

IN THE  
**Supreme Court of the United States**

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STATE OF FLORIDA,

*Plaintiff,*

*v.*

STATE OF GEORGIA,

*Defendant.*

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**STATE OF GEORGIA'S OPPOSITION TO FLORIDA'S  
MOTION FOR LEAVE TO FILE A COMPLAINT**

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SAMUEL S. OLENS  
*Counsel of Record*  
ATTORNEY GENERAL  
STATE OF GEORGIA  
GEORGIA DEPARTMENT  
OF LAW  
40 Capitol Square  
Atlanta, GA 30334  
(404) 656-3383  
AGOlens@law.ga.gov

CHRISTOPHER LANDAU, P.C.  
CRAIG S. PRIMIS, P.C.  
K. WINN ALLEN  
SARAH HAWKINS WARREN  
KIRKLAND & ELLIS LLP  
*Special Assistant*  
*Attorneys General*  
666 15th Street, NW  
Washington, DC 20005

SETH P. WAXMAN  
PAUL R.Q. WOLFSON  
CHRISTOPHER E. BABBITT  
JOSHUA M. SALZMAN  
DANIEL AGUILAR  
*Special Assistant*  
*Attorneys General*  
WILMER CUTLER PICKERING  
HALE AND DORR LLP  
1875 Pennsylvania Ave., NW  
Washington, DC 20006



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**INTRODUCTION**

The flow of water from the Chattahoochee and Flint River basins in Georgia into the Apalachicola River in Florida is largely controlled by a system of federal dams and reservoirs operated by the U.S. Army Corps of Engineers. The Corps is currently updating the operating manual for those projects, and that process will directly affect the flow into the Apalachicola River. Florida, however, seeks to end-run those proceedings and embroil this Court in the same issues now pending before the Corps. The Court should not indulge Florida's attempt to disrupt the orderly resolution of what has already been a long-running dispute.

For more than two decades, Florida challenged, under the APA, the Corps' management of its dams in the Apalachicola-Chattahoochee-Flint Basin (ACF Ba-

sin). Florida contended that the Corps was adversely affecting threatened and endangered species by not allowing sufficient flow to cross the Georgia-Florida border into the Apalachicola River and that the Corps' operations were otherwise contrary to law. Florida's challenges were unsuccessful, and the litigation resulted in the Eleventh Circuit effectively requiring the Corps to undertake a study of the ACF Basin and update the decades-old Master Water Control Manual that specifies operating protocols for the Corps' ACF Basin projects. That process is actively underway. In completing that process, the Corps, exercising statutory authority delegated by Congress, will consider, among other things, effects on endangered and threatened species.

Florida, however, is not content to await the outcome of the Corps' deliberative process. Instead, it seeks to bypass that entire proceeding by asking this Court to engage in a common-law "equitable apportionment" of the States' rights to those waters. But Florida has brought its case against the wrong party, in the wrong court, and at the wrong time.

Florida attempts to plead around the role of the Corps, but the Corps is inescapably involved in any sensible adjudication of Florida's claims. No water enters the Apalachicola River from either the Chattahoochee or Flint River without passing through the Corps' Woodruff Dam, which is located at the Florida-Georgia border. Although the (unexplained) relief Florida requests is an order capping Georgia's consumptive water uses at the level existing on January 3, 1992, the injuries that Florida alleges—harm to threatened and endangered species and the oyster industry in the Apalachicola River and Bay—stem from purportedly inadequate minimum flows through Woodruff Dam during dry times.

The flow out of Woodruff Dam is precisely one of the issues that the Corps is examining even now in its revisions to its Master Manual. Determining flow rates involves the Corps' consideration of numerous technical issues, including the hydrology of the ACF Basin and potential impacts on the Apalachicola River and Bay, as well as the Fish and Wildlife Service's evaluation of any adverse impacts on federally protected and other species as part of the interagency consultation process required by the Endangered Species Act and the Fish and Wildlife Coordination Act. In submissions to the Corps, Florida has raised the very same contentions it raises here—that reduced flow into the Apalachicola is harming both protected species and the commercial oyster industry in the Apalachicola. Only after the Corps adopts a new Master Manual will it be possible to determine whether (1) the injuries that Florida seeks to prevent may actually come to pass, and (2) those injuries are caused by Georgia's water use.

An original action in this Court at this stage would disrupt that entire process and would proceed in a vacuum. Current flow conditions in the ACF Basin are a product of interim measures adopted by the Corps because of the practical constraints of years of litigation. No set of operations free from those artificial constraints will be established until the Corps completes its updated manual; any litigation before that process is complete—especially in this Court—makes little sense. Moreover, Florida's proposed complaint against Georgia ignores a key actor: The Corps is not a party, and Florida cannot make it a party unless the United States waives its sovereign immunity. Practical considerations, including the orderly resolution of disputes through customary procedures, strongly favor denial of Florida's motion for leave to file its complaint.

Florida's allegations of harm also have little claim to this Court's discretionary exercise of its original jurisdiction. As this Court has long held, that jurisdiction is extraordinary in nature and is to be exercised sparingly. A State must persuasively allege that it has suffered a "substantial injury," which must be proven by clear and convincing evidence. Florida's complaint gives barely a hint that its citizens are suffering any injury caused by a supposedly reduced flow into the Apalachicola—much less that any such injury is attributable to Georgia. Federal regulators have determined that the flow from Woodruff Dam does not jeopardize any federally protected species, and Florida has not pursued a challenge to that determination. Nor has Florida alleged any facts plausibly linking the sudden collapse of its oyster fishery in the 2012-2013 winter season to any action by Georgia; indeed, Florida has pointed only to other factors when raising the issue with other federal agencies.

At bottom, this is not a case that calls for this Court to exercise its extraordinary power to entertain a lawsuit between States. All of Florida's alleged harms concern the flow from dams operated by the Corps. The Corps is reexamining those operations, and its final conclusions can be challenged under the APA. Accordingly, this Court should deny Florida's motion for leave to file a bill of complaint.

## STATEMENT

### A. The ACF Basin

The ACF Basin encompasses a drainage area of roughly 19,800 square miles. *See Army Corps of Engineers, Final Updated Scoping Report: Environmental Impact Statement, Update of the Water Control Manu-*

*al for the Apalachicola-Chattahoochee-Flint (ACF) River Basin, in Alabama, Florida, and Georgia* 2 (Mar. 2013) (*Scoping Report*). Approximately 74% of that area is in Georgia and 15% is in Alabama; only 11% is in Florida. *Id.*; see also Fla. App. 1; App. 1a.

The Chattahoochee rises in northern Georgia and flows south through Georgia to the Florida border. Compl. ¶ 2.<sup>1</sup> Along the way, it passes Atlanta, where it serves as the primary source of water for 3.3 million people in the metropolitan region. Fla. App. 4. Further downstream, the Chattahoochee supports municipal, industrial, and agricultural needs in Georgia and Alabama all the way to the Florida state line.

The Chattahoochee is regulated by five federally owned dams operated by the Army Corps of Engineers. Compl. ¶ 22. Three of these dams—Buford, West Point, and Walter F. George—impound reservoirs that have substantial capacity to store water from the wet winter and early spring for release during the drier summer and fall. Because the Corps can store water in these reservoirs and choose the timing of releases, the Corps effectively controls how much water flows downstream from these dams at any time. The Corps' five dams are operated as "a unified whole" to serve several congressionally directed project objectives and other requirements of federal law. *Id.* For example, pending completion of the Master Manual, the Corps has determined to coordinate releases from its dams to maintain certain flows in the Apalachicola River for threatened and endangered species. App. 19a-23a.

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<sup>1</sup> A substantial portion of the Chattahoochee runs along the Georgia-Alabama border, but the river itself is in Georgia. See *Howard v. Ingersoll*, 54 U.S. (13 How.) 381, 388 (1852).

Buford Dam is the northernmost of the Corps' five dams and is located about 40 miles above Atlanta. The Corps has long operated Buford Dam to accommodate the Atlanta region's water supply needs, both by timing releases to provide sufficient flow for withdrawals downstream in Atlanta and by allowing withdrawals directly from the reservoir it impounds. *See In re MDL-1824 Tri-State Water Rights Litig.*, 644 F.3d 1160, 1171-1174 (11th Cir. 2011) (per curiam). Buford Dam has several authorized purposes besides water supply, including flood control, navigation, and the generation of hydroelectric power. *Id.* at 1200. The Corps manages the size and timing of releases from Buford Dam to accommodate these sometimes competing purposes.<sup>2</sup>

The Flint River also rises in northern Georgia. Essentially unregulated, it flows exclusively through Georgia, where it serves as a source of irrigation for southwestern Georgia's agricultural region, which annually generates two billion dollars in farm-based revenue. The Flint River joins the Chattahoochee just above the southernmost of the Corps' five projects, Woodruff Dam. Compl. ¶ 20; *see* App. 1a. The resulting reservoir spans the border between Georgia and Florida.

The Apalachicola River begins at Woodruff Dam and flows exclusively through the Florida panhandle, terminating at the Apalachicola Bay in the Gulf of Mexico. Compl. ¶ 20. No water flows into the Apalachicola from either the Chattahoochee or Flint River unless and until the Corps releases it from Woodruff Dam. Because Woodruff Dam does not have significant stor-

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<sup>2</sup> *See, e.g.,* Stockdale, *Memorandum for the Chief of Engineers re Authority to Provide for Municipal and Industrial Water Supply from the Buford Dam/Lake Lanier Project, Georgia* 27-28 (June 25, 2012) (Stockdale Mem.).



age capacity, the Corps regulates the flow into Florida by scheduling releases further upstream to ensure that the combined flows of the Flint and Chattahoochee meet certain minimums. Thus, although the federal government does not own the water in the ACF rivers, the operations of the Corps effectively regulate the amount of water that reaches Florida.

## B. Prior Litigation

For more than two decades, Florida, Georgia, the Corps, and other parties were enmeshed in litigation over the Corps' dam operations in the ACF Basin. That litigation, which began in 1990 and concluded in 2013, ultimately encompassed seven different suits brought against the Corps under the APA. In 2007, the suits were consolidated by a multi-district litigation panel and assigned to a single judge in the Middle District of Florida (No. 07-md-1). The cases were then divided into two phases. Phase 1 concerned the extent to which the Corps has authority to operate Buford Dam to provide water supply to the Atlanta region. Phase 2 concerned whether the Corps' operations—and the resulting flows into the Apalachicola—complied with federal environmental statutes.

The Phase 1 litigation ultimately reached the Eleventh Circuit, which issued two significant rulings. First, it dismissed an APA challenge by Florida that the Corps had exceeded its congressionally delegated authority in providing water from Buford Dam to Atlanta. The court held that, although the Corps had provided water to Atlanta on an ad hoc basis, decades of litigation had prevented the Corps from taking final agency action to determine how it would balance the various project purposes of Buford Dam, including providing water to the Atlanta area. *Tri-State*, 644 F.3d at 1181-

1185. Accordingly, the court held that there was no jurisdiction under the APA to hear Florida's challenge.

Phase 1 also involved an APA challenge by Georgia to a decision by the Corps rejecting Georgia's request for a permanent allocation of storage at Buford Dam sufficient to meet future water needs. The Corps had concluded that it lacked statutory authority to grant that request, but the Eleventh Circuit agreed with Georgia that the Corps had understated the extent of its authority to provide water to metropolitan Atlanta. *Tri-State*, 644 F.3d at 1188-1189. The court further held, however, that it remained unclear whether the Corps had authority to grant Georgia's water supply request in its entirety and remanded the matter so that the Corps could reassess the scope of its authority. *Id.* at 1196-1197. The court stated that this remand analysis should be done in conjunction with "a comprehensive decision about the Corps' future water supply operations." *Id.* at 1197. Florida unsuccessfully sought this Court's review of the Eleventh Circuit's ruling. 133 S. Ct. 25 (2012).

The Eleventh Circuit's ruling effectively required the Corps to devise and implement a final plan for operating Buford Dam and to undertake a comprehensive review of its integrated operation of all the dams in the ACF Basin. As explained below (pp. 10-12, 20-23), that administrative review is underway.

Phase 2 of the multi-district litigation concerned whether the Corps' operations of the system—and in particular, the rate and timing of flows from Woodruff Dam—are sufficiently protective of threatened and endangered species in Florida. Because the lengthy litigation over the ACF Basin had prevented the Corps from adopting a final water control plan to govern the

operations of its dams and reservoirs, the Corps adopted a Revised Interim Operating Plan (RIOP) to address the needs of threatened and endangered species in the Apalachicola River and Bay pending development of a comprehensive Master Manual for the ACF reservoirs. This RIOP specified flow levels to be maintained at the Georgia-Florida border under various hydrological conditions. The Corps obtained a 2008 Biological Opinion (BiOp) from the Fish and Wildlife Service (FWS), which concluded that the RIOP would not jeopardize endangered or threatened species or adversely modify their critical habitat.<sup>3</sup> Florida challenged the RIOP and the 2008 BiOp, but the district court rejected Florida's challenge. *See* Order, Dkt. 376 (July 21, 2010).

Florida appealed, but during the pendency of the appeal, FWS issued a new, 2012 BiOp, which superseded the 2008 BiOp, while reaching fundamentally similar conclusions.<sup>4</sup> Specifically, the 2012 BiOp confirmed that the RIOP will not jeopardize over thirty federally listed species in the Apalachicola, including those that Florida's present complaint alleges are harmed by Georgia's water consumption. *See* App. 35a (proposed action "will not jeopardize the continued existence" or "destroy or adversely modify designated critical habi-

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<sup>3</sup> The 2008 BiOp was prepared during the interagency consultation process required by Section 7 of the Endangered Species Act, 16 U.S.C. § 1536.

<sup>4</sup> FWS prepared the 2012 BiOp to evaluate new information about the distribution of certain mussels that had not been considered in the 2008 BiOp. Florida cites the 2012 BiOp in its complaint (¶ 53). Pertinent parts of the 2012 BiOp are reprinted in the appendix to this brief (App. 2a-36a); it is available in full at <http://www.fws.gov/southeast/news/2012/pdf/woodruffBOFinal.pdf>.

tat" for the fat threeridge, purple bankclimber, and Chipola slabshell mussels); *see also* App. 8a-10a; Fla. Br. 16. Because the 2012 BiOp mooted Florida's challenge to the 2008 BiOp, Florida terminated its appeal from the district court's decision; that ruling was vacated and the Phase 2 litigation was dismissed as moot. Order, Dkt. No. 391 (Jan. 25, 2013). Florida has not sued to challenge the 2012 BiOp.

### C. The Corps' Ongoing Efforts To Reexamine Its Operations In The ACF Basin

The pendency of the *Tri-State* litigation effectively stymied the Corps from fully reexamining its operations in the ACF Basin. The Corps' Master Manual for the ACF system was last formally updated in 1958; a revised manual was drafted in 1989 but never finalized because of litigation initiated by Florida and Alabama. With the impediment of that litigation removed, the Corps is consulting with federal resource agencies and preparing an Environmental Impact Statement on its operations so that it can adopt a new Master Manual that fully considers present hydrological and environmental conditions and balances the various authorized purposes of the ACF projects while complying with environmental laws. *See Scoping Report* 1; 33 C.F.R. § 222.5(f)(1). The Corps expects to issue a new Master Manual for public comment by 2015.<sup>5</sup>

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<sup>5</sup> Corps regulations require "developing a water control plan for each reservoir project, as well as a basin Master Water Control Manual (Master Manual) for the coordinated operation of multiple projects within a river basin." *Scoping Report* 18. The Master Manual outlines in general terms how the particular projects are to be operated to accomplish various project purposes. *Id.* 17-18. As the Corps has explained, "[u]pdated Water Control Manuals are needed to enable managers to strike the best balance possible

Among the matters to be decided in the new Master Manual is the rate of water release to the Apalachicola River at the Georgia-Florida border under various hydrological conditions. *Scoping Report* 18. Under the Corps' current RIOP, the Corps maintains a minimum flow at the Florida-Georgia border and makes greater releases, depending on the hydrological conditions and other operational parameters, to benefit threatened and endangered species. App. 16a-23a. In the new Master Manual, the Corps will decide whether to maintain or modify these operating rules. Many potentially affected parties, including Florida, have made submissions to the Corps concerning the appropriate rate and timing of flows into the Apalachicola. Florida has once again contended that the Corps must revise those flows to ensure protection for endangered and threatened species, and has also argued that the Corps' current operations are providing insufficient fresh water for the oyster fishery in the lower Apalachicola, which Florida claims are being harmed by increased salinity levels.<sup>6</sup> Those submissions will be part of the administrative record for the Corps' ultimate decisions.

The Corps will also consider Georgia's water supply request, which was at issue in the Phase 1 litigation. On remand from the Eleventh Circuit, the Corps issued a legal opinion concluding that it has authority to grant

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for the many purposes and demands. A complex set of factors is needed to determine appropriate water management at each lake. In addition to the authorized project purposes, power contract commitments, hydrologic and climatologic factors, downstream lake and basin-wide conditions, potential threats of flood and drought, and lake levels must all be considered."

<sup>6</sup> See Florida Department of Environmental Protection, *Comments on ACF Master Water Control Manual* 11-12 (Jan. 14, 2013) (*Florida Comments*).

Georgia's water supply request in its entirety. See Stockdale Mem. 48 ("The Corps has the legal authority to accommodate Georgia's request[.]"). The Corps did not, however, decide whether it would grant Georgia's request. Rather, the Corps explained that "[f]urther study, including environmental analysis and consideration of public comments, would be required prior to any decision to actually exercise some or all of this authority." *Id.* The Corps also noted that it "is presently engaged in an effort to update the water control plans and manuals for the ACF Basin," and that its conclusions about the scope of its authority would be taken into account as it "continues with that necessary and important process." *Id.*

In 2013, Georgia updated its water supply request. Fla. App. 3. Although Georgia continued to request storage to meet the same level of water supply as before, it submitted additional supporting detail and revised projections in an affidavit by Judson Turner, Director of the Environmental Protection Division of Georgia's Department of Natural Resources.<sup>7</sup> This affidavit explained that by 2040 the Atlanta region anticipates needing to withdraw up to 705 million gallons per day (mgd) of water from Buford Dam's reservoir and the Chattahoochee River, but that 78% of that water (550 mgd) will be returned to the basin as highly treated wastewater, rendering it available for use downstream. *Id.* 15-16. At that point, metropolitan Atlanta's consumptive use of water from the Chattahoochee River will be "a mere 1.1%" of the average daily flow of the Apalachicola River just downstream of the state line. *Id.* 16. Annexed to Mr. Turner's affidavit was a

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<sup>7</sup> Mr. Turner's affidavit also detailed the extensive water conservation measures Georgia has undertaken. Fla. App. 9-13.

technical analysis showing that “net water consumption associated with the municipal and industrial withdrawals contemplated in Georgia’s water supply request is projected to have a minor impact on the flow in the Apalachicola River at the state line.” *Id.* 25; *see also* App. 47a-51a, 56a-57a.

## ARGUMENT

### I. THIS COURT’S STANDARDS FOR EXERCISING ITS ORIGINAL JURISDICTION ARE STRINGENT

By invoking this Court’s original jurisdiction, Florida asks the Court to “exert its extraordinary power to control the conduct of one State at the suit of another.” *Connecticut v. Massachusetts*, 282 U.S. 660, 669 (1931). That is not a power this Court exerts lightly. To the contrary, the Court has consistently maintained that its “original jurisdiction should be invoked sparingly,” *Illinois v. City of Milwaukee*, 406 U.S. 91, 93 (1972), and that it will exercise that jurisdiction only in the “most serious of circumstances,” *Nebraska v. Wyoming*, 515 U.S. 1, 8 (1995). As the Court has explained, its original “jurisdiction is of so delicate and grave a character that it was not contemplated that it would be exercised save when the necessity was absolute.” *Louisiana v. Texas*, 176 U.S. 1, 15 (1900).

Thus, to justify exercise of this Court’s original jurisdiction, a State must carry a burden significantly greater than that normally imposed in litigation between private plaintiffs. *See Alabama v. Arizona*, 291 U.S. 286, 292 (1934). Whereas district courts have a “virtually unflagging obligation ... to exercise the jurisdiction given them,” *Colorado River Water Conservation Dist. v. United States*, 424 U.S. 800, 817 (1976), this Court exercises its original jurisdiction only “sparingly,” *South Carolina v. North Carolina*, 558 U.S.

256, 267 (2010) (quoting *Mississippi v. Louisiana*, 506 U.S. 73, 76 (1992)). The fact that a case falls within this Court's original jurisdiction does not mean that this Court should or will assume that jurisdiction. Rather, this Court exercises "substantial discretion to make case-by-case judgments as to the practical necessity of an original forum in this Court," *Texas v. New Mexico*, 462 U.S. 554, 570 (1983), "even as to actions between States where [its] jurisdiction is exclusive," *Wyoming v. Oklahoma*, 502 U.S. 437, 450 (1992). In the exercise of such discretion, this Court often denies motions for leave to file an original complaint.<sup>8</sup>

Several principles guide the Court's discretion in determining whether to grant leave to file a bill of complaint. As an initial matter, the Court is traditionally reluctant to grant such leave where the dispute and the relief requested may be intertwined with proceedings pending in another forum. See, e.g., *Arizona v. New Mexico*, 425 U.S. 794, 797 (1976) (declining original jurisdiction in light of pending state-court action); *Washington v. General Motors Corp.*, 406 U.S. 109, 116 (1972) (declining original jurisdiction where dispute could be effectively resolved by federal district courts); see also *Illinois*, 406 U.S. at 93 (taking account of the "availability of another forum where there is jurisdiction over the named parties, where the issues tendered may be litigated, and where appropriate relief may be had").

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<sup>8</sup> See, e.g., *Michigan v. Illinois*, 130 S. Ct. 2397 (2010); *Mississippi v. City of Memphis*, 559 U.S. 901 (2010); *Arkansas v. Oklahoma*, 546 U.S. 1166 (2006); *Arkansas v. Oklahoma*, 488 U.S. 1000 (1989); *South Dakota v. Nebraska*, 475 U.S. 1093 (1986); *United States v. Nevada*, 412 U.S. 534, 538-540 (1973) (per curiam).



Similarly, when deciding whether to entertain an original case, the Court has taken into account practical considerations of litigating the controversy, whether the Court may grant relief to the parties, and the alternative availability of adequate relief. For example, the Court has declined to exert jurisdiction where the United States is essential to a complete adjudication of the controversy but has not voluntarily become a party in this Court, *see Arizona v. California*, 298 U.S. 558, 568-572 (1936)—an even stronger consideration since the United States became subject to suit in district court under the APA. And the Court has declined to exercise jurisdiction where the controversy would inevitably involve complex technical questions that are properly within the province of expert federal agencies, and where challenges to those agencies' conclusions would be more suitable for litigation in a trial court. *See Ohio v. Wyandotte Chems. Corp.*, 401 U.S. 493, 503-505 (1971).

Finally, the Court is "traditional[ly] reluctan[t] to exercise original jurisdiction in any but the most serious of circumstances, even ... in cases between two or more States." *Nebraska*, 515 U.S. at 8. Thus, a complaining State must point to an injury of "such seriousness that it would amount to *casus belli* if the States were fully sovereign." *Mississippi*, 506 U.S. at 77; *see also New York v. New Jersey*, 256 U.S. 296, 309 (1921) (requiring an "invasion of rights" of "serious magnitude" to warrant exercise of original jurisdiction). In the context of a common-law equitable-apportionment action, that at least requires a State to allege facts that, if proven, would amount to "clear and convincing evidence [of] some real and substantial injury or damage." *Idaho ex rel. Evans v. Oregon*, 462 U.S. 1017, 1027 (1983). In-substantial or speculative harms will not suffice.

Establishing the “substantial injury” necessary for an equitable-apportionment case is a weighty matter. When one State seeks to enjoin water usage by another, “the burden on the complainant State of sustaining the allegations of its complaint is much greater than that imposed upon a complainant in an ordinary suit between private parties.” *North Dakota v. Minnesota*, 263 U.S. 365, 374 (1923). And given the substantial costs to this Court and the parties of adjudicating such a case, the petitioning State’s proposed complaint must persuasively make a case for exercise of that jurisdiction—surely more persuasive than the minimum in an ordinary civil case, wherein a party seeking relief must allege at least “sufficient factual matter” to “state a claim to relief that is plausible on its face.” *Ashcroft v. Iqbal*, 556 U.S. 662, 678 (2009).

## II. FLORIDA’S COMPLAINT SUFFERS FROM SEVERE DEFECTS THAT COUNSEL AGAINST EXERCISING ORIGINAL JURISDICTION

Florida’s proposed complaint falls well short of the demanding standard for exercise of this Court’s original jurisdiction. Two interlocking flaws in that complaint demonstrate why the Court should decline jurisdiction. First, the source of Florida’s alleged harm is inadequate flow at the state line; but whether the flow at the state line is inadequate cannot, as a practical matter, be meaningfully adjudicated unless and until the Corps establishes a final set of operating procedures for the ACF basin. That process will establish operating rules for water flows from Georgia into the Apalachicola, as well as other rules that will directly affect the flow at the state line. Once the Corps completes that task, then Florida, insofar as it is aggrieved by the Corps’

decisions, can seek to challenge those decisions in district court under the APA.

Second, Florida's extraordinarily weak complaint does not warrant this Court's discretionary exercise of jurisdiction. The allegations and materials relied upon by Florida fall far short of indicating imminent and substantial harm to Florida's sovereign rights. Florida mischaracterizes its own evidence about Georgia's consumption of water and wildly overstates the effect of that consumption on flow at the state line and any harm that might result from any slightly reduced flow. And Florida fails to acknowledge that most of its alleged harms have been extensively evaluated and rejected by expert federal agencies.

#### **A. Florida's Suit Is At Best Premature**

Florida's claim for equitable apportionment is essentially a claim about reduced flows into the Apalachicola out of the Corps' Woodruff Dam at the state line. The appropriate remedy for those reduced flows, Florida contends, is an order "capping Georgia's overall depletive water uses at the level then existing on January 3, 1992." Compl. 21. But that relief is disconnected from Florida's alleged injuries, which pertain only to flow at the state line, and Georgia cannot provide increased flow at the state line, at least not alone. It is the Corps that releases water from Georgia's Chattahoochee and Flint Rivers into the Apalachicola, through its management of Woodruff Dam (the spigot to the Apalachicola) and the integrated system of reservoirs upstream on the Chattahoochee.

Florida's allegations drive at the heart of the Corps' operation of that system. *See* Compl. ¶ 23 (acknowledging "[t]he Corps determines how much water

to release from its reservoirs” and that “less water reaches Florida due to ... the Corps’ operational protocols”); *see also See In re MDL-1824 Tri-State Water Rights Litig.*, 644 F.3d 1160, 1200 (11th Cir. 2011) (*per curiam*). No water flows from Georgia into the Apalachicola unless and until the Corps releases it from Woodruff Dam. Thus, as a practical matter, the Corps must be involved in any adjudication of Florida’s claim, since any resolution of that claim will need to be implemented by the Corps. *Cf. Arizona*, 298 U.S. at 571-572.<sup>9</sup>

Indeed, even if Georgia reduced its consumption significantly, Florida would not necessarily enjoy a corresponding increase in flow in the Apalachicola. Rather, the Corps could very well offset the impact of any change by Georgia. For instance, the RIOP specifies that during the droughts that are the focus of Florida’s complaint, the Corps will release from upstream storage whatever water is necessary to maintain a 5,000 cubic-feet-per-second (cfs) minimum flow out of Woodruff Dam, but the Corps has not guaranteed any greater flow. *See* App. 4a-5a (describing the Corps’ augmentation of flow). Thus, if Georgia reduced its consumption from either the Chattahoochee or the Flint, but the

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<sup>9</sup> A useful contrast can be drawn between this case and *Texas v. New Mexico*, No. 141, Orig., which is also pending before the Court. While both cases involve interstate disputes over water that is at times stored in federally operated reservoirs, in *Texas*, the United States plays a more ministerial role in managing a dam according to an allocation formula to which the States previously agreed, and the alleged harm is solely attributable to New Mexico’s consumption downstream of the federal project. *See* U.S. Br. 5, 8. Here, by contrast, all of Georgia’s withdrawals are upstream of Woodruff Dam, and the Corps’ decisions about how to retain and release water at its projects throughout the Chattahoochee River to meet a variety of authorized project purposes directly affects flow at the state line.

Corps adhered to the same flow target, the effect of Georgia's reduction would not be higher flow for Florida, but rather higher levels in the Corps' upstream reservoirs (since the Corps would need to release less water to satisfy the minimum flow).

The Corps' operations and the water flow rate at the Georgia-Florida border are inextricably intertwined. The source of Florida's alleged harm (low flow rates during the dry season) directly implicates the Corps, and it would be wholly impractical to adjudicate Florida's claims without the active participation of the Corps, which is not a defendant to Florida's complaint and cannot be bound by the Court's decree unless it is a party. See *Arizona*, 298 U.S. at 572 (characterizing similar procedural posture as a disincentive "for this Court to decide the rights of the states which are before it by a decree which, because of the absence of the United States, could have no finality").<sup>10</sup>

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<sup>10</sup> During the dry season, when both Georgia's consumption and Florida's need for more water are allegedly greatest, natural flow into the ACF Basin for prolonged periods can be much less than the 5,000 cfs that the Corps regularly delivers to Florida from Woodruff Dam. The Corps is able to meet its 5,000 cfs target only by releasing large amounts of water from storage upstream. That would continue to be true even if Georgia significantly reduced its consumption. Thus, Georgia could not assure compliance with any decree based upon the 5,000 cfs or any other state-line flow requirement unless the decree had binding instructions for how the Corps would operate. But there is a substantial question whether the United States could participate in this original case as a full party and be bound by a decree of the Court. Florida cannot name the United States as a defendant in this Court because there is no waiver of sovereign immunity, at least pending completion of the Master Manual and Florida's assertion of a proper claim against the Corps under the APA. Given the numerous other practical impediments to this litigation and deficiencies in the proposed

And the time for Florida to challenge the Corps' management of its system of dams in Georgia is not ripe. For the first time in more than half a century, the Corps will adopt a revised Master Manual for all the federal projects in the ACF Basin. The Corps was previously unable to update its operations manual because it was hamstrung by decades of litigation over its operational authority in the ACF Basin. *Tri-State*, 644 F.3d at 1182 (noting that the Corps "has made sincere efforts to effectuate permanent water supply allocations but has been thwarted by the litigation process"). The Corps has now finally been liberated by the Eleventh Circuit to take final agency action implementing a comprehensive plan of operations for the five federal dams in the ACF Basin.

In its final version, the Corps' operating manual will specify the timing of releases from its dams under various climatic conditions and will directly affect the timing of water flow into the Apalachicola. To be sure, the Corps will not (and lacks authority to) adjudicate the issue of *ownership* of the water in the ACF Basin rivers; that water belongs to the States. But the manual will govern how the Corps manages water storage and releases from its dams for a variety of congressionally authorized purposes, including water supply, navigation, hydropower, and flood control.

In updating its Master Manual, the Corps will confront both Georgia's request that the Corps facilitate additional withdrawals at Buford Dam and from the Chattahoochee River,<sup>11</sup> and Florida's request that the Corps operate its projects to maintain higher flows in

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complaint, the Court may deny Florida leave to file and save this question for another day.

<sup>11</sup> See Compl. ¶ 45; Fla. App. 8; Stockdale Mem. 48.

the Apalachicola River.<sup>12</sup> Until the Corps' proceedings are completed, neither the parties nor the Court will know whether the flow rate the Corps sets at the Georgia-Florida border injures Florida. Indeed, Florida cannot even know at this time whether, or to what extent, it will be dissatisfied with the Corps' ultimate decisions. Without knowing what the Corps' baseline for flows will be, the parties cannot practically litigate, and the courts cannot meaningfully adjudicate, a federal common-law claim that Florida is receiving insufficient water at the state line. Were the case to go forward now, the entire focus of the litigation might change once the Corps finalizes its Master Manual (assuming the long-overdue updating process were not brought to a standstill).

The Corps, in updating its manual, must take account of numerous statutory directives and considerations governing the operation of these dams. Thus, the Corps must consider not only how to reconcile the various purposes Congress has specified for those dams (such as water supply, navigation, hydropower, and flood control), but also generally applicable statutes such as the National Environmental Policy Act, 42 U.S.C. §§ 4231 *et seq.*, the Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.*, the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661 *et seq.*, the Water Supply Act of 1958, 43 U.S.C. § 390B, and the Water Resources Development Act, 33 U.S.C. § 2316, and its own regulations, *see* Army Corps of Engineers Reg. No. 1110-2-8154, § 6(b) (May 31, 1995) ("It is Corps policy to develop and implement a holistic, environmentally sound water quality management strategy for each project."). Thus, any contentions about equitable apportionment of

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<sup>12</sup> *See Florida Comments* 11-12.

the waters that flow through the Corps' projects cannot be evaluated in a vacuum, but must be considered against and in light of Congress's extensive legislation in this area—the interpretation and application of which falls in the first instance to federal agencies.

These federal agencies will necessarily evaluate the effect of Corps operations on the Apalachicola River, including its alleged injuries to wildlife caused by low flow. As an example, the FWS 2012 BiOp concluded that the Corps' current operations are not likely to adversely affect the Gulf Sturgeon or its eggs and “will not jeopardize the continued existence” of or “destroy or adversely modify designated critical habitat” for the fat threeridge, purple bankclimber, and Chipola slab-shell mussels. *Compare* App. 8a-10a, 35a-36a, *with* Compl. ¶ 58 (alleged harm to mussels and sturgeon). As the Corps revises its Master Manual, it will again incorporate the interagency consultation process required by the Endangered Species Act, and any new information about the effect of the Corps' operations on protected species will be considered by both FWS and the Corps.

It would be counterproductive for a special master to begin amassing evidence about those same subjects at this time. The Corps should be free to devote its resources and attention to completing its current study without being diverted into litigation that will likely take years to complete. Worse still, if the special master were to take evidence without the active participation of the Corps and other agencies, the special master might well reach determinations that conflict with those of the Corps.

Once the Corps completes its updated Master Manual for the ACF Basin, then Florida—if aggrieved—may challenge the Corps' conclusions in fed-



eral district court. The APA would provide an avenue of judicial review if Florida believed that the operating procedures adopted by the Corps were arbitrary and capricious or otherwise contrary to law. Likewise, to the extent Florida disagrees with the FWS' conclusions about the effects of the Corps' operations on endangered species, it is also free to challenge those conclusions under the APA. See *Bennett v. Spear*, 520 U.S. 154, 177-178 (1997). But Florida has not challenged the FWS 2012 BiOp, and it voluntarily dismissed its suit challenging the 2008 BiOp when the 2012 BiOp was published.<sup>13</sup>

Given the pendency of the Corps proceedings, it is neither necessary nor appropriate for this Court to accept Florida's invitation to initiate an original equitable-apportionment action at this time. "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." *Colorado v. New Mexico*, 459 U.S. 176, 183 (1982). Because the Corps is applying federal *statutory law* in its pending proceeding, that proceeding legally and logically takes precedence over a federal *common law* action.

As this Court has long recognized, "[t]here is no federal general common law," *Erie R.R. Co. v. Tompkins*, 304 U.S. 64, 78 (1938), and judge-made federal

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<sup>13</sup> Florida has an additional source of relief for economic harm caused by its oyster fishery failure. The Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended, empowers the Department of Commerce to declare a "commercial fishery failure" and to direct federal funds to help restore the fishery and "assist a fishing community affected by such failure." 16 U.S.C. § 1861a(a)(1), (2). As Florida admits, the Department took precisely that step in August 2013 with respect to the Apalachicola Bay oyster fishery. Fla. Br. 20.

common law—even in the context of disputes between States—is always “subject to the paramount authority of Congress,” *City of Milwaukee v. Illinois*, 451 U.S. 304, 313 (1981) (quoting *New Jersey v. New York*, 283 U.S. 336, 348 (1931)). This Court developed the common-law equitable-apportionment doctrine “to decide river controversies between States” in the absence of any relevant federal statutes. *Arizona v. California*, 373 U.S. 546, 565 (1963) (citing *Nebraska v. Wyoming*, 325 U.S. 589 (1945); *Wyoming v. Colorado*, 259 U.S. 419 (1922)). Since that doctrine was developed, Congress has enacted legislation extending federal regulation to many areas of our national life. As the scope of federal positive law has expanded over the years, it follows that the scope of federal common law has narrowed. *See, e.g., Milwaukee*, 451 U.S. at 314 (“Federal common law is a ‘necessary expedient,’ and when Congress addresses a question previously governed by a decision rested on federal common law the need for such an unusual exercise of lawmaking by federal courts disappears.” (citation omitted)).

Because the whole point of federal common law is to fill the interstices of federal statutory law, *see, e.g., Milwaukee*, 451 U.S. at 312-317, there is no basis for applying federal common law to a dispute before the application of federal statutory law. Unless and until the Corps applies the relevant federal statutes here, this Court cannot know whether there remains an “‘interstice’ ... to be filled by federal common law.” *Id.* at 323; *cf. Wyandotte Chems. Corp.*, 401 U.S. at 503, 505 (declining to exercise original jurisdiction where case presented problems that “many competent adjudicatory and conciliatory bodies are actively grappling with on a more practical basis” and would require “primarily skills of factfinding,

conciliation, detailed coordination with—and perhaps not infrequent deference to—other adjudicatory bodies”).

There is no basis for applying federal common law to address alleged injuries that fall within the broad scope of the thicket of federal environmental and natural resource statutes, and certainly not before those statutes have been applied, Florida has determined that they fail to address its alleged injuries, and an APA action has been unsuccessful. Then, and only then—after the application of the relevant federal statutes and the subsequent determination whether Florida is injured—will it be possible to determine whether there remains any common law claim at all for whatever particular injury is left.<sup>14</sup>

### **B. Florida Has Not Alleged Any Injury Sufficient To Warrant This Court’s Exercise Of Its Original Jurisdiction**

Coupled with the above practical impediments are the legally insufficient allegations in Florida’s complaint, which also make this case unsuitable for exercise of the Court’s original jurisdiction. The complaint fails to make out a plausible case that Georgia’s consumption is causing significantly reduced flows at the state line,

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<sup>14</sup> Although Georgia has previously suggested that Florida might be entitled to bring an equitable apportionment action in this Court at some point (see Opp. 32-33 & n.10, *Florida v. Georgia*, Nos. 11-999, -1006, -1007 (U.S. May 25, 2012)), Georgia has never suggested that Florida could bring—before the conclusion of the ongoing Corps proceeding—such an action to redress alleged injuries potentially within the scope of the federal legislation the Corps is applying, see, e.g., *Arizona*, 373 U.S. at 565 (declining to apply equitable-apportionment doctrine in light of relevant federal statutes).

and it also fails to tie Florida's alleged injury to such reduced flows.

Florida's allegations about water consumption by Georgia are not only flawed, but also mischaracterize the source documents on which they rely. Florida relies heavily on highly selective citations to the documents incorporated by reference into its complaint. In particular, Florida attaches and relies on the affidavit submitted by Judson Turner in support of Georgia's revised 2013 water supply request to the Corps as supposedly establishing that metropolitan Atlanta currently withdraws 360 mgd from the Chattahoochee.<sup>15</sup> Compl. ¶ 45 (citing Fla. App. 7). But Florida neglects to mention that the same affidavit establishes that roughly 70% of this water is *returned* to the Chattahoochee and is available for downstream uses. See Fla. App. 15 (describing how in 2011, roughly 219 mgd were returned to the river); see also App. 41a-42a (showing that, in addition to the 219 mgd returned to the Chattahoochee, Georgia returns 38 mgd to Lake Lanier itself).<sup>16</sup> Thus, according to the documents on which Florida itself relies, metropolitan Atlanta's net consumption stands at roughly 0.8% of the entire annual average daily flow of Florida's Apalachicola River. App. 41a-42a; Fla. App. 16.

Likewise, Florida's claims based on Georgia's projected future use are incomplete and misleading. Florida notes that Georgia has requested that the Corps

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<sup>15</sup> One million gallons per day is approximately equal to a flow of 1.55 cfs.

<sup>16</sup> Florida has submitted Mr. Turner's affidavit but not its supporting exhibits. The cited document is Exhibit 4 to the Turner affidavit and is referenced at page 6 of Florida's appendix.

make available storage in Lake Lanier sufficient to support 705 mgd of gross withdrawals for the metropolitan Atlanta region by the year 2040.<sup>17</sup> Compl. ¶ 45. But Mr. Turner's affidavit explains that Georgia expects to return 78% of these withdrawals (or 550 mgd) back to the river if the Corps grants Georgia's request. Fla. App. 16. This total net withdrawal of 155 mgd will constitute a mere 1.1% of average daily flow at the Florida-Georgia border. *Id.* As a technical exhibit to the Turner affidavit shows (App. 47a-51a, 56a-57a), "Georgia's water supply request is projected to have a minor impact on the flow in the Apalachicola River at the state line" (Fla. App. 25).

To be sure, severe droughts will reduce the flow of water available to Florida. But those natural droughts reduce Georgia's access to water as well, and nothing in Florida's complaint suggests that Georgia consumes more than its fair share of water during these droughts—particularly given that Florida comprises only 11% of the drainage area of the ACF Basin, while Georgia comprises approximately 74%. *See supra* p. 5. Moreover, the Corps presently augments flows to en-

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<sup>17</sup> To the extent Florida alleges separate harms from Georgia's consumption that may occur in 2040, those are too remote in time to justify this Court's intervention now. *See Alabama*, 291 U.S. at 292 (alleged harm must be "imminent" to warrant exercise of original jurisdiction). The Corps has not yet even decided whether to grant Georgia's water supply request for 2040, and if it does, that decision would be subject to judicial review under the APA, to the extent embodied in a final agency action and challenged by a party with standing. But at this stage, any allegations of harm from projected water use twenty-six years in the future are too speculative to warrant this Court's intervention. *See Connecticut*, 282 U.S. at 674 (injunction "will not be granted against something merely feared as liable to occur at some indefinite time in the future").

sure that Florida receives a minimum flow of 5,000 cfs at the state line to minimize any adverse effects to federally listed species in the Apalachicola. *See* App. 16a-23a (detailing schedule of releases). When net basin inflows fall below 5,000 cfs, the Corps supplements them by releasing water stored in the Corps' upstream reservoirs at Buford, West Point, and Walter F. George Dams. *Id.* 16a. The Corps releases higher flows to benefit threatened and endangered species at other times, and the flow out of Woodruff Dam historically is well in excess of the 5,000 cfs minimum. *Id.* 27a (flows below 5,050 cfs occurred on 0.9% of observed days from 1975-2008).

But even if Florida's claims of reduced flows into the Apalachicola River are accepted, Florida still has not plausibly alleged that those reduced flows cause any significant harm. Notably, Florida does not claim that its citizens are being deprived of water for drinking, domestic, agricultural, or other consumptive uses. *Cf. Tri-State*, 644 F.3d at 1190 (noting that metropolitan Atlanta uses the Chattahoochee River for drinking, municipal, and industrial purposes). Instead, Florida asserts that Georgia's consumption has "diminish[ed] the likelihood" that certain endangered and threatened "species will survive." Compl. ¶ 59. But the document Florida cites as support, the 2012 BiOp (*id.* ¶ 53), finds that the Corps' current operations are *not* likely to jeopardize the three listed mussel species in the Apalachicola on which Florida focuses or the rest of the more than thirty other listed species considered. App. 8a-10a, 35a-36a.

Florida also alleges that low flows have caused commercial harm to its oyster fishery in the Apalachicola (which does not involve threatened or endangered species). But Florida fails to allege any plausible connection between Georgia's water consumption and the

“collapse of the Apalachicola Bay oyster fishery.” Compl. ¶ 54. Tellingly, the complaint does not allege that Apalachicola oyster landings have gradually diminished over time in proportion to Georgia’s alleged increase in water consumption. To the contrary, the complaint alleges that oyster landings precipitously dropped by “62.3 percent” during the 2012-2013 winter season. *Id.* ¶ 56. That sudden and recent shock to oyster landings is completely disconnected from Florida’s allegation that Georgia caused that harm by gradually increasing its consumptive uses since January 3, 1992. Compounding this problem, Florida fails to explain why its arbitrary request to cap Georgia’s consumption at January 3, 1992 levels in any way corresponds to or effectively remedies a collapse in Florida’s oyster fishery that occurred more than twenty years later. Compl. 21.<sup>18</sup>

Florida’s elected officials have themselves attributed the 2012-2013 decline to far more plausible causes, which Florida’s complaint summarily discounts. *See, e.g.*, Compl. ¶ 44 (asserting that “[c]hanging climatic conditions cannot ... explain reductions in inflows to the Apalachicola River”). In the midst of Florida’s oyster troubles in 2012, Governor Rick Scott sought and received a declaration of a commercial fishery failure from the Department of Commerce. *Id.* ¶ 56. Governor

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<sup>18</sup> Florida’s allegations of increased salinity in Apalachicola Bay (Compl. ¶ 56) are similarly deficient. As Florida itself has recognized, the Bay’s salinity levels are affected by myriad factors other than Georgia’s consumption, including “[r]iver flow, local rainfall, wind speed and direction, tidal currents, and basin configuration,” which have different levels of importance in different portions of the Bay. Edmiston, Florida Department of Environmental Protection & National Oceanic and Atmospheric Administration, *A River Meets the Bay: The Apalachicola Estuarine System* 19 (Dec. 2008).

Scott's letter was drafted outside the context of litigation and candidly attributed reduced oyster harvests to two factors: (1) the "Apalachicola, Flint, and Chattahoochee Rivers, have experienced drought conditions for several years;" and (2) "overharvesting of illegal and sub-legal oysters" in response to the suspension of oyster harvesting in contiguous states (as a result of the Deepwater Horizon oil spill) have led to fewer oyster landings. App. 59a; *see also id.* 76a-77a.

Governor Scott nowhere suggested in that letter that the difficulties in Florida's oyster industry could be traced to Georgia's alleged overconsumption of water. And Florida's own Fish and Wildlife Conservation Commission concluded that years of drought have contributed to Florida's oyster fishery troubles not just in Apalachicola Bay, but across eight counties along Florida's Gulf Coast. Sempsrott et al., Florida Fish and Wildlife Conservation Commission, *Apalachicola Bay Issues—Oysters: Review and Discussion* 5-6 (Oct. 22, 2012).

Florida's attempts to attribute the 2012-2013 low oyster harvest to Georgia's upstream water usage do not even cross "the line between possibility and plausibility" necessary for an ordinary complaint filed in district court, *see Iqbal*, 556 U.S. at 678—much less the far more demanding standard that this Court has established for commencement of an original case. In light of the significant costs that accompany this Court's extraordinary exercise of original jurisdiction and the Court's important gatekeeping function at this stage, Florida must allege a theory of liability that goes well beyond mere "conceivab[ility]." *Bell Atl. Corp. v. Twombly*, 550 U.S. 544, 570 (2007). Florida's allegations do not come close; to the extent they are not refuted by Florida's own submission, they are plainly "in line with a



wide swath of” other, more probable factors contributing to any declining flow in the Apalachicola River, *cf. id.* at 554, such as the recent overharvesting of oysters and exceptional droughts that have struck the ACF Basin.

In sum, Florida has not pleaded facts plausibly suggesting that it will be able to establish clear and convincing evidence that it suffers substantial injury as a result of Georgia’s consumption of water.<sup>19</sup> *See Idaho ex rel. Evans*, 462 U.S. at 1027 (“A State seeking equitable apportionment under our original jurisdiction must prove by clear and convincing evidence some real and substantial injury or damage.”); *Alabama*, 291 U.S. at 291 (allegations must be “clearly sufficient to call for a decree in [plaintiff State’s] favor”). The Court should therefore deny Florida leave to file its complaint.<sup>20</sup>

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<sup>19</sup> The insubstantiality of Florida’s allegations is particularly apparent when considered in light of the socially beneficial uses to which Georgia has put the Chattahoochee and Flint Rivers—supporting a major American metropolis and a thriving agricultural region. *See Colorado v. New Mexico*, 459 U.S. 176, 187 (1982) (recognizing that “the equities supporting the protection of existing economies will usually be compelling”); *cf. Connecticut*, 282 U.S. at 673 (“Drinking and other domestic purposes are the highest uses of water.”).

<sup>20</sup> At a minimum, the Court should allow Georgia to file a prompt motion to dismiss the complaint and entertain full briefing and argument on that motion, without referring the case to a special master. *See Texas*, 2014 WL 273246 (U.S. Jan. 27, 2014); *see also Idaho ex rel. Andrus v. Oregon*, 429 U.S. 163, 164 (1976) (per curiam) (grant of leave to file “is not a judgment that the bill of complaint ... states a claim upon which relief may be granted”). As noted above, there is substantial reason to doubt that Florida’s proposed complaint sets forth a basis for this Court to grant relief. First, the relief Florida has requested—consumption caps on Georgia—would not necessarily remedy the harm Florida has alleged. Second, it is questionable whether this Court can effectively grant Florida alternative relief (that Florida has not requested) regarding state-line flows,

## CONCLUSION

Florida's motion for leave to file a bill of complaint should be denied.

Respectfully submitted.

SAMUEL S. OLENS  
*Counsel of Record*  
 ATTORNEY GENERAL  
 STATE OF GEORGIA  
 GEORGIA DEPARTMENT  
 OF LAW  
 40 Capitol Square  
 Atlanta, GA 30334  
 (404) 656-3383  
 AGOlens@law.ga.gov

CHRISTOPHER LANDAU, P.C.  
 CRAIG S. PRIMIS, P.C.  
 K. WINN ALLEN  
 SARAH HAWKINS WARREN  
 KIRKLAND & ELLIS LLP  
*Special Assistant*  
*Attorneys General*  
 666 15th Street, NW  
 Washington, DC 20005

SETH P. WAXMAN  
 PAUL R.Q. WOLFSON  
 CHRISTOPHER E. BABBITT  
 JOSHUA M. SALZMAN  
 DANIEL AGUILAR  
*Special Assistant*  
*Attorneys General*  
 WILMER CUTLER PICKERING  
 HALE AND DORR LLP  
 1875 Pennsylvania Ave., NW  
 Washington, DC 20006

JANUARY 2014

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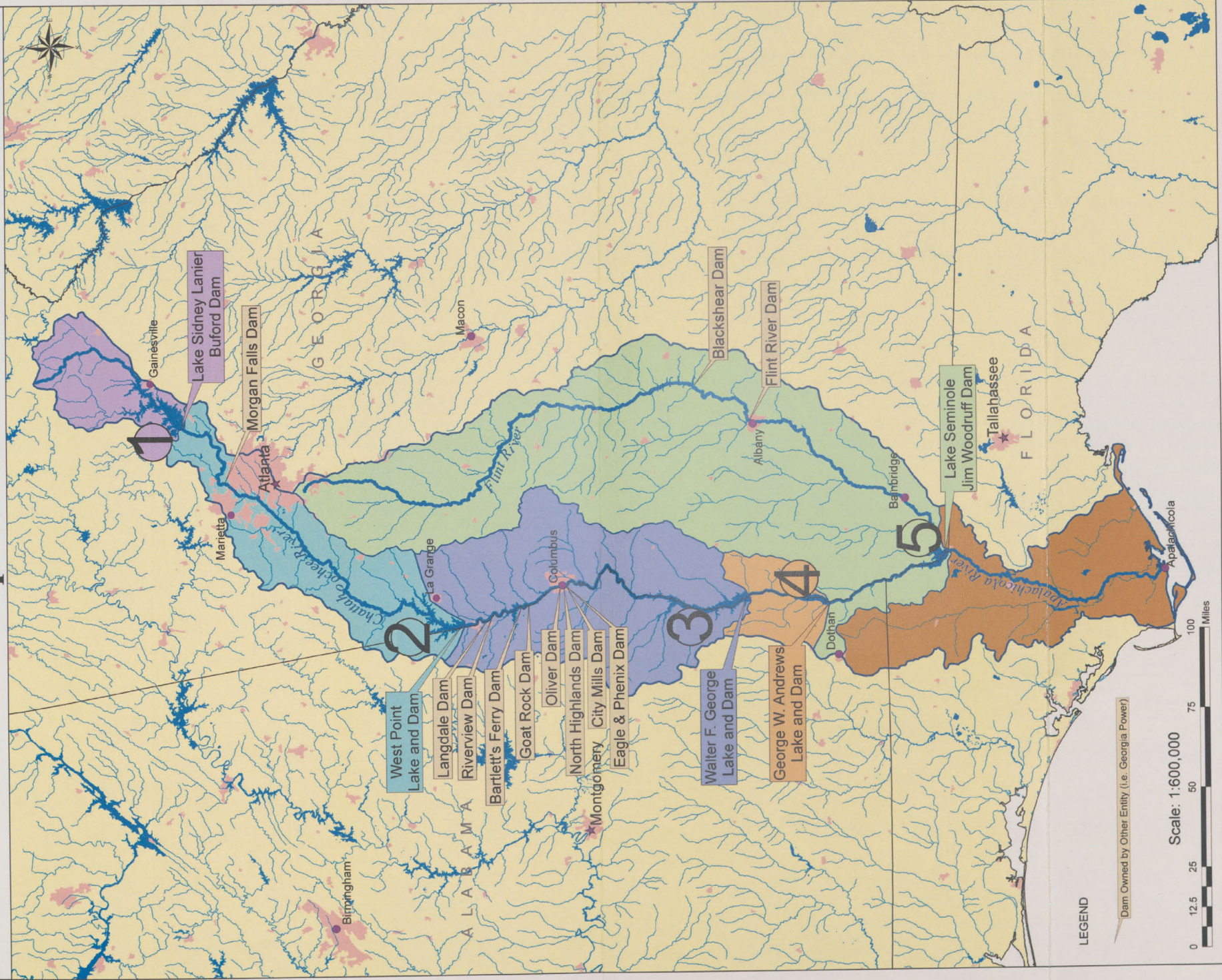
when that remedy requires implementation by the Corps but the Corps is not a party to this action. Third, the complaint does not adequately allege a substantial injury caused by Georgia that warrants resolution through an extraordinary equitable-apportionment action. If the complaint is deficient on these or other grounds, then the case should not proceed past the pleading stage.

# APPENDIX





# ACF Corps Dam Watersheds







**BIOLOGICAL OPINION ON THE U.S. ARMY CORPS  
OF ENGINEERS, MOBILE DISTRICT, REVISED  
INTERIM OPERATING PLAN FOR JIM WOODRUFF  
DAM AND THE ASSOCIATED RELEASES TO THE  
APALACHICOLA RIVER**

**Prepared by:  
U.S. Fish and Wildlife Service  
Panama City Field Office, Florida  
May 22, 2012**

**EXECUTIVE SUMMARY**

The action evaluated in this consultation is the Corps' Revised Interim Operating Plan (RIOP) for Jim Woodruff Dam, which describes releases from the dam to the Apalachicola River. Consultation on the RIOP was completed in 2008 and reinitiated in 2010, because of new information on the distribution and mortality of fat threeridge mussels. Substantial numbers of fat threeridge mussels recolonized habitats at elevations above the minimum 5,000 cfs flow, and many were subsequently exposed and killed when flows declined in September 2010. The Corps determined that the proposed RIOP may adversely affect the fat threeridge, purple bankclimber, and Chipola slabshell, and may affect but would not likely adversely affect (NLAA) the Gulf sturgeon or designated Gulf sturgeon or mussel critical habitat. The Service concurred with the Corps' determination of NLAA for the Gulf sturgeon and its designated critical habitat. Mussel effects were addressed in this biological opinion (BO).

The current version of the RIOP is very similar to the 2008 RIOP. It does not address operational specifics at the four federal reservoirs upstream of Woodruff. The

RIOP addresses two specific parameters of the daily releases from Woodruff Dam into the Apalachicola River: a minimum discharge in relation to average basin inflows (i.e., the actual amount of water flowing into all of the Corps projects during a given time period) and maximum fall rate (vertical drop in river stage per day). These two parameters vary by basin inflow, composite conservation storage level and by month. Except when basin inflow is less than 5,000 cfs and during some down-ramping periods, the minimum releases are not required to exceed basin inflow. The Corps proposed five modifications to the 2008 RIOP to minimize impacts to listed species: 1) volumetric balancing is eliminated; 2) minimum flow releases will match basin inflow between 5,000 and 10,000 cubic feet per second (cfs) from June through November (except during drought contingency operations); 3) drought contingency operations are not suspended until composite conservation storage has recovered above Zone 2 into Zone 1; 4) when releases are less than 10,000 cfs, the maximum fall rate is limited to 0.25 ft/day; and 5) river stage declines of 8 feet or more will not occur in less than 14 days when river flows are less than 40,000 cfs during the spawning season (March-May) under both normal and drought operations.

The current status of the three mussel species and their critical habitat is discussed in detail in the BO. Notable mortality of the purple bankclimber and fat threeridge has occurred during recent droughts in 2006-2008 and 2010-2012, but no Chipola slabshell mortality has been observed. The Chipola slabshell population is stable but generally occurs in relatively low abundance. The purple bankclimber is rare and occurs at low abundance in the Apalachicola River (with the exception of one location), and it appears to be experiencing poor recruit-



ment. The fat threeridge population appears stable and may be increasing in size. They are abundant in the middle reach of the Apalachicola River and the lower Chipola River, the population is relatively large, and there is evidence of recruitment.

Fat threeridge are likely moving in response to changing water levels to maintain an optimal depth or associated habitat parameter. At the time of the 2008 BO there were no listed mussels at river stages greater than 5,000 cfs due to the drought of 2006-2008. Although we noted that take may occur when individuals occupy stages greater than 5,000 cfs, we did not anticipate take under this scenario because it was considered an anomaly related to very high flows in 2005. However, based on recent data, it appears that fat threeridge readily recolonize higher bank elevations at flows greater than 5,000 cfs, where they could be at risk of stranding and mortality when flows decline. Mortality during these events was highest in the middle reach of the Apalachicola River where the main channel populations are the most abundant and slopes are shallow. Some mortality occurred in the Chipola River, but it appears to be limited. Mortality estimates from all of these events range from <1% to 2% depending on preceding hydrologic conditions, fall rates, habitat condition, and the size of the population in Swift Slough and unsurveyed deep-water habitats.

Relative to the Baseline period (1975-2008), the proposed RIOP provides both beneficial and adverse effects to the species and designated critical habitats we have assessed. Many of these effects derive from relatively minor differences between the RIOP and Baseline; however, we attribute these differences to changes in reservoir operations and not consumptive water use. Generally, it appears that the Corps would store water

more often and augment flows less often under the RIOP than has occurred historically. The RIOP uses some of this stored water to augment basin inflow in order to maintain a minimum flow of 5,000 cfs, but the frequency and duration of flows less than 10,000 cfs is increased.

Lower flows for longer durations will negatively impact all three mussel species. We expect impacts to Chipola slabshell to be minimal because it occurs almost entirely within the Chipola River where movement is facilitated by higher bank slopes and the species' probable tendency to move. Impacts to the purple bankclimber will also likely be minimized because this species appears to occur more often in deeper portions of the stream channel, which is likely why we have observed limited mortality during recent low flows. The results of the fat threeridge population viability analysis (PVA) indicate that the population can sustain reductions of 1-2% (estimated have occurred during recent droughts) if flows are reduced to 5,000 cfs and 4,500 cfs with currently projected probabilities. However, the PVA also indicates that increasing the frequency of such events results in a greater impact to population viability. The RIOP may affect three of the five primary constituent elements (PCEs) of mussel critical habitat: 1) permanently flowing water; 2) water quality; and 3) fish hosts. It does not appear to reduce the amount of important floodplain habitat available to fish hosts. Droughts substantially change the nature of all of these PCEs, but the RIOP would not appreciably change the quantity or quality of the PCEs to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role. Therefore, it is the Service's biological opinion that the proposed action: 1) will not jeopardize the continued existence of

the fat threeridge, purple bankclimber, and Chipola slabshell; and 2) will not destroy or adversely modify designated critical habitat for the fat threeridge, purple bankclimber, and Chipola slabshell.

The Incidental Take Statement issued exempts the Corps from “take” under the Endangered Species Act. During each of these events (flow reduction to 4,500 cfs, and exposure at stages >5,000 cfs following recolonization), a maximum the following may be exposed: 30 purple bankclimbers (60 total); three Chipola slabshell (six total); and 9,150 fat threeridge (18,300 total). Three mandatory reasonable and prudent measures are also included: 1) adaptive management; 2) maintenance of the Chattahoochee gage; and 3) monitoring.

This BO is effective for five years (May 22, 2017). No further consultation is needed unless the Corps operates Woodruff Dam in a way that is different from the RIOP, new information indicates that the RIOP may affect listed species to an extent not considered in the BO, or if more mussels or Gulf sturgeon are “taken” under the Corps’ operations than anticipated.

\* \* \*

[U.S. Department of the Interior letterhead]

May 22, 2012

Mr. Curtis Flakes  
Chief, Planning and Environmental Division  
U.S. Army Corps of Engineers  
P.O. Box 2288  
Mobile, Alabama 36628-0001

Dear Mr. Flakes:

This document is the Fish and Wildlife Service's (Service) biological opinion (BO) of the Revised Interim Operating Plan (RIOP) for Jim Woodruff Dam. The RIOP addresses water management operations at Jim Woodruff Dam and the associated releases to the Apalachicola River. This opinion is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*) and provides considerations for provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

The U.S. Army Corps of Engineers (Corps) originally requested formal consultation on this action by letter dated April 15, 2008. At that time, the Corps determined that the RIOP may adversely affect the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), endangered fat threeridge mussel (*Amblema neisleri*), threatened purple bankclimber mussel (*Elliptioideus sloatianus*), threatened Chipola slabshell (*Elliptio chipolaensis*), and areas designated as critical habitat for the Gulf sturgeon and these mussels. In the June 1, 2008 BO, the Service determined that the RIOP would not jeopardize the continued existence of these species nor destroy or adversely modify their designated criti-

cal habitats. An Incidental Take Statement (ITS) and Reasonable and Prudent Measures (RPMs) were issued to minimize the impacts of incidental take on these species.

Consultation was reinitiated by letter dated November 17, 2010, because of new information on the distribution and mortality of fat threeridge mussels. Substantial numbers of fat threeridge mussels recolonized habitats at elevations above the minimum 5,000 cfs flow, and many were subsequently exposed and killed when flows declined in September 2010. Since that time, we have worked with your staff on potential modifications to the RIOP to minimize impacts to fat threeridge mussels (Corps 2011 and 2012). As described in your most recent amended biological assessment (BA), the Corps is proposing to adopt some of these modifications (Corps 2012). The Corps has determined that the proposed RIOP may adversely affect the fat threeridge, purple bankclimber, and Chipola slabshell, and may affect but would not likely adversely affect (NLAA) the Gulf sturgeon or designated Gulf sturgeon or mussel critical habitat.

Based on the information you provided in the 2012 BA and your supplementary letter on April 12, 2012, the Service concurs with the Corps' determination of NLAA for the Gulf sturgeon and its designated critical habitat. We do not expect take of Gulf sturgeon eggs and larvae to occur because the RIOP's fall rate provision prevents river stage declines of 8 feet or more in less than 14 days, which were expected to result in take in the 2008 BO. In addition, there is little, if any, change to the available amount of spawning habitat in the spring or fall or juvenile sturgeon habitat (using the surrogate measure for salinity in the bay of consecutive days with flows less than 16,000 cfs). The RIOP may

benefit spawning and juvenile habitat relative to the environmental baseline period (1975-2008) by generally providing: 1) more 30 day-continuous habitat in the known spawning depth range, and 2) a slight reduction in the maximum number of consecutive days of flows less than 16,000 cfs during October through March when Gulf sturgeon are using the bay, which may be associated with lower salinities preferred by juveniles. No further impacts to Gulf sturgeon resulting from the RIOP have been identified. Therefore, we will not discuss Gulf sturgeon further in this BO.

A total of 34 federally listed species are known to occur within the Apalachicola-Chattahoochee-Flint (ACF) River Basin, but effects of the proposed action are limited to those that depend primarily on riverine habitat. Except for the temporary waiver of winter drawdown requirements during drought conditions, the Corps would implement the RIOP within the constraints of the existing water control plans for the upstream reservoir projects, i.e., the RIOP would not change the top of the flood control pools, conservation pools, or the rule curves of the upstream projects. Therefore, the proposed action will have no effect or an insignificant effect (*i.e.*, any impacts should never reach the scale where take occurs) on all but the riverine- and estuarine-dependent species. Two species of sea turtles and the West Indian manatee may sometimes occur in Apalachicola Bay or the lower Apalachicola River; however, any effects of the proposed action to these species would be insignificant also, due to their low numbers and only occasional seasonal residence in the river and bay. Three of the 34 ACF listed species are freshwater mussels that do not occur in areas downstream of the Corps' ACF projects: the shiny-rayed pocketbook, Gulf moccasinshell, and oval pigtoe. The proposed action will

have no effect on these mussel species. Altogether, the proposed action will have either no effect or an insignificant effect on the species listed below; therefore, these species are not further discussed in this BO. No further consultation is necessary for these species unless the RIOP is subsequently modified in a manner that causes an effect to listed species or designated critical habitat or new information reveals the RIOP may affect listed species or designated critical habitat in a manner or to an extent not previously considered.

Frosted flatwoods salamander ( <i>Ambystoma cingulatum</i> )
Reticulated flatwoods salamander ( <i>Ambystoma bishopi</i> )
Loggerhead turtle ( <i>Caretta caretta caretta</i> )
Eastern indigo snake ( <i>Drymarchon corais couperi</i> )
Atlantic ridley ( <i>Lepidochelys kempi</i> )
Piping plover ( <i>Charadrius melodus</i> )
Wood stork ( <i>Mycteria americana</i> )
Gray bat ( <i>Myotis grisescens</i> )
Indiana bat ( <i>Myotis sodalis</i> )
West Indian manatee ( <i>Trichechus manatus</i> )
Shiny-rayed pocketbook ( <i>Lampsilis subangulata</i> )
Gulf moccasinshell ( <i>Medionidus penicillatus</i> )
Oval pigtoe ( <i>Pleurobema pyriforme</i> )
Little amphianthus ( <i>Amphianthus pusillus</i> )
Apalachicola rosemary ( <i>Conradina glabra</i> )
Telephus spurge ( <i>Euphorbia telephiodides</i> )
Harper's beauty ( <i>Harperocallis flava</i> )
Black-spored quillwort ( <i>Isoetes melanospora</i> )
Pondberry ( <i>Lindera melissifolia</i> )
White birds-in-a-nest ( <i>Macbridea alba</i> )
Canby's dropwort ( <i>Oxypolis canbyi</i> )
Godfrey's butterwort ( <i>Pinguicula ionantha</i> )
Harperella ( <i>Ptilimnium nodosum</i> )

Chapman's rhododendron ( <i>Rhododendron chapmanii</i> )
Michaux's sumac ( <i>Rhus michauxii</i> )
Green pitcherplant ( <i>Sarracenia oreophila</i> )
American chaffseed ( <i>Schwalbea Americana</i> )
Florida skullcap ( <i>Scutellaria floridana</i> )
Fringed campion ( <i>Silene polypetala</i> )
Gentian pinkroot ( <i>Spigelia gentianoides</i> )
Cooley meadowrue ( <i>Thalictrum cooleyii</i> )
Florida torreya ( <i>Torreya taxifolia</i> )
Relict trillium ( <i>Trillium reliquum</i> )
Gulf sturgeon ( <i>Acipenser oxyrinchus desotoi</i> )

The RIOP is intended to govern the releases from Woodruff Dam until revised or replaced with a new Water Control Plan (WCP). The Corps will prepare a draft environmental impact statement for updated water control manuals for the ACF River Basin. We understand that the revision of the WCP may take up to five additional years; therefore, we have structured this opinion to evaluate the effects of the proposed action over the next five years.

This BO is based on numerous coordination meetings, clarifying letters, and conference calls between the Corps and the Service in recent months, as well as unpublished data in Service files, the experience of Service biologists, and an extensive literature search. It does not rely on the regulatory definition of destruction or adverse modification of critical habitat as set forth in the Code of Federal Regulations at 50 CFR § 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat. A complete administrative record is on file in the Panama City Field Office, Florida.



## **BIOLOGICAL OPINION**

This opinion supersedes the 2008 BO dated June 1, 2008, which addressed the effects of the Revised Interim Operating Plan (RIOP), because the 2008 RIOP has been amended during reinitiation of consultation. The Corps has described changes to the RIOP and its effects in the revised amended BA dated February 15, 2012. Where appropriate, we have incorporated their descriptions and analysis into this BO. This document also supersedes the 2008 ITS and associated RPMs.

### **1 DESCRIPTION OF PROPOSED ACTION**

The action evaluated in this consultation is the Corps' RIOP for Jim Woodruff Dam, which describes releases from the dam to the Apalachicola River. The RIOP and modifications were formulated to address protection of endangered and threatened species and critical habitat in the Apalachicola River, manage reservoir storage for other project purposes, and meet drought-related contingencies. According to the Corps, the RIOP is not a new WCP for Woodruff Dam; it is a definition of ACF operations that is within the limits established by the existing ACF WCP except during defined drought conditions. It is our understanding that the RIOP is effective until it is revised or until the ACF WCP is formally updated, at which time the Corps would reinitiate consultation.

The Corps operates five dams in the ACF River Basin: (in downstream order) Buford, West Point, Walter F. George, George W. Andrews, and Jim Woodruff (Figure 1.A). All are located wholly on the Chattahoochee River arm of the basin except the downstream-most dam, Woodruff, which is located at the confluence of the Chattahoochee and Flint rivers and marks the up-

stream extent of the Apalachicola River. Andrews is a lock and dam without any appreciable water storage, and Lake Seminole has very limited storage capacity. Both are essentially operated as run-of-river reservoirs (i.e., what goes in comes out without being stored for any substantial amount of time). The impoundments of Buford, West Point, and Walter F. George dams, however, provide for combined conservation storage of approximately 1.6 million acre-feet, relative to the top of each reservoir's full summer pool and the bottom of the conservation pool, which is potentially available to support water management operations. For about half of its length, the Chattahoochee River forms the boundary between Georgia and Alabama. Lake Seminole straddles the boundary between Florida and the southwest corner of Georgia.

The Corps operates the ACF reservoirs as a system, and releases from Woodruff Dam reflect the downstream end-result of system-wide operations. The RIOP addresses specific parameters of the daily releases from Woodruff Dam into the Apalachicola River. The RIOP does not address operational specifics at the four federal reservoirs upstream of Woodruff or all aspects of the operations at Woodruff, other than to anticipate waivers from the winter pool rule curves at West Point and Walter F. George reservoirs during exceptional drought conditions. The RIOP specifies two parameters applicable to the daily releases from Woodruff: a minimum discharge in relation to average basin inflows (see definition below) and maximum fall rate (vertical drop in river stage [ft/day]). For purposes of this BO, we use data for both parameters that are collected by the USGS at gage number 02358000, "Apalachicola River at Chattahoochee, FL," which is located 0.6 mi downstream of Woodruff Dam. We refer to this

flow measurement point throughout the BO simply as the "Chattahoochee gage".

Basin inflow is defined as the amount of water that would flow by Woodruff Dam during a given time period if all of the Corps' reservoirs maintained a constant water surface elevation during that period. The Corps estimates basin inflow daily from a combination of river and reservoir level measurements, mathematical stage/volume/discharge relationships, and operating characteristics of the various water release structures of the dams. The RIOP uses a 7-day moving average of daily basin inflow calculations for daily release decisions. Basin inflow is not the natural or "unimpaired" flow of the basin at the site of Woodruff Dam, because it reflects the influences of reservoir evaporative losses, inter-basin water transfers, and consumptive water uses, such as municipal and industrial water supply and agricultural irrigation.

The proposed action includes five modifications to the 2008 RIOP: 1) the use of volumetric balancing is eliminated; 2) minimum flow releases will match basin inflow when basin inflow is between 5,000 and 10,000 cfs during the months of June through November (this provision is suspended during drought contingency operations); 3) drought contingency operations are not suspended and normal operations reinstituted until composite conservation storage has recovered above Zone 2 into Zone 1; 4) when releases are within powerhouse capacity (which is flows less than about 16,000 cfs) and less than 10,000 cfs, the maximum fall rate is limited to 0.25 ft/day; and 5) river stage declines of 8 feet or more will not occur in less than 14 days when river flows are less than 40,000 cfs during the spawning season (March-May) under both normal and drought operations. Pro-

visions of the proposed RIOP are described in detail below.

### **1.1 Action Area**

Service regulations define “action area” as all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR §402.02). Although the RIOP specifically addresses the releases from Woodruff Dam, the downstream-most project among the Corps’ ACF reservoirs, these releases are accomplished through the collective operations of all of the Corps’ ACF reservoirs. Therefore, the action area includes all aquatic habitats that are downstream of the Corps’ upstream-most ACF project, Lake Lanier/Buford Dam, ending with and including Apalachicola Bay (Figure 1.A). However, the only aquatic listed species that is known to occur in this action area upstream of Woodruff Dam is a single purple bankclimber found in Goat Rock Reservoir in 2000 (Stringfellow 2011 pers. comm.). The proposed action is not anticipated to result in any physical changes to the environment of this individual animal. Therefore, while the action area includes all aquatic habitats that are downstream of the Corps’ upstream-most ACF project, Lake Lanier/Buford Dam, ending with and including Apalachicola Bay, the effects of the action are limited to the aquatic habitats downstream of Woodruff Dam ending with and including Apalachicola Bay. This portion of the action area, which we address in the remainder of this BO, is shown in Figure 1.1.A. Hereafter, our use of the term “action area” refers to this limited portion of the broader action area. We refer to locations in the action area by river mile (RM), which is the distance from the mouth of the river as noted on USGS 7.5-minute topographic maps.

## 1.2 Minimum Discharge

Like the 2008 RIOP, the proposed action varies minimum discharges from Jim Woodruff Dam by basin inflow, composite conservation storage level and by month. The releases are measured as a daily average flow in cfs at the Chattahoochee gage. Table 1.2.A illustrates minimum releases from Jim Woodruff Dam prescribed by the proposed action and shows when and how much basin inflow is available for increasing reservoir storage. Except when basin inflow is less than 5,000 cfs and during some down-ramping periods, the minimum releases are not required to exceed basin inflow. The RIOP defines basin inflow threshold levels that vary by three seasons: spawning season (March-May); non-spawning season (June-November); and winter (December-February).

The RIOP incorporates composite conservation storage thresholds that factor into minimum release decisions. Composite conservation storage is calculated by combining the conservation storage of Lake Sidney Lanier, West Point Lake, and Walter F. George Lake. Storage in each of the individual storage reservoirs is divided into four operational Zones. The composite conservation storage utilizes the four-Zone concept as well; e.g., Zone 1 of the composite conservation storage represents the combined conservation storage available in Zone 1 for each of the three storage reservoirs (Figure 1.2.A).

During the spawning season (March-May), the RIOP defines two sets of four basin inflow thresholds and corresponding releases based on composite conservation storage. When composite conservation storage is in Zones 1 and 2, a less conservative operation is in effect. When composite conservation storage is in Zone 3, a more conservative operation allows for greater reten-

tion of basin inflow in storage, and when composite conservation storage falls below the bottom of Zone 3 into Zone 4 the most conservative drought contingency operations are "triggered." Drought contingency operations are described in section 1.4 below. During the spawning season, a daily monitoring plan that tracks composite storage will be implemented in order to determine water management operations. Recent climatic and hydrological conditions experienced and meteorological forecasts will be used in addition to the composite conservation storage values when determining the appropriate basin inflow thresholds to utilize in the upcoming days.

During the non-spawning season (June-November), the RIOP defines one set of four basin inflow thresholds and corresponding releases based on composite conservation storage in Zones 1-3. The proposed action modifies the 2008 RIOP while operating in these composite conservation zones by requiring that releases match or exceed basin inflow when basin inflow is between 5,000 and 10,000 cfs (was between 5,000 and 8,000 cfs in the 2008 RIOP). This change also requires slight adjustments to the basin inflow levels and minimum release provisions at basin inflows greater than 10,000 cfs. Table 1.2.A reflects the proposed action with the modifications to the 2008 RIOP. When composite conservation storage falls below the bottom of Zone 3 into Zone 4 the drought contingency operations are "triggered".

During the winter season (December-February), there is only one basin inflow threshold and corresponding minimum release (5,000 cfs) while in composite conservation storage Zones 1-3. There are no basin inflow storage restrictions provided this minimum flow is met. When composite conservation storage falls below the

bottom of Zone 3 into Zone 4 the drought contingency operations are “triggered”.

The flow rates included in Table 1.2.A prescribe minimum, and not target, releases for Jim Woodruff Dam. During a given month and basin inflow rate, releases greater than the Table 1 minimum releases may occur consistent with the maximum fall rate schedule, described below, or as needed to achieve other project purposes, such as hydropower or flood control.

### **1.3 Maximum Fall Rate**

The RIOP prescribes maximum fall rates for the releases from Woodruff Dam (Table 1.3.A). Fall rate, also called down-ramping rate, is the vertical drop in river stage (water surface elevation) that occurs over a given period. The fall rates are expressed in units of feet per day (ft/day), and are measured at the Chattahoochee gage as the difference between the daily average river stage of consecutive calendar days. Rise rates (i.e., today’s average river stage is higher than yesterday’s) are not addressed. The proposed action modifies the maximum fall rate schedule (Table 1.3.A) prescribed by the 2008 RIOP by limiting the maximum fall rate to 0.25 ft/day or less when releases are within powerhouse capacity and less than 10,000 cfs (was 8,000 cfs in the 2008 RIOP). Unless otherwise noted, fall rates under the drought contingency operation would be managed to match the fall rate of the 1-day basin inflow. The Corps proposes to adopt in this amended RIOP its response to RPM 2008-4 of the 2008 BO, which ensures that river stage declines of 8 feet or more will not occur in less than 14 days when river flows are less than 40,000 cfs (March-May). The proposed action eliminates the use of volumetric balancing, which was included in the 2008 RIOP.

#### 1.4 Drought Contingency Operations

The RIOP incorporates a drought contingency operation (referred to as drought plan). The drought plan specifies a minimum release from Jim Woodruff Dam and temporarily suspends the other minimum release and maximum fall rate provisions until composite conservation storage within the basin is replenished to a level that can support them. The minimum discharge is determined in relation to composite conservation storage and not average basin inflow under the drought plan. The drought plan is "triggered" when composite conservation storage falls below the bottom of Zone 3 into Zone 4. At that time all the composite conservation storage Zone 1-3 provisions (seasonal storage limitations, maximum fall rate schedule, and minimum flow thresholds) are suspended and management decisions are based on the provisions of the drought plan. The drought plan includes a temporary waiver from the existing WCP to allow temporary storage above the winter pool rule curve at the Walter F. George and West Point projects if the opportunity presents itself and/or begin spring refill operations at an earlier date in order to provide additional conservation storage for future needs, including support of minimum releases from Jim Woodruff Dam.

The drought plan prescribes two minimum releases based on composite conservation storage in Zone 4 and an additional zone referred to as the Drought Zone (Figure 1.2.A). The Drought Zone delineates a volume of water roughly equivalent to the inactive storage in lakes Lanier, West Point and Walter F. George plus Zone 4 storage in Lake Lanier. However, the Drought Zone line has been adjusted to include a smaller volume of water at the beginning and end of the calendar year. When the composite conservation storage is within



Zone 4 and above the Drought Zone, the minimum release from Jim Woodruff Dam is 5,000 cfs, and the Corps may store all available basin inflow above 5,000 cfs. Once the composite conservation storage falls below the Drought Zone, the minimum release from Jim Woodruff Dam is 4,500 cfs, and the Corps may store all available basin inflow above 4,500 cfs. When transitioning from a minimum release of 5,000 cfs to 4,500 cfs, maximum fall rates are limited to a maximum 0.25 ft/day drop. The 4,500 cfs minimum release is maintained until composite conservation storage returns to a level above the top of the Drought Zone, at which time the 5,000 cfs minimum release is re-instated.

Under the 2008 RIOP, the drought plan was in effect until composite conservation storage reached a level above the top of Zone 3 (i.e., within Zone 2). At that time, the temporary drought plan provisions were suspended, and all the other provisions were re-instated. The proposed action modifies the 2008 RIOP drought plan by increasing the composite conservation storage level “trigger” for re-instating normal operations (i.e., the Corps can store more water for a longer period than in the 2008 RIOP). Under the proposed action, the drought plan provisions remain in place until composite conservation storage reaches a level above the top of Zone 2 (i.e., within Zone 1). The proposed action also requires adherence to the spawning season fall-rate provision during drought contingency operations, which ensures fall rates less than 8 feet in 14 days when river flows are less than 40,000 cfs (March-May).

During drought contingency operations, the Corps will assess the status of water management operations relative to the triggers on the first day of each month, also considering other relevant data, recent climatic and hydrological conditions experienced, and meteorological

forecasts will be used when determining the set of operations that apply to the upcoming month.

### **1.5 Conservation Measures**

Conservation measures are actions that benefit or promote the recovery of a listed species that a Federal agency includes as an integral part of its proposed action and that are intended to minimize or compensate for potential adverse effects of the action on the listed species. The RIOP and the proposed modifications were formulated in large part to avoid and minimize impacts to listed species while achieving other authorized project purposes. Minimum flow and maximum fall rates are set based upon the current basin inflow in a way that limits most project-induced alterations of the flow regime to higher flow rates. At lower flow rates in the months of March through November and when composite storage is in Zone 3 or higher, the Corps releases a minimum of not less than basin inflow (Table 1.2.A) and limits the rate of river stage decline (Table 1.3.A). When basin inflow is less than 5,000 cfs, which did not occur in the pre-Lanier average daily flow record of the Chattahoochee gage (1929 through 1955), the Corps augments basin inflow, which offsets to some degree the impact of the evaporative losses, non-project related consumptive water uses, and drought conditions more severe than previously observed in the Basin.

\* \* \*

## 1.6 Tables and Figures for Section 1

Table 1.2.A. Proposed Action RIOP Releases From Jim Woodruff Dam.

Months	Composite Storage Zone	Basin Inflow (cfs)	Releases from JWLD (cfs)	Basin Inflow Available for Storage <sup>1</sup>
March - May	Zones 1 and 2	>= 34,000	>= 25,000	Up to 100% BI > 25,000
		>= 16,000 and < 34,000	>= 16,000 + 50% BI > 16,000	Up to 50% BI > 16,000
		>= 5,000 and < 16,000	>= BI	
		< 5,000	>= 5,000	
	Zone 3	>= 39,000	>= 25,000	Up to 100% BI > 25,000
		>= 11,000 and < 39,000	>= 11,000 + 50% BI > 11,000	Up to 50% BI > 11,000
		>= 5,000 and < 11,000	>= BI	
		< 5,000	>= 5,000	
June - November	Zones 1,2, and 3	>= 22,000	>= 16,000	Up to 100% BI > 16,000

<sup>1</sup> Consistent with safety requirements, flood control purposes, and equipment capabilities.

		>= 10,000 and < 22,000	>= 10,000 + 50% BI > 10,000	Up to 50% BI > 10,000
		>= 5,000 and < 10,000	>= BI	
		< 5,000	>= 5,000	
December -February	Zones 1,2, and 3	>= 5,000	>= 5,000	Up to 100% BI > 5,000
		< 5,000	>= 5,000	
At all times	Zone 4	NA	>= 5,000	Up to 100% BI > 5,000
At all times	Drought Zone	NA	>= 4,500 <sup>2</sup>	Up to 100% BI > 4,500

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<sup>2</sup> Once composite storage falls below the top of the Drought Zone ramp down to 4,500 cfs will occur at a rate no greater than 0.25 ft/day drop.

#### 4.2.2 General Effects on the Flow Regime

The Corps alters the flow regime of the Apalachicola River by storing and releasing water from its reservoirs. The ResSim model of the RIOP simulates these operations using the historically measured/estimated consumptive water uses. To the extent that these consumptive use data are accurate, differences between the historically observed flows (i.e., baseline, 1975 to 2008) and the simulated flows of the RIOP are due to differences in reservoir operations, as the model is driven by the observed hydrology. The volume of water in the Corps' three largest ACF reservoirs (composite storage of Lanier, West Point, and W.F. George) is seldom stable for extended periods, and follows a general pattern of increasing storage from January through June or July, and decreasing storage thereafter. The expected general pattern of flow alteration, therefore, is depletion during the first half of the year during periods of relatively high flow and augmentation during the second half of the year during periods of relatively low flow.

Figure 4.2.2.A shows the magnitude of this annual cycle of re-fill and draw-down by comparing the January-to-June maximum composite storage level with the July-to-December minimum composite storage level for both historical operations and the RIOP for the years 1976 to 2008 (we could not use 1975 to 2008 for this comparison because composite storage values for the complete year of 1975 were not available). The primary difference between the observed historical levels and the RIOP levels is the amplitude of the annual cycle: the RIOP generally has lower maximum storage in the first half of the year, and higher minimum storage in the

second half of the year. The annual average drawdown under the RIOP by this measure is 407,003 acre feet, compared to 653,772 acre feet historically, a 38% reduction in reservoir drawdown. Stored or released at a constant rate over a 6-month period (180 days), these volumes are equivalent to flow rates of 1,140 cfs and 1,831 cfs, respectively.

Figures 4.2.2.B and 4.2.2.C examine how the RIOP's change in the overall range of reservoir elevations would affect the seasonal timing and magnitude frequency of the flow of the Apalachicola River. These figures show the frequency (% of days) that daily average discharge (cfs) values are exceeded during the years 1975-2008 for each calendar month. To better view the differences between the exceedance frequencies of the historical flows and the RIOP flows, Figures 4.2.2.B and 4.2.2.C display the results of this analysis for flows that are exceeded more than 10% of the time because the highest flows are generally several orders of magnitude greater than all other flows and would require a much expanded scale for the vertical axis. Figures 4.2.2.B and 4.2.2.C also list the average of all the days included in the analysis for each month, including the highest flows, which is a measure of the total volume of water represented by the frequency/magnitude curves.

Despite the reduced amplitude of the annual reservoir refill/drawdown cycle noted above, the frequency and magnitude of simulated flows under the RIOP are generally comparable to historical flows in January through April and in December. Average flows under the RIOP for these months are within 3% of the historical baseline averages. The remaining months of the year, however, show greater departures from the historical flows. RIOP flows are higher more often in No-

vember, making average flow in November 10.7% greater under the RIOP. Average flow in October is 4.0% greater under the RIOP, with higher frequencies at flows greater than about 14,000 cfs and less than about 10,000 cfs. RIOP flows are generally lower more often in May through September, with the greatest departures in August and September, where average flows of the RIOP are 1,053 cfs (7.4%) and 757 cfs (6.3%) lower than historical baseline flows, respectively. Lower flows during these months negatively affect mussels because the risk of exposure is higher, habitat is constricted, and water temperatures are higher.

We used the Corps' simulated RoR operation to count the number of days that reservoir operations, both historically observed and simulated under the RIOP, were either decreasing or increasing the flow into the Apalachicola River, and to quantify the volume of that depletion and augmentation. For simplicity, we counted all deviations from RoR flow as either a depletion or an augmentation, and on no days did the simulated RoR flow exactly equal the Baseline or RIOP flow. Historical ACF reservoir operations altered the flow 56.3% of the days by flow augmentation and 43.7% of the days by flow depletion, whereas the RIOP simulation is slightly more evenly divided between augmentation days (53.7%) and depletion days (46.3%). The more striking difference between the Baseline and the RIOP is in the volume of the alterations. When Baseline flow was greater than the estimated RoR flow, the average daily augmentation was 3,287 cfs, and when Baseline flow was less than RoR, the average daily depletion was 3,936 cfs. Under the RIOP, average daily augmentation was 1,801 cfs, and average daily depletion was 2,066 cfs. Operations in support of commercial navigation throughout most of the Baseline, a practice which

is not simulated in the RIOP, may partially account for this difference in depletion/augmentation volumes. However, even in the more recent years of the Baseline (post 1999), during which the Corps has only occasionally stored water and made releases for navigation, the average daily flow alteration (both augmentation and depletion) is about 50 percent greater than under the same years of the RIOP simulation.

The RIOP model maintains a minimum release from Woodruff Dam of between 4,550 and 5,050 cfs, a flow range which occurs about 3.7% of the time (464 days) in the years 1975-2008. Flows less than or equal to 5,050 cfs occurred for 117 days in the Baseline record, or 0.9% of the time, and the lowest flow recorded was 3,900 cfs. The RIOP is intended to support the minimum flow 5,000 cfs until composite storage falls into the "drought zone" of Zone 4, which occurs for one month in the simulation (November, 2007). Only the 5,000 cfs minimum release (and 4,500 cfs while in the drought zone) and downramping according to the fall rate schedule are supported with releases from storage: all other minimum release provisions of the RIOP do not require flows that are greater than current levels of basin inflow. If we discount the storage required to meet the fall rate schedule, we may estimate the amount of storage required each year solely to sustain the minimum release schedule of the RIOP as the sum of daily deficits in basin inflow relative to 5,050 cfs (5,050 minus basin inflow), and relative to 4,550 cfs during drought operations (4,550 minus basin inflow in November, 2007). Figure 4.2.2.D shows the total deficits for the years 1975 to 2008 using the RoR simulation as the measure of basin inflow (actual operations use 7-day average basin inflow computed from daily local inflow for each reservoir). Most years (19 years of the 34 years, or



55.9%) have no deficit, and the non-zero deficit years vary from almost none to 702,411 ac-ft in 2007. Total storage capacity of lakes Lanier, West Point, and George is about 3.5 million ac-ft, of which 1.6 million ac-ft is considered “conservation” or “active” storage.

We examine the possible effects of these various changes to the flow regime to the listed species and their habitats in the remaining sections of this chapter.

\* \* \*

## 6 CONCLUSION

The proposed action provides both beneficial and adverse effects to the species and designated critical habitats we have assessed. To the extent that the consumptive use assumptions are accurate, differences between the Baseline and the simulated flows of the RIOP are due to differences in reservoir operations, as the model is driven by the observed hydrology. Therefore, we attribute all differences between the Baseline and RIOP simulated flow regime to the Corps’ discretionary operations. Differences between the Baseline and RIOP are summarized in general form below (for more details, see sections 4 and 5):

### Beneficial Effects

- Basin inflow is augmented when it is less than 5,000 cfs; no daily flows would be less than 5,000 cfs at the Chattahoochee gage. However, if exceptional drought provisions are triggered, this would become no days less than 4,500 cfs (Figure 4.2.3.A).
- The frequency (percent of years) of growing-season (April-October) floodplain connectivity to the main channel is increased (Figure 4.2.4.B).

- A reduction in the inter-annual frequency of flows less than 7,500 cfs (Figure 4.2.3.A).
- A decrease in the maximum number of days/year of flows at all levels except less than 6,000 cfs (Figure 4.2.3.B).
- A decrease in the maximum number of consecutive days/year of flows between 7,000-10,000 cfs (Figure 4.2.3.C).
- A decrease in the median number of days/year of flows less than 9,000 cfs (Figure 4.2.3.D).
- A decrease in the median consecutive number of days/year of flows less than 8,000 cfs (Figure 4.2.3.E).
- Lower fall rates in the most extreme categories (>1 ft/day) (Figures 4.2.3.F-H).

#### Adverse Effects

- RIOP flows are lower than the baseline more often in May through September, with the greatest departures in August and September (Figures 4.2.2.B-C).
- Lower minimum flows in about half the years from 1975-2008 (Table 4.2.3.A)
- An increase in inter-annual frequency of flows from about 7,500 to 10,000 cfs (Figure 4.2.3.A).
- An increase in maximum number of days per year of flows less than 6,000 cfs (Figure 4.2.3.B).
- An increase in maximum number of consecutive days per year of flows less than 6,000 cfs (Figure 4.2.3.C).

- An increase in median number of days per year of flows between 7,000 and 9,500 cfs (Figure 4.2.3.D).
- An increase in the median consecutive number of days/year of flows less than 9,000-10,000 cfs (Figure 4.2.3.E).
- An increase in percent of days with fall rates from 0.25 to 1.0 ft/day (Figure 4.2.3.F).
- An increase in the median fall rates over the Baseline rate in the range of flows where mussels occur (Table 4.2.3.B).
- Fall rates less than about 0.20 ft/day occur with greater frequency than the Baseline period (when flows are less than 8,000 cfs) since the implementation of the maximum fall rate schedule in 2006 (Figure 4.2.3.H).

Most of these effects, both the beneficial and the adverse, derive from relatively minor differences between the RIOP and Baseline. Generally, it appears that the Corps would store water more often and augment flows less often under the RIOP than has occurred historically. The RIOP uses some of this stored water to maintain a minimum flow of 5,000 cfs, but the frequency of flows less than 10,000 cfs is increased.

The remainder of this section summarizes and consolidates our findings in the previous sections for each listed species and critical habitat in the action area.

### **6.1 Fat threeridge**

Fat threeridge located in moderately depositional habitat are likely moving in response to changing water levels to maintain an optimal depth or associated habitat parameter. Sediment deposition also likely plays a role. At the time of the 2008 BO there were no listed mussels

at river stages greater than 5,000 cfs due to the drought of 2006-2008. Although we noted that take may occur when individuals occupy stages greater than 5,000 cfs, we did not anticipate take under this scenario because it was considered an anomaly related to very high flows in 2005. However, based on recent data, it appears that fat threeridge readily recolonize higher bank elevations at flows greater than 5,000 cfs, where they could be at risk of stranding and mortality when flows decline.

Mortality during these events was highest in the Wewa reach of the Apalachicola River where the main channel populations are the most abundant and slopes are shallow. Some mortality occurred in the Chipola River, but it appears to be limited. Mortality estimates from these all of these events range from <1% to 2% depending on preceding hydrologic conditions, fall rates, habitat condition, and the size of the population in Swift Slough. Since the first event was recognized in 2006, 3-4% of the total estimated population of fat threeridge may have died during these various low flow events. We may be over-estimating the relative amount of mortality because we are likely underestimating the total population of fat threeridge in the action area.

Channel morphology changes have likely contributed to a substantial decline of the species distribution in the upstream-most 30 miles of the river. It is abundant in moderately depositional habitat in the Wewa reach and the Chipola River and the population is relatively large. There is evidence of good recruitment in the Wewa and Lower reaches, but more information is needed to determine the status of recruitment in the Chipola River.

Based on best available information, we believe the population of fat threeridge in the action area is stable and possibly increasing. The population appears to be

doing well despite the principal effects to the fat threeridge in the action area that we described in section 3, Environmental Baseline. The inter-annual frequency and the intra-annual duration of low flows in the pre-Lanier period substantially increased in the post-West Point period. Flows under the RIOP will further increase the frequency and duration of low flows. Flows less than 5,000 cfs were not recorded in the pre-Lanier period. The RIOP supports a minimum flow of 5,000 cfs, which benefits the fat threeridge, except when exceptional drought operations are triggered and minimum-flow support is reduced to 4,500 cfs. Supporting a minimum flow of 5,000 cfs in the future with less basin inflow as demands increase would require greater storage releases from the reservoirs, which could trigger the 4,500 cfs minimum flow provision of the RIOP more frequently. The results of the PVA indicate that the population can sustain reductions of 1-2% that we estimate occurred in the population recently if such reductions occur with a probability of once every 6 years, and if similar reductions occur when flows are reduced to 4,500 cfs, with a probability of once every 69 years. However, the PVA also indicates that increasing the frequency of such events results in a greater impact to long-term population viability. As such, we need to continue to monitor the frequency and severity of these events. If the events occur with greater frequency, it may be necessary to reinitiate consultation.

Therefore, our analysis indicates that the RIOP would have a negative, but not appreciable, impact on the survival and recovery of the fat threeridge due to mortality and other adverse effects if flows are reduced to 4,500 cfs or if additional recolonization and subsequent mortality occurs at flows above 5,000 cfs.

## 6.2 Purple bankclimber

Although the population of purple bankclimbers at the Race Shoals (the limestone shoal at RM 105) is relatively large (about 30,000 individuals), the species is apparently rare in the rest of the river and may be experiencing poor recruitment. A whole river population estimate is not available, but the species is much more detectable and probably much more abundant in other parts of its range, such as the Flint River and the Ochlockonee River. The principal effects to the purple bankclimber in the action area are those we described in section 3, Environmental Baseline. Channel morphology changes may have contributed to a decline of the species in the upstream-most 30 miles of the river, although the species is still found in this reach in relatively high numbers at Race Shoals. Flow regime alterations discussed above (section 6.1) for the fat threeridge apply also to the bankclimber, but probably to a lesser extent, because this species appears to occur more often in deeper portions of the stream channel than the threeridge. As such, we have observed limited mortality of the population during low flows since 2008.

Therefore, our analysis indicates that the RIOP would have a negative, but not appreciable, impact on the survival and recovery of the purple bankclimber due to mortality and other adverse effects if flows are reduced to 4,500 cfs or if additional recolonization and subsequent mortality occurs at flows above 5,000 cfs. Bankclimbers are rarely found at stages greater than 4,500 cfs in the Apalachicola River.

## 6.3 Chipola slabshell

Recent surveys (1990 to present) have documented many new subpopulations but found the species gener-

ally occurs in relatively low abundance. We have no evidence that these populations are currently declining and we consider the Chipola slabshell status to be stable. Many of the effects we described in section 3, Environmental Baseline, do not apply to the Chipola slabshell, as its known range within the action area is limited to the Chipola River downstream of the Chipola Cutoff. Most of the species range is in the Chipola River upstream of the action area. Channel morphology appears less altered in the Chipola River than the Apalachicola River. Flow regime alterations discussed above (section 6.1) for the fat threeridge apply also to the slabshell, but probably to a lesser extent in the narrower channel and higher bank slopes of the Chipola. No slabshell mortality has been documented during the low flows of 2006-2008 and 2010-2011. We also expect the mortality of the Chipola slabshell to be less than the expected for the fat threeridge or purple bankclimber because of its expected higher mobility.

Therefore, our analysis indicates that the RIOP would have a negative, but not appreciable, impact on the survival and recovery of the Chipola slabshell due mortality and other adverse effects if flows are reduced to 4,500 cfs or if additional recolonization and subsequent mortality occurs at flows above 5,000 cfs.

#### **6.4 Critical Habitat**

Designated critical habitat for the fat threeridge and purple bankclimber in the action area includes most of the Apalachicola River unit, and the downstream-most part of the Chipola River Unit. Designated habitat for the Chipola slabshell only occurs within the downstream-most part of the Chipola River Unit. In the effects analysis, we discussed how the RIOP may affect the three of the five PCEs of the mussel critical habitat:

1) permanently flowing water; 2) water quality; and 3) fish hosts. The RIOP does not appear to reduce the amount of floodplain habitat available to fish hosts, some of which likely rely upon floodplain habitats for spawning and rearing habitat. Droughts substantially change the nature of all of these PCEs compared to normal flows, but our analysis does not show that the RIOP would appreciably change the quantity or quality of the PCEs relative to the Baseline under the drought conditions represented in the 1975-2008 record.

While the RIOP may also negatively affect mussel habitat primary constituent elements by reducing minimum releases to 4,500 cfs, the circumstances triggering this action would occur infrequently (probability of 1 in 69 years). We do not anticipate that increasing the frequency and duration of low flows or reducing minimum releases to 4,500 cfs at this frequency would alter or affect the critical habitat in the action area to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role for the three mussel species. In addition, the nature of these effects is dynamic and would not produce permanent or static alterations to any PCE.

## **6.5 Determinations**

After reviewing the current status of the listed species and designated critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action: 1) will not jeopardize the continued existence of the fat threeridge, purple bankclimber, and Chipola slabshell; and 2) will not destroy or adversely modify designated critical habitat for the fat threeridge, purple bankclimber, and Chipola slabshell.



The RIOP is intended to apply until a new WCP is adopted. Given the Corps' current timeline, the findings of this BO shall apply for 5 years until May 22, 2017, or until amended through a reinitiation of consultation or superseded with a new opinion for a new proposed action.

\* \* \*

**APPENDICES AND EXHIBIT A TO THE AFFIDAVIT OF JUDSON H. TURNER,  
DIRECTOR OF THE GEORGIA ENVIRONMENTAL  
PROTECTION DIVISION (January 10, 2013)**

**APPENDIX 1  
Historical and Forecasted Population of Counties  
Using Lake Lanier  
System for Water Supply**

County	1990 <sup>1</sup>	2000 <sup>1</sup>	2010 <sup>1</sup>	2020 <sup>2</sup>	2030 <sup>2</sup>	2040 <sup>3</sup>
Cobb	447,745	607,751	688,078	800,469	909,747	1,033,943
Dawson <sup>4</sup>	9,429	15,999	22,330	27,029	32,022	37,937
DeKalb	545,837	665,865	691,893	761,537	817,276	877,096
Forsyth	44,083	98,407	175,511	256,307	383,258	573,089
Fulton	648,951	816,006	920,581	1,095,897	1,284,954	1,506,626
Gwinnett	352,910	588,448	805,321	1,019,098	1,270,020	1,582,724

Habersham <sup>4</sup>	27,621	35,902	44,553	48,705	54,623	61,260
Hall	95,428	139,277	179,684	226,172	282,164	352,018
Lumpkin <sup>4</sup>	14,573	21,016	29,966	38,075	47,960	60,411
White <sup>4</sup>	13,006	19,944	26,704	31,057	34,841	39,086
Totals <sup>5</sup>	2,199,583	3,008,615	3,584,621	4,273,267	5,116,865	6,127,000

<sup>1</sup> From US Census Bureau

<sup>2</sup> Georgia Office of Planning and Budget 2012 Projections

<sup>3</sup> Projection based upon assumption that 2030–2040 growth rate (in per cent) will be same as 2020–2030.

<sup>4</sup> Watershed counties not currently withdrawing from Lanier, but may withdraw in future.

<sup>5</sup> This total does not include the additional counties that purchase water from the water systems that withdraw water from Lake Lanier and the Chattahoochee River, such as Paulding County.

**APPENDIX 2**

**Water Systems That Withdraw Directly from Lake Lanier**

County	System Name	2011 Withdrawals (MGD)		
		Max. Month	Max. Day	Annual Average
Forsyth	City of Cumming	17.5	18.8	11.6
Forsyth	Forsyth County	11.8	12.8	8.6
Gwinnett	City of Buford	1.5	1.7	1.3
Gwinnett	Gwinnett County Water & Sewerage Authority	90.9	118.8	76.1
Hall	City of Gainesville	20.7	28.5	17.6
Total				115.2

## APPENDIX 3

**Water Systems That Rely on Water Supply Releases from Lake Lanier to the  
Chattahoochee River**

County	System Name	2011 Withdrawals (MGD)		
		Max. Month	Max. Day	Annual Average
Cobb	Cobb County Marietta Water Authority	51.9	64.8	45.1
DeKalb	DeKalb County Public Works (Water and Sewer)	84.7	114.8	72.7
Fulton	Atlanta-Fulton Water Resources Commission	54.3	69.9	38.7
Fulton	City of Atlanta	101.8	123.4	89.2
Total				245.7

**APPENDIX 4**  
**Projected 2040 Water Withdrawals and Returns**  
 (Annual Average)

Table 1 Current and Projected 2040 Water Withdrawals and Returns Above Buford Dam

Time Horizon	Withdrawal (mgd)	Return (mgd)	Net Consumptive Loss (mgd)
2011	120.6 <sup>1</sup>	38.1	82.4
2040	297	165	132

Table 2 Current and Projected 2040 Chattahoochee River Water Withdrawals and Returns

Time Horizon	Withdrawal (mgd) (Buford Dam to Peachtree Creek)	Return (mgd)		Net Consumptive Loss (mgd)
		Atlanta Reach (Buford Dam to Peachtree Creek)	Whitesburg Reach (Peachtree Creek to Whitesburg gage)	
2011	247.5 <sup>2</sup>	34.5	185.3	27.7
2040	408	94	291	23

## Notes:

<sup>1</sup> Including facilities upstream of Lake Lanier. These additional withdrawals are included to provide the sum of all consumptive loss above Buford Dam.

<sup>2</sup> Including facilities that withdraw from tributaries of the Chattahoochee River. These additional withdrawals are included to provide the sum of all consumptive loss below Buford Dam and above the Whitesburg gage.

# APPENDIX 5

## HTIME REQUIRED TO PLAN, PERMIT, FINANCE, AND CONSTRUCT WATER SUPPLY RESERVOIRS IN GEORGIA

Project Activity	Bear Creek Reservoir, Jackson Co.	Cedar Creek Reservoir, Hall Co.	Tussahaw Creek Reservoir, Butts Co.	Big Haynes Creek Reservoir, Rockdale Co.	Line Creek Reservoir (Lake McIntosh), Fayette Co.	Hickory Log Creek Reservoir, Cherokee Co.
Applicant's initial contact with EPD regarding a new reservoir.	2/2/1994	7/17/1996	9/22/2000	11/5/1987	10/27/1987	3/22/2000



Applicant initial contact with the Corps regarding 404 permit for reservoir	2/2/1994	7/17/1996	9/22/2000	4/29/1991	1/6/1989	3/22/2000
Applicant submits water withdrawal permit application	3/3/1997	4/2/2002	3/13/2001	6/21/1999	3/21/2001	10/4/2005
EPD comments on withdrawal application	5/28/1997	4/22/2002	5/22/2001	12/7/1999	4/16/2001	11/22/2005
EPD provides confirmation of need (to the Corps).	4/20/1995	Information unavailable	11/3/2000	5/6/1991	11/20/2000	11/20/2000
Applicant submits 404 application to the Corps.	2/22/1995	8/26/1997	11/15/2000	5/28/1991	5/1/2002	4/27/2000

The Corps notifies public of the 404 application and requests comments	5/26/1995	10/8/1997	12/27/2000	11/22/1991	10/3/2002	12/27/2000
The Corps responds to applicant's 404 application	7/1/1995	11/13/1997	2/1/2001	12/28/1991	11/8/2002	2/28/2001
EPD issues 401 Water Quality Cert.	5/17/1996	8/21/1998	5/22/2001	8/31/1992	9/6/2006	8/2/2002
EPD issues with-drawal permit	4/1/2002	8/1/2002	2/14/2003	3/22/2002	9/6/2006	9/12/2008
The Corps issues final 404 permit to applicant	7/20/1996	11/16/1998	10/23/2002	10/2/1992	6/27/2007	5/24/2004
EPD issues Safe Dams permit	10/1999	10/2001	8/25/2003	5/31/1994	12/9/2009	4/29/2008

Jurisdiction con- structs dam.	04/2011	9/11/2003	June 2005	1/27/1997	April 2010	8/5/2005
Jurisdiction fills reservoir.	Spring 2002	8/11/2005	Sept. 2005	June 1998	Started November 1, 2012	6/30/2011

**EXHIBIT A**

**Memorandum of Dr. Wei Zeng  
Manager, Hydrologic Analysis Unit**

[Georgia Department of Natural Resources letterhead]

**Memorandum**

**To: Judson Turner, Director, Georgia EPD**

**From: Wei Zeng, Hydrology Unit, Georgia EPD**

**Date: January 10, 2013**

**Subject: Technical Analysis of Georgia's 2000 Water  
Supply Request**

**Introduction**

You asked me to analyze the impact to the federal reservoirs in the Apalachicola-Chattahoochee-Flint (ACF) River Basin, to hydropower production and recreation at those reservoirs, and to river flows at the state line with Florida, of Georgia's 2000 Water Supply Request. Georgia submitted the water supply request to the U.S. Army Corps of Engineers in May 2000, asking for the Corps to operate Lake Lanier to accommodate future municipal and industrial direct withdrawals from Lake Lanier and river withdrawals downstream totaling 705 million gallons per day (mgd). As more than twelve years have passed since Georgia submitted its water supply request to the Corps, Georgia is providing the Corps updated demographic and water demand information in support of its request. Georgia forecasts that its municipal and industrial water supply demands from

Lake Lanier will reach or exceed 705 mgd by approximately 2040.

The Hydrology Unit of EPD set up a mathematical model of the ACF Basin to analyze the potential impacts of Georgia's request. This memorandum documents the model settings and results.

#### Platform Model- HEC-ResSim

The mathematical model that we used for this analysis was developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) for analyzing reservoir operations and basin-wide water resource management. The Corps calls this platform model "HEC-ResSim." The Corps periodically upgrades HEC-ResSim's capability. The Corps released its current version of the model to the public in May 2011. This version of the model reflected the Corps' then-current ACF Basin reservoir operating plan, known as the Revised Interim Operation Plan (RIOP), as it existed as of May 2011.

Since May 2011, the Corps has made minor changes to the RIOP. The Hydrology Unit of EPD has added these changes to the Corps' May 2011 platform model. Thus, EPD's version of the HEC-ResSim model reflects operations under the current RIOP.

We modeled a 34-year period, assuming rainfall and inflow conditions that occurred from January 1, 1975 to December 31, 2008, and applied to each of these years the Corps' RIOP and, as discussed below, varying levels of water supply use. We chose the 1975-2008 period for several reasons. First, the Unimpaired Flow (UIF) data developed by the Corps only covers hydrologic conditions through December 31, 2008. In addition, this period excludes the period before all ACF federal res-

ervoirs have been in operation. Finally, the U.S. Fish and Wildlife Service has used the same simulation period for its analyses of various ACF operations. It should be noted that the droughts that most affected the federal reservoirs in the ACF Basin occurred within in this period, with the possible exception of the current drought, the duration and severity of which cannot yet be determined.

### Model Setting on Water Demand

To understand the impacts of Georgia's water supply request, we compiled current and proposed future water use conditions and ran three different scenarios: what we call Baseline Condition, Scenario A, and Scenario B. The Baseline Condition assumes current water use, as further defined below. Scenario A isolates the effect of the withdrawals associated with Georgia's water supply request by applying to the model annual average gross withdrawals of 705 mgd from Lake Lanier and the Chattahoochee River through Atlanta but keeps current demands throughout the remainder of the ACF Basin. Scenario B evaluates the effects of the water use contemplated in Georgia's water supply request in combination with forecasted demands throughout the basin by assuming annual average gross withdrawals of 705 mgd from Lake Lanier and the Chattahoochee River through Atlanta and year 2040 water use throughout the remainder of the ACF Basin in Georgia, plus increasing water use in ACF Basin in Alabama, as discussed further below.

#### *Baseline Condition*

To capture the effect of current water use within the ACF Basin, we included in the model the most recent available annual (2011) withdrawal and discharge data of all permitted municipal and industrial facilities in the

Georgia portion of the ACF Basin. These include thermal electric power generating facilities that use water for cooling purposes and that incur consumptive water losses as a result of their cooling operations. We included the estimate of 2007 total ACF Basin agricultural water use that Georgia developed as part of its statewide water planning, which is the best information that we have on Georgia's current agricultural use.

We included Alabama's 2007 water consumption from the ACF Basin as estimated by the Alabama Office of Water Resources (OWR) in 2009. For water consumption in Florida, we used the numbers contained in the Corps' platform model.

In the Baseline Condition, and in Scenarios A and B, we assumed the current RIOP would remain in effect.

#### *Scenario A – Impact of Water Supply Request*

As Georgia's water supply request remains 297 mgd annual average gross lake withdrawal and 408 mgd annual average gross river withdrawal, for a total of 705 mgd, those are the amounts of withdrawal that we used in the impact analysis. We added back projected returns of treated wastewater to Lake Lanier and the Chattahoochee River. Using EPD projections, we assumed that 78% of the 705 mgd that is withdrawn will be discharged back to surface waters within the basin in the form of highly treated wastewater. This includes 165 mgd returned to Lanier and its upstream tributaries, 94 mgd returned to the Chattahoochee River between Buford Dam and Peachtree Creek, and 291 mgd returned to the Chattahoochee River downstream of Peachtree Creek. As Scenario A is intended to isolate the impact of meeting the forecasted water supply needs that would be dependent on withdrawals and water supply releases from Lake Lanier, we held water

use elsewhere in the basin at current levels (that is, levels according to most recent data available).

*Scenario B – Impact of Water Supply Request in Combination with Other 2040 Georgia Demands in ACF Basin*

In Scenario B, we added to the water supply uses contemplated by Georgia's water supply request the other projected 2040 water demands within the ACF Basin in Georgia. These include projected municipal, industrial, and agricultural water needs. EPD developed the forecasts for those demands as part of the planning associated with the State Water Plan and Regional Water Development Plans. We do not have projected water demands for portions of the basin that are in Alabama. To estimate the cumulative impact resulting from future Alabama demand, we assumed an increase of 15% to the current Alabama figure used in the baseline condition alternative. We held the level of water use in the Apalachicola River reach the same as in the Baseline Condition because we have no information upon which to base an estimate of future water use in the State of Florida. I have enclosed a DVD containing these models.

Results and Analysis

In my discussion of the modeling results, Scenarios A and B are compared to the Baseline Condition. The potential impact of Georgia's Request is described with regard to:

- (1) Average elevations in the federal reservoirs of Lanier, West Point, and Walter F. George;
- (2) Minimum elevations in these reservoirs;
- (3) Elevation duration curves in these reservoirs;



- (4) Daily average power generation in the federal reservoirs;
- (5) Percentage of time when there is some level of recreational impact; and
- (6) State line flow duration curve.

### *Reservoir Elevations*

Using the Res-Sim Model, we determined the average and minimum daily elevations, and the elevation duration curves, of the federal reservoirs in the ACF Basin under the Baseline Condition and Scenarios A and B. The average and minimum daily elevations of a reservoir are obtained by looking at the daily elevation of the period of simulation, from January 1, 1975 to December 31, 2008, and calculating the average and minimum daily value for each of the 365 days in a year. The elevation duration curve shows the percentages of time over the entire 34-year period that the reservoirs will exceed certain elevations.

As shown in Slides 9 and 25 of the attached Exhibit 1, the average daily elevation of Lake Lanier under both Scenarios A and B will be no more than 0.7 feet lower around May 1 as compared with the Baseline Condition. May 1 is the date on which the top of conservation pool guide curve for Lake Lanier rises to 1071 feet for the first time in the year and is the beginning of the primary recreational season. Similarly, the average daily elevation of Lake Lanier around December 1 under Scenarios A and B is no more than 1.5 feet lower than under the Baseline Condition.

The difference between the Baseline Condition and Scenarios A and B is more pronounced in terms of the daily minimum elevation in Lake Lanier. (See Slides 10 and 26.) At the lowest point on the minimum daily ele-

vation curve, which usually takes place in the month of December, the elevation under Scenarios A and B is approximately 6 feet lower than in the Baseline Condition.

The elevation duration curves for Lake Lanier are shown on Slides 11 and 27. For the upper 30% of the duration curve (representing the times of higher reservoir elevation), the elevation of Lake Lanier is essentially the same in the Baseline Condition and Scenarios A and B. Moreover, for approximately 70% of the duration curve, the elevation under Scenarios A and B is only approximately one foot or less lower than in the Baseline Condition. The difference is greater, up to 6 feet, at the lowest point in the lower 30% of the duration curve.

The impact on Lakes West Point and Walter F. George is minor. (See Slides 12 through 17 and Slides 28 through 33.) There is very little, only inches, difference in average daily elevation at both West Point and Walter F. George between the Baseline Condition and Scenarios A and B. In terms of minimum daily elevation, the greatest difference between the Baseline Condition and Scenarios A and B is only 1.5 feet in West Point (in the months of September and October), and up to 1.2 feet at Walter F. George (in September and October). At the point in the year when West Point and Walter F. George typically reach their lowest elevation for the year (usually in November or December), there is little difference between the Baseline Condition and Scenarios A and B. Even less of a change is evident in the elevation duration curves for Lakes West Point and Walter F. George. (See Slides 14, 17, 30, and 33).

*Power Generation*

The projected water withdrawals and Corps operations necessary to support them will not have a material impact on the production of hydropower at Buford Dam. Under Scenario A, with water supply needs of 705 mgd for the Metro Atlanta Area and current demands elsewhere, the daily average energy generated at Lake Lanier is modeled to be 319 MWh, and the annual average energy generated at Lake Lanier is modeled to be 116,435 MWh. In comparison, the daily average energy generated under the Baseline Condition is modeled to be 339 MWh and the annual average is 123,735 MWh. When Georgia has reached demands of 705 mgd from Lake Lanier and the Chattahoochee River above the Peachtree Creek confluence, combined with 2040 water supply demands throughout the remainder of the basin, the annual average energy generated at Lake Lanier is modeled to be 116,435 MWh, in comparison to 123,735 MWh under the Baseline Condition. Thus, assuming 2040 water supply demands throughout the ACF Basin, there would be less than a 6% reduction in power produced at Lanier. The impact will be even less in the years before Georgia's water demand has reached 705 mgd.

As shown by Slides 18 and 34, Georgia's future water supply demands will have very little impact on the total amount of energy produced by all of the federal reservoirs in the ACF Basin. Under Scenario A, when Georgia has reached demands of 705 mgd, the daily average energy output from all ACF federal reservoirs is modeled to be 2,671 MWh (annual average 974,915 MWh). The daily average energy output under the Baseline Condition is 2,707 MWh, and the annual average is 988,055 MWh. Thus, there will be only a reduction in daily average generation of 36 MWh (annual av-

erage reduction of 13,140 MWh) for all reservoirs combined. Under Scenario B, the daily average energy output from all ACF federal reservoirs is modeled to be 2,660 MWh (annual average 970,900 MWh). The reduction in daily average generation will be only 47 MWh (annual average reduction of 17,155 MWh). For the combined generation of all of the federal reservoirs in the ACF Basin, there is only a 1.3% reduction under Scenario A and a 1.7% reduction under Scenario B. Georgia's conclusions are consistent with those reached by the Corps in its assessment of the impact to hydropower from granting Georgia's water supply request as compared with a baseline that assumed virtually no water supply operations at all. Using that baseline of comparison, the Corps concluded that the water supply operations and lake withdrawals under Georgia's water supply request each would result in less than a 1% reduction to ACF Basin dependable hydropower capacity; that the lake withdrawals contemplated by the request would result in a reduction in basin-wide hydropower value of 4.4%; and, that the water supply releases contemplated by the request would result in a reduction in basin-wide hydropower value of less than 1%.

### *Recreational Impact*

We evaluated the recreational impact by looking at the primary recreational season, defined by the Corps as May 1st through September 8th, and tallying the percentage of days when elevation of a reservoir is lower than the three levels of recreational impact, which are, in increasing degree of impact, the Initial Impact Line (IIL), Recreational Impact Line (RIL), and Water Access Limitation (WAL). According to the Corps, the IIL at Lake Lanier is 1066 feet above mean sea level (msl), the RIL is 1063 feet above msl, and the WAL is 1060 feet above msl. For West Point Lake, the IIL is

632 feet above msl, RAL is 628 feet above msl, and WAL is 627 feet above msl. For Lake Walter F. George, the ILL is 187 feet above msl, the RAL is 185 feet above msl, and the WAL is 184 feet above msl.

The impact to recreation is shown on Slides 19 through 21 and 35 through 37. In Scenarios A and B as compared with the Baseline Condition, the increase in percentage of days of IIL, RIL, and WAL at Lake Lanier will be 5%, 8%, and 8% respectively. Under hydrologic conditions of Year 2007, a drought year of exceptional dry conditions, the total number of days when the elevation of Lanier falls below the RIL under Scenario A is 47 days, under Scenario B is 48 days, and under the Baseline Condition is 27 days.

The recreational impact on West Point and Walter F. George is virtually non-existent. The only impact on West Point under Scenario A and Scenario B is a 1% increase in the frequency of WAL, while the recreational impact of IIL and RIL actually are lessened. At Walter F. George, there is a 1% and 2% increase in IIL in Scenario A and Scenario B, respectively. The elevation of Walter F. George does not fall to the RIL or WAL in any of the three scenarios.

#### *State Line Flow*

There is no noticeable difference between Scenario A and the Baseline Condition alternative in terms of state line flow duration curve, which suggests that the isolated increase in water supply in the metro Atlanta area itself will not result in any significant change in state line flow. (See Slides 22 and 23.) When we look at the portion of the graph between the 80 and 95 percentiles exceedence, the curve resulting from Scenario B is only around 200 cfs below the curve resulting from the Baseline Condition. (See Slides 38 and 39.) This 200 cfs is

only 4% of the minimum flow requirement of 5,000 cfs, and less than 1% of the long term average simulated flow. At the very bottom of the duration curve, note that the RIOP's Drought Zone Operation will be triggered roughly 0.2% of the time under Scenario A and only 0.2% more often under Scenario B. Overall, the change in state line flow is minor in comparison to the magnitude of state line flow assuming the RIOP remains in place, and will likely remain so in any new operation plan that replaces the RIOP.

Enclosure

\* \* \*

Rick Scott  
Governor

September 6, 2012

Ms. Rebecca Blank  
Acting Secretary  
U.S. Department of Commerce  
1401 Constitution Avenue, NW  
Washington, D.C. 20230

Dear Secretary Blank:

On behalf of Florida's oyster industry, I respectfully request that you declare a commercial fishery failure due to a fishery resource disaster for Florida's oyster harvesting areas in the Gulf of Mexico, particularly those in Apalachicola Bay, pursuant to Section 312(a) of the Magnuson-Stevens Fishery Management and Conservation Act.

The State of Florida has experienced an unprecedented decline in the abundance of oysters within our coastal estuaries, a direct consequence of which has been a significant loss of income to commercial oyster fishermen, oyster processors and rural coastal communities. Recent oyster resource assessments indicate that the outlook for the 2012/2013 harvesting season is "poor" and unlikely to sustain commercial harvesting levels. I enclose a letter and report from Florida's Department of Agriculture and Consumer Services (FDACS) assessing the current impacts. The FDACS report estimates the dockside value of oyster landed in Franklin County at \$6.64 million in 2011, which translates to a larger and significant overall economic impact to the affected communities. After conferring with county leadership, Franklin County estimates the em-

ployment impact to affect 2,500 jobs, including commercial oyster fishermen, processors and related coastal economies.

According to the report, observations and sampling of oyster populations on the primary oyster producing reefs in Apalachicola Bay during July 2012 indicated that oyster populations were in poor condition. It is believed that a combination of factors has led to the recent decline in oyster populations.

The Florida Panhandle and Apalachicola Bay, as the drainage basin of the Apalachicola, Flint, and Chattahoochee Rivers, have experienced drought conditions for several years resulting in reduced freshwater input into Apalachicola Bay. This absence of freshwater contributes to higher salinity levels adversely affecting oyster populations and contributing to mass natural mortality events and a dramatic increase in oyster predation.

Harvesting pressures and practices were altered to increase fishing effort, as measured in reported trips, due to the closure of oyster harvesting in contiguous states during 2010. This led to overharvesting of illegal and sub-legal oysters further damaging an already stressed population. Other undetermined causes may also have been involved.

Disaster relief funds authorized by the Magnuson-Stevens Act are needed to: 1) further assess the primary and secondary causes of the oyster decline; 2) determine the feasibility of actions to remediate or restore the affected resources; 3) begin actions to prevent and restore affected resources; and 4) provide economic assistance to fishing communities and small businesses, including oyster fishermen affected by the disaster.



The State of Florida is prepared to provide the information necessary for you to properly assess this situation. On behalf of Florida's oyster community, I thank you for your prompt consideration of this urgent request.

Sincerely,

/s/ Rick Scott  
Rick Scott  
Governor

Florida Department of Agriculture and Consumer Services  
Commissioner Adam H. Putnam  
The Capitol

September 5, 2012

The Honorable Rick Scott  
Governor  
State of Florida  
The Capitol, Plaza Level 05  
Tallahassee, Florida 32399

Dear Governor Scott:

I am writing today to advise you of a situation that is quickly becoming a crisis for Florida's coastal communities who rely on a vibrant and healthy oyster population for economic viability. The oyster resources in the state, particularly those in Apalachicola Bay, have been significantly impacted by the prolonged drought that many areas of the state are facing. The drought conditions in the Bay have caused the oyster resources to decrease to a level that will no longer sustain Florida's commercial oyster industry. This situation has been exacerbated by the low level of fresh water coming down the Apalachicola River into the Bay.

As you know, oysters require a delicate balance of both fresh and salt water. If salinity levels in and around oyster reefs get too high, the water is hospitable to marine organisms that prey on oysters such as oyster drills, stone crabs and conchs. In addition, high salinity creates unfavorable conditions for juvenile oyster growth. First with Tropical Storm Debby and followed shortly thereafter by Tropical Storm Isaac, the already scarce resource was further impacted. A recent assessment of the oyster resources in the Bay conducted by the Florida Department of Agriculture and Consumer Service (FDACS) concluded that current

oyster resource levels have not been this low since immediately after Hurricane Elena in 1985.

In addition to Apalachicola, we have already begun to hear from oyster harvesters in Wakulla, Dixie and Levy counties that they are also seeing high oyster mortality rates due to the drought. These areas have been closed seasonally to oyster harvesting through the summer and only opened on September 1, 2012. FDACS will conduct assessments on those areas over the next two weeks, however given the situation in Apalachicola Bay, it is likely these areas will also not support a sustained commercial harvest.

On behalf of Florida's oyster harvesters and processors, I respectfully request that you ask United States Department of Commerce Acting Secretary Rebecca Blank to declare a federal fishery disaster for Florida's oyster harvesting areas in the Gulf. I believe the current conditions meet the requirements established in Section 312(a) of the Magnuson-Stevens Fishery Conservation and Management Act and Section 308(b) of the Interjurisdictional Fisheries Act and therefore warrant this request.

To assist in your consideration of this request, I am enclosing the Apalachicola Bay Oyster Resource Assessment Report. Thank you in advance for your support of Florida's commercial oyster industry. Should you need additional information on this situation, please do not hesitate to contact me.

Sincerely,

/s/ Adam H. Putnam

Adam H. Putnam

Commissioner of Agriculture

Enclosure

**OYSTER RESOURCE ASSESSMENT REPORT  
APALACHICOLA BAY  
AUGUST 2012  
DEPARTMENT OF AGRICULTURE  
AND CONSUMER SERVICES  
DIVISION OF AQUACULTURE**

**EXECUTIVE SUMMARY**

Observations and sampling of oyster populations on the primary oyster producing reefs in Apalachicola Bay during July 2012 indicated that oyster populations were depleted over most of the reef areas sampled and that surviving oyster populations are severely stressed. Staff of the Department of Agriculture and Consumer Services' Division of Aquaculture conducted assessments of oyster populations after preliminary reconnaissance following the passage of Tropical Storm Debby indicated that oyster populations on Cat Point Bar and East Hole Bar were in poor condition. More detailed sampling and analyses confirmed the condition of oyster resources and suggested that the poor condition was the result of combination of environmental factors and fishery practices. Analyses and observations further suggested that Tropical Storm Debby was only a minor contributing factor to the overall poor condition of oyster resources and confirmed evidence that prolonged drought conditions, continuing low river discharge rates and intensive harvesting were adversely affecting oyster populations in Apalachicola Bay.

This report provides interpretative analyses of sampling data, fisheries data, environmental conditions, fishery practices and other factors to describe the current status of oyster resources and predict oyster fishery trends for the 2012/13 Winter Harvesting Season in Apalachicola Bay. Analyses and observations indicate

that a combination of factors have resulted in a cascading effect that has contributed to the depletion of oyster populations and may lead to longer-term debilitation of oyster resources and oyster reef habitats.

## **INTRODUCTION**

The Florida Department of Agriculture and Consumer Services (DACS) shares responsibility for managing oyster resources in Apalachicola Bay with the Florida Fish and Wildlife Conservation Commission (FWC); more specifically, the Division of Aquaculture manages oysters from both resource development and public health protection perspectives. This report summarizes information related to oyster resource compiled by the Division of Aquaculture from 2009 through August 2012.

## **OYSTER FISHERIES STATISTICS**

Since 1980, reported landings of oysters in Florida ranged from about 1 to 6.5 million pounds of meats: highest landings were reported in the early 1980s, around 6.5 million pounds. Apalachicola Bay accounts for about 90% of Florida's landings and about 9% of the landings from the Gulf of Mexico (2000-2008 average). Reported oyster landings from Apalachicola Bay for 2011 were approximately 2.4 million pounds of meat, representing a slight increase in landings from 2010 (Table 1).

In 2011, oystermen in Franklin County reported landings of 2,380,810 pounds of meats from 39,176 trips. Landings for Apalachicola Bay are higher than reported for Franklin County, because oystermen in neighboring counties may report landings from Apalachicola Bay in those counties.

Table 1. Oyster Landings in Apalachicola Bay, Florida

Year	Pounds (Meats)	Number of Trips Reported	AB Oyster Harvesting Licenses	Bags/ Trip
2000	2,327,402	25,550	958	13.9
2001	2,333,968	25,261	1,135	14.1
2002	1,725,776	20,294	914	13.0
2003	1,449,890	18,467	759	12.0
2004	1,502,056	17,692	719	12.9
2005	1,260,996	12,663	714	15.2
2006	2,127,049	22,644	916	14.3
2007	2,645,359	29,104	1,142	13.9
2008	2,238,482	27,603	1,168	12.3
2009	2,695,701	39,942	1,433	10.2
2010	1,938,059	32,330	1,909	9.1
2011	2,380,810	39,176	1,799	9.3
2012			1,687	

Landings per trip remained relatively stable during 2010 and 2011, ranging from 9.1 to 9.3 bags per trip. Landings per trip continued to trend downward from about 15 bags per trip in 2005 to about 9.3 bags per trip in 2011. Oyster landings and bags per trip do not show a direct correlation with the number of ABOHL sold; there were 1,799 ABHOL sold in 2011 and 1,687 sold in 2012. The dockside value of oyster landed in Franklin County was estimated at \$6.64 million in 2011.

Oyster landings appear to be correlated with three primary variables; resource availability, fishing effort, and market demand. Fishing effort has increased while market demand has been highly variable due to economic instability, concerns associated with the Deep Water Horizon (DWH) oil spill incident in 2010, and inconsistent supplies from other Gulf states.

## OYSTER RESOURCE ASSESSMENTS

The Division has conducted oyster resource surveys on the principle oyster-producing reefs in Apalachicola Bay since 1982. This information is used by resource managers to reliably predict trends in oyster production; to monitor oyster population dynamics, including recruitment, growth, natural mortality, standing stocks; and to determine the impacts of climatic events such as hurricanes, floods, and droughts on oyster resources. Sampling oyster populations allows resource managers to compare the relative condition of standing stocks over time using a denned sampling protocol. The Standard Oyster Resource Management Protocol (SORMP) provides a calculation to estimate production based on the density of legal size oysters collected during a defined sampling interval. Production estimates exceeding 400 bags of oysters per acre is applied as an indicator of healthy oyster reefs capable of sustaining commercial harvesting.

The Division of Aquaculture conducted oyster resource assessments on the commercially important oyster reefs in Apalachicola Bay during July 2012. Commercially important reefs included Cat Point Bar, East Hole Bar and the St. Vincent Bar and Dry Bar reef complex. Oyster resource assessments were also conducted on three recently rehabilitated reefs, and on shallow and intertidal reefs in St. Vincent Sound.

Production estimates for July 2012 from Cat Point Bar (287 bags/acre) and East Hole Bar (294 bags/acre) were the lowest production estimates reported in the past twenty years prior to the opening of the Winter Harvesting Season. Similarly, production estimates from St. Vincent Bar and Dry Bar (bags per acre) demonstrated depressed production estimates. Esti-

mated oyster population parameters for Cat Point Bar, East Hole Bar and St. Vincent / Dry Bar are below levels generally observed on these reefs prior to opening the Winter Harvesting Season, and suggest that stocks are not sufficiently abundant at this time to support commercial harvesting throughout the Winter Harvesting Season. Factors affecting estimated production parameters on individual reef complexes are discussed later in this report.

Cat Point Bar and East Hole Bar have historically been the primary producing reefs in Apalachicola Bay. These reefs form a contiguous reef system (except for the Intracoastal Waterway) that extends north to south across St George Sound and separates the sound from Apalachicola Bay. Over the past twenty years, landings from these reefs have been critical to supporting the oyster fishery in the region.

Oyster density and estimated production showed marked declines on Cat Point Bar when compared to 2011. Estimated production declined from 417 bags per acre in August 2011 to 287 bags per acre in July 2012 (Table 2). Oyster densities decreased substantially from 430 to 64 oysters per square meter over the same sampling interval (Table 2). The decrease in oyster density reflects poor recruitment, as well as severely reduced number of oysters in the juvenile size classes, and is indicative of the degraded quality of reef substrate and structure.

Cat Point and East Hole Bar have been subject to a combination of factors that have adversely affected oyster populations, oyster reef habitat, and the oyster fishery. Oyster populations over much of the reef area are depleted and the quality of the substrate is degraded to a point where spat settlement and recruitment



have been disrupted. Stress associated with prolonged high salinity, high natural mortality and predation, and intensive fishing effort have markedly reduced standing stocks of juvenile, sub adult and adult oysters.

The Dry Bar and St. Vincent Bar complex is a large contiguous reef system in western Apalachicola Bay. This reef complex provides a substantial portion of the Bay's landings during normal years, but fishing pressure was sporadic during 2011 and 2012. The estimated production for Dry Bar-St. Vincent (Table 2) indicated a substantial reduction from 323 bags per acre in August 2011 to 215 bags per acre in July 2012. Samples were collected from the Little Gully area on Dry Bar, because no live oysters were collected on St Vincent Bar. St. Vincent Bar, extending from Dry Bar southward was considered to be depleted of marketable oysters. The oyster population on St. Vincent Bar was likely decimated by stress associated with high salinity, disease and predation. Fishing pressure has declined as a result of reduced standing stocks of market-size oysters over the entire reef complex over the past two years. The current condition of oyster resources on Dry Bar is not expected to be at levels that will sustain commercial harvesting through the 2012/13 Winter Harvesting Season.

Estimated production parameters for the reef complexes in the western portion of the Bay and the "Miles" indicate that standing stocks of market size oysters are at various levels. Standing stocks on some reefs will support commercial harvesting, while other reefs show signs of severe stress and depletion. Oyster reefs, including North Spur, Green Point and Cabbage Lumps Plant Sites are in moderately good condition, with standing stocks and production at levels that will support limited commercial harvesting. These plant

sites have been planted with processed oyster shell within the last three years, and the substrate remains in good condition; size frequency distributions are typical of healthy oyster populations. However, these reefs are small and overall production will be limited. Also, oysters on these reefs will likely be subject to intense predation from rock snails, while salinity levels remain high. Oyster populations on shallow and intertidal reefs in the 'Miles' (Spacey's Flats, Eleven Mile Bar, Picolene Bar) are also severely stressed, showing signs of intense predation and natural mortality. Bars in northwestern Apalachicola Bay and eastern St. Vincent Sound, including Green Point, North Spur and Cabbage Lumps are more strongly influenced by river flows than bars located further away from the river mouth. Prevailing flows and circulation patterns move plumes of freshwater westward from the river over these reefs before they are dispersed throughout the Bay and St. Vincent Sound.

### **The Standard Oyster Resource Management Protocol**

Continuous monitoring and data analyses have allowed resource managers to develop a scale using defined sampling protocol to determine the relative condition of oyster resources based on estimated production parameters. The Standard Oyster Resource Management Protocol (SORMP) provides that estimated production exceeding 400 bags of oysters per acre is applied as an indicator of healthy oyster reefs capable of sustaining commercial harvesting. Accordingly, oyster populations are 1) capable of supporting limited commercial harvesting when stocks exceed 200 bags/acre, 2) below levels necessary to support commercial harvesting when stocks fall below 200 bags/acre, and 3) considered depleted when marketable stocks are below 100 bags/acre. Generally, production from Cat Point

Bar has been the most accurate indicator of oyster production in Apalachicola Bay, but East Hole Bar and St. Vincent Bar are also reliable indicators of the condition of oyster resources throughout the Bay. This scale forms the basis for the Standard Oyster Resource Management Protocol provided in Subsection 68B-27.017, Florida Administrative Code, which has been used as the criteria for setting the number of harvesting days in the Winter Harvesting Season in Apalachicola Bay.

## **DEPLETION OF OYSTER RESOURCES**

### **Standing Stocks and Commercial Production Estimates**

Size frequency distributions for oyster standing stocks are strong indicators of the health of oyster populations and are useful for predicting fishery trends. Size distributions among oyster populations are used to evaluate recruitment to the population, recruitment of juveniles to market size, growth, survival and potential production. Accordingly, size frequency distributions can be used to evaluate oyster depletion events. Current analyses of size frequency distributions and oyster standing stocks indicate that oyster populations on the major producing reefs in Apalachicola Bay are experiencing an on-going depletion event.

Oyster populations can be depleted from a number of factors; including climatic conditions, water quality, drought and flood events, catastrophic storms and hurricanes, natural mortality from diseases and predation, and fisheries. Most of the time, depletions occur because of a combination of these factors (multiple stressors).

Data analyses and observations on the major reef complexes showed substantial losses of oyster popula-

tions over the past two years, with severe declines in oyster densities, standing stocks and production estimates. Declining populations can be attributed to less than optimal environmental conditions (prolonged drought, reduced river discharge rates, high salinity), storm events (Tropical Storm Debby), and increased predation and natural mortality, weak recruitment, and extensive harvesting on the major reefs. It is evident from divers' observations that many reefs in Apalachicola Bay are showing the negative effects of decreased rainfall and freshwater flow rates from the Apalachicola River over the past two years, including depressed recruitment and increased natural oyster mortality (predation, disease, and stress associated with high salinity regimes). Additionally, the long-term impairment of reef structure (reef elevations, shell matrix, and shell balance) is of serious concern. Each of the factors contributing to oyster depletion in Apalachicola Bay are discussed below.

### **Prolonged Drought and Elevated Salinity**

Adverse environmental conditions can have a devastating effect on oyster populations; and high salinity is among the most detrimental factors. Because oysters are sessile animals, they are not capable of moving when environmental conditions become less than optimal or sometimes lethal. While oysters can tolerate a wide range of salinities, prolonged exposure to less than optimal conditions will adversely impact affected populations. Oysters become physiologically stressed when salinity levels are below or above optimal levels (10-25 ppt) for extended periods, affecting reproductive potential, spatfall, recruitment, growth and survival.

Rainfall and concomitant river discharge are essential for productive oyster populations in Apalachicola

Bay, and provide three critical requirements for survival. First, survival depends upon salinity regimes that are suitable for oysters to reproduce, grow and survive. Rainfall in the drainage basin and discharge into the Bay are essential, as productive oyster populations require a combination for fresh water and marine waters. Fluctuating salinity regimes, within the oyster's tolerance limits, is the single most important factor influencing oyster populations in Apalachicola Bay. Second, rainfall, flooding in the flood plain, and river discharge into the Bay are essential for supplying nutrients and detritus necessary to nourish and sustain food webs and trophic dynamics within the estuarine system. And third, rainfall and river discharge is a critical factor driving fluctuations in salinity levels that prevent destructive predators with marine affinities from becoming established in the Bay. The critical influences of rainfall and river discharge were severely diminished during the past two years. The region and much of the drainage basin have been subject to extensive drought during 2011 and 2012, and these conditions have been reflected in low river stages and low river discharge rates.

Although, environmental conditions improved with relatively normal rainfall and river discharge in 2009 and early 2010, and abundant spat fall was reported on Cat Point and East Hole Bars during 2010, oyster resources have not rebounded completely. Conditions began to decline and drought conditions have persisted in the Apalachicola River Basin since August 2010. With drought conditions returning to the region, decreased rainfall and river discharge have contributed to stress on oyster populations in Apalachicola Bay.

The Florida Panhandle and the Apalachicola River (ACF) drainage basin have experienced prolonged

drought conditions for several years, and the reduced freshwater input into Apalachicola Bay has seriously affected oyster populations in the Bay. Poor recruitment and poor survival can be directly attributed to prolonged high-salinity environment, which is also confirmed by the presence of marine predators, primarily stone crabs and Florida rock snails (oyster drills). The predators are present in great numbers and are currently overwhelming oyster populations throughout Apalachicola Bay. Petes et al., (2012) and Wilber (1992) investigated the effects of reduced freshwater flows on oyster populations in Apalachicola Bay and reported adverse impacts resulting from low river flows.

### **Natural Mortality and Predation**

The combination of high salinity and high water temperatures are known to severely stress oyster populations and may result in massive mortality events. It is highly likely that these environmental factors have contributed substantially to natural mortality and low recruitment in the Bay. High salinity and high water temperatures also correlate with the increased prevalence and intensity of the oyster parasite, *Perkinsus marinus*. This parasite (dermo) is often associated with oyster mortality in the hotter summer months and is commonly described as 'Summer Mortality Syndrome' in Florida. The Department participates in the Oyster Sentinel Program in the Gulf and monitors the presence and intensity of *P. marinus* in oysters in Apalachicola Bay.

Observations by divers confirmed the presence and abundance of stone crabs, *Menippe mercenaria*, on the primary oyster reefs in Apalachicola Bay. Stone crab burrows are easy to recognize and the appetite of these destructive predators is obvious. Stone crab burrows

are surrounded by living and dead oysters; the result of crabs actively foraging and bringing live oysters to their burrows. The shells of devoured oysters are also present and form a ring around burrows. Examining dead oyster shell provides confirmation of the crushing action of stone crabs on the shell of oysters. Stone crabs are considered primary predators of oysters when salinities remain high for extended periods and crab populations become established on oyster reefs.

Observations and sampling confirmed the presence and abundance of the Florida rock snail, *Stramonita haemastoma*, (formerly *Thais haemastoma*), a destructive snail commonly referred to as an oyster drill. Oyster drills are considered as one of the most serious oyster predators along Florida's Gulf Coast, and have become established in Apalachicola Bay over the past two years. Reports from oystermen suggest that drills are more abundant than at any time in recent memory. It appears that drill populations are moving farther into the estuary as oyster populations in the more marine portions of the Bay are depleted. High numbers of drills were found wherever viable oyster populations were observed. The presence and establishment of snail populations correlate with prolonged high salinity waters. It is also disturbing that drills are completing their life cycles within the estuary, since egg cases, juvenile, subadult and adult snails are abundant on oyster reefs.

Additionally, the Florida crown conch, *Melongena corona*, was commonly observed on oyster reefs. These conchs are also known to be serious oyster predators with marine affinities. Mud crabs of various species are also common predators on oyster reefs, generally attacking spat and smaller juvenile oysters.

Increased stress associated with high salinity regimes acts to exacerbate the level and intensity of predation by weakening oysters. Prolonged periods of high salinity result in natural mortality from predation which can have a significant impact on oyster populations and result in serious economic losses to commercial oyster fisheries. The presence and abundance of marine predators on oyster reefs in Apalachicola Bay the long duration of high salinity conditions within the estuary.

### **Harvesting Pressure**

Declining oyster population parameters can be associated with harvesting, as well as environmental influences and natural mortality. Reported oyster landings for Franklin County in 2011 increased marginally over 2010 in both production and bags per trip, but harvesting pressure (as measured in reported trips) increased by about 20 percent. Oyster population parameters for Cat Point Bar and East Hole Bar suggest that oyster abundances and potential production is markedly depressed, possibly reflecting the effects of continuous harvesting, poor harvesting practices, as well as, less than optimal environmental conditions in 2010 and 2011. Over harvesting is most damaging when environmental conditions are less than optimal, recruitment is low, and natural mortality is high.

Resource managers believe that several activities associated with harvesting have had a detrimental impact on standing stocks and oyster resources on the primary producing reefs in St. George Sound in eastern Apalachicola Bay. The standing stocks of juvenile, sub-legal, and market-size oysters suggest that the overall condition of many reefs has declined substantially over the past two years as a result of continuous harvesting



from Cat Point and East Hole Bars, concentrated and intensive harvesting by the majority of the fishing fleet, and the excessive harvesting of sub-legal oysters.

Vessel counts during the 2011/12 Winter Harvesting Season show that about 60 percent of the fishing fleet was concentrated on Cat Point and East Hole Bars. Fishing effort often averaged more than 120 vessels per day throughout 2011 and 2012 placing added pressure on Cat Point and East Hole Bars. In response to limiting the number of hours harvest can occur each day to control for *Vibrio vulnificus*, additional harvesting days during 2011 and 2012 were implemented which increased fishing pressure and further deteriorated the condition of the resource. Another contributing factor was the management decision to allow harvesting from these reefs during the summer of 2010 in response to the oil spill event (April, 2010). This resulted in an intense harvesting effort which precluded any recovery time for the resource

Harvesting pressure is usually high on reefs in the eastern portion of the Bay at the beginning of the oyster harvesting season, and in 2011 and 2012 harvesting pressure was almost exclusively directed to Cat Point and East Hole Bars. Harvesting pressure on Cat Point Bar and East Hole Bar in St. George Sound demonstrated an upward trend in effort over the past two years. This change in fishing effort is not easy to explain, since it does not seem to be strictly associated with resource availability. One plausible explanation may be the proximity of St George Sound to Eastpoint, where many licensed oystermen reside and sell their oysters.

Some of the decline of legal-size oysters can be attributed to the excessive harvesting of sub-legal oys-

ters. Since 2010, there have been numerous reports of oystermen harvesting oysters below the legal size limit and observations in the marketplace confirmed that the harvest of small oysters was very common during the DWH oil spill event and has persisted to the present. Excessive harvesting of sub-legal oysters from 2010 through 2012 reduced recruitment among sub-legal size classes to legal size, contributing to declining trends in estimated production in 2012/2013. This situation results from harvesting and culling practices of the fishermen, when sub-legal oysters are not culled and returned to the reef to grow to marketable size.

The practice of harvesting sub-legal oysters appears to be an extension of a “use it or lose it” attitude that prevailed during the fall and winter of 2010. Following the oil spill in April 2010, there was an acknowledged threat to oyster resources in Apalachicola Bay, and management policies were directed toward harvesting available resources in the face of a growing risk of loss. Throughout the period when oil posed an unpredictable threat to the oyster fishery, less effort was directed toward enforcing size limits, perhaps, yielding to the view that it would be more beneficial to harvest the available resource. But unfortunately, many oystermen have continued the same harvesting practices that were allowed during the oil spill threat.

The Division’s 2011 *Oyster Resource Assessment Report for Apalachicola Bay* (Division of Aquaculture, 2011) stated that oyster population estimates indicated that recruitment would keep pace with harvesting pressure and sustain production throughout the 2011/12 Winter Harvesting Season: with the caveat that increased harvesting pressure and/or the unabated harvesting of sublegal stocks may alter the production / harvesting balance. In 2011, reports of the harvest and

sale of oysters below the legal size limit was still common practice, and it is now clear that there are not sufficient numbers of juvenile and market size oysters to support harvesting throughout the up coming season.

### **Tropical Storm Debby**

Tropical Storm Debby made its closest approach to Apalachicola Bay on June 25, 2012 before moving eastward and making landfall near the mouth of the Suwannee River. Despite the fact that Debby never achieved hurricane strength, it was accompanied by moderate storm surge in the Big Bend region. Maximum surge at Apalachicola was 3.51 feet.

The greatest impacts to oyster reefs were expected to be in St George Sound and western Apalachicola Bay (St. Vincent Bar) because of the long fetch of open water. Scouring was expected as a result of storm surge and wave action across the Bay. Fortunately, most of the storm surge and strongest wave action occurred during high tides when the reefs are most protected from severe hydrological impacts.

Preliminary reconnaissance following T.S.Debby did not indicate severe disruption of oyster reef structure. Examination of shells and live oysters did not display the effects of severe scouring (ex. polished shell surfaces, abrasion, dead oysters) and observations by divers did not demonstrate extensive disruption of the reefs surface (suspension and deposition of reef shell and sediments, concretion of reef material, or burial of shell and living oysters). Although reef areas were sometimes devoid of live oysters, clusters of oysters were present in adjacent areas that did not indicate severe disturbance. Scouring and wave action may have impacted reef surfaces and oyster resources in some

areas, but widespread damage to reef structure was not observed.

Heavy rainfall and coastal flooding may have an adverse impact on oyster reefs closest to the river and distributaries in the river delta, but the sudden influx of freshwater did not appear to cause extensive oyster mortalities on reefs away from the river delta (reefs in the Winter Harvesting Areas). Preliminary reconnaissance and sampling did not identify oyster populations where mass mortalities occurred; it is generally apparent when a mass mortality event occurs from a freshet or poor water quality (low dissolved oxygen concentrations). However, it remains likely that oyster populations in close proximity to the river delta may be subject to prolonged low salinity and associated low dissolved oxygen concentrations, and may suffer mortalities. There have been some reports of recent mortalities (late July) among oysters on reefs in the Summer Harvesting Area (Norman's Lumps).

### **Fishery Management Implications**

The Department of Agriculture and Consumer Services and the Fish and Wildlife Conservation Commission enacted several policies that allowed oystermen a greater opportunity to harvest available oyster resources in Apalachicola Bay in response to the Deepwater Horizon oil spill event and national shellfish program requirements. The Executive Director of the FWCC signed an Executive Order that allowed commercial harvest of oysters from Apalachicola Bay seven days a week beginning September 1, 2011, contingent upon the Standard Oyster Resource Management Protocol (SORMP). On June 1, 2012, the FWCC enacted rule amendments in Chapter 68B-27.017 that allowed harvesting of oysters seven days a week, year round in

Apalachicola Bay. This action was taken, in part, to accommodate commercial oyster fishermen for time on the water harvesting that was decreased as a result of recent management practices to enhance public health protection. These practices, consistent with national *Vibrio vulnificus* reduction criteria, imposed more stringent limitations on harvesting times from April through November.

Subsection 68B-27.017(1)(a), Florida Administrative Code, provides that oysters may be harvested for commercial purposes on any day of the week. Subsection (1)(b) provides that—If during the period of November 16 through May 31 DACS establishes that the oyster resources on Cat Point Bar and East Hole Bar can not sustain a harvest of 300 bags per acre (SORMP), then the harvest of oysters for commercial purposes shall be prohibited on Saturdays and Sundays. Results of the current assessment indicated that estimated production on Cat Point Bar and East Hole Bar may not exceed the level provided in the SORMP for DACS to recommend that oyster harvesting for commercial purposes be continued at seven days a week. Oyster resources will be re-assessed in November and recommendations will be forwarded to the Florida Fish and Wildlife Conservation Commission.

## **FISHERY TRENDS**

Analyses of oyster resource assessment data over the past two years indicate several general conclusions regarding oyster resources in Apalachicola Bay.

The outlook for oyster production for the 2012/2013 Winter Harvesting Season in St. George Sound (Cat Point, East Hole, Porters Bar and Platform) is described as “poor”. It appears unlikely that oyster populations on Cat Point and East Hole Bars can sustain

concentrated harvesting effort throughout the Winter Harvesting Season.

Declining population estimates over the past two years generally indicated that oyster populations are severely stressed. Although oyster population parameters for 2010 and 2011 reflected relatively stable production estimates, declines in 2012 suggest that overall resource availability may not be capable of sustaining current harvesting levels (bags per trip). The number of bags per trip has continued to decline over the past five years.

Prior to 2009, the demand for oysters from Apalachicola Bay was a primary factor limiting harvests, as harvests did not appear to be limited by available stocks. Higher landings in 2009 likely reflected strengthening market demand and increased fishing effort rather than increased resource availability. However, in 2011/2012 demand for Apalachicola Bay oysters increased because of reduced production from historically productive areas in other Gulf states, while oyster resources in the Bay have suffered during the current drought. Consequently, oyster resources may not be adequate to support increased harvesting pressure and meet increased demand throughout the upcoming season.

Table 2. Cat Point Bar Population Estimates: September 2008 to July 2012.

<u>Sample</u> Date	<u>Quadrat</u> (0.25m)	<u>Oyster</u> Number (n)	<u>Mean</u> Leng. (mm)	<u>Density</u> (/m)	<u>Oysters</u>			<u>Bags</u>	
					>50mm (%)	>75mm (%)	(/m)	1000X (/ac)	(/ac)
09/08	20	616	55.2	123.2	66.2	17.21	212	85.8	381
11/08	10	564	52.0	225.6	55.7	19.33	43.6	176.4	784
12/08	10	333	56.9	133.2	66.1	24.92	33.1	134.3	597
08/09	20	828	50.1	165.6	49.9	15.10	25.0	101.1	449
11/09	10	626	48.2	250.4	50.2	7.83	19.6	79.3	352
04/10	20	969	48.4	193.8	46.7	9.91	19.2	77.7	345
08/10	20	1,043	50.5	208.6	53.9	8.92	18.6	75.3	334
11/10	20	865	52.8	173.0	63.7	12.25	21.2	85.7	381
08/11	15	1,611	48.2	429.6	48.5	5.40	23.2	93.9	417
07/12	10	161	58.8	64.4	67.1	24.84	15.9	64.7	287

Table 2. East Hole Bar Population Estimates: November 2008 to July 2012.

<u>Sample</u>		<u>Oyster</u>	<u>Mean</u>	<u>Density</u>	<u>Oysters</u>			<u>Bags</u>
Date	Quadrat (0.25m)	Number (n)	Leng. (mm)	(/m)	>50mm (%)	>75mm (%)	1000X (/ac)	(/ac)
11/08	10	318	57.5	127.2	69.1	22.33	28.4	114.9
09/09	20	1,023	49.3	204.6	50.7	9.09	18.5	75.2
11/10	10	682	47.0	272.8	48.6	9.38	25.6	103.6
07/12	10	127	60.8	50.8	65.3	32.28	16.3	66.3
								294
								460
								334
								510



Table 2. Dry Bar Population Estimates: September 2008 to July 2012.

<u>Sample</u> Date	<u>Quadrat</u> (0.25m)	<u>Oyster</u> Number (n)	<u>Mean</u> Leng. (mm)	<u>Density</u> (/m)	<u>Oysters</u>			<u>Bags</u> (/ac)
					>50mm (%)	>75mm (%)	1000X (/m)	
09/08	20	1,467	54.0	293.4	64.1	14.86	43.6	784
12/08	10	986	47.1	394.4	49.8	7.81	30.8	554
08/09	20	1,353	46.6	272.6	41.2	6.31	17.2	309
11/09	10	589	45.6	235.6	41.7	7.13	16.7	302
08/10	20	877	50.2	175.4	50.5	10.83	18.9	341
11/10	20	1,313	43.1	262.5	34.4	11.65	30.5	550
08/11	15	567	47.5	151.2	44.8	11.90	17.9	323
07/12	10 <sup>a</sup>	150	56.0	60.0	66.0	20.0	12.0	215 <sup>a</sup>

a - Samples collected from Little Gully on Dry Bar. No live oysters were collected from St. Vincent Bar

Table 2. North Spur (Plant) Population Estimates: September 2008 - July 2012.

[illegible]

Table 2. Green point (Plant) Population Estimates: September 2008 - July 2012.

[illegible]







