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Apalachicola-Chattahoochee-Flint Drought: Species and Ecosystem Management

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Abstract. This report outlines the species conflicts in the ACF basin, the legal status of protection for those species, and the difficulty in determining the effects of dams and their operation on listed species. It also briefly describes the implications of protecting those listed species for conservation of other living resources in the ACF basin, its estuary, and the upper Gulf of Mexico.

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Apalachicola-Chattahoochee-Flint Drought: Species and Ecosystem Management

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Prepared for Members and Committees of Congress

Apalachicola-Chattahoochee-Flint Drought: Species and Ecosystem Management

Summary

Drought in the Southeast has brought congressional attention to an ongoing interstate water conflict among Alabama, Florida, and Georgia over water allocation and management of the Apalachicola-Chattahoochee-Flint (ACF) basin. Reservoir drawdown and predictions for a continued drought have Georgia's upper basin municipal and industrial customers concerned about depleting their principal (in some cases, their only) water supply, Lake Lanier in northern Georgia. Alabama, Florida, and Georgia's lower basin interests are concerned about sustaining river flows to meet their municipal, agricultural, electrical, recreational, and ecosystem needs. In addition, four federally protected species, once widely distributed but now confined to the lower basin, are caught in the controversy.

The issue for the U.S. Army Corps of Engineers (Corps) is how to manage ACF federal reservoirs, now at record low levels, to meet needs in the upper and lower basin equitably. The challenge includes complying with federal law (e.g., the Endangered Species Act (ESA)); minimizing harm to the ACF basin and Apalachicola Bay species, ecosystems, recreation, fishing, and oyster industry; and providing flows for hydropower and thermoelectric cooling, while also meeting water needs of the Atlanta region, other communities, and industries.

To varying degrees, the ACF drought has lasted for several years, depleting water supplies, with Lake Lanier being the largest source for downstream needs. The Corps has released water at various times from Lake Lanier to meet minimum flow requirements in the lower basin — to the consternation of upper basin users. As an emergency drought response in 2007, the Corps began to reduce flows in the Apalachicola River, thereby slowing the drawdown of Lake Lanier, though heavy rains in early 2008 in the lower basin temporarily halted extra releases from Lake Lanier. The Corps' Revised Interim Operating Plan (RIOP) calls for three operational seasons, contingencies for drought operations, and additional water storage before and after a drought phase. It differs from previous plans in allowing water flows to fall to a specified level during drought without additional ESA consultation. In addition, a previous agreement to limit the rate of reduction in flow (to allow species to move to deeper water) will end under certain conditions. Judging that the Corps' actions would not jeopardize the continued existence of listed species or adversely modify their critical habitat, the Fish and Wildlife Service issued a Biological Opinion on June 1, 2008, that approved the RIOP.

Four species protected under the Endangered Species Act — three mussels and a sturgeon — depend on Apalachicola River flows. The impacts of the RIOP on these species continue to be the subject of study and debate. Yet the four are not the focus of debate. Rather the law itself acts as a hammer, forcing parties to reach decisions that may produce winners and losers. As climate change and population growth continue to affect ecosystems, ESA controversies may be at the center of still more stormy debates. Responses of the various parties in the ACF and species protection controversy may presage responses to future river management controversies in other regions.

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In most quarters, conflict in the Apalachicola-Chattahoochee-Flint (ACF) basin is considered an aspect of a debate over allocation of scarce water resources. But it might also be considered an aspect of an ongoing debate over the protection of endangered species and allocation of other living resources. This second debate has increased in recent decades as the Endangered Species Act (ESA, P.L. 93-205, as amended; 16 U.S.C. § 1531) has been invoked repeatedly in conflicts over "the ecosystems upon which endangered species and threatened species depend ..." (16 U.S.C. § 1531(b)). Water resources are even uniquely recognized in the first section of the act: "It is further declared to be the policy of Congress that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species" (16 U.S.C. § 1531(c)(2)).

Debates over species and water allocation are generally thought of as a hallmark of western water conflicts. While the ACF debate is an eastern issue, it has several features common to many western water debates: multi-state disputes; changing demographics causing increased water demand; jobs and various economic interests lined up both against *and* for the protection of species; and the prospect of drought and long-term climate changes not only exacerbating demands on and tensions concerning water supplies, but also making future responses that much more difficult. Congressional involvement in such issues is specified in the Constitution: when states are the parties disputing water allocation, the conflict may be resolved by agreement in an interstate compact,[1] through apportionment by the courts,[2] or through allocation by Congress.[3] (Issues concerning water management per se and the conflicts among other users (e.g., municipal use, electrical generation, irrigation, and navigation) are analyzed in CRS Report RL34326, *Apalachicola-Chattahoochee-Flint (ACF) Drought: Federal Water Management Issues*, coordinated by Nicole T. Carter.)

This report outlines the species conflicts in the ACF basin, the legal status of protection for those species, and the difficulty in determining the effects of dams and

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[1] Generally, interstate compacts, which create a binding agreement between two or more states, require congressional approval in addition to approval by the states involved in the agreement. (U.S. Const., Art. I, § 10, cl. 3.)

[2] The U.S. Supreme Court has original jurisdiction to hear disputes between states. (U.S. Const., Art. III, § 2, cl. 1.) In the case of the ACF litigation, no state has sued another state, and therefore the cases must be heard first by lower courts.

[3] Congress may apportion interstate waters under its power to regulate interstate commerce. (See U.S. Const., Art. I, § 8, cl. 3; Arizona v. California, 373 U.S. 546 (1963).) Although Congress has the authority to act in the interest of interstate commerce, congressional allocation in such conflicts is rare.

their operation on listed species. It also briefly describes the implications of protecting those listed species for conservation of other living resources in the ACF basin, its estuary, and the upper Gulf of Mexico.

ACF Ecosystem from Top to Bottom

The ACF basin is geographically varied, with population density highest at the north end of the basin around metropolitan Atlanta (2,483 people/mi^2 in DeKalb County and 1,544 people/mi^2 in Fulton County), lowest near the mouth of the system in Florida (8.4 people/mi^2 in Liberty County and 20.3 people/mi^2 in Franklin County), and at intermediate densities in Alabama and southern Georgia.[4] A fall line marking the boundary between more ancient rocks of the Appalachian Mountains and the broad coastal plain was an ancient barrier to species movement, and later marked a line of hydropower and navigation in a string of settlements running roughly from Montgomery (AL) through Columbus to Macon (GA). (See **Figure 1**.)

The Apalachicola and Chipola Rivers are designated by the state as "Outstanding Florida Waters,"[5] and the state designated a 104,000 acre Apalachicola Bay Aquatic Preserve.[6] Apalachicola Bay is the site of the Apalachicola National Estuarine Research Reserve, one of 27 research sites designated by the National Oceanic and Atmospheric Administration.[7] At the lower end of the ecosystem, the estuarine and coastal area comprising Apalachicola Bay was named a Biosphere Reserve in 1983.[8]

Habitat in the upper basin has undergone profound alteration, while the lower basin has been less altered. A series of dams along the rivers has had the most profound effects, closing major portions of habitat to movement up and down the system. For those species that range among various river habitats, or move into the Gulf at some stage, the changes produced substantial loss of habitat.

On April 15, 2008, the Corps incorporated elements of the previous Emergency Operating Plan and added other changes to form a revised IOP (RIOP); it submitted

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[4] U.S. Census Bureau, *Census 2000 Summary File 1*.

[5] According the state's website, "This special designation ... is intended to protect existing good water quality." See [http://www.dep.state.fl.us/water/wqssp/ofw.htm].

[6] See [http://www.dep.state.fl.us/coastal/sites/apalachicola-ap/]. The designation occurred in 1969 (although the same website states that enabling legislation was passed in 1975).

[7] See [http://nerrs.noaa.gov/Apalachicola/].

[8] See [http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=USA+37]. The recognition comments, "Increased demand for water by large upstream cities and agriculture now puts pressure on the floodplain ecosystem." A biosphere reserve is "an area that has been nominated by the locality and the country in which it is located for participation in the worldwide U.S. Man and the Biosphere Program (MAB), and accepted for such recognition by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) ... on the basis of [its] significance for research and study of representative biological regions of the world" (CRS Report 96-517, *Biosphere Reserves: Fact Sheet*, by Susan R. Fletcher).

the RIOP to the Fish and Wildlife Service (FWS).[9] The Corps proposal was to store 50% of basin inflow, instead of 30%; this was to be accomplished by eliminating a minimum flow of 6,500 cfs during wetter periods, making fish spawn releases dependent on the storage level, and switching from a two-season to a three-season operation regime. The intent was to avoid storage reaching levels that would trigger the lowering of the Apalachicola River minimum flows from 5,000 cfs to 4,500 cfs.

Since the Revised Operating Plan (RIOP) could alter flows in the Apalachicola River and its tributaries downstream of Woodruff Dam, and alter freshwater inflow to Apalachicola Bay, many species could be affected by these changes. As many species interactions are incompletely known, the Florida Fish and Wildlife Conservation Commission, the Apalachicola National Estuarine Research Reserve (Florida Department of Environmental Protection), and the Northwest Florida Water Management District are cooperatively working to analyze the relationship of freshwater inflow to the benthic communities of Apalachicola Bay and changes in fish and shellfish abundance.

Variations in freshwater runoff can cause changes in habitat features of the receiving estuaries, including (1) salinities, (2) turbidity; (3) nutrient availability, (4) pathogen exposure, and (5) sedimentation. While mobile species are able to move to avoid suboptimal habitat conditions, sedentary species are less able to move and are more likely to experience detrimental effects from changing habitat features. Although some mobile species may become less abundant in Apalachicola Bay if they are able to move to avoid newly unsuitable habitat features, other species that find the modified habitat to be more acceptable may move into the bay and increase in abundance. This species movement is a generally expected response to changing habitat features, but may present problems of crowding or competition in some areas.

Oysters and Fisheries

More than 95% of all species harvested commercially and 85% of all species harvested recreationally in the open Gulf spend a portion of their lives in estuarine waters. (For example, blue crabs may migrate as far as 300 miles to spawn in Apalachicola Bay.) In addition, Apalachicola Bay is a major forage area for such offshore fish species as gag grouper and gray snapper.[10] Apalachicola Bay is also an unusually important nursery area for Gulf of Mexico commercial fish species. Reductions in freshwater flow change salinity downstream and are generally associated with a decline in some coastal fisheries and with overall harm to biota.[11] (Specific fisheries are discussed below.) Salinity changes in Apalachicola Bay could

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[9] For more information on the revised plan, see CRS Report RL34326, *Apalachicola-Chattahoochee-Flint (ACF) Drought: Federal Water Management Issues*, coordinated by Nicole T. Carter.)

[10] Florida Department of Environmental Protection, *About the Apalachicola National Estuarine Research Reserve and Associated Areas*, available at [http://www.dep.state.fl.us/coastal/sites/apalachicola/info.htm].

[11] K. F. Drinkwater and K. T. Frank, "Effects of River Regulation and Diversion on Marine Fish and Invertebrates," *Aquatic Conservation: Marine and Freshwater Ecosystems*, vol. 4, no. 2 (1994), pp. 135-151.

affect the suitability of this habitat for forage and nursery use. In particular, higher salinity levels in Apalachicola Bay could prevent juvenile and adult Gulf sturgeon from entering the bay in the fall and winter, blocking access to productive feeding habitat.[12]

Because of the importance of the bay to commercial and recreational fisheries, the town of Apalachicola became the first Florida city to sue the Corps to block any further reductions in flows to the bay. In its argument, it said that lower flows (and therefore higher salinity) had already harmed the bay.[13]

Oysters. Apalachicola Bay oysters constitute an important part of northwestern Florida's economy. More than 1,000 people are employed by the oyster industry in Florida's Franklin County, which harvests approximately $10 million in oysters annually. Historically, this county harvests more than 90% of Florida's oysters and 10% of the national supply. Within Franklin County, oysters account for almost one-third of the value of all commercial marine landings.[14]

In Apalachicola Bay, oyster distribution is controlled by both salinity and sea-floor geology. Oyster beds generally occur in areas where the salinity is 5 to 25 parts per thousand, on three types of shallow bars formed by different geologic processes.[15] In normal circumstances, the varying salinities, over time, prevent the building up of the species of parasites and predators that can survive only in a fairly constant salinity (e.g., oyster drills, which are adapted only to salt water). Any decrease in freshwater inflow into the bay from the Apalachicola River may result in increased salinity in the bay. The potential effects of such increased salinity on oysters in the bay would depend upon several factors, including how fresh and saltwater mix within the bay, how rapidly and to what extent salinity increases, and the amount of oyster habitat in the bay that might be exposed to salinities exceeding oyster tolerance (as well as the amount of time these oysters were exposed to excessive salinities).

Although some studies have found that Gulf coast oyster landings generally are inversely related to freshwater inflow — that is, oyster landings increase when

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[12] Army Corps of Engineers, *Biological Assessment: Temporary Modifications to the Interim Operating Plan for Jim Woodruff Dam and the Associated Releases to the Apalachicola River*, Document #CESAM-PD-E1, pp. 22, 24, available at [http://www.sam.usace.army.mil/ACF%20Water%20Resources%20Management/ACFDrought_Consultation2007/FinalBiologicalAssessment_1_Nov_2007.pdf]. This document was amended on November 7, 2007; the amendment is available at [http://www.sam.usace.army.mil/ACF%20Water%20Resources%20Management/ACFDrought_Consultation2007/BA_AmendmentLetter11_7_2007.pdf]. Hereafter the two documents are referred to as the *BA* and the *amended BA*.

[13] Ron Word, "Apalachicola sues Corps over Chattahoochee," *Atlanta Journal-Constitution*, January 17, 2008. Available at [http://www.ajc.com/metro/content/metro/stories/2008/01/17/apalachicola_0117.html].

[14] Apalachicola Bay Chamber of Commerce, at [http://www.apalachicolabay.org/eastpointhome.php].

[15] D. Twichell, "Habitat Mapping to Assess Health of Oyster Fishery in Apalachicola Bay, Florida," *Sound Waves* (USGS, June 2005).

freshwater inflow decreases[16] — the Florida Department of Environmental Protection has raised concerns that the minimum flows proposed under the EDO could "precipitate a catastrophic collapse of the oyster industry in Apalachicola Bay."[17] Apalachicola town officials asserted in their lawsuit that four oyster beds had died due to high salinity.

Marine Commercial Fishing. In addition to oysters, important commercial species include shrimp, blue crabs, and striped mullet. Blue crabs may migrate as much as 300 miles to spawn in Apalachicola Bay, and the bay serves as a major nursery for juvenile penaeid shrimp, blue crabs, and many fish (e.g., striped bass, grouper, redfish, speckled trout, flounder, and various species of sturgeon). In addition, Apalachicola Bay is a major forage area for offshore fish such as gag grouper and gray snapper. In 2006, the total value of commercial fish landings at Apalachicola, FL, was about $33 million.[18]

Marine Sport Fishing. Species that can be caught in the bay include spotted seatrout, flounder, cobia, sheepshead, redfish, Spanish mackerel, pompano, speckled trout, tripletail, black drum, whiting, bluefish, grouper, jack crevalle, snapper, amberjack, king mackerel, and tarpon. Fish that spend their juvenile stages in Apalachicola Bay waters include striped mullet, spotted seatrout, red drum, flounders, and sharks. Most of these open ocean sport fish enter the bay primarily for foraging. Changes in the estuarine environment could cause changes in the distribution of these species, their prey, and their predators, to uncertain effect in the complex exosystem.

Freshwater Sport Fishing. A total of 131 species of freshwater and estuarine fish have been identified in the Apalachicola River, with 40 of these species found only in the lower tidal reaches of this river system.[19] The Apalachicola River has the only know reproducing Gulf population of striped bass. Southern stocks of this species tend to be primarily riverine and rarely undertake coastal migrations.[20] Important sport species in the lower river include largemouth bass, striped bass, sunshine bass, white bass, and river bream (redbreast sunfish). In addition, speckled trout and redfish move into the lower river during the winter, and young grouper and snapper inhabit wetlands and marshes of the Apalachicola basin before moving into marine waters. The Florida Fish and Wildlife Conservation Commission and FWS annually stock striped bass and sunshine bass in the lower River.

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[16] R. E. Turner, "Will Lowering Estuarine Salinity Increase Gulf of Mexico Oyster Landings?," *Estuaries and Coasts*, vol. 29, no. 3 (June 2006), pp. 345-352.

[17] Florida DEP November 8 letter, p. 2.

[18] National Marine Fisheries Service, *Fisheries of the United States 2006*, p. 7.

[19] Helen M. Light, Melanie R. Darst, and J. W. Grubbs, *Aquatic Habitats in Relation to River Flow in the Apalachicola River Floodplain, Florida*, U.S. Geological Survey Professional Paper 1594 (1998), p. 45.

[20] U.S. Department of the Interior, Fish and Wildlife Service, *Life History Requirements of Selected Finfish and Shellfish in Mississippi Sound and Adjacent Areas*, FWS/OBS-81/51 (March 1982), p. 51.

The Four Species: A Sturgeon and Three Mussels

A focal point of the debate on management of the ACF basin during drought has been protection of four notably uncharismatic protected species: the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the endangered fat threeridge mussel (*Amblema neislerii*), the threatened Chipola slabshell mussel (*Elliptio chipolaensis*), and the threatened purple bankclimber mussel (*Elliptoideus sloatianus*). Water flow rates, temperature, dissolved oxygen, and other aspects of water quality are important to all four. The biology of each species is discussed below, along with the conclusions of FWS in its 2007 Biological Opinion.

Consultation Under the Endangered Species Act

Under §7 of the ESA, federal agencies are obliged to consult with FWS when their actions may affect listed species. The most recent formal consultations by the Corps on ACF management took place in 2006 and 2007. FWS issued Biological Opinions and Incidental Take Statements regarding the actions.

Consultation in 2006-2007

In March 2006, the Corps requested formal consultation with FWS on the Interim Operating Procedure (IOP) of the Corps' Jim Woodruff Dam on the Georgia-Florida border; the Corps submitted a Biological Assessment (BA) on the IOP. (For a brief description of earlier consultations, see CRS Report RL34326, *Apalachicola-Chattahoochee-Flint (ACF) Drought: Federal Water Management Issues*.) FWS responded with a Biological Opinion (BiOp), and included reasonable and prudent measures (RPMs) to modify the IOP to reduce incidental take of listed species. Among the five RPMs, one specified that the Corps develop a set of trigger points (of the reservoir, climatic or hydrologic conditions, and species conditions) and water management measures to take effect when drought conditions were reached. The Corps submitted a revised BA on February 16, 2007. FWS issued a BiOp and incidental take statement approving these changes to the IOP on February 28, 2007. Among the conditions set in the 2006 IOP to protect listed species were these:

- Minimum flow in drought conditions: 5,000 cfs (cubic feet per second) daily average, but 6,500 cfs daily average considered desirable.
- Maximum fall rate during drought conditions: 0.25 feet/day (i.e., the height of the river to drop no more than 3 inches in the course of any given day), but a lower rate considered desirable.

The first figure was intended to provide a certain minimum of available habitat. This flow rate was chosen because no rate below 5,000 cfs had ever been recorded in the Apalachicola River.[21] The maximum fall rate was set to allow the sturgeon, and the

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[21] Fish and Wildlife Service, *Biological Opinion and Conference Report on the U.S. Army Corps of Engineers, Mobile District, Interim Operating for Jim Woodruff Dam, and the* (continued...)

very slowly moving mussels, some chance to relocate to more suitable habitat before a given location dried out.

Consultation in 2007

As the drought continued, on November 1, 2007, the Corps proposed Exceptional Drought Operations (EDO, amending the IOP) for the Jim Woodruff Dam. It requested a new, expedited formal consultation with FWS concerning the EDO's effects on listed species, and submitted a new BA to FWS. In it, the Corps proposed to reduce flows from the Jim Woodruff Dam still further:

- Minimum flow: 4,150 cfs (down from 5,000 cfs, and from the 6,500 cfs considered "desirable" in the previous IOP).
- Maintenance of the 0.25 ft/day maximum fall rate, until 4,200 cfs is achieved.

According to the Corps BA, "adverse impacts to listed species (especially the listed mussel species) are reasonably certain to occur as flows on the Apalachicola River drop below 5,000 cfs."[22] As noted previously, any flow below that rate would be less than any previous record for the Apalachicola River. Among the issues mentioned in the rationale for adopting EDO and its lower minimum flows was reducing "the demand of storage in order to ... provide greater assurance of future ability to sustain flows for listed species during a severe multi-year drought, as currently being experienced in the ACF basin."[23] The result of the proposal was that the listed species would face a reduced water flow this year to reduce risks in later years, if the drought continues.[24] The Corps requested a BiOp from FWS on an expedited basis, and both agencies agreed to a goal of November 15, 2007 for a BiOp and the associated Incidental Take Statement from FWS.

Commonly, when another agency (e.g., Forest Service, Environmental Protection Agency) requests formal consultation with FWS, the other agency's BA may provide considerable information not only about its own project, but also about the range, food, known distribution, laboratory studies, etc., of the species in question, and that information is site-specific. While the Corps BA included relatively little new information about the listed species (e.g., distribution changes

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[21] (...continued)
Associated Releases to the Apalachicola River, September 5, 2006, p. 11. Available at [http://www.fws.gov/southeast/drought/JWDIOP_BO_FINAL_corrected9-22-06.pdf].

[22] BA, p. 6.

[23] BA, p. 6.

[24] While this tradeoff in time — some risk now, to lower a species' risk later — is not especially common in the consultation process, it has occurred before (e.g., spotted owls and the Northwest Forest Plan). On the other hand, tradeoffs in general are very common in the consultation process. Examples would include direct habitat protection (less in one area, more acquired in another); greater intrusion before or after a nesting season and less intrusion during it; more public access if access is more carefully controlled, etc. At issue with the listed ACF species is not a tradeoff per se, but the degree to which the current likely harm is balanced by potential future benefits.

since implementation of the IOP in fall 2006), the BA did provide data concerning the effects of its operations to date on water quality. Among other things, the Corps BA stated that under the IOP as it stood then,

> impairments [due to point and non-point source pollution] identified include turbidity, coliforms, total suspended solids, dissolved oxygen (DO), biology, and unionized ammonia.... We lack sufficient information to determine if implementation of the IOP has altered the baseline water quality of the action area. However, we recognize that the extraordinary drought conditions ... have resulted in salinity changes in Apalachicola Bay and increased temperatures and associated localized dissolved oxygen changes due to extended periods of low flow (approximately 5,000 cfs).[25]

And, after acknowledging that the Corps does not have data on water temperature or dissolved oxygen levels, the Corps BA further noted:

> However, observations made by USFWS field personnel this summer, indicate that mussels found in isolated pools or shallow slack water habitats are showing signs of stress or mortality likely due to high temperatures and low DO [dissolved oxygen]. Significant reductions in river flow below 5,000 cfs would likely exacerbate the temperature and DO conditions observed this year; as well as substantially increase the risk of stranding aquatic organisms.[26]

The FWS decision concerning jeopardy appeared to turn on whether to trade rather likely immediate harm (below then-current levels) to the four species (and especially the mussels) to avoid a risk of still greater future harm.

While agencies are required under § 7(a) (16 U.S.C. 1536(a)) to "utilize their authorities in furtherance of the purposes of [ESA]," FWS cannot require an action to save a listed species that is outside of that agency's authorities. Thus, while some might argue that reasonable and prudent alternatives (RPAs; see **Appendix A**) in the ACF basin could (or should) include water conservation measures (e.g., improving irrigation practices, restricting outdoor watering, changing commercial or residential building codes to improve water conservation, increasing water rates to fund municipal water conservation projects, etc.), FWS did not require that the Corps undertake these tasks because the Corps has no authority to implement them.[27] Only those choices legally open to the Corps were considered.

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[25] Corps BA, p. 21.

[26] Ibid., p. 22.

[27] However, the Corps would not have been prevented from volunteering such an option, if it had found partners willing to cooperate in the effort. In the Platte River Recovery Plan, for example, the Bureau of Reclamation consulted with FWS about a project; its partners — Colorado, Wyoming, and Nebraska — pledged to fund (with cash or payments in kind) a program of habitat improvement (including purchase of land from willing sellers), improved water flow, and adaptive management. The program provides $317 million over 13 years, with the Bureau responsible for half. FWS could not have required the states to participate, but took their efforts into account in issuing a finding of no jeopardy. (Personal communication between Lynne Corn and Mark Butler, FWS Denver Regional Office, November 6, 2007.)

FWS had the option of concluding that there was no way to carry out the change without jeopardizing the species or adversely modifying critical habitat. Such decisions are extremely rare (and often referred to as the "nuclear option"), and would have left the Corps with three choices: (a) facing a citizen suit if it proceeded, (b) choosing not to carry out the modification, or (c) considering asking for a formal exemption under §7 (16 U.S.C. § 1536(e)-(p); see **Appendix A**). FWS did not select this option.

On November 7, 2007, the Corps amended its BA to take into account new data it had received from FWS indicating that a greater level of harm to the fat threeridge mussel could result from a reduction to 4,150 cfs than was previously thought.[28] It therefore proposed to reduce flows in increments — first to 4,750 cfs, then 4,500 cfs, and finally the target of 4,150 cfs. The Corps' letter also stated that it would consult with FWS on the triggers and conditions that would allow it to make the incremental reductions. It stated the Corps' understanding "based on review of the new mussel and modeling data and consultation with your [FWS] office, that this amendment will result in less adverse impacts" to the listed species and their designated or proposed critical habitat.

Biological Opinion and Species Analysis. In the BiOp issued November 15, 2007, regarding the Corps' action, FWS analyzed the effects of the proposed action on each of the four listed species. Its conclusions are described in detail below, but overall, FWS concluded that the EDO would not appreciably affect the survival and recovery of the Gulf sturgeon and would not appreciably affect the ability of its designated critical habitat to provide its intended conservation role for Gulf sturgeon in the wild.[29] In addition, FWS concluded that for the fat threeridge, Chipola slabshell, and purple bankclimber mussels, the Corps' EDO would have a measurable — but not appreciable — impact on survival and recovery. While critical habitat primary constituent elements[30] for these mussel species may be adversely affected by reducing minimum releases to 4,500 cfs, FWS did not anticipate that this adverse affect 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 these mussels in the wild.[31] Triggers for incremental reduction would have to be supplied to FWS in order to make additional reductions.

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[28] Letter from Corps to FWS Field Office in Panama City, FL, to amend BA of November 1, 2007, at [http://www.sam.usace.army.mil/ACF%20Water%20Resources%20Management/ACFDrought_Consultation2007/BA_AmendmentLetter11_7_2007.pdf].

[29] However, FWS does not state that *no* harm would come to these four species. Rather, it concludes that the Corps' action would not be sufficient to jeopardize the continued existence of the four species, provided that certain reasonable and prudent alternatives are carried out. Any future consultation on ACF management would occur in light of a pre-existing harm that, if not appreciable, was still measurable according to the BiOp.

[30] On the same day that the BiOp was released, FWS published the final rule for critical habitat designation for the three mussels, but the BiOp generally refers to their critical habitat as proposed rather than designated. See 72 *Federal Register* 64286; November 15, 2007.

[31] BiOp, p. 56-58.

Gulf Sturgeon: Biology and BiOp. The threatened Gulf sturgeon once spawned in streams and rivers throughout the northeastern Gulf of Mexico, and it still does, though its distribution in the rivers has changed. (See **Figure 1** for historic and current sturgeon habitat.) In the ACF system, it once occupied 636 river miles, well into the higher portions of the basin.[32] Spawning is thought to occur in deep waters of remaining habitat. The Gulf sturgeon are anadromous, migrating upriver from the Gulf of Mexico in the springtime to spawn near the headwater of rivers, in areas with coarse substrates (rocks, sand, or gravel, rather than mud). The fish then spend the summer in the mid- to lower river before migrating back into the Gulf of Mexico. Adult Gulf sturgeon seldom feed while in rivers, instead using stored nutrients to supply energy needed for spawning.[33] Adults feed once they return to estuaries or the Gulf of Mexico. Once the eggs hatch, young fish remain in the river, probably for a few months. They are a very long-lived species: females mature at about 8-12 years, and males at 7-10 years. Adult length can exceed 6 feet. In addition to the fish flesh itself, the fish were prized for caviar. Major limiting factors for the population include barriers (dams) to historical spawning habitats, loss of habitat, poor water quality, and overfishing.[34]

A series of dams gradually reduced spawning habitat in the ACF basin. With construction of the Jim Woodruff Dam, spawning habitat was confined to the 107 miles below the dam. This remaining accessible portion of the ACF basin is considered a major fraction of the species' spawning habitat. A century ago, the ACF system supported a major commercial fishery on Gulf sturgeon, but by the time of its listing in 1991, FWS and NMFS stated, "Any additional decline in this population could result in its extirpation."[35] Critical habitat was designated on March 19, 2003, and took effect one month later; the designated critical habitat encompasses several rivers and estuaries along the Gulf coast from Florida to Louisiana, including the Apalachicola River.

The effects of a reduction to 4,500 cfs on the listed species are outlined in the BiOp (pp. 39-48). Sturgeon spawning habitat is highly dependent on the proper water depth; the EDO would cause a drop from the current 13 acres of suitable spawning habitat to 10 to 12 acres. The reduction was judged "probably not significant," but the BiOp noted a paucity of data.

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[32] 56 *Federal Register* 49655, September 30, 1991.

[33] U.S. Department of the Interior, Geological Survey (USGS), *Gulf Sturgeon Facts*, available at [http://cars.er.usgs.gov/ Marine_Studies/Sturgeon_FAQs/sturgeon_faqs.html].

[34] U.S. Department of Commerce, National Marine Fisheries Service, *Gulf Sturgeon Recovery/Management Plan*, available at [http://www.nmfs.noaa.gov/pr/pdfs/recovery/ sturgeon_gulf.pdf].

[35] 56 *Federal Register* 49655, September 30, 1991.

Figure 1. Critical Habitat and Historic Range of Gulf Sturgeon in ACF Basin

Source: FWS Field Office, Panama City, Florida; slightly modified by CRS for clarity in monochrome.

The Mussels: Biology and BiOp. The endangered fat threeridge mussel, the threatened purple bankclimber, and the threatened Chipola slabshell live in the sand and gravel bottoms of streams and rivers. Larvae of these mussels are parasites on the gills and fins of freshwater fishes (e.g., darters, minnows, and bass), using these host fish for dispersal and causing them little or no harm. All three mussels require good water quality, stable stream channels, and flowing water. Major limiting factors include manmade structures (e.g., dams and channel alterations) that destroy free-flowing water habitats and restrict the three species and their hosts from dispersing, resulting in small, isolated populations. The three species are also threatened by point and nonpoint source pollution, such as runoff containing fertilizers, herbicides, and pesticides from various land-use practices.[36] The mussels usually move very little, but a muscular "foot" helps them burrow and allows slow and limited movement if they are disturbed by floods or droughts. All three species were listed on March 16, 1998. Critical habitat was designated for them on November 15, 2007; the designation took effect on December 17, 2007.[37]

For all three mussels, the BiOp reported that mortality increases with low water levels and decreases with higher levels and cooler temperatures. Mussels commonly move downslope within the river channel as waters recede, but may encounter problems during their slow progress. For example, if they arrive at an area that has had too high a flow rate in the past, they may find a river bottom that is scoured and has a substrate too coarse to be suitable for mussels. If they reach an area with a very low flow rate, they may become smothered with silt or overheated. As a result, their preferred habitats in a river can be very patchy, with high populations in favorable areas and low populations in the intervening areas. In addition, mussels may become stranded in isolated pools as water levels fall; oxygen in the isolated pools may drop to fatal levels. Once stranded, they are unable to escape and may die unless waters rise in time. Effects on the individual species are discussed below.

Fat Threeridge Mussel. This species was found historically in the Apalachicola, Flint, and Chipola Rivers. (See **Figure 2** for historic and current distribution of fat threeridge mussel.) The species has never been found in the Chattahoochee River. It is no longer found in the Flint River and occurs only in the lowest portion of the Chipola River. Siltation above dams may have contributed to their loss in higher parts of the river basin. While the fat threeridge mussel is found over a large portion of the Apalachicola River, over half the population is found between River Miles 40 and 50, even though that stretch is much less than half the species' range. Population densities in this portion of the river range from 5 to 77 times the densities in any other part of the river.[38] Because the river margins in this concentrated area are relatively flat, a small drop in water level exposes large amounts of habitat. The EDO would cause suitable habitat to drop from 74 to 55 acres in this critical stretch. The mussels may respond by moving downslope. But

[36] U.S. Department of the Interior, Fish and Wildlife Service, *Endangered and Threatened Mussels in the Apalachicola-Chattahoocheee-Flint Basin*, available at [http://www.fws.gov/southeast/october07/ Mussels-FactSheet-ACFBasin.pdf].

[37] 72 *Federal Register* 64286, November 15, 2007.

[38] BiOp, p. 42.

deeper unoccupied habitat is subject to higher water velocities, which result in scouring and a coarser substrate, rather than the silt and clay substrate the species seems to prefer. Higher spring flows could wash away mussels, perhaps killing them outright, or depositing them in unsuitable habitat. By analogy with studies on closely related (and better studied) species, FWS concluded in the November 2007 BiOp that the species could decline as much as 30% between 2006 and 2008.[39]

Purple Bankclimber. The purple bankclimber is a large mussel, once found widely in the ACF basin, plus the Ochlocknee River (FL and GA). (See **Figure 3** for historic and current distribution of purple bankclimber.) It has nearly disappeared in the Chattahoochee and Chipola Rivers, and is now rare in the Flint River. The purple bankclimber is found primarily at two sites in the Apalachicola River, though a few animals are found elsewhere. One site, at River Mile 105, is a limestone shoal, and the species is found among jagged rocks at this site. Movement down this surface as water recedes would be problematic. At the second site, bankclimbers are found at various depths in a sandy substrate. FWS found that "decreasing the water levels further will harm some fraction of the bankclimber at the [limestone] site, but we can not determine the size of that fraction from the information we have."[40]

Chipola Slabshell. The Chipola slabshell was historically found only in the Chipola River, its headwater streams, and one creek that joins the lower Apalachicola. It is now gone from that creek, and appears to be gone from Dead Lake on the mainstem of the Chipola. Six subpopulations remain, all in the Chipola River. (See **Figure 4** for historic and current distribution of the Chipola slabshell.) The BiOp expects the EDO to affect only a small fraction of the population, primarily because the affected portion of the Chipola River, where the mussel lives, represents only the lower end of the species' distribution. The higher parts of its range would not be affected by the lowered flows.

No Long-Term Analysis Provided, or Expected. As noted in these individual species analyses, FWS commented that a lack of data prohibited drawing long-term conclusions about effects of the EDO. To that end, it limited its opinion to a period of only a few months. Moreover, it did not determine a minimum flow that would avoid jeopardy indefinitely into the future; it would be surprising if it had. Not only does FWS lack sufficient data to predict confidently the effects of such a change in flow over the long term, it also lacks sufficient information to determine what other factors might change in the species' habitat. For instance, if water flows remained low, but all communities and industries in the basin were to improve their pollution levels markedly, might the species tolerate an even lower flow, in light of this improvement? What would happen if pollution were to increase? Or if all farms planted shade trees along all tributaries, thereby lowering water temperatures, would that favor mussel populations? What if existing trees were removed, or if paved surfaces increased, and together raised water temperatures? Such complexities make long term analyses very difficult. (See "What Does a Species *Need*?" below.)

[39] No studies were found to demonstrate whether the projected decline has occurred or not.

[40] BiOp, p. 42.

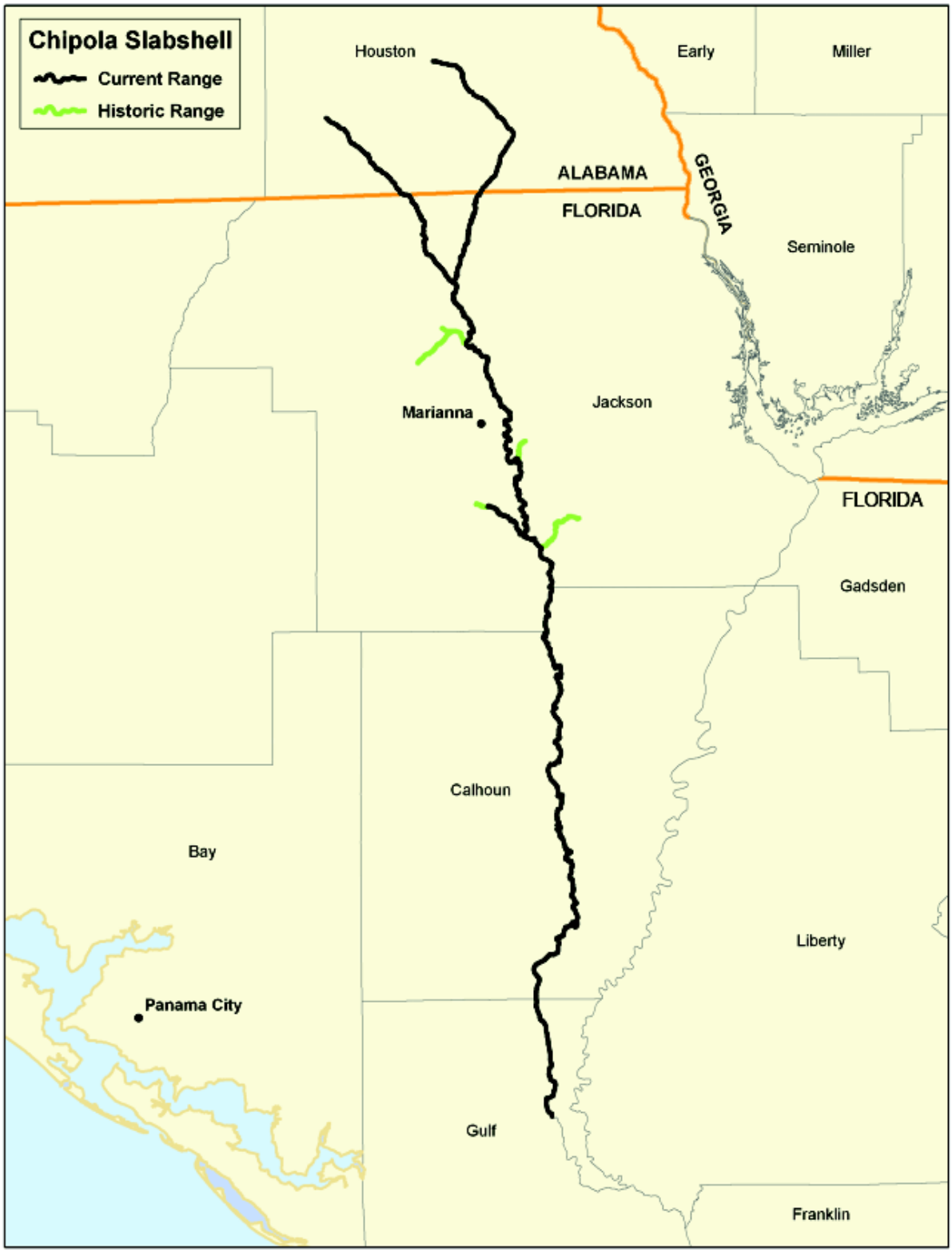
Figure 2. Current Range and Additional Range of Fat Threeridge in ACF Basin

Source: FWS Field Office, Panama City, Florida; slightly modified by CRS for clarity in monochrome.

Figure 3. Current and Additional Range of Purple Bankclimber in ACF Basin

Source: FWS Field Office, Panama City, Florida; slightly modified by CRS for clarity in monochrome.

Figure 4. Current and Historic Range of Chipola Slabshell in ACF Basin



Source: FWS Field Office, Panama City, Florida; slightly modified by CRS for clarity in monochrome.

Incidental Take Statement and Reasonable and Prudent Measures. In issuing the Incidental Take Statement (ITS) on November 15, 2007, FWS limited duration of the ITS to June 1, 2008, and to a reduction to 4,750 cfs in an initial stage, to be followed by a reduction to not less than 4,500 cfs and then to 4,150 cfs.[41] The ITS in the Amended BiOp included non-discretionary measures to determine the appropriate triggers for these incremental reductions. It directed that the Mobile District Corps insure that the measures become binding conditions of any contract or permit issued to carry out the EDO. Mandatory terms and conditions were attached to the ITS to ensure that the ITS provisions are implemented. These terms and conditions included reporting requirements, monitoring, and assuming responsibility for certain studies, among other things. These studies include measurements of take of the listed species resulting from lower flows, changes in mussel distribution, and life history studies to provide better information to inform future decisions. The ITS also warned that failure to carry out the terms and conditions could invalidate the ITS.[42]

In addition to mandatory terms and conditions, the ITS also made discretionary recommendations to the Corps. Among other things, the ITS recommended that the Corps work with states and other stakeholders to reduce water depletions to the ACF basin, particularly in the Flint River; its examples included incentives to reduce agricultural demands. It also recommended that the Corps, with other stakeholders, "evaluate ways to ensure that listed mussel mortality due to low flows does not become a chronic or annual source of mortality."[43]

Consultation in 2008

On April 15, 2008, the Corps submitted its Revised Interim Operating Plan (RIOP) to FWS for consultation, thus eliminating the temporary EDO by incorporating elements of the EDO and other changes into the RIOP.[44] It is generally more complicated than previous plans, but on the whole allows for more water retention in the upper basin. The RIOP proposal includes provisions to store additional water during the winter and during drought periods and to release more during spawning periods. The intent is to avoid storage reaching levels that would trigger the lowering of the Apalachicola River minimum flows from 5,000 cfs to 4,500 cfs. The Corps proposal is to store 50% of basin inflow, instead of 30%; this would be accomplished by eliminating a minimum flow of 6,500 cfs during wetter periods, making fish spawn releases dependent on the storage level, and switching from a two-season to a three-season operation regime. Key changes resulting from the RIOP include

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[41] Amended BiOp, p. 58.

[42] Amended BiOp, pp. 58-59.

[43] Amended BiOp, p. 64.

[44] U.S. Army Corps of Engineers. *Description of Proposed Action: Modification of Interim Operations Plan at Jim Woodruff Dam.* April 15, 2008. Available at [http://www.fws.gov/southeast/drought/ProposedActionDescription-ModificationIOP.pdf]. Hereafter referred to as *RIOP*.

- change in the protocol to determine the minimum discharge from Woodruff Dam. In times of low inflow[45] that is still above 5,000 cfs, amounts above 5,000 cfs would be released below Woodruff Dam. If basin inflow is below 5,000 cfs, then 5,000 cfs would be released anyway. However, if storage of water dipped to drought levels, then water release could fall to 4,500 cfs.
- suspension of requirements for a maximum fall rate (0.25 ft/day) if water storage drops to a specified level and the Corps is operating under a drought plan.

Conclusions of the BiOp. FWS issued its most recent BiOp on June 1, 2008.[46] FWS concludes that the RIOP would not jeopardize the four listed species, nor would it adversely modify their critical habitat. It stated (p. 174):

> Generally, it appears that the Corps would store water more often under the RIOP (about 9% more often) than has occurred historically, which means that the river would have less water about 9% of the time. The RIOP uses this stored water to maintain a minimum flow of 5,000 cfs, but the frequency of flows less than 10,000 cfs is increased by about 5%.

As is the case in other consultations, FWS compared the effects of the proposed action to the effects that would occur on the listed species if the proposed action were not taken. Thus, a conclusion of "no added harm" for the four species cannot be interpreted as "no harm" to the species. In general, FWS concluded that, with certain reasonable and prudent measures (mandatory under the terms of the new ITS), neither jeopardy nor destruction or adverse modification of designated critical habitat would occur. In its conclusions, FWS focused primarily on those periods when flows below Woodruff Dam would be at or below 5,000 cfs. Because the RIOP would apply until a new water control plan is adopted in two to five years, the BiOp would apply until June 1, 2013, or until the RIOP is amended or superseded by a new proposed action. The effects of the RIOP on each of the four species is discussed below, followed by a discussion of effects on other species in the Apalachicola River and Bay.

For the Gulf sturgeon, FWS concluded that the RIOP "may have a moderate beneficial effect by decreasing the maximum number of consecutive days/year less than 16,000 cfs.... However, future depletions to basin inflow from non-project related water uses might further change sturgeon estuarine habitats by increasing the duration of flows less than 16,000 cfs during drought years" (2008 BiOp, p. 175).

For the fat threeridge mussel, FWS commented on the effects of more frequent periods of low inflow (below 5,000 cfs, a level which had not been reported before

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[45] Inflow is the unimpaired runoff into the basin, minus the consumptive uses that might occur above a reservoir. The use of inflow into reservoirs, rather than unimpaired runoff into the basin, to guide operations is contentious because of the exclusion of consumptive uses, such as irrigation in the Flint River sub-basin above Lake Seminole.

[46] U.S. Fish and Wildlife Service. *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.* Panama City Field Office, FL. 211 p. Hereafter referred to as the 2008 BiOp.

the creation of Lake Lanier) into the basin would be about 7.3% of the time under current estimated water demands throughout the basin, and 8.3% of the time if municipal and industrial demands increase by 27%. Under the RIOP, while additional releases upstream would be triggered to maintain 5,000 cfs downstream at Woodruff Dam, if inflow (not unimpaired runoff; see above) fell below 5,000, then the RIOP's minimum inflow provision would be triggered, which would lower the releases below Woodruff Dam to 4,500 cfs (2008BiOp, p. 176). "We anticipate a take of not more than 21,000 fat threeridge (9% of the population) if the 4,500 cfs minimum release is triggered" (2008 BiOp, p. 176). Continuing, FWS concluded that the RIOP would have a measurable but not appreciable impact on this species, if flows fall to 4,500 cfs. It expected that drop to occur once in the next five years.

The purple bankclimber tends to occur more commonly in deeper water than the fat threeridge. FWS concluded that, while there is evidence that the species is declining throughout its range, they anticipated a take of about 200 animals if flows fell to 4,500 cfs. Because of the species' preference for deeper water, and given models suggesting that the lower flow would occur only about once in the next five years, FWS concluded that critical habitat would not be adversely modified.

The Chipola slabshell is found in the Chipola River, a tributary of the lower Apalachicola River (**Figure 4**), and FWS reported discoveries of 12 new subpopulations with many individuals. It concluded that the species is now improving rangewide. FWS further concluded that the changes in the mainstem of the Apalachicola, and a reduction to 4,500 cfs in the main river, might lead to a take of about 2% of the population. It found that this level of additional take would not jeopardize the species, or destroy or adversely modify its designated critical habitat.

Reasonable and prudent measures to implement the ITS were also given by FWS. These mandatory measures included additional monitoring and evaluation of other strategies for reducing fall rates, especially during sturgeon spawning season from March to May. In addition, and after consulting appropriate water resource and management agencies, the Corps was to:

> provide the Service by June 1, 2009, an evaluation of methods to estimate total surface water flow of the basin to Woodruff Dam by accounting for depletions to basin inflow. The goal of this evaluation is to outline the steps whereby the Corps may integrate up-to-date estimates of water depletions into its monthly operational decisions.[47]

FWS made recommendations to the Corps as well. These recommendations are discretionary, and included efforts to work with stakeholders to reduce depletions in the ACF, especially in the Flint River; assistance for stakeholders in plans to reduce water consumption; additional monitoring, education, and research; and other measures.

Effects on Other Species. Change in salinity is one of the more likely features to have observable effects on species of economic importance in Apalachicola Bay. High flows and runoff from the Apalachicola River to

[47] 2008 BiOp, p. 185.

Apalachicola Bay dilute saltwater and reduce estuarine salinity, providing nursery habitat for many marine species with early life stages that are intolerant of high salinity, and preventing the permanent intrusion of marine predators, such as oyster drills, that are intolerant of low salinity. Freshwater flow from the Apalachicola River into Apalachicola Bay, as modified by winds, tides, and local rainfall runoff, regulates the bay's salinity and likely influences the amount of habitat available.[48] The June 1, 2008, BiOp notes that extended duration of high salinity in the estuarine environment is ecologically significant, because aquatic organisms widely differ in their salinity tolerance. More variable salinity favors those with the widest tolerance, and less variable salinity favors those with narrower tolerance.[49]

The Eastern oyster (*Crassostrea virginica*) is the commercial species of primary concern in considering effects of the RIOP because it is sedentary, is affected by changes in salinity, and has considerable economic value. Oysters grow and reproduce optimally at intermediate salinities; prolonged exposure to freshwater inhibits oyster growth, while higher salinity waters harbor marine predators and correlate with an increased susceptibility of oysters to the potentially lethal parasite *Perkinsus marinus* (commonly referred to as "dermo").[50] Within Apalachicola Bay, highest oyster densities and overall growth occur in the vicinity of the confluence of high salinity water moving westward from St. George Sound and river-dominated (lower salinity) water moving south and eastward from East Bay. High salinity (proximity of an oyster bar to entry points of saline Gulf water into the bay) and relatively low-velocity currents are important factors contributing to increased oyster mortality. River flow reduction, whether through drought or increased upstream use, could have serious adverse consequences for oyster populations.[51]

A benthic survey of Apalachicola Bay conducted by the Florida Department of Environmental Protection found that polychaetes, bivalves, gastropods, and amphipods dominated the total abundance of this community.[52] How this fauna might respond to changes in freshwater inflow is not well known. As noted above, the more sedentary species would likely be more detrimentally affected, while some of the more mobile species might move to more acceptable habitat, though increased competition for resources in these areas could result until populations stabilize at a new level.

Thus far in 2008, investigations of Apalachicola Bay and the lower Apalachicola River indicate conditions similar to 2007, with record duration of low flows, yielding

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[48] R.J. Livingston, *The Ecology of the Apalachicola Bay System: an Estuarine Profile*,. U.S. Fish and Wildlife Service, USFWS/OBS-82/05 (1984).

[49] 2008 BiOp, p. 83.

[50] Summary of literature in S. Gregory Tolley, Aswani K. Volety, and Michael Savarese, "Influence of Salinity on the Habitat Use of Oyster Reefs in Three Southwest Florida Estuaries," *Journal of Shellfish Research*, v. 24, no. 1 (2005): 127-137.

[51] R. J. Livingston, et al., "Modelling Oyster Population Response to Variation in Freshwater Input," *Estuarine, Coastal, and Shelf Science*, v. 50 (2000): 655-672.

[52] Florida Department of Environmental Protection, NOAA Coastal Service Center, and R.J. Diaz, *Draft Apalachicola Bay Benthic Mapping Project Data Report* (2000), 58 p.

conditions similar to an exceptional drought. Salinities are higher in most areas of Apalachicola Bay and the lower Apalachicola River, with observed oyster dieoffs from both predators and disease (e.g., dermo) and low oyster spat survival; reduced density of submerged aquatic vegetation in estuarine marshes; lower white shrimp and flounder abundance; encroachment of marine sea grasses, marine pelagic fish, and stony corals further into the bay; and occurrence of more estuarine salt water species higher into freshwater tributaries.[53]

The June 1, 2008, BiOp notes that, although two species of sea turtles and the West Indian manatee may sometimes occur in Apalachicola Bay or the lower Apalachicola River, any effects of the proposed action on these species would likely be insignificant, due to their low numbers and only occasional seasonal residence in the river and bay.[54]

Consistency with Previous Court Decisions. The 2008 BiOp does not appear to contradict court decisions pertaining to the ACF. The only court to have addressed the Corps' ACF programs in the context of a BiOp is the Northern District of Alabama. In that case the State of Florida sought to enjoin the Corps' plan to release only 5,000 cfs of water, arguing that the reduced water flow harmed species listed under the ESA. The court held that "even assuming the loss of any mussels qualifies as a take, Florida has not established the necessary causal link between the actions of the Corps and the harm to the mussels," indicating that the drought, not the Corps, was causing the water shortage.[55] That decision did not address future actions by the Corps or the FWS and this BiOp does not appear inconsistent with that ruling.[56]

The underlying agency action reviewed in the 2008 BiOp does not appear to be at odds with the recent decision from the D.C. Circuit Court of Appeals. The D.C. Circuit Court held that, pursuant to the Water Supply Act,[57] the Corps lacked congressional authority to enter into the Lake Lanier storage contracts in a 2003 agreement with the State of Georgia and other parties.[58] The disputed contracts had not become effective and therefore have not affected operations to date.

The disputed contracts called for reallocation of storage space, not the delivery of a specific quantity of water, from other uses to municipal and industrial water supply. It is unclear from available information whether a reallocation of space to

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[53] Communication with Theodore S. Hoehn, biologist, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL, (850) 410-0656, ext. 17336, on July 2, 2008.

[54] 2008 BiOp, p. 2.

[55] Alabama v. Army Corps of Engineers, 441 F. Supp. 2d 1123, 1134 (N.D. Ala. July 25, 2006).

[56] Florida has filed suit challenging an earlier BiOp by FWS that found the Corps' water allocation did not jeopardize the continued existence of ESA-listed mussels. No ruling has been made. Florida v. Fish and Wildlife Service, 4:06W410-RH/WCS (N.D. Fla. Sept. 6, 2006).

[57] 43 U.S.C. § 390b(d).

[58] Southeastern Federal Power Customers v. Geren, No. 06-5080 (D.C. Cir. Feb. 5, 2008).

a water supply would change the quantity stored. For instance, differences in the timing of releases from Lake Lanier for in-stream hydropower uses and releases for off-stream, consumptive municipal uses potentially could affect the stored volume, as well as in-stream flows, at a particular time. The BA and its BiOp describe an operational regime that evaluates both the volume of stored water and basin inflow to determine releases at Woodruff Dam. However, the flow amounts from the Jim Woodruff Dam, which are the agency action underlying the BiOp, are not influenced by the storage capacity in the Lake Lanier reservoir, but are based on basin inflow quantities.

What Does a Species *Need*?

The question of what a species needs is often asked by many parties in any ESA debate — to the frustration of both the questioners and the biologists trying to respond. How many big trees does a spotted owl need; how pure does the water need to be to restore a run of chinook salmon; and how much water flow do mussels in the ACF system need? The answers to such questions depend on some factors that are obvious, though the details may differ from case to case:

- Is the minimum in question a feature that affects a species at a critical portion of its life cycle (e.g., calving)?
- Is the species also threatened by incidental take in the course of other human activities (e.g., fishery bycatch)?
- Are invasive species competing with the species?
- Are diseases, particularly newly introduced diseases, weakening the species' ability to withstand stress?

These and similar questions are a common feature of BiOps, or any other analysis of species and threats to their welfare, whether for examining ESA issues (listing, consultation, Habitat Conservation Plans, etc.), or for state or local conservation matters. These sorts of questions are the most obvious reason why FWS biologists are reluctant to pick out a single feature, such as cubic feet of water per second in a river, and state that this particular hard number is what the species needs for all time.

But a more subtle issue also arises, and it is often less clearly stated than the previous questions: *to what end is the species being managed?* In ESA terms, how far down the road to recovery does a recovered species have to travel to be considered recovered? The probability of a population surviving over a particular period is usually chosen as the standard of recovery: 10% chance of becoming extinct in the next 50 years, 15% in the next 100 years, 1% chance in the 100 years, etc. The stronger the probability and the greater the desired time span, the more caution is required in a species' management. However, these probabilities (analyses of the viability of a population) are difficult to calculate and hard to defend: FWS and NMFS have set no generally agreed standard of recovery to be applied across the board to all species.

While it may seem esoteric, this choice of a recovery standard has major consequences over a long span of time. Ecologist Daniel Goodman of Montana State University offered an interesting analysis of this problem:

> We might date the beginning of civilization to 5,000 years ago, when the Upper and Lower Kingdoms of Egypt were united. Imagine that, at that time, a global policy had been adopted of managing the environment to a standard of 15% probability of extinction within 100 years for all mammalian species. How many mammal species would be left on earth now? The starting number of species would have been about 4,400. Compounding the 15% probability per 100 years over the 5,000 years gives a probability of about 0.0003 [0.03%, or 3 chances in 10,000] per species, of surviving to the present. If the extinction dynamics of all the respective species were independent, the probability of no mammals remaining would be 27%; the probability of more than three species remaining would be about 4%. This doesn't sound very good. Our preferred vision of managing the environment for posterity obviously entails very low probabilities of extinction over large time spans.[59]

In the ACF context, there is no river flow that would guarantee that any of the listed species would last another 5,000 years, if only because the species could go extinct for other reasons. More practically, though, if a guarantee is impossible, how much of a risk is acceptable? Is a prolonged flow of 5,000 cfs sufficient for one of the mussels to have at most a 1% chance of extinction in the next decade? Century? Millennium? If the flow is lowered still further, how much greater does the risk to the species become, and is *that* level of risk acceptable? If a higher risk is tolerated, a lower flow could be acceptable; if only a low risk of extinction is acceptable, then higher flows would be desirable.

In the ACF context, instead of setting itself the difficult or impossible task of determining the minimum flow necessary for the various species, FWS instead accepted the far more specific task of determining whether any one plan offers sufficient flows to avoid jeopardy to the species. It is noteworthy that in the ACF case, FWS limited its opinion to a specific period of months, not years, and further requested additional studies and data from the Corps. Only then does FWS, presumably with more data in hand, plan to address the risks from any further cutbacks in flows.

[59] Daniel Goodman, "Predicting Bayesian Population Viability Analysis: A Logic for Listing Criteria, Delisting Criteria, and Recovery Plans," in Steven R. Beissinger and Dale R. McCullough, eds., *Population Viability Analysis* (Chicago: University of Chicago Press, 2002), p. 447.

Appendix A. How the Endangered Species Act Works: Consultation

Under the ESA (16 U.S.C. § 1531), the taking of species listed as endangered or threatened is prohibited. *Taking* is broadly defined and includes not only obvious actions such as killing or trapping, but also *harming*. (See 50 C.F.R § 17.3 for a definition of *harm*.) In addition, under § 7(a)(2) (16 U.S.C. § 1536(a)(2)), federal agencies must insure that their actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. To that end, they must consult with FWS. The consultation process is described below, in simplified form.[60]

Federal agencies must consult with FWS on "any action authorized, funded, or carried out by such agency" if that action may harm a listed species or its critical habitat (16 U.S.C. § 1536(a)(2)). If FWS advises the action agency that a listed species, or one proposed for listing, may be present in the affected area, then the action agency must conduct a *Biological Assessment* (BA) describing its proposed action. According to FWS regulations, the purpose of the BA is to "evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action ..." (50 C.F.R. § 402.12(A)). If, with the help of information in the BA, formal consultation between the agency and FWS is determined to be necessary, either because of potential taking of the species or effects on critical habitat, the action agency submits a formal request for consultation. The action agency must provide the *best scientific data available* regarding its action and potential effects of the action on the species or its critical habitat. Once a request for formal consultation is submitted, certain deadlines apply, but these may be extended when additional information is needed (50 C.F.R. § 402.14).

The responsibilities of FWS during consultation are various but — notably in the ACF context — include an evaluation of the effects of the action itself as well as cumulative effects of the action. The evaluation is called a *Biological Opinion* (BiOp) or, sometimes, a *jeopardy opinion*. Among other things, FWS must evaluate whether the proposed action, "taken together with cumulative effects, is likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat" (50 C.F.R. § 402.14(g)). In forming the BiOp, FWS first consults with the agency on the availability of "reasonable and prudent alternatives (if a jeopardy opinion is to be issued) that the agency ... can take to avoid violation of section 7(a)(2)" (50 C.F.R. § 402.14(g)). A reasonable and

[60] The discussion below omits those species under the jurisdiction of the Department of Commerce, since the mussels are under the jurisdiction of FWS, and while the two departments share responsibility for the Gulf sturgeon, FWS has taken the lead in this particular case. However, regulations concerning consultation apply to both agencies, and their procedures do not differ substantively. The discussion also omits consultations that agencies may carry out informally. For a more general overview of the ESA, see CRS Report RL31654, *The Endangered Species Act: A Primer*, by M. Lynne Corn, Eugene H. Buck, and Kristina Alexander.

prudent alternative (RPA) must be an action that can be "implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is economically and technically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat" (50 C.F.R. § 402.02). Note that even if an alternative exists that might better fulfill the purpose of the agency action and reduce risks to the species or to critical habitat, FWS may not specify that alternative *if it is not within the authority of the action agency*. In some instances, this limitation will mean that other solutions, perhaps more desirable from an economical, biological, social, or other point of view, may not be considered, simply because the action agency has no authority to implement those options.

The BiOp must include a summary of the information on which the decision is based, and a "detailed discussion" of the effects of the action on the listed species or critical habitat (50 C.F.R. § 402.14). It must also include the opinion on whether the agency's action:

(a) is not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat (a *no jeopardy opinion*); or

(b) is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat (a *jeopardy opinion*), and if so whether:

(1) any RPAs would avoid jeopardy or adverse modification, or

(2) there are no RPAs; i.e., there appear to be no RPAs consistent with both the agency's proposed action and avoidance of jeopardy and/or adverse modification.

If the FWS BiOp concludes that jeopardy is unlikely or that jeopardy could be avoided with suitable RPAs, then along with the BiOp, it issues an *incidental take statement* (ITS), describing the impact and any *reasonable and prudent measures* (RPMs). RPMs are of a lesser nature than RPAs and are simply steps that FWS believes necessary or appropriate for the action agency to minimize any incidental take of the species. An RPM cannot alter the project in its major aspects, such as duration, location, timing, etc. The ITS may include mandatory terms and conditions for the action agency. These terms and conditions may include reporting requirements, monitoring, scientific studies, etc.

If FWS issues a jeopardy opinion but cannot offer RPAs, then the action agency has, fundamentally, two choices: to abandon the action, or to seek an exemption for the action (not for the species) under the terms of § 7 (e)-(p) (16 U.S.C. § 1536 (e)-(p)). In actual practice, jeopardy opinions without RPAs are exceedingly rare over the history of the ESA.[61] Among other drawbacks to the exemption process are (a)

[61] For example, see U.S. General Accounting Office, *Endangered Species Act: Types and* (continued...)

the exemption applicant must pay for mitigation; and (b) the burden of FWS to recover the species is not terminated by the exemption and the burden of conserving the species will likely fall more heavily on those places where the species is still found. Over the history of the ESA, only three exemption applications have been considered. One was granted; one was granted in part; and one was rejected. (See CRS Report RL31654, *The Endangered Species Act: A Primer*.)

Other Options for Federal Agencies Under Section 7

The ESA offers three options to manage federal agency conflict like those in the ACF basin: (1) additional consultation by the agency under § 7(b) (16 U.S.C. § 1536(b)) to determine if taking or adverse modification would result from the agency action; (2) an attempt to invoke § 7(p) (16 U.S.C. § 1536(p)), involving exemptions in presidentially declared disaster areas; and (3) an exemption for management of the basin under § 7(e)-(p) (16 U.S.C. § 1536 (e)-(p)). The first option, discussed above, is currently being pursued by the federal agencies. The other two options are outlined briefly below, since they may be considered at some later time.

Dim Prospects Under the Disaster Provision. In § 7(p) (16 U.S.C. § 1536(p)), the ESA allows the President to make the determinations necessary for an exemption to be granted in a presidentially declared major disaster area. However, the President's authority extends only to

> the repair or replacement of a public facility substantially as it existed prior to the disaster ... which the President determines (1) is necessary to prevent the recurrence of such a natural disaster and to reduce the potential loss of human life, and (2) to involve an emergency situation which does not allow the ordinary procedures of this section to be followed.

This provision could be used for quick repair of a levee after a flood, for example. Since, on several factual grounds, these features are not present in the ACF basin, this provision offers apparently no solution in the ESA context, and no such presidential declaration has occurred.

Georgia Disaster Declaration Request. On October 20, 2007, the Governor of Georgia requested a presidential drought disaster declaration. The likelihood of a *presidential* drought disaster declaration is unclear: the last presidential disaster declaration for a drought in the continental United States was in New Jersey in 1980.[62] Instead, accessing federal resources for drought disasters largely has been limited to agricultural assistance made available by disaster declarations by the Secretary of Agriculture. Because of the ongoing drought conditions and the severe freeze of April 2007, the U.S. Secretary of Agriculture already has declared 48 of the 159 counties in Georgia disaster areas as of March 18,

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[61] (...continued)
Number of Implementing Actions, GAO/RCED-92-131BR, May 1992, pp. 30-32.

[62] See [http://www.fema.gov/femaNews/disasterSearch.do]. There have been more recent declarations for droughts in U.S. territories in the Pacific.

2008, making them eligible for U.S. Department of Agriculture Farm Service Agency emergency disaster loans.[63]

An Outright Exemption: The Long Road. Were FWS to find no reasonable and prudent alternatives to an agency's action that would be consistent with avoiding jeopardy to a species or adversely modifying its designated critical habitat, it would issue a jeopardy opinion in the agency consultation. The federal agency or a governor[64] could ask for an exemption for the federal action (in this case, the EDO). Under § 7 (16 U.S.C. § 1536(e)-(p)), a seven-member Endangered Species Committee (usually called the "God Squad") chaired by the Secretary of the Interior is empowered to pronounce on an activity of regional or national significance. This panel has been convened only three times in the history of the act. In part because of the time involved, and the fact that the requestor must both demonstrate that a variety of other options have been justifiably rejected and pay for mitigation to balance the effects of the proposed action, this option has fallen out of favor, and has not been used in the past 15 years. (For more on this option, see CRS Report RL31654, *The Endangered Species Act: A Primer*.) It appears to be a somewhat unlikely option, and appears not to have been mentioned in the current debate.

[63] For more information on this program, see CRS Report RS21212, *Agricultural Disaster Assistance*, by Ralph M. Chite.

[64] If there is a permit or license applicant involved, that person might also request an exemption.

Appendix B.
NEPA in the Context of the Exceptional Drought Operations and ESA

Timing and Content

A factor in the Corps' plan to release less water is whether an environmental review document, such as an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), is required under the National Environmental Policy Act (NEPA; 42 U.S.C §§ 4321 et seq.). NEPA requires federal agencies to comply with its requirements "to the fullest extent possible."[65] However, NEPA does not require any particular results, such as choosing the least harmful project. The U.S. Supreme Court has said NEPA "merely prohibits uninformed — rather than unwise — agency action."[66] Accordingly, where courts have found that agencies took a hard look at the relevant areas of environmental impact and satisfied the other demands of § 4332(2)(C), the courts have upheld the NEPA process.

To comply with NEPA, the agency must show that the environmental review informed the decisionmaking process. NEPA regulations promulgated by the Council on Environmental Quality (CEQ) address the timing of an environmental review. The regulations all require the environmental review before the agency decision, indeed, as early as practical. A section discussing timing of environmental reviews says:

> An agency shall commence preparation of an environmental impact statement as close as possible to the time the agency is developing or is presented with a proposal (Sec. 1508.23) so that preparation can be completed in time for the final statement to be included in any recommendation or report on the proposal. The statement shall be prepared early enough so that it can serve practically as an important contribution to the decisionmaking process and will not be used to rationalize or justify decisions already made.[67]

Early in NEPA practice, the courts established that a NEPA review should occur before an agency action was decided upon: "That the filing of an EIS should precede rather than follow federal agency action has been consistently recognized by the courts."[68] The Fifth Circuit described the harm in reversing the order:

> Whenever an agency decision to act precedes issuance of its impact statement, the danger arises that consideration of environmental factors will be pro forma and that the statement will represent a post hoc rationalization of that decision.

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[65] 42 U.S.C. § 4332. For a general discussion of NEPA, see CRS Report RS20621, *Overview of NEPA Requirements*, by Kristina Alexander.

[66] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351 (1989).

[67] 40 C.F.R. § 1502.5.

[68] *Cady v. Morton*, 527 F.2d 786, 794 (9th Cir. 1975).

> NEPA was intended to incorporate environmental factors and variables into the decisional calculus at each stage of the process.[69]

The courts agree that a NEPA review is intended to inform the decisionmaking process. The Ninth Circuit addressed the timing of the environmental review in relationship to the agency decision. It said the purpose of the review is to provide "decisionmakers with an environmental disclosure sufficiently detailed to aid in the substantive decision whether to proceed with the project in light of the environmental consequences."[70] A reviewing court is likely to find that an agency failed to take a hard look at the environmental consequences of its action when the decision on what action to take predates the consideration of the environmental effects.

The contents of a NEPA document may also influence a court as to whether an agency took a hard look at the environmental effects of the proposed action. The regulations provide a general description of the contents. Environmental Assessments (EAs) are intended to be concise, but are also required to consider the need for the project, the environmental impacts of the project and its alternatives, alternatives required by § 102(2)(E), and a list of the agencies and persons consulted.[71] The NEPA process should synchronize with the ESA consultation, even though they are independent of each other. Section 7(c)(1) of ESA states that the Biological Assessment prepared by the action agency "may be undertaken as part of" the NEPA review. As the BA considers whether there are any endangered or threatened species likely to be affected by the agency action, that evaluation ties neatly with the review under NEPA to consider whether the action would have any significant adverse environmental effects. Since both the NEPA review and the § 7 consultation must be completed before the agency makes its decision, there is no timing issue in gathering the data for both purposes.

Emergency Exception

It has been suggested that because the Governor of Georgia declared a State of Emergency related to the drought, NEPA could be waived. However, the statute provides for no such unilateral waiver. NEPA emergency provisions are found within CEQ regulations, 40 C.F.R. § 1506.11. The provision, in its entirety, states:

> Where emergency circumstances make it necessary to take an action with significant environmental impact without observing the provisions of these regulations, the Federal agency taking the action should consult with the Council about alternative arrangements. Agencies and the Council will limit such arrangements to actions necessary to control the immediate impacts of the emergency. Other actions remain subject to NEPA review.

An agency must consult with the CEQ if it is taking action without following NEPA; without CEQ's approval, the agency would be acting in violation of the law.

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[69] *Sierra Club v. Lynn*, 502 F.2d 43, 59-60 (5th Cir. 1974).

[70] *Methow Valley Citizens Council v. Regional Forester*, 833 F.2d 810 (9th Cir. 1987). See also *Save Barton Creek Ass'n v. FHWA*, 950 F.2d 1129, 1137 (5th Cir. 1992) (purpose of NEPA is to inform the decision-maker).

[71] 40 C.F.R. § 1508.9(b).

Waiver authorization is within the CEQ's discretion. According to one court that considered the issue, CEQ has the authority to "waive its own regulations ... [and] also to interpret the provisions of NEPA to accommodate emergency circumstances."[72] If the Corps requested a waiver from strict compliance with NEPA, and the CEQ agreed, that decision would be given substantial deference.[73] The CEQ could authorize *alternative arrangements* under the emergency provision, which would not waive NEPA, but provide another means of compliance.

Research did not reveal many examples of § 1506.11 being invoked by agencies in which a court reviewed the decision. None of the actions found was similar to the facts at hand. The cases involved waiving NEPA for an industrial project,[74] night-time use of an Air Force base during the Desert Storm military operation,[75] and Navy sonar training.[76] In the case of the Navy sonar training, the court found that there was no emergency and rejected the use of § 1506.11. In both cases where CEQ authorized the emergency provision, alternative environmental procedures were used. Shortly after Hurricane Katrina, CEQ issued a memorandum in which it emphasized that NEPA should continue to be followed to "demonstrate our continuing commitment to environmental stewardship."[77] It provided guidance on complying with § 1506.11 as an appendix.

The Right to Sue Under NEPA

NEPA suits are brought under the Administrative Procedure Act (APA). Therefore, courts review whether an agency's action was arbitrary or capricious or otherwise not in accordance with law.[78] Parties have to show standing. That limits plaintiffs to those who could show they were adversely affected or aggrieved by the agency action and that NEPA intended to protect against that actual or threatened injury.[79] For example, a economic injury by itself is not the type of harm NEPA protects against and could not be the basis for a lawsuit. However, the reduced use of the river by a recreational kayaker could be the basis for standing. Plaintiffs could include individuals and groups, provided they were able to show they suffered an injury in fact that was different from the injury suffered by the community at large.[80]

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[72] *Crosby v. Young*, 512 F.Supp. 1363, 1386 (D.C. Mich. 1981).

[73] *Andrus v. Sierra Club*, 442 U.S. 347, 358 (1979).

[74] *Crosby v. Young*, 512 F.Supp. 1363 (D.C. Mich. 1981).

[75] *Valley Citizens for a Safe Environment v. Vest*, 1991 WL 330963 (D. Mass. May 6, 1991).

[76] *NRDC v. Winter*, 2008 U.S. App. Lexis 4504 (9th Cir. February 29, 2008).

[77] Memo of September 8, 2005, from the Associate Director for NEPA Oversight, "Emergency Actions and NEPA," available at [http://www.nepa.gov/nepa/regs/Memo_to_NEPA_Contacts_September_8_05.pdf].

[78] 5 U.S.C. § 706(2)(A).

[79] 5 U.S.C. § 702.

[80] See *Massachusetts v. EPA*, 127 S. Ct. 1438, 1453 (2007) (a personal stake confers standing, even when there is "widespread harm").