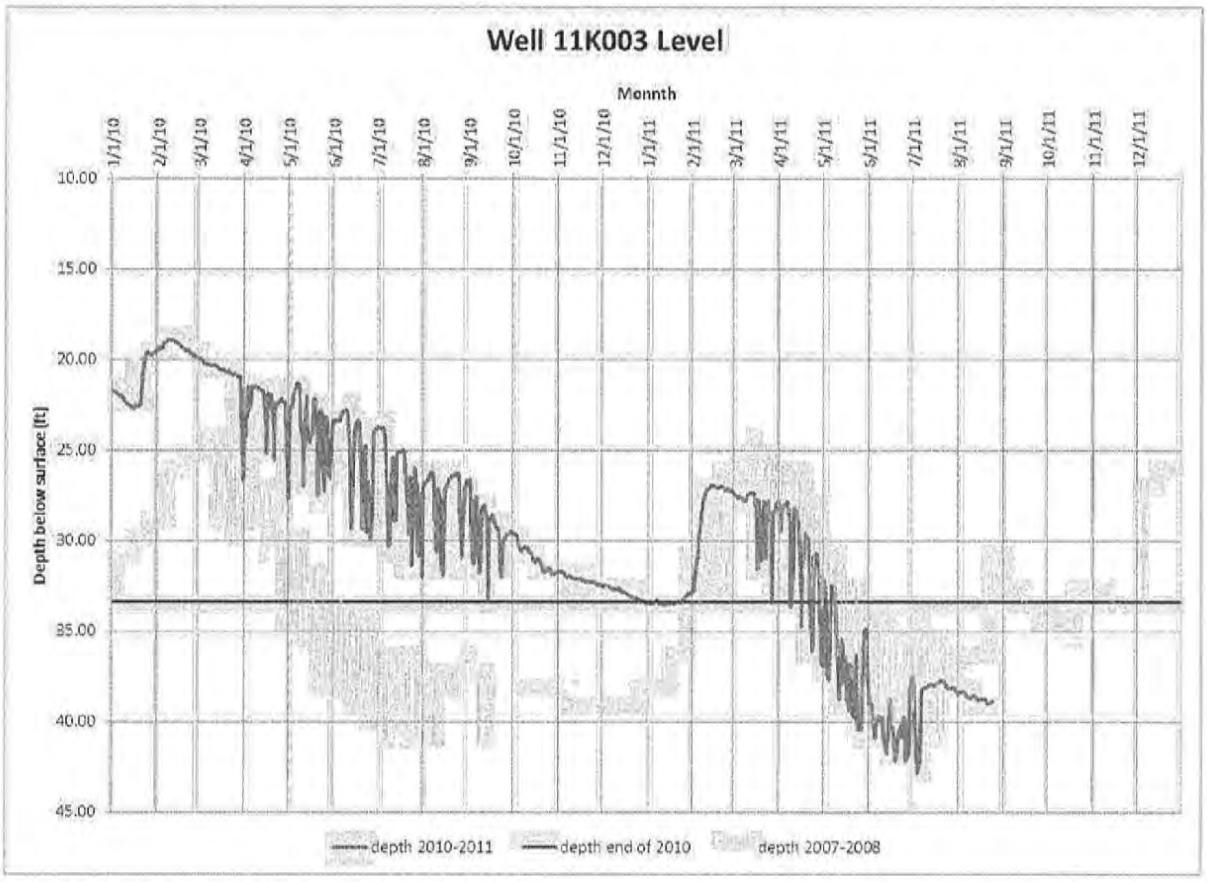

Figure 3 Well 11K003 in west Dougherty County

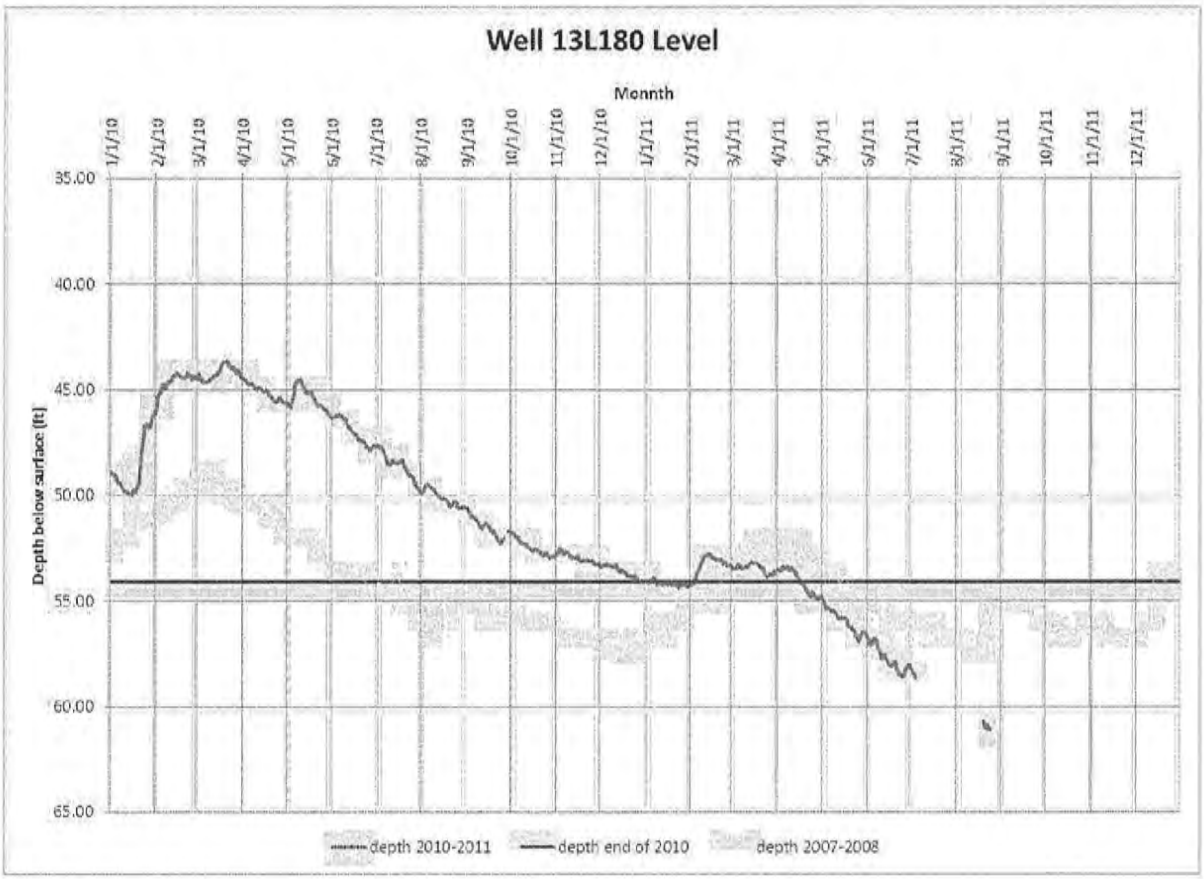

Figure 4 Well 13L180 in east Dougherty County

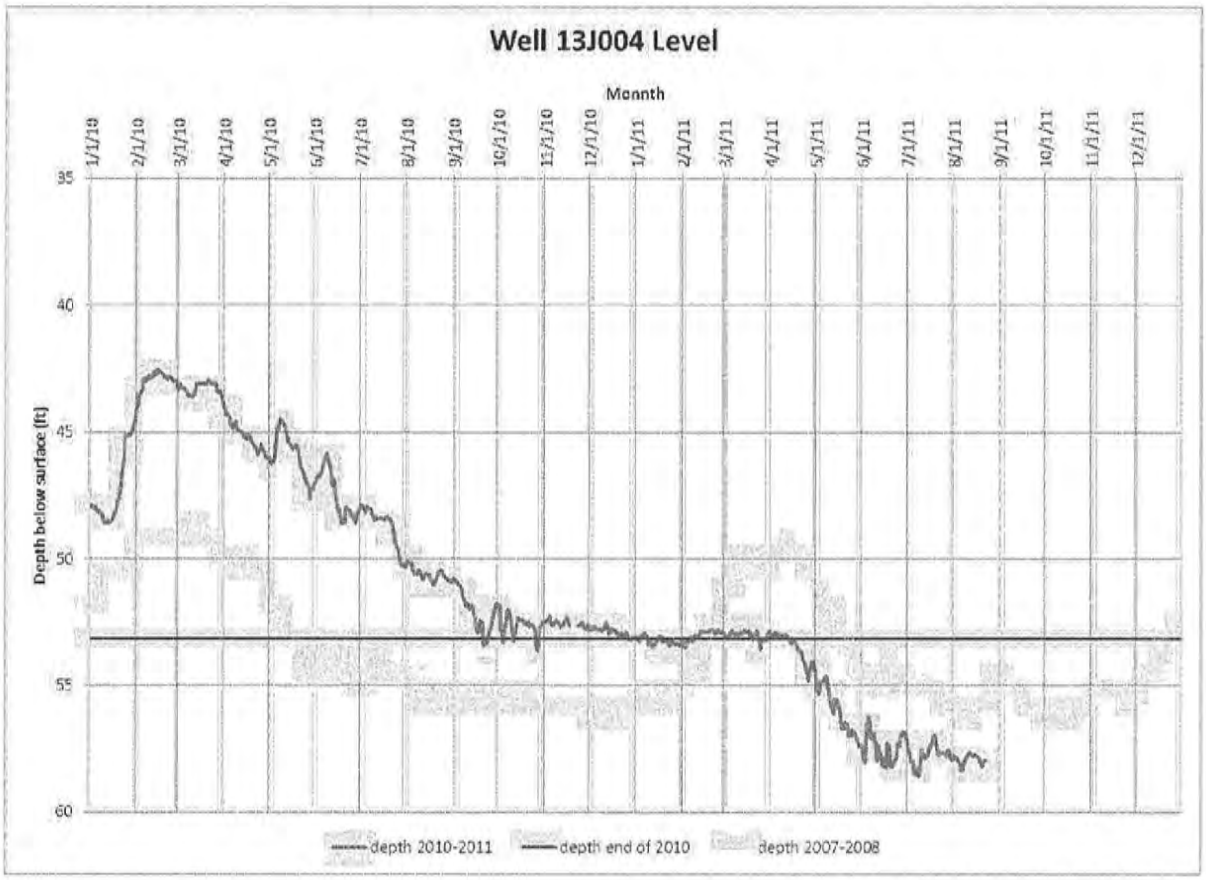

Figure 5 Well 13J004 in Mitchell County

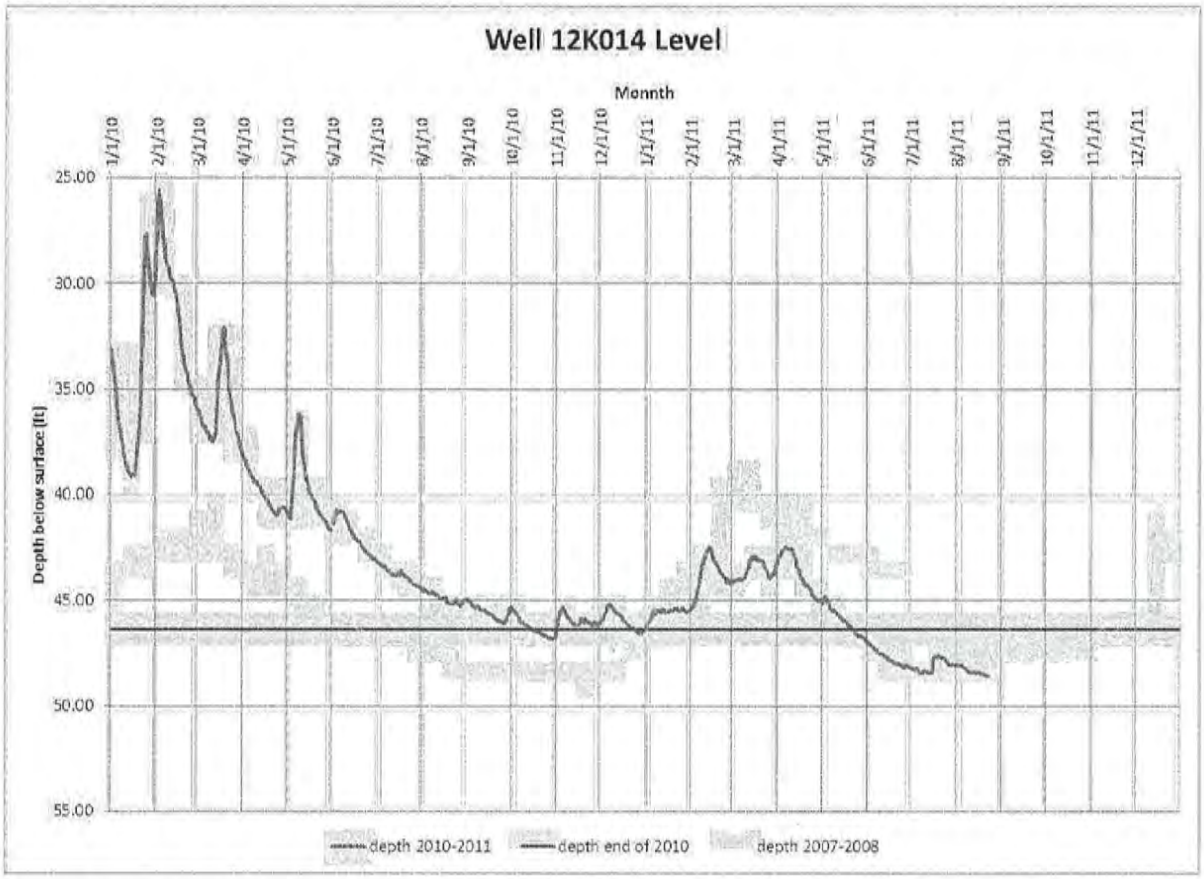

Figure 6 Well 12K014 in northeastern Baker County

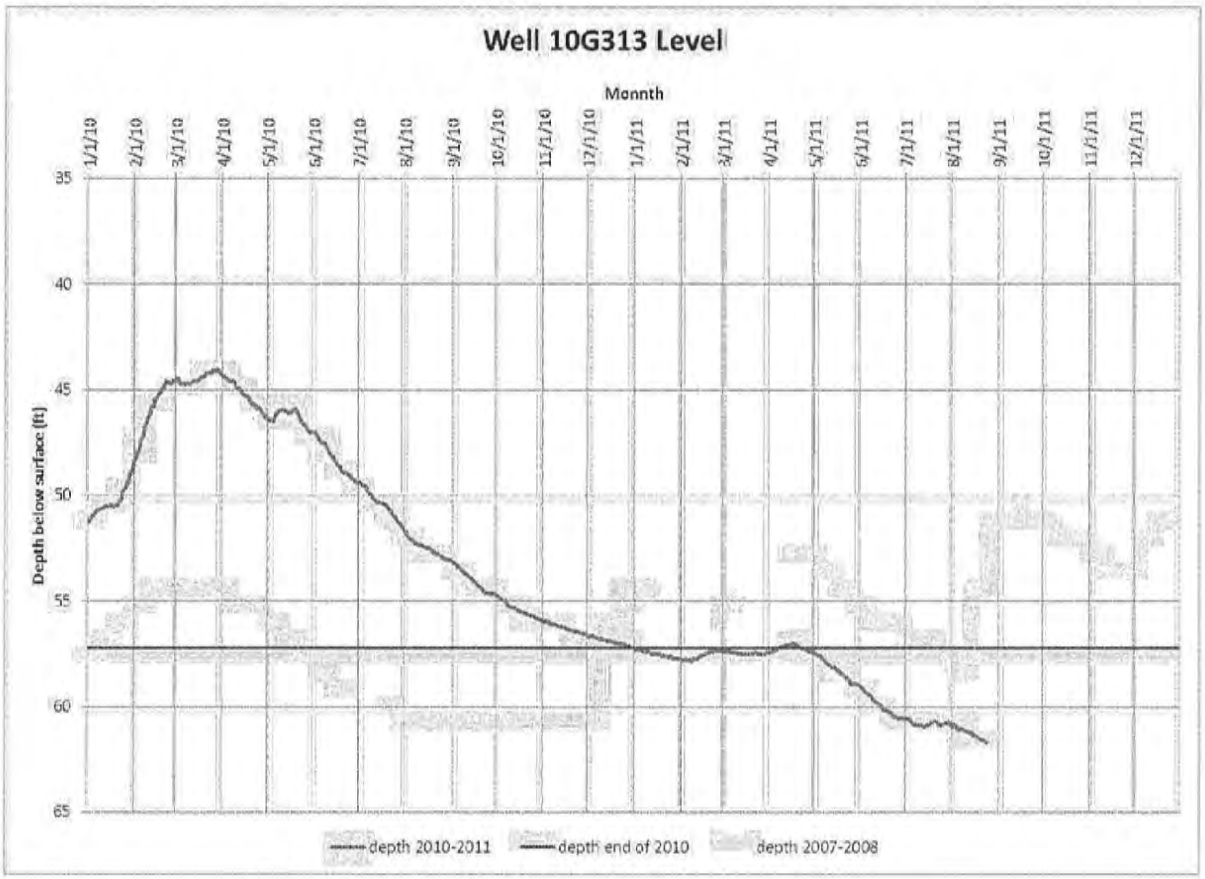

Figure 7 Well 10G313 in southwestern Mitchell County

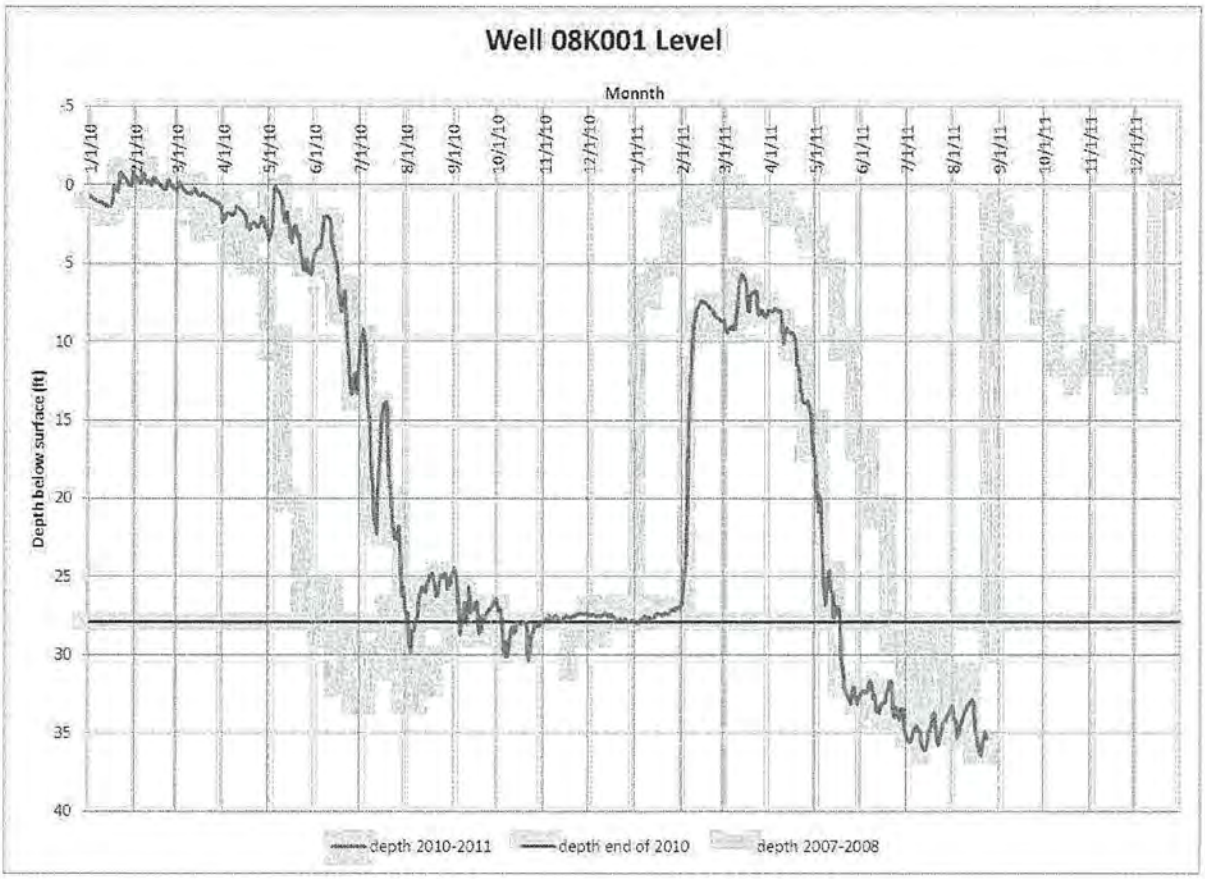

Figure 8 Well 08K001 in Early County

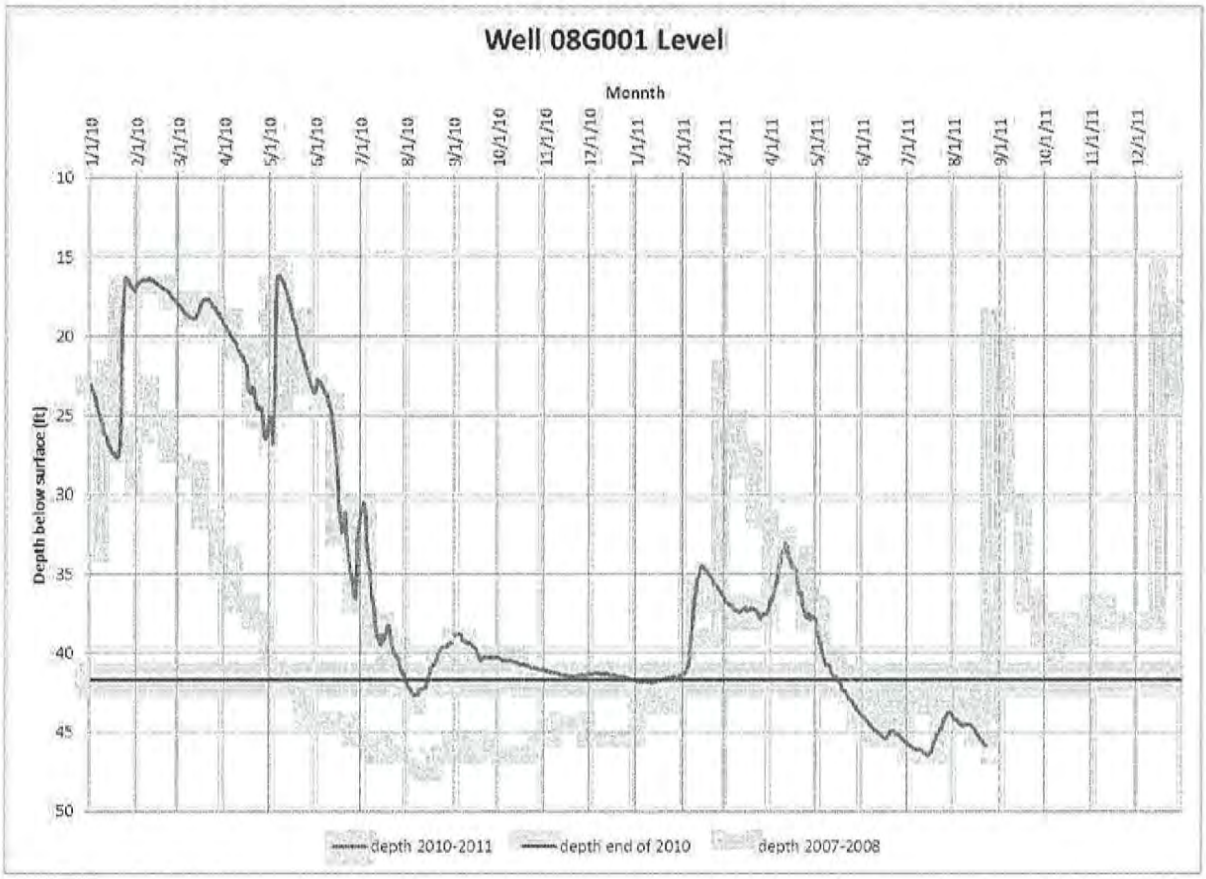

Figure 9 Well 08G001 in Miller County

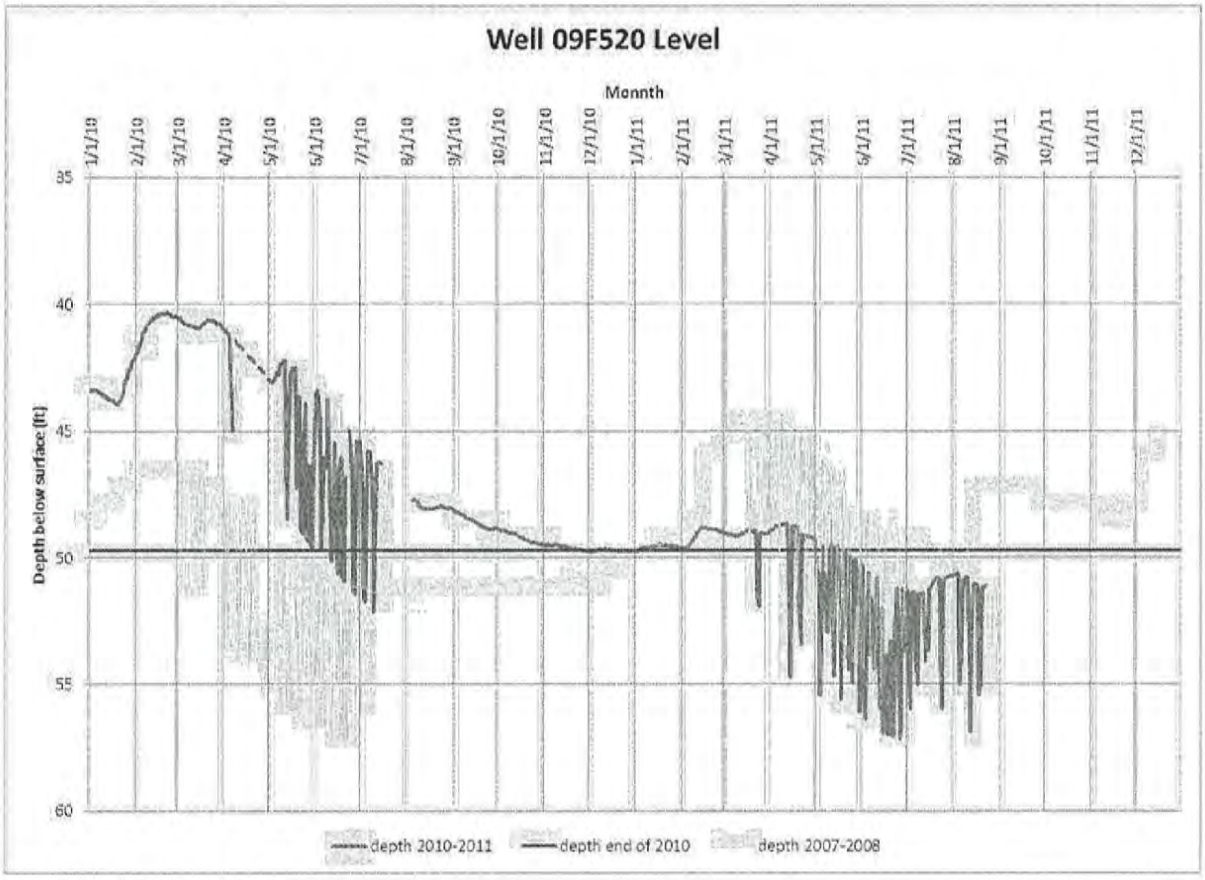

Figure 10 Well 09F520 in Decatur County

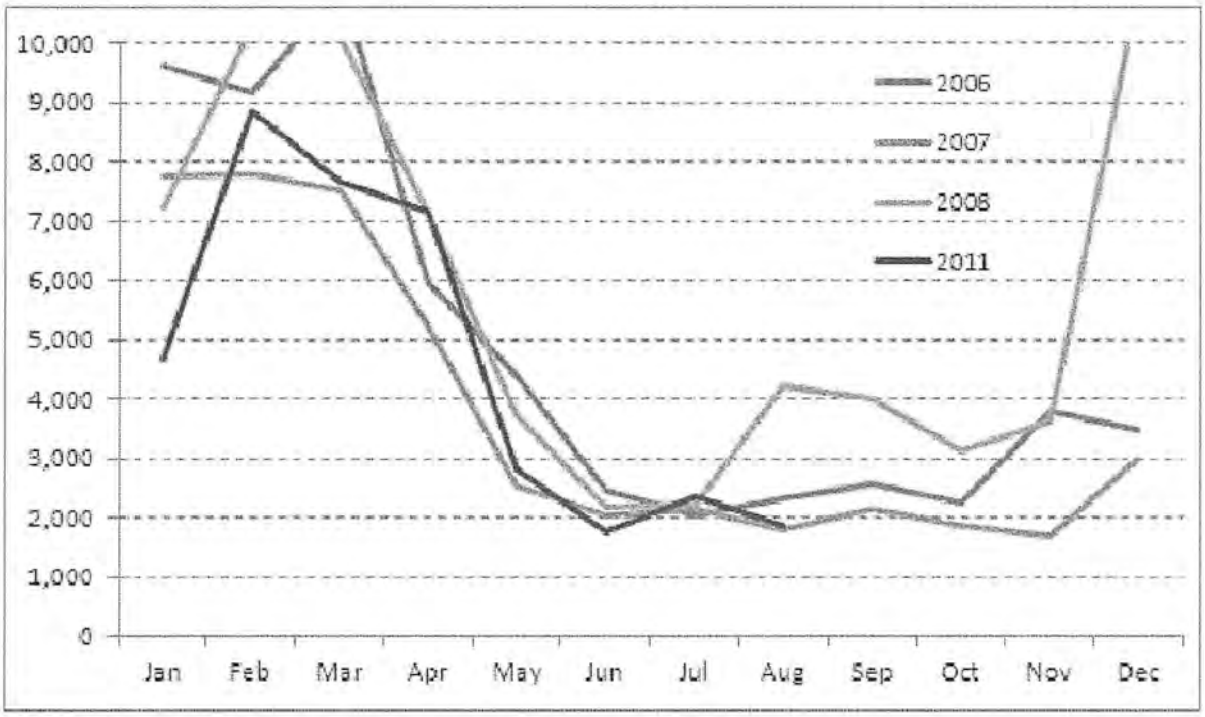

Figure 11 Monthly average flow at Flint River near Bainbridge, GA (in cfs)

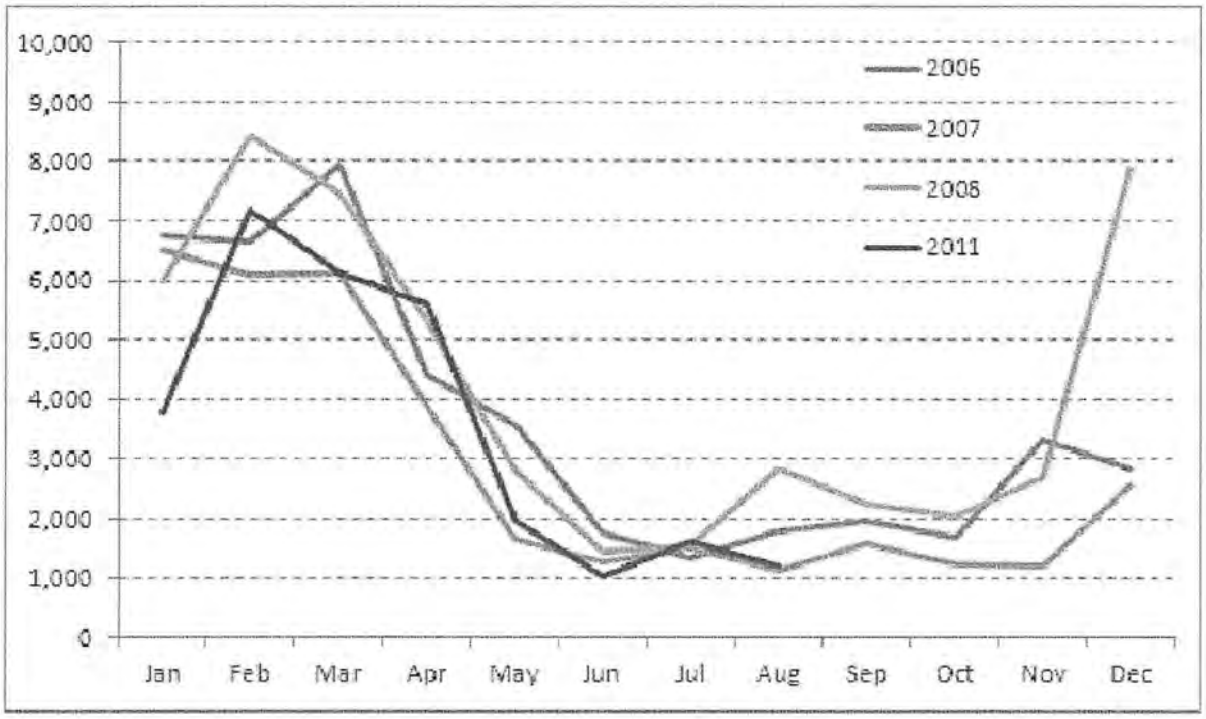

Figure 12 Monthly average flow at Flint River near Newton, GA (in cfs)

30. FX-87 - KENNEDY'S MODIFICATIONS (18 FEB)

Kennedy's Modifications (18 Feb)

By statute, each February the Georgia Environmental Protection Division (EPD) evaluates a set of lower Flint River basin rainfall, stream flow, and groundwater data before predicting the likelihood of severe drought conditions over the basin during the calendar year. One of the intentions of the statue was protection of the Flint River stream flow as necessary for a healthy riverine ecosystem and a healthy population of aquatic life. The statute defined drought conditions as any condition which results in a stream flow that is lower than an acceptable Flint River stream flow. EPD's evaluation of those data in February 2012 indicates that severe drought conditions can be expected. When such a prediction is made, the statute provides EPD with an irrigation reduction auction water management tool whose purpose is to limit the impact of irrigation water use on Flint River flows. EPD will not implement such a auction this year.

EPD's evaluation of flow conditions in some of the tributaries feeding the Flint River - before irrigation – indicates low stream flows and base flows. These streams may go dry because of a combination of extended lack of rainfall and already depleted aquifer levels, resulting in little or no contribution from the aquifer to stream base flow. In such instances there is no stream flow from which farmers may withdraw, and the water level in some portions of the aquifer may be so low that further withdrawals would not have a material adverse impact on the base flow in some of these streams. Where such instances occur, there would be limited or no value in paying farmers to cease irrigation from non-existent stream flow and groundwaters already too low to affect stream flows.

"EPD has analyzed data on stream flows and determined that a reduction in irrigation would not make a difference this year," said EPD Director Jud Turner. "Southwest Georgia has been in drought for XX months and it's going to take a significant amount of rain to improve conditions."

Along those tributaries where there are indeed flow benefits associated with suspending irrigation (e.g., Ichawaynochaway Creek), the 2012 net value (to growers) of an acre of major farm commodities is expected to be in the $300 to $700 range. The average per acre price Georgia paid to suspend irrigation acres during the '01 and '02 auctions was between $127 and $136. (There is likely to be legitimate questions regarding why EPD does not suspend irrigation water use by those permit holders who are subject to involuntary suspension of their ag water use.) Given such high farm commodity prices in 2012, there will be no incentive for eligible farmers to participate in an auction. Georgia's drought protection fund does not contain the financial resources necessary to finance suspension of irrigation acres in the range of $300 to $700 per acre.

EPD is working closely with the U.S. Fish and Wildlife Service to demonstrate how flows in Spring Creek could be augmented using groundwater. (More details about augmentation program.) This is being done to protect specific reaches of Spring Creek during periods of low flows caused by drought.

EXHIBIT

Caldwell 21

31. FX-67 - Flint Studies Work Plan – Email and Draft Agenda for Kickoff Meeting

From: Capp, James
Sent: Friday, June 27, 2014 11:41 AM
To: Turner, Jud
Cc: Walker, Mary; Cowie, Gail
Subject: RE: Flint studies work plan - Draft Agenda for Kickoff Meeting
Attachments: kickoff meeting outline 06272014.docx

Jud,

Please see the attached draft agenda for a kickoff meeting regarding development of improvements to the Flint River Drought Protection Act. You will note the potential for an outside facilitator. I'm not sure this is really necessary but it is an option to consider.

Please let us know how you would like us to proceed.

Jac

From: Cowie, Gail
Sent: Monday, June 23, 2014 12:12 PM
To: Turner, Jud
Cc: Walker, Mary; Capp, James
Subject: Flint studies work plan

Jud, please see attached for a three-page outline of activities directed toward a January 2016 legislative package for the Lower Flint basin.

Activities are laid out on two tracks: 1) stakeholder/political outreach and 2) scientific/technical studies. In each track, I've identified immediate next steps as well as areas where Director's Office feedback would be valuable.

We will proceed with the internal work on the second track, pending further discussion. I look forward to your reactions.

Gail

Lower Flint Drought Protection Kick-Off Meeting Outline

Proposed 3 hour meeting in mid-August, Jones Center (tentative)

Title: Toward More Comprehensive Drought Protection for the Lower Flint Basin

Messages

- Impetus for action
  - Increased frequency of drought in recent years
  - Extreme low flows observed in recent years, unlike those observed in previous drought periods
- Benefits of supporting streamflow during droughts
  - Localized benefits to E&S species
  - Regional benefits to agricultural producers from decreasing uncertainty due to E&S concerns and improving the sustainability of the basin's water resources
  - Regional and state benefits from increasing low flows in streams that flow into Florida and further demonstrating the state's responsible management of the ACF basin
- What SB213 does and does not accomplish
  - Example: Clarifies Director's authority to protect augmented streamflows but does not help us determine, in a strategic way, where to undertake augmentation and where to pursue other practices
- Process that EPD is undertaking to move toward comprehensive drought protection
  - Focus on targeted locations in the lower basin
  - Focus on proximate rather than ultimate solutions
  - Studies and policy development as coordinated sets of activity over next year and half

Agenda

9:00 Coffee and check-in

9:15 Introduction (EPD or external facilitator)

9:20 Where we are and where we need to go

EPD perspectives (Jud Turner)

SW Georgia perspectives (Panel)

- Richard Royal
- Farmer (Lucious Atkins or Jimmy Webb; suggest getting feedback from Richard)
- "Greener" representative (Robin Singletary?)

10:00 Next round of studies and policy development

Goals: What we want to accomplish (Gail Cowie) [5 minutes]**

What does the current science tell us?

- Potential streamflow benefits from irrigation removals in different parts of the basin (Wei Zeng) [15 minutes]. Note that this could be turned to causes of streamflow declines; therefore delete?
- Availability of groundwater resources (Woody Hicks, Doug Wilson, and/or Jim Kennedy) [20 minutes]
- Multiple alternatives identified to date (Gail Cowie) [10 minutes]

11:00 What do we need to know to move toward more comprehensive drought protection for the Lower Flint Basin? (Facilitated group discussion)

11:30 Wrap-up (EPD or external facilitator)

Potential Participants

First tier:

- Richard Royal, LFO Chair
- Lucious Atkins, Baker County
- Jimmy Webb, Calhoun County
- Mike Newberry, Early County
- Hal Haddock, Early County
- Cader Cox, Mitchell County
- Glenn Cox, Mitchell County
- Bubba Johnson, Mitchell County
- James Lee Adams, Mitchell County
- Marty McLendon, Calhoun County
- Charles Stripling, Mitchell County
- Robin Singletary, Coveyrise Plantation
- Gordon Rogers, Flint Riverkeeper
- Deron Davis or Thomas Farmer, The Nature Conservancy
- Doug Wilson, Water Planning & Policy Center
- Woody Hicks, Jones Center
- Calvin Perry, Stripling Irrigation Research Park
- GA Farm Bureau staff representative (Jon Huffmaster, Jeffrey Harvey or Tas Smith)
- Bryan Tolar, Agribusiness Council
- GA Dept of Ag representative

Possible additions (or follow-up contacts):

- David Holton, Baker County
- John Bridges, Decatur County
- Murray Campbell, First United Ethanol
- Steve Golliday, Jones Center
- Paul DeLoach, Flint Riverkeeper Board
- Commodity Commission representatives (Don Koehler, Richey Seaton)
- Bob Hanner or other GSWCC representative
- Local government representatives (Jerry Pressley, Mitchell County; Connie Hobbs, Baker County; Chris Hobby, Bainbridge)
- Albany WG&L Commission representative
- P&G representative
- Legislators: Ross Tolleson, Tom McCall, Tyler Harper, Buddy Harden

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** Draft goals for review:

- Define sustainable practices to improve low flows in priority areas within the Lower Flint basin;
- Develop funding and implementation mechanisms to bring those practices online; and
- Determine the extent to which those practices contribute to the support of specific benefits derived from the water resources of the Flint River basin (i.e., as indicated by accepted or proposed streamflow targets).

32. FX-49B - Water Resources and Security Issues in the Fling River Basin, Georgia EPD Stakeholders Meeting Presentation

EXHIBIT B

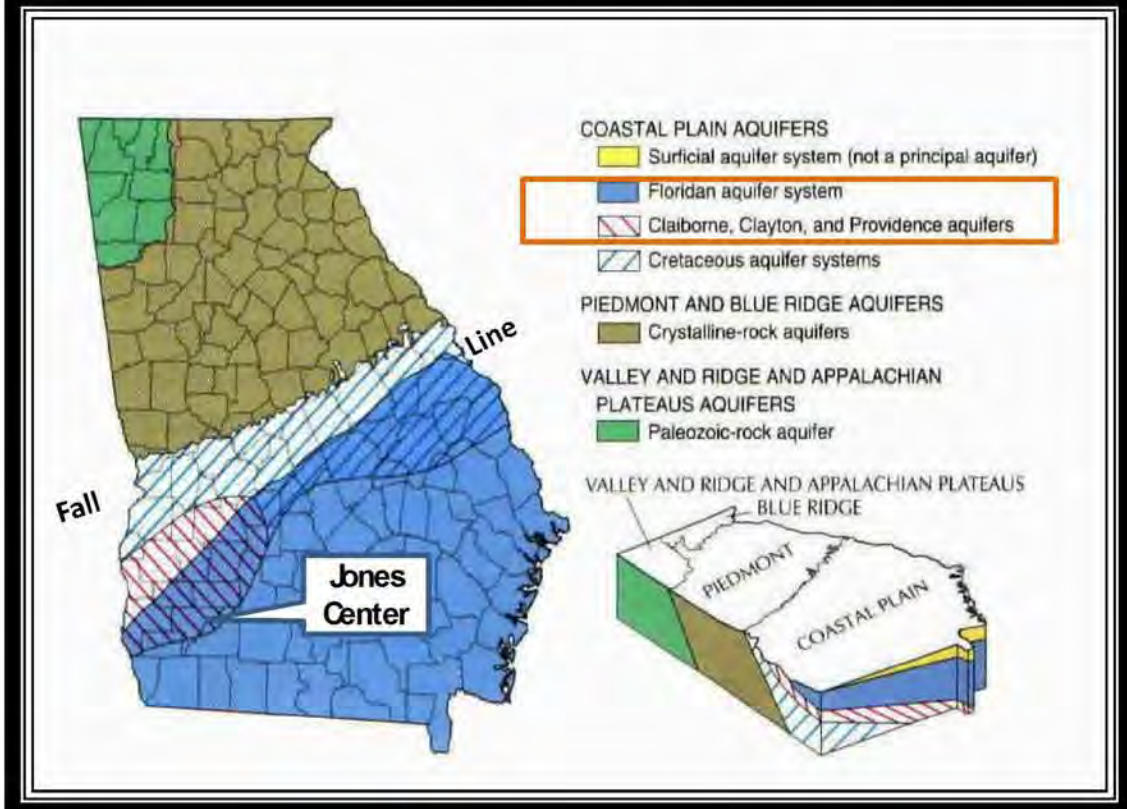
Water Resources and Security Issues In the Flint River Basin

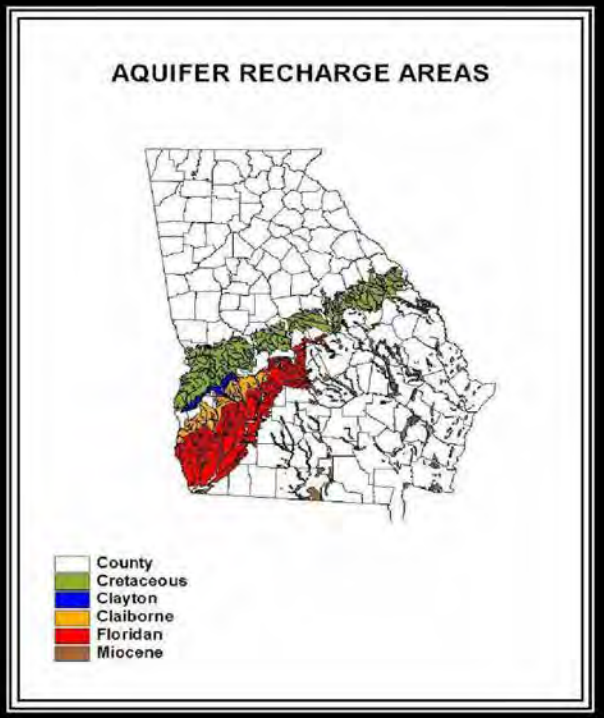
Georgia EPD Stakeholders Meeting

November 21, 2014


Agriculture is Georgia's Largest
Water Consumer

Georgia's Groundwater

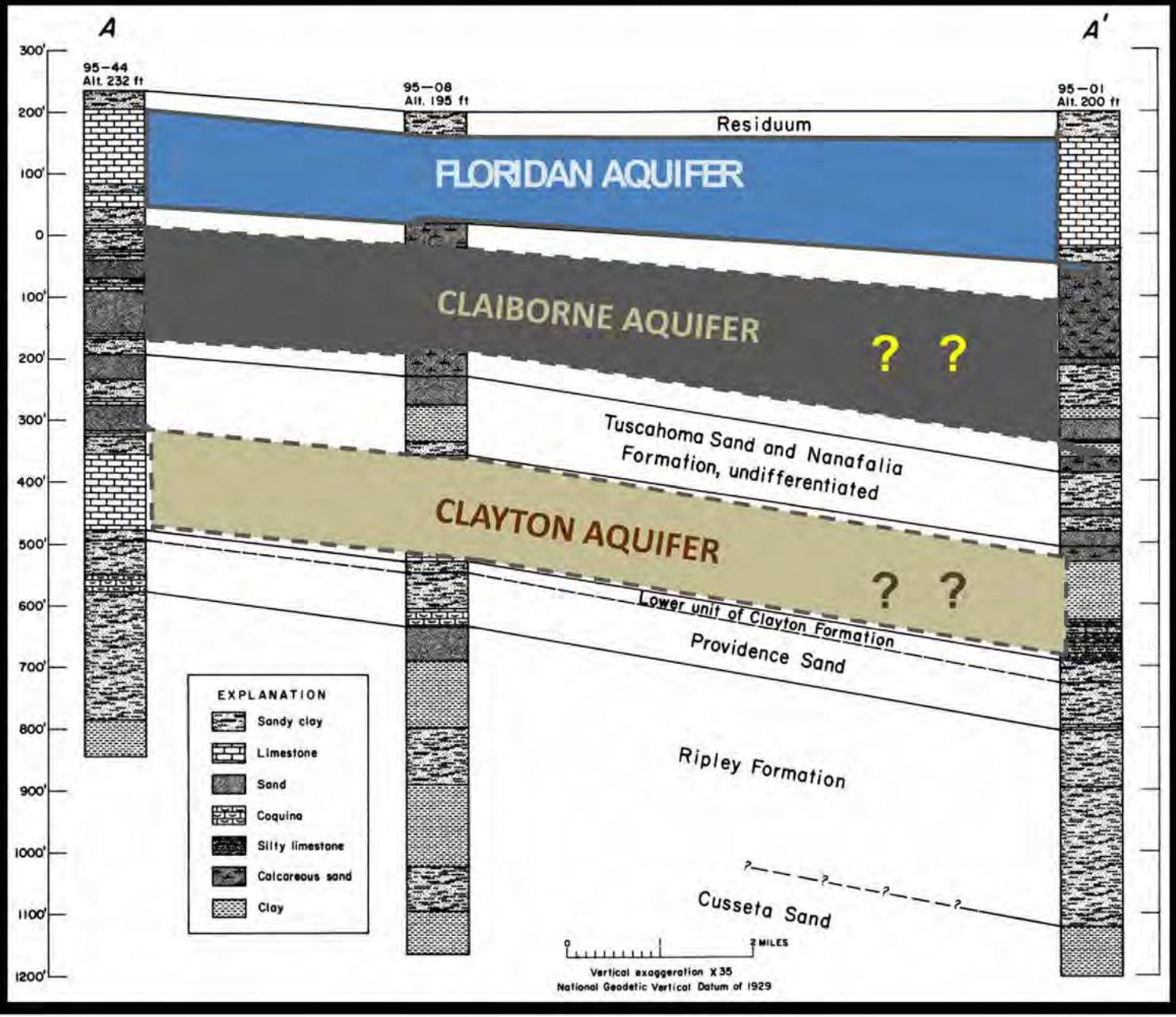




In SW Georgia, our groundwater supply options are the Floridan, Claiborne, Clayton, and Providence aquifers. Presently each of these aquifers are used for groundwater supply to some capacity

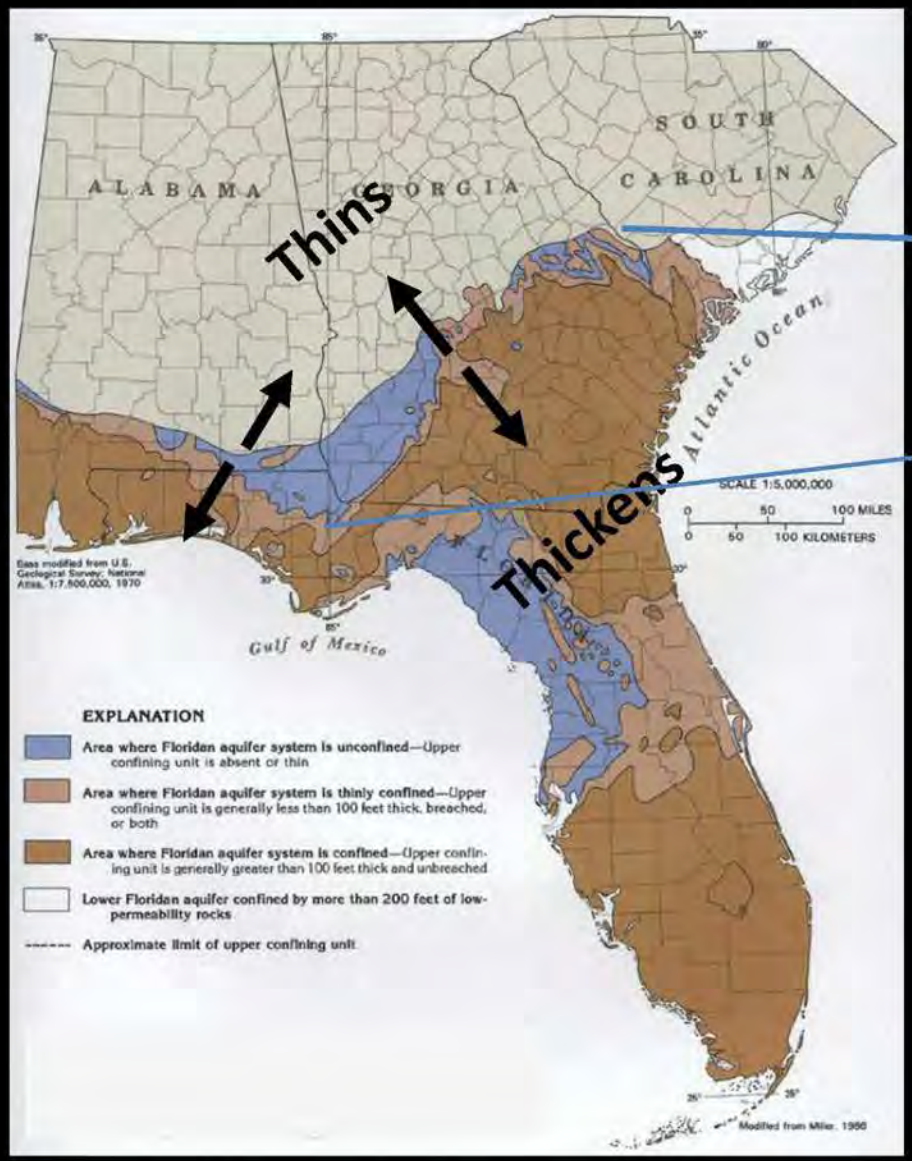
GA00278815

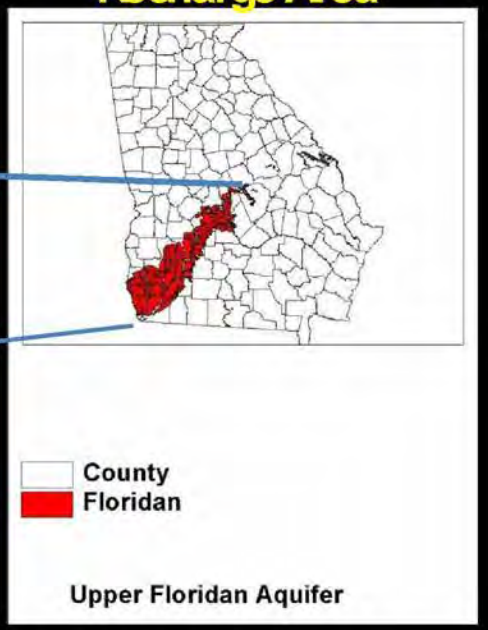
Geologic Profile in Dougherty County



GA00278816

The Floridan Aquifer supplies more than 80% of the water supply in SW Georgia

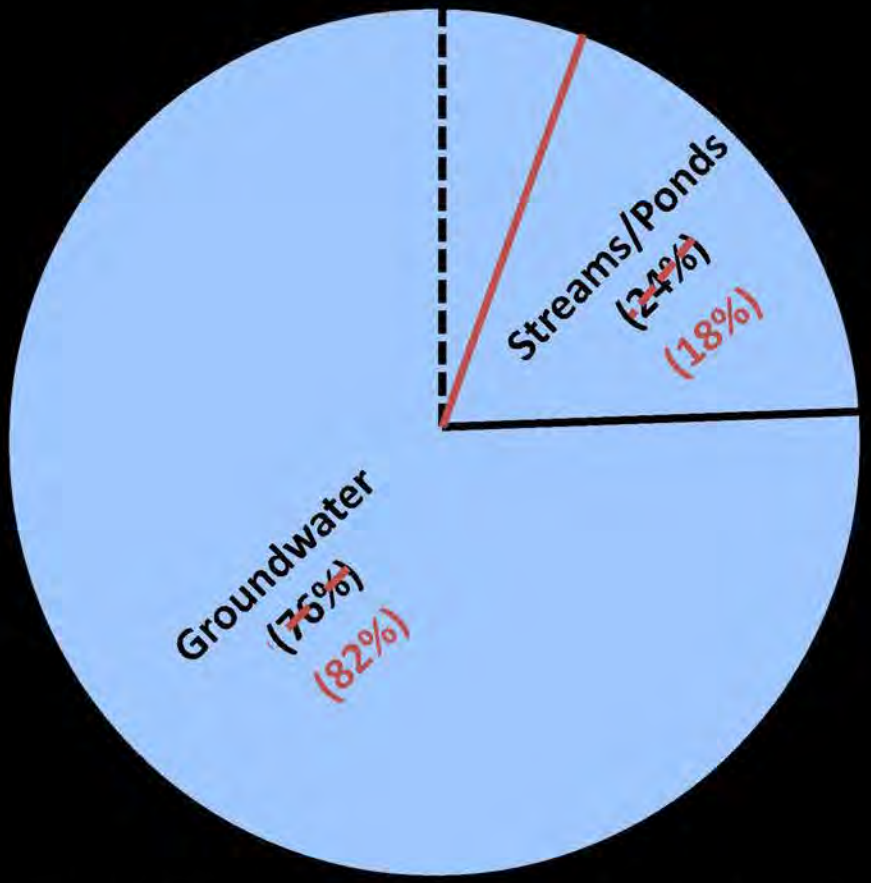




Becomes thinner and less productive to the north

GA00278817

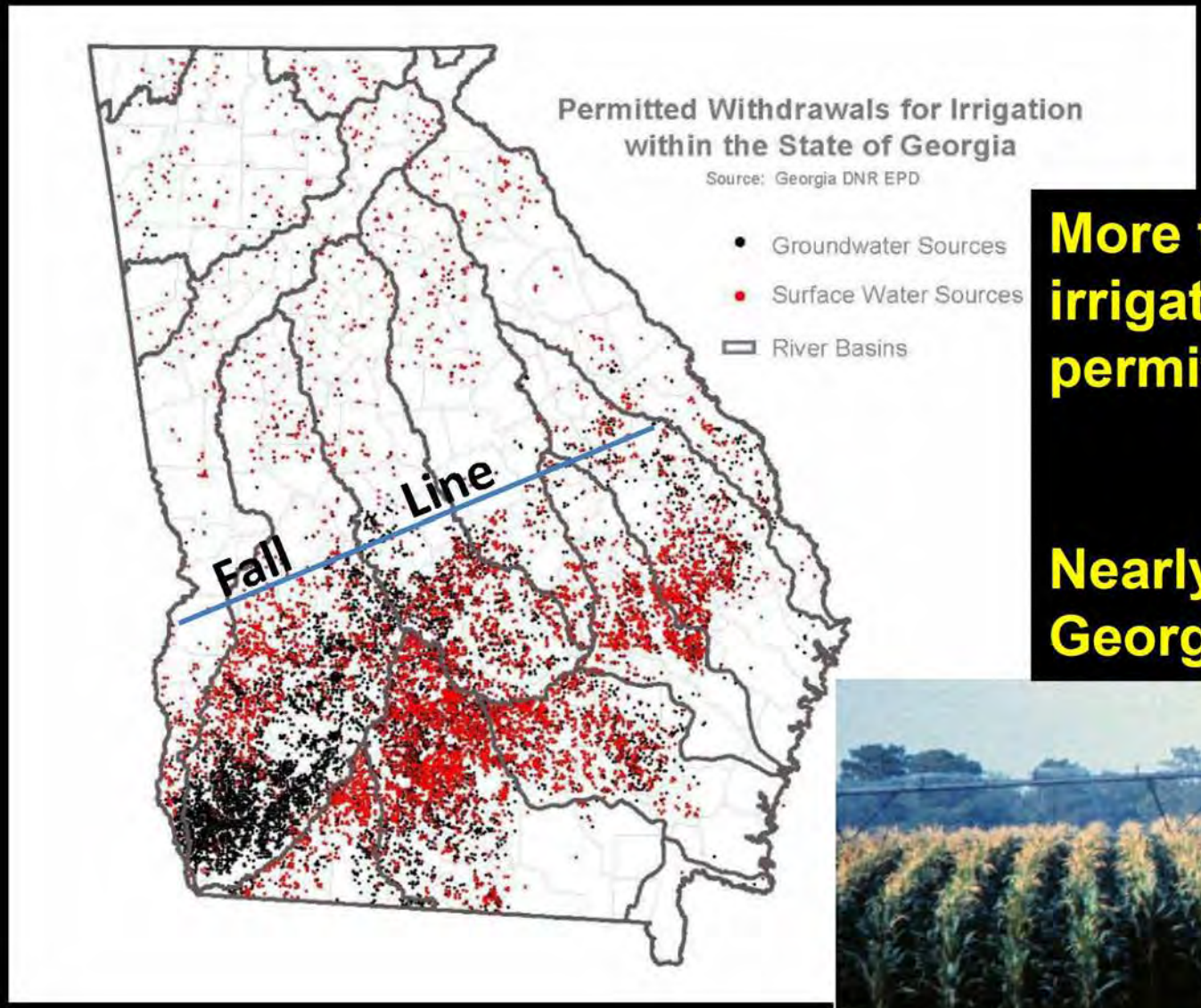
Distribution of Permitted Agricultural Withdrawals in the 21-County LFRB Area (2012)



EPD permitted withdrawal is about 9.5 Bgals/ day—average use is about 1.3 Bgals/ day during the 6-month growing season

Source Ga. DNR-EPD, FRWPPC, and UGA

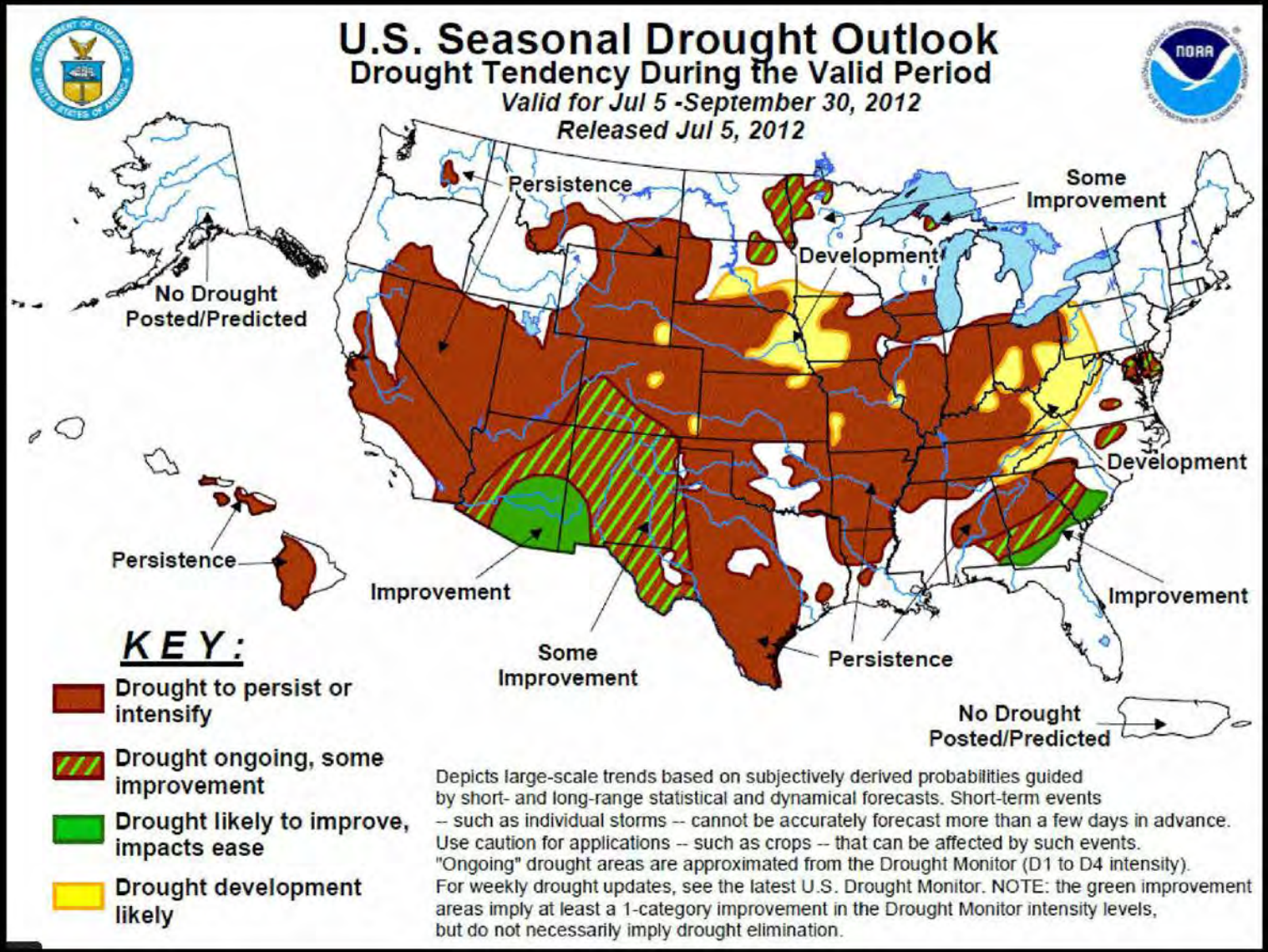
Agricultural Water Demand



More than 24,000 irrigation permits statewide

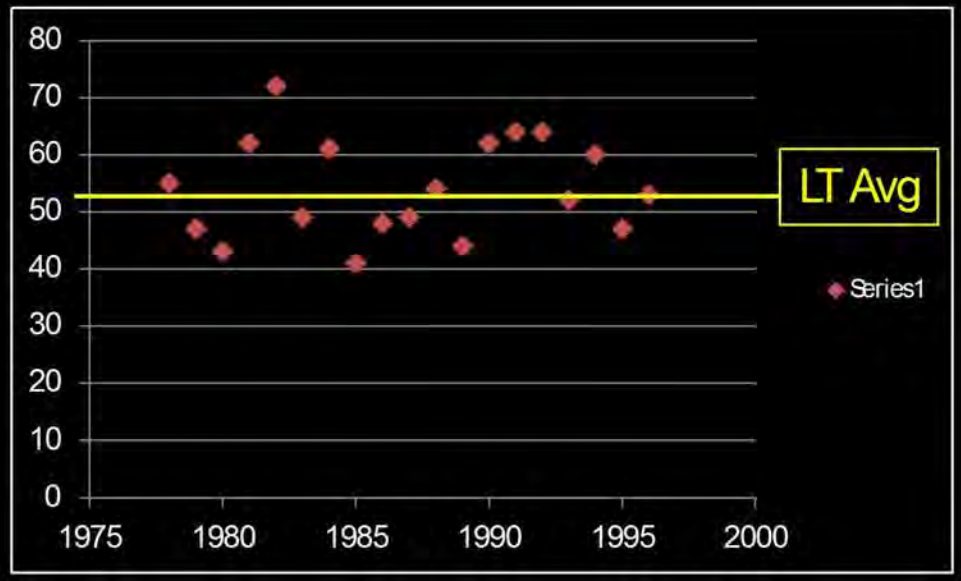
Nearly 8,000 in SW Georgia

Our Climate is in Control

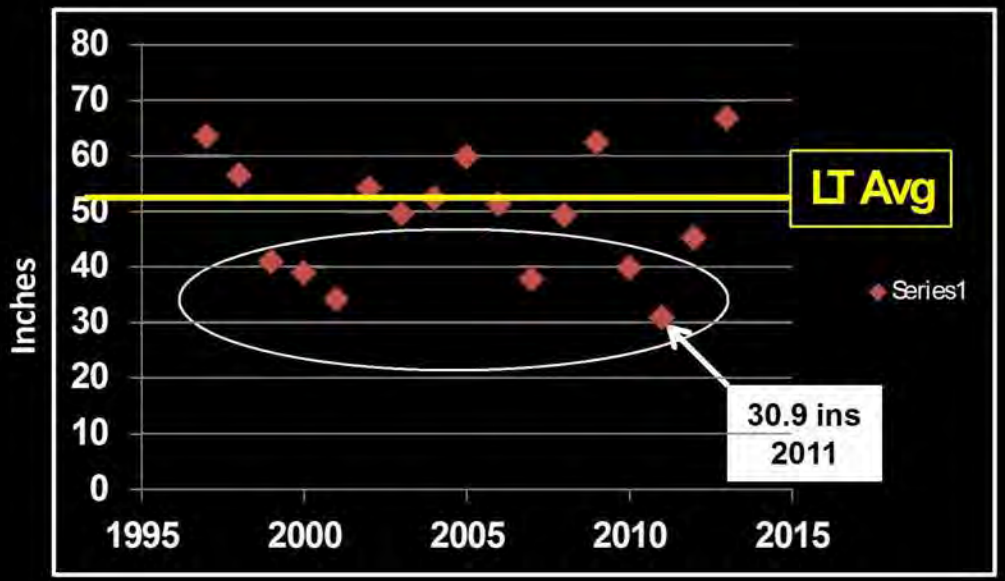


GA00278820

Annual Rainfall at Newton, Georgia



Annual Rainfall at Newton, Georgia

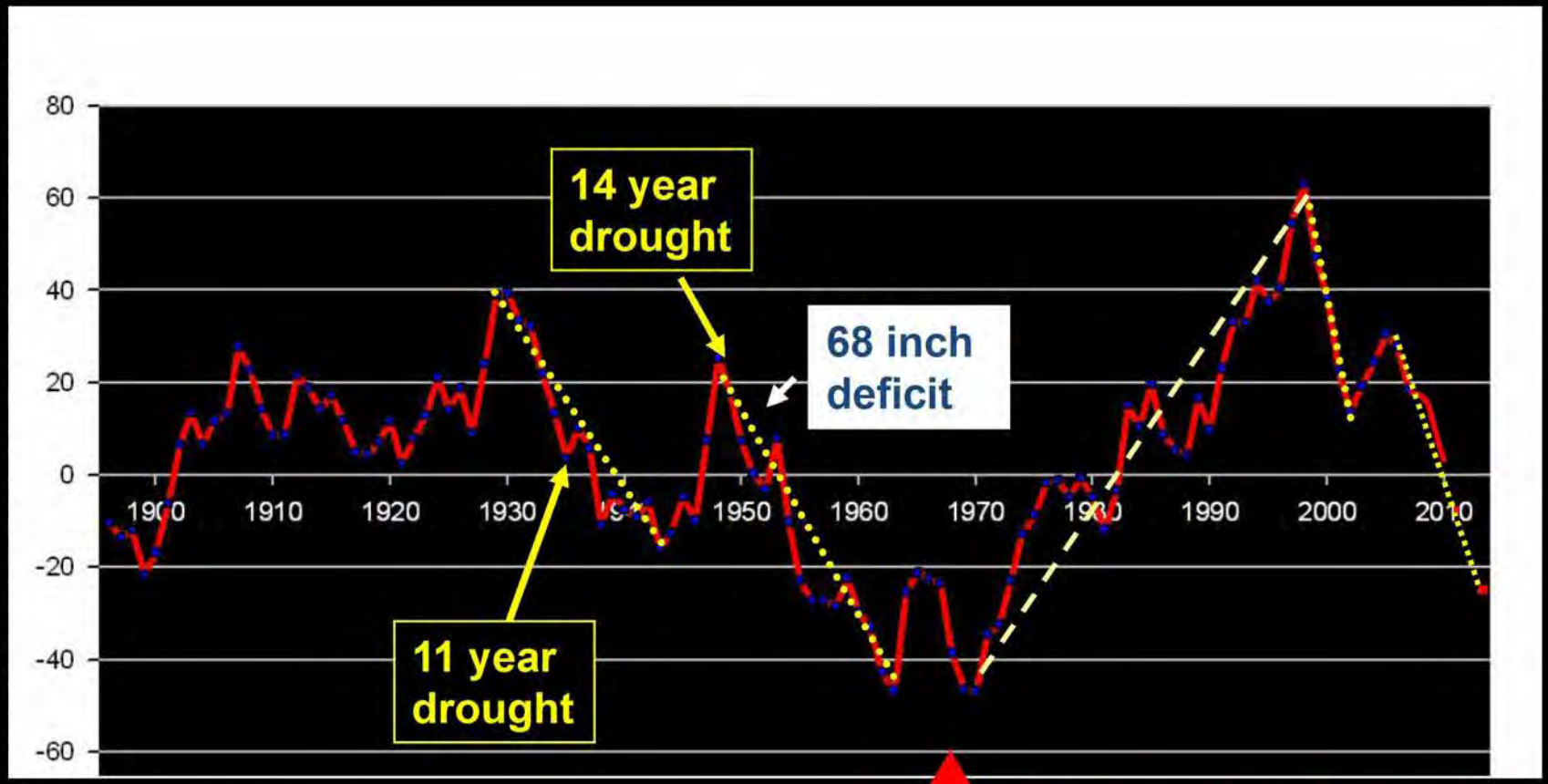


Below normal rainfall in 10 of the last 14 years, and significantly below normal in 6 years

Climate change or normal drought cycle???

GA00278822

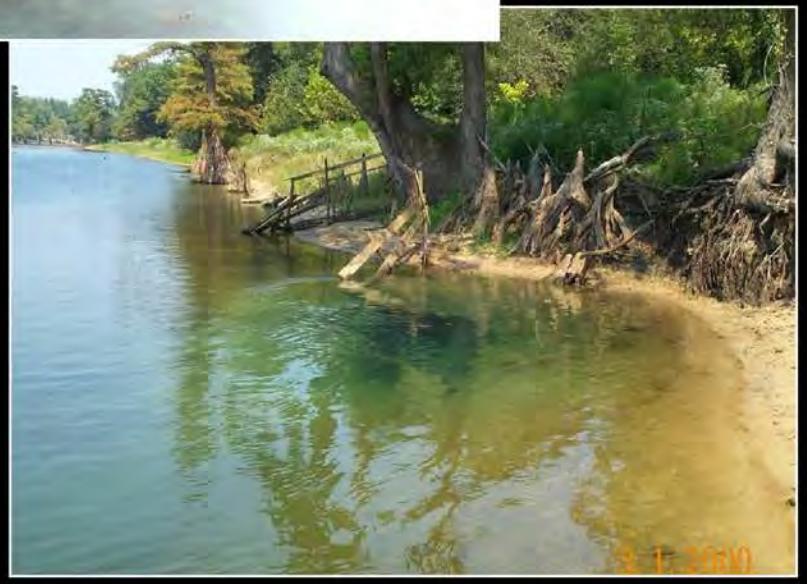
Rainfall Trends in SWGA



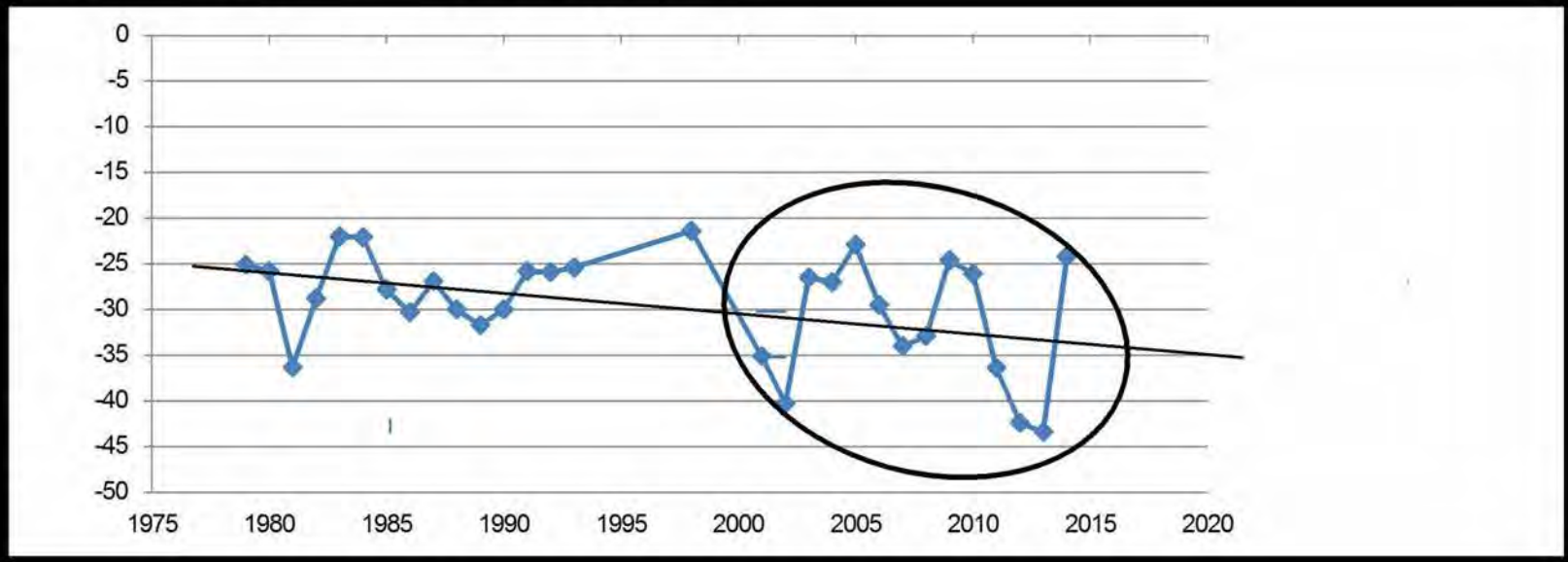
Data provided by NOAA

GA00278823

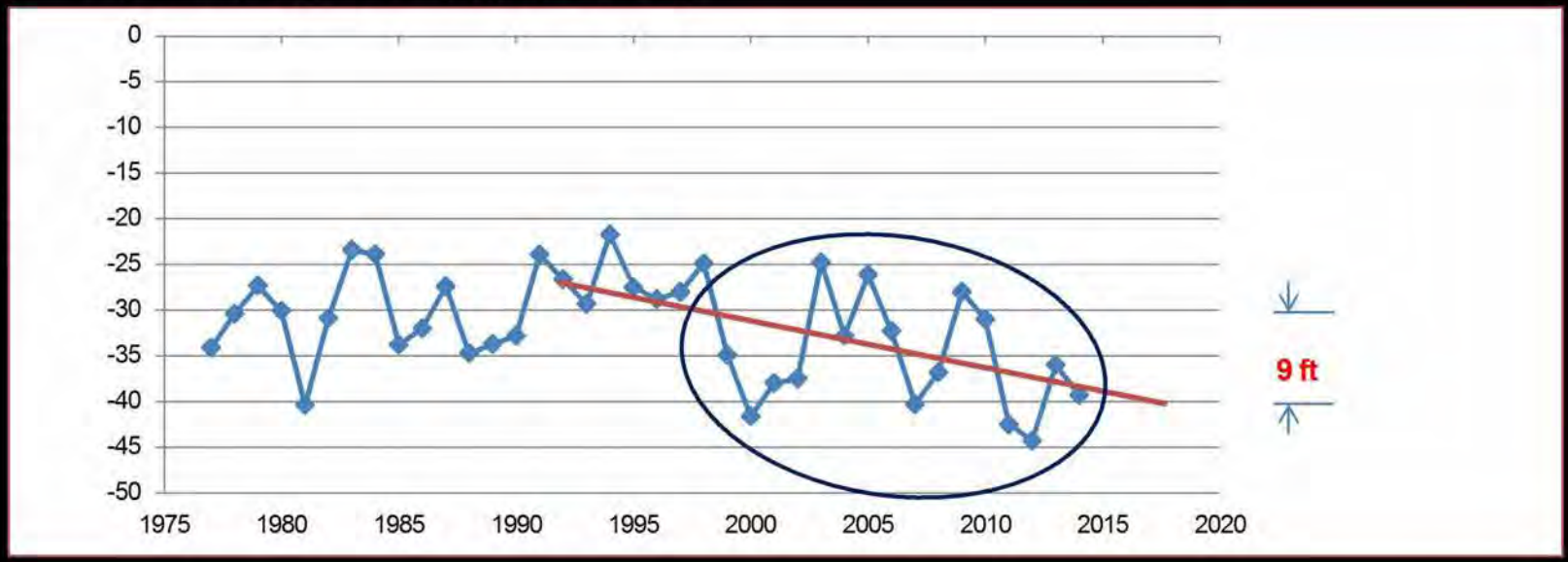
Groundwater Levels



Floridan Aquifer – Dougherty County



Floridan Aquifer – Miller County



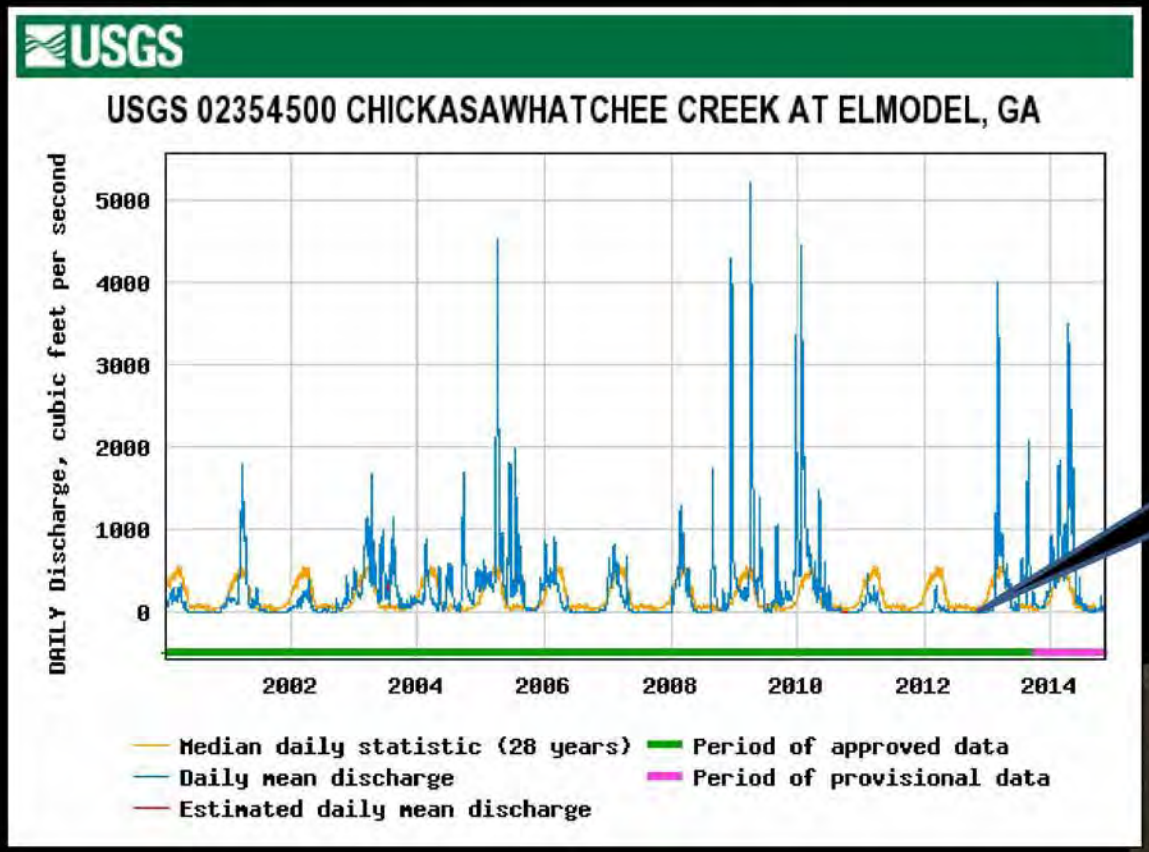
Depth below land surface, in feet

GA00278825

Stream Flows in the Flint Basin

Flint River at Sprewell Bluff State Park

Groundwater levels and rainfall effect stream flow

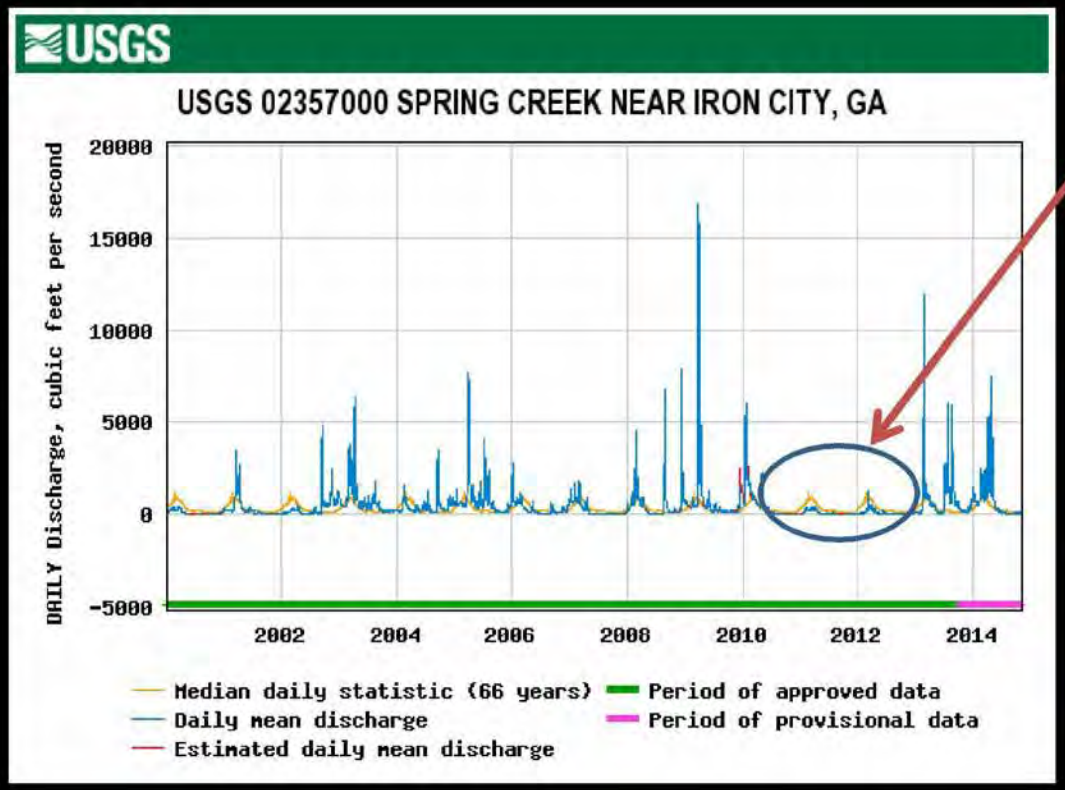


Stream non-flowing in some months in 9 of the past 14 years

USGS Gaging Station

GA00278827

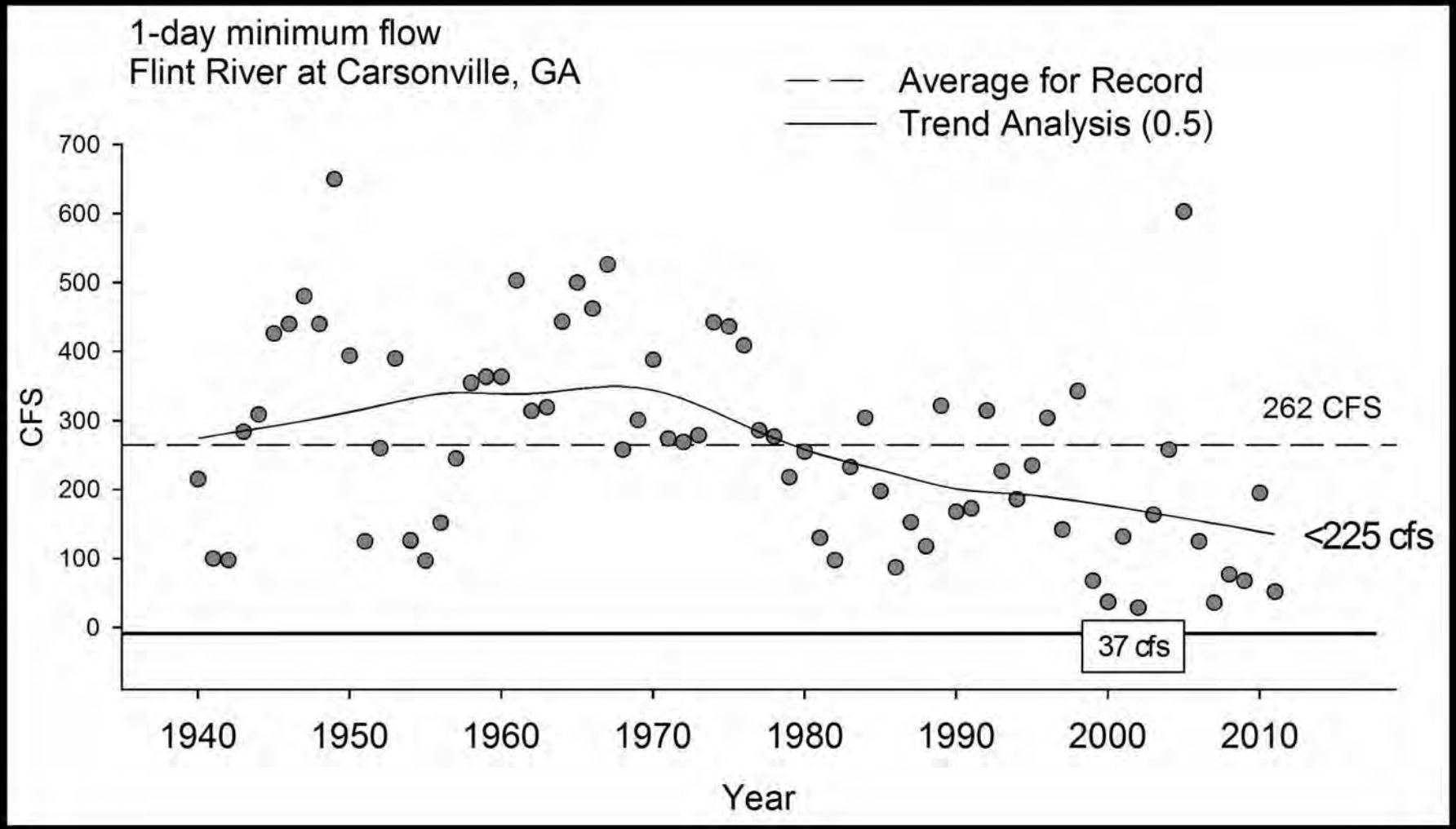
Spring Creek did not have measureable flow in some months during 8 of past 14 years



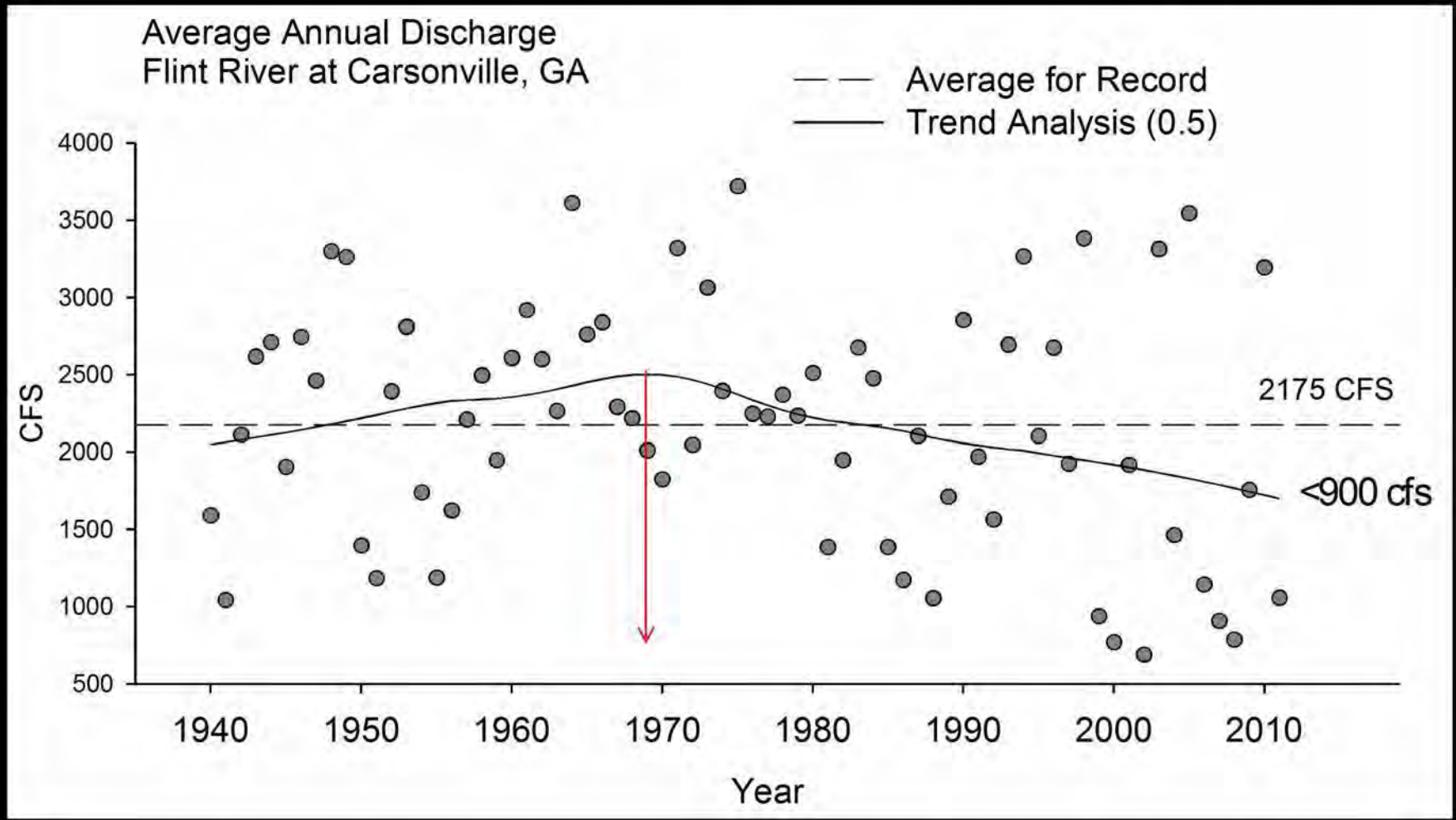
Had measureable flow in only 9 of the 20 months from July 2010 until February 2013

October 2007

Upstream uses in urban Atlanta region are negatively impacting Flint River flows

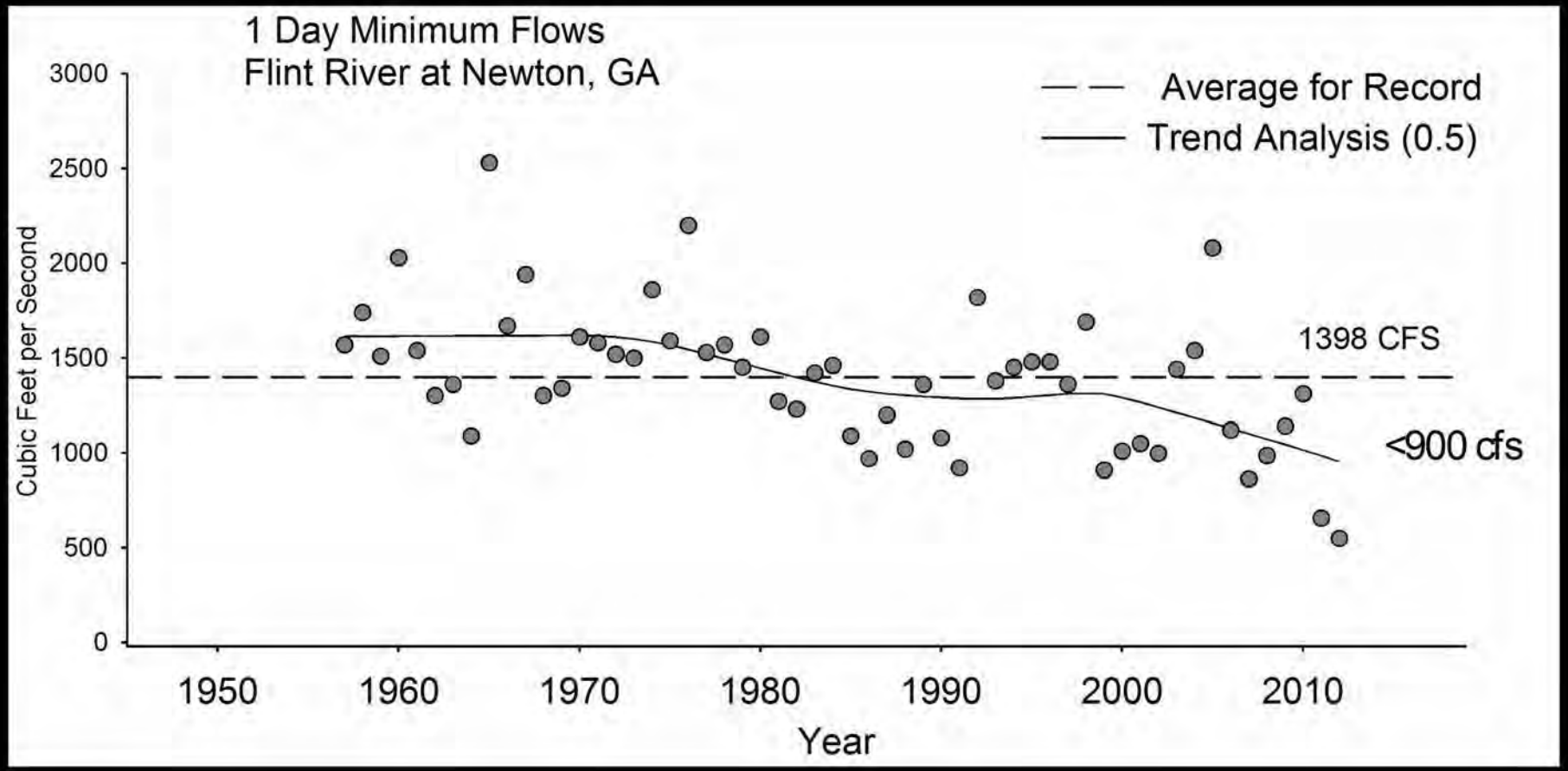


LT Flow Changes in the Upper Flint



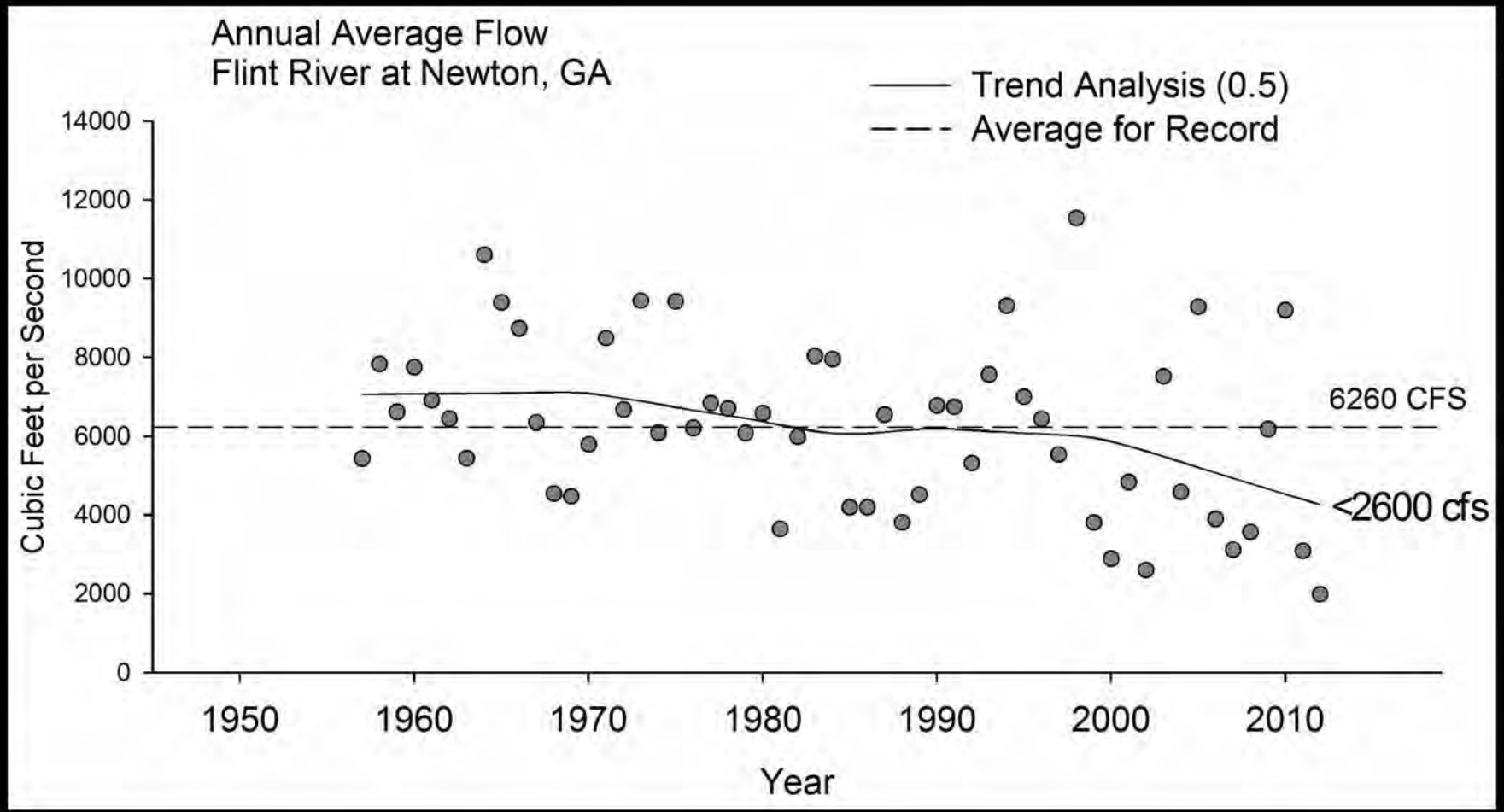
GA00278830

Flow Changes in the Lower Flint



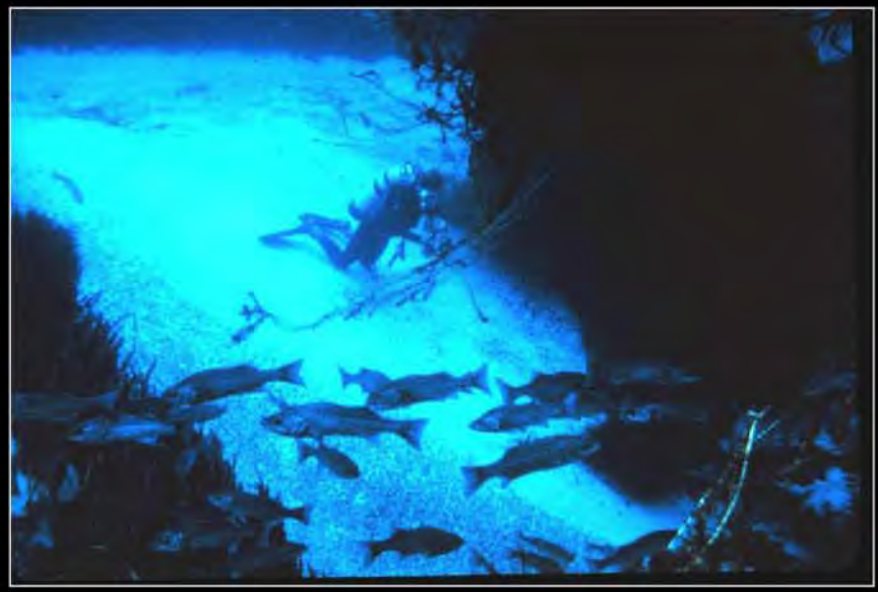
GA00278831

LT Flow Changes in the Lower Flint



GA00278832

We are morally and federally mandated to protect the Critical Habitat

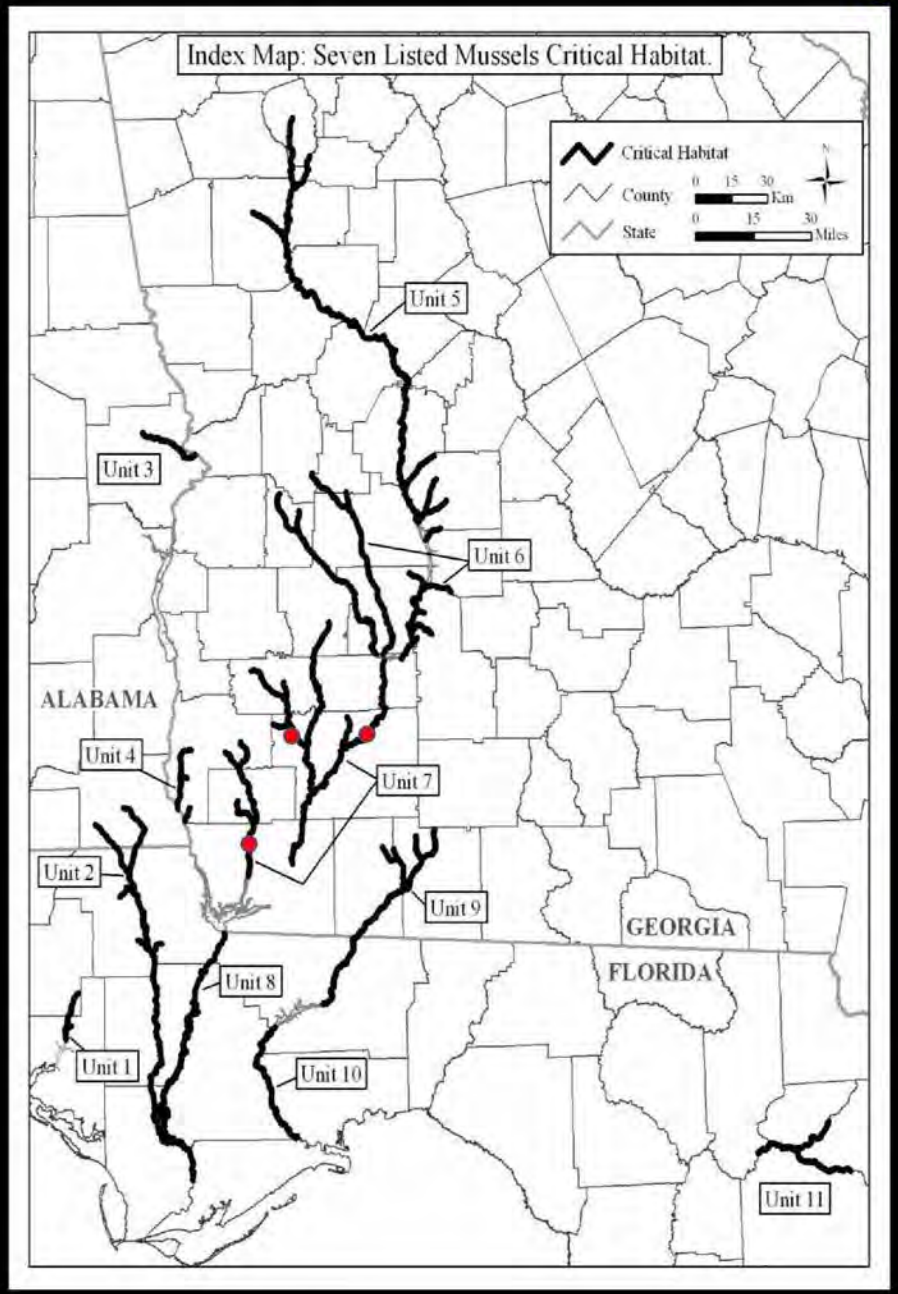


"Nothing is more priceless and more worthy of preservation than the rich animal life with which our country has been blessed"

President Richard M. Nixon
ESA-1973

GA00278833

Critical Habitat for the ACF



Mussels

Fat three-ridge (E)
Chipola slabshell (T)
Purple bankclimber (T)
Shiny-rayed pocketbook (E)
Gulf moccasinshell(E)
Oval pigtoe (E)

Fish

Gulf sturgeon

GA00278834

Freshwater Mussels

Source unknown

Freshwater mussels are sedentary, long-lived (some more than 100 years) mollusks

They nestle in sediments while filtering particles and oxygen from the water to feed and breathe. Mussels are good biological indicators of stream health.

Mussels are vulnerable to stream habitat disturbances such as dams, channelization, pollution, exotics, and dry stream beds

Freshwater mussels are one of the most endangered animals in North America

Mussels are our best natural water purification systems

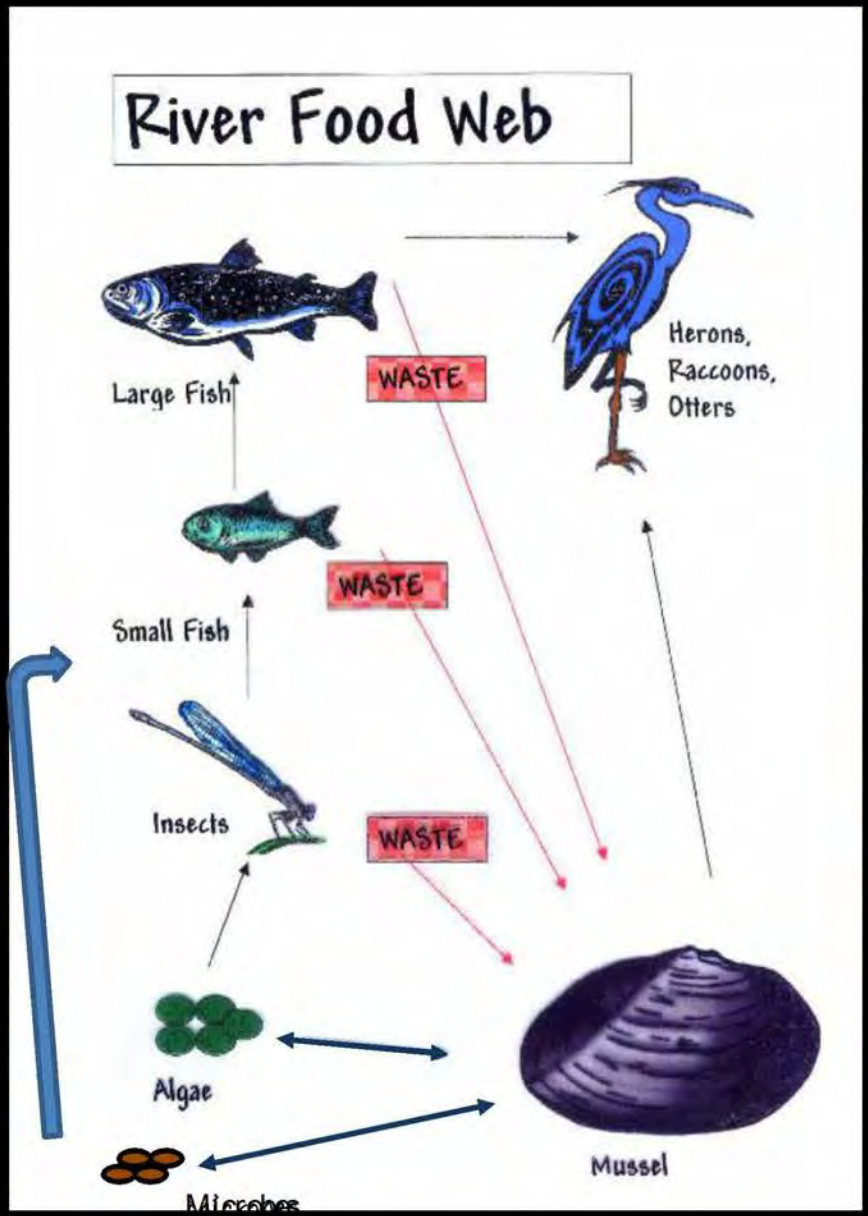
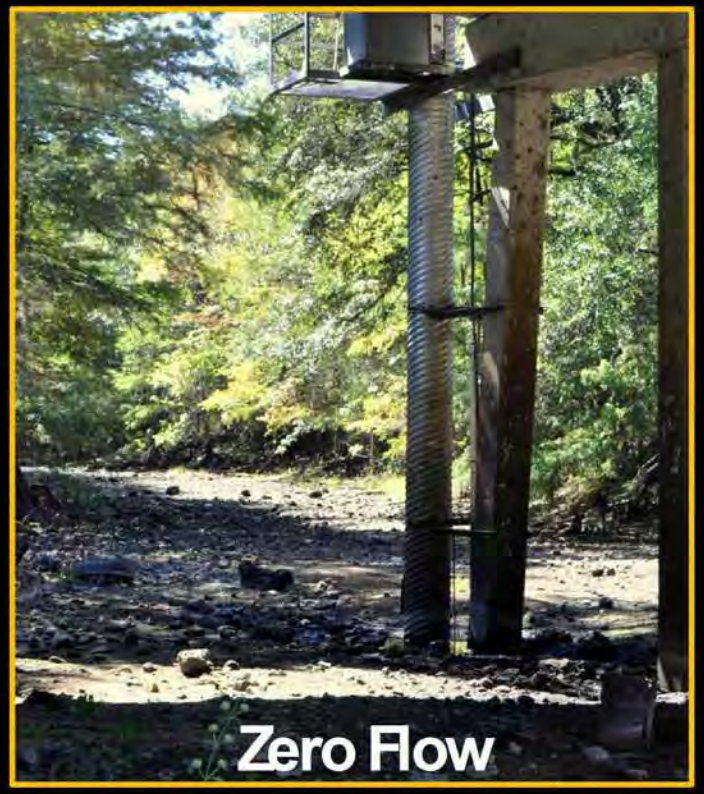
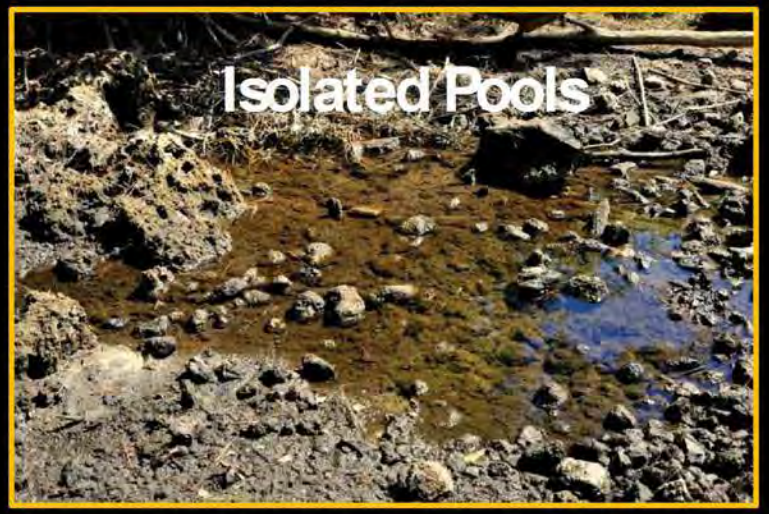


Photo Credit: Shane Ruessler

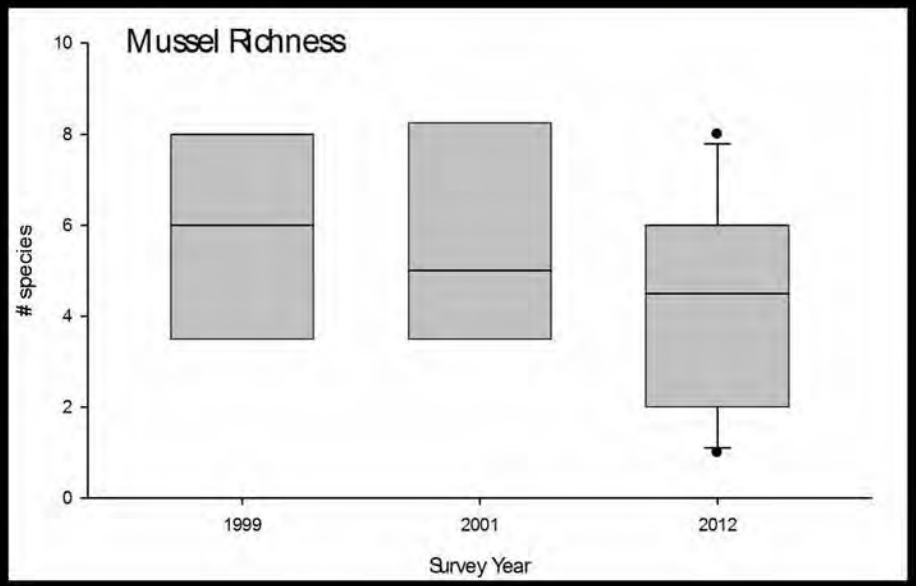
“Freshwater Mussels Need Water To Survive”

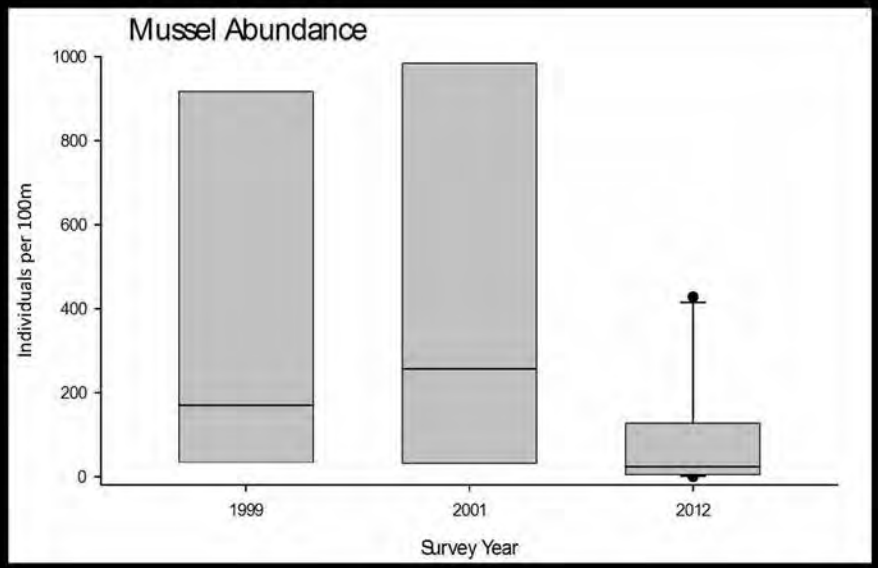




Longterm Trends

- Historically there has been high variability among sites
- For overall mussel richness (kinds) and abundance there is a declining trend





GA00278838

So, where are we at in terms of the health of our aquifers, streams, and animals?

1. Our groundwater levels suffer from heavy irrigation pumping, particularly during drought. But, the Floridan aquifer has historically recovered with the return of abundant rain. But, GW declines impact flow to streams.

2. The flow in the Flint River is on a long-term decline that began more than 45 years ago.

3. Flows have declined in the upper part of the Flint from human consumption, IBT's, and from ET loss from myriad lakes and ponds constructed in the Flint watershed (other causes???).

4. Flows 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 river, and from streams, which have a direct effect on the resource.

5. 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.

6. Stream drying and degraded aquatic habitat within Federally defined Critical Habitat has resulted in significant loss in Federally protected freshwater mussels.

33. FX-71 - Drought Protection in the Lower Flint Basin, Georgia EPD Stakeholder Meeting Summary

GEORGIA ENVIRONMENTAL PROTECTION DIVISION

DROUGHT PROTECTION IN THE LOWER FLINT BASIN
STAKEHOLDER MEETING SUMMARY

November 21, 2014
Jones Ecological Research Center
Newton, GA

EPD Director Jud Turner opened the meeting by recognizing the importance of local and state actions on drought protection in the Lower Flint basin. He stated that EPD is kicking off its next round of work on this topic and thanked participants for taking the time to provide feedback.

Director Turner introduced Woody Hicks with the Jones Ecological Research Center, who he asked to give a scientific baseline on resources in the Lower Flint. Woody's presentation addressed trends in precipitation, observations from recent droughts, groundwater levels, streamflow patterns, and long-term trends in freshwater mussels in the lower Flint River basin. The presentation provided useful background to inform discussions of long-term drought protection in the basin.

Director Turner then gave an overview of the activities that the State of Georgia and EPD have undertaken over the past 15 years to address drought issues. He started with the original Flint River Drought Protection Act, which was passed in 2000 and applied in 2001 and 2002 to take land out of irrigation. The funds weren't targeted, among other problems, which contributed to the expenditure of millions of dollars with little to show in terms of return on that investment.

Other initiatives mentioned by Director Turner include the agricultural metering program, the 2006 Flint River Basin Plan, regional water planning under the 2008 State Water Plan, and the investments in modeling to improve our understanding of connections between surface and groundwater resources. He also described the pilot groundwater augmentation project on Spring Creek and EPD's 2012 suspension of agricultural permitting. The Governor's Water Supply Program has helped the state take a larger role in water supply development, including the Baker County demonstration project that is evaluating the feasibility of aquifer storage and recovery in Southwest Georgia.

Director Turner recognized the good work being done by parties other than state agencies, particularly in the area of irrigation efficiency. The Stripling Irrigation Research Park, the Flint River Partnership, and the Flint Soil and Water Conservation District have all helped make the region a national leader in irrigation efficiency. In the metro Atlanta area, the money invested in water conservation and returning highly treated wastewater is also an important part of the good story that Georgia can tell.

Director Turner then turned toward the question of what happens now. He described the 2014 amendments to the Flint River Drought Protection Act, recognizing again that these are modest steps toward improving drought protection and that more is needed to provide long-term solutions. 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.

In the Flint basin, drought is one of the biggest problems. Unlike other parts of the country, the region relies on an aquifer that recharges, despite the periodic droughts. Additional changes in the Flint River Drought Protection Act are one way to move forward on effectiveness and sustainability, and EPD may bring legislation as soon as the 2016 session.

Director Turner stressed several principles as we work on long-term drought protection for the basin: find low hanging fruit; the perfect should not be the enemy of the good; and identify actions that provide a good return on investment. He also noted that, because of the differences in geology, hydrology, and water use, amendment of the Act will focus on the Lower Flint basin. EPD has initiated parallel activities to address concerns about low flows in the Upper Flint basin.

EPD's initial analysis has suggested several options for further evaluation:

- Transferring water users to deeper aquifers
  - Surface water users
  - Floridan aquifer users
- Augmenting streamflow from groundwater
- Aquifer storage and recovery for streamflow augmentation or for irrigation
- Acquiring easements for permanent removal from irrigation
- Temporary removal of land from irrigation
  - More targeted than provided in the current Act? Other changes to be more effective?

EPD will be evaluating these options in more detail over the coming months and participants were asked to provide input on the information needed to be successful in building long-term solutions to the basin's drought challenges.

To open the discussion portion of the meeting, Gail Cowie described some studies that EPD has underway or in the pipeline. The Water Planning and Policy Center at Albany State has a project underway to evaluate water supply alternatives for surface water irrigators in Ichawaynochaway sub-basin. Several other studies focus on evaluating the capacity of the region's deeper aquifers:

- Baker County aquifer storage and recovery demonstration project will provide information on yield and water quality for the Claiborne and Clayton aquifers
- USGS will be collecting data on yield and water quality from existing and new Clayton, Claiborne and Cretaceous wells
- A Claiborne well at Stripling Irrigation Research Park will provide information on costs, water quality, and crop yield with Claiborne water during the 2015 growing season.

Participants then discussed the information needed to move forward on drought protection in the basin. Questions and answers from the discussion included the following:

- The focus seems to be on the Ichaway watershed, leaving Spring Creek out of the discussion. Why is that? A: We're looking first at the Ichaway to evaluate moving surface water users to the deeper aquifers, because there are more surface water users there than in Spring Creek. We'll likely be looking at different solutions in the Spring Creek basin.
- What do we know about how water use from the Claiborne interacts with the Floridan? Given that there is some interaction, why are we talking about moving users to the Floridan? A: This is clearly an area where more information is needed. The goal is to decrease use of the Floridan aquifer, which has a direct influence on surface water in this area. The data we have indicates there is some interaction between the Claiborne and Floridan aquifers, but it is small. We will be working with USGS to get more information on this question.
- There are questions about capacity of the aquifers. In some areas, growers can't get the capacity they need to operate. A: Yield in different parts of the basin is an area where USGS will be helping us get more information and the well at Stripling will provide some information on operational considerations.
- If a surface water irrigator is moved to the Claiborne, do they lose the permit provisions associated with being a long-standing user? Do they become a 'last-in' user? A: No.
- Would there be a cost-share program to help transfer a user to another water source? How would this work? A: Yes, in principle, some people are taking action, such as moving from surface water to deeper aquifers, which benefits a larger group. It is reasonable for the large benefiting from the move to chip in and share the costs.
- If there's a cost share program, how do you get around the constitutional provision of investing public money in a private endeavor? A: There has to be a demonstration of public benefit, so the science that we're doing is important to justify that.
- What is the plan to learn more about the capacity of the Claiborne so that additional use is undertaken in a way that is not detrimental to this resource? A: This is also an area where more information is needed. We'll be working with USGS to collect data from existing and new production wells in the Claiborne over the next year and incorporating that data in existing EPD models. We will also have new data from test wells that will be added to the analysis in 2015.
- How will success in feasibility of ASR be defined? A: The technical team is working on specific criteria for that.

A number of participants raised questions related to funding and how this effort might be funded. Director Turner raised the topic first, noting that while a funding source is not provided, the current Flint River Drought Protection Act does have a state role in funding drought protection. However, use of state funds in the future will have to be done with an eye toward effectiveness and return on investment. And, given the likely expense, it will be necessary to tap resources beyond those available from the state.

In discussion, participants noted that the State benefits from the region's agricultural economy and has an interest in keeping it going. However, funding the actions under discussion will add up to a large number and people have to be prepared to pay more in the future than they have in the past. The costs are a concern, as farmers' profit margins are thin and many cannot shoulder the cost involved in

switching to alternative sources. Some commented on the difference among users, stating people withdrawing legally shouldn't be penalized to pay for everyone else. In addition, consideration should be given to those users that are retrofitting and conserving. An important next step will be to develop cost estimates (e.g., how many users would go to alternate sources at what cost?).

The potential for agricultural easements to remove land from irrigation was addressed by several participants. There are some concerns because easements were misused in past, but those can be addressed through education and learning from programs like South Carolina's land bank program. Standardized easement criteria may be important to make it work, however. Some participants felt easements should be temporary to allow options for the next generation, while others felt they should be permanent. Either way, it should be clear they take land out of irrigation, not out of production.

Other comments during the discussion included the following:

- Farmers don't waste water; we have good reasons to be good stewards.
- If you're looking at temporary removal from irrigation, the timing of a drought declaration affects a grower's ability to make dryland crop insurance decisions.
- NRCS programs may be a resource to help with this effort.
- The drilling and casing of Claiborne wells should be checked to be sure they are not drawing Floridan water.
- The Upper and Lower Flint should be kept together and not disengaged.
- Subsurface drip is a technology that should be applied more in the basin.
- It's important to have a united Southwest Georgia acting in support of efforts to find long-term drought solutions. Failure to do so could have serious consequences.

Gail Cowie closed the meeting by discussing next steps. EPD expects to have data from the studies currently underway by mid-summer 2015 and will be providing information on the results and related activities at that time. EPD anticipates holding another meeting like this after the 2015 growing season. In the interim, people should contact Gail with any suggestions or questions (Gail.Cowie@dnr.state.ga.us or 404-657-5739).

34. FX-06 - HANDWRITTEN NOTES OF ACF MEETING

ASK TANNER, CHUCK & RON

EXHIBIT 35

Huseby.com GLOBAL LITIGATION SUPPORT 85 YEARS OF TRADITION & EXCELLENCE

1.28.16

Holcolt's Random Thoughts on "Range" of ~~Possible~~ Streamflows

If we tell Corps what we really want, and they start using it in their open EIS process, it becomes public early.

FL & AL might be scared off. Compact may get scuttled.

FL & AL will learn sooner or later what we want, and won't like it. Big question is, should they know sooner, or later (after compact pass?) ?

One advantage of getting low end of range cranked in and evaluated early is, ~~if~~ we get to see (and influence?) what the impacts are, and see FL/AL reactions to them. Depending on their reactions, we can anticipate what we need to adjust for negotiations.

Disadvantage – perhaps allows more time for FL/AL to prepare their arguments against us. Maybe not much time, since WFA expects to start negotiating in Jan.

AL, whatever they want, can be expected to ~~stay~~ delay telling us as long as possible.

Problems we need to be done w negotiating (have a formula)

by 7/98 or 8/98, so there's enough time to have public meeting, brief govs + gov candidates on it, etc.


AH
Cole
Kew
Dale
For
Ful
Kew
Hall

HOW DO WE GET RANGE?

ACF

Lanier ≠ WPt no longer used for new releases or ~~peaking power~~ just M&I, Rec, & WQ/Envir
(except incidentally when reservoir is above 1068?)

Satisfy 2050 water needs for the following from Lanier:

City of Atl.	100%
City of Buford	100%
City of G'ville	100%
City of Cumming	100%
Cobb Co	50%
Dawson Co	100%
DeKalb Co	100%
Forsyth Co	100%
Fulton Co	100%
Gwinnett Co	100%
Hall Co	100%

(Use the more conservative ARC per capita consumption for all)

Note - other 50% from Allatoona.

Maintain min Q of 850 cfs @ Peachtree Ct. (just below confl.)

Maintain min Q of ___ cfs @ W.Pt. (just below WPt Dam)

Set this to get about what Columbus wants @ Columbus, considering trib inflow WPt to Col.

Ag use from Flint as we project but assume all NEW permitted acres (1998 and beyond) consume 25% less water than existing (1997) situation, AND assume 25% of existing (1997) farmers will

retrofit their systems and reduce water use 25% from current.

Then, whatever is left to go to Flint does so.

And - new M&I for South Metro Atl. (Spalding, Fayette, Pike, Coweta) and all existing M&I intakes get their 2050 needs.

FL gets (at Brownstown or Sumatra, or do we measure @ Chattahoochee/Seminole?) rest of Flint, rest of Chattahoochee, and rest of spring flows.

ALL of the above to be calculated on a worse drought than '86-'88 - create a synthetic one from worst cases @ basins gages.

ACT — (Calculate all the below @ worst Synthetic drought, as in ACT

Allatoona & Carters not used for New except as incidental to hydropower.

Allatoona to provide 2050 needs of the following:
- Cobb County — 50%
- Cartersville/Bartow 100%
- Cherokee County 100%

Carters to provide 2050 needs of
- Chatsworth/~~Murray~~ + Murray Co 100%
- Ellijay / Gilmer Co 100%
- Dalton/Whitfield — All of Daltons needs above their current permitted w/D's from Carters ga.

All other existing M+I & Ag to go to 2050 needs in basin, all new ag demands will be met, but @ 25% conservation.

Whatever is left @ Rome Coosa gage is the number.

(What about Chattooga R and Cedar Ct ?)

We build WGR; meet all 2050 needs of the portions of Douglas, Paulding, Carroll, & Haralson Counties that lie within the watershed, and we provide 20% of AAF @ min. @ state line.