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Maintenance and Restoration of Freshwater Flows to Estuaries for Fisheries Habitat Purposes

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Department of Natural Resources

Florida Sea Grant College Program

Funded by Florida Saltwater Fishing License Fee Revenues.

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EXECUTIVE SUMMARY

Its reputation as a fishing mecca is one of the most important images that Florida projects. Commercial and recreational fisheries represent a significant component of the state's revenues. Over the period of 1953-1982, total commercial marine landings in Florida ranged from 163 million to 215 million pounds annually. A 1982 study calculated that saltwater sport fishing alone contributes approximately $2 billion per year to the economy. However, despite continuing increases in the numbers of commercial fishing trips, and the establishment of many fish hatcheries, total harvests of fish and shellfish have been generally declining since the mid-1960s. As a result, the state's well deserved image may be in jeopardy. One factor in this decline has been the loss or degradation of estuarine fishery habitat.

Estuaries play a critical role in the maintenance of fishery populations. Approximately 95% of Florida's commercial fisheries species and most of the recreational species depend on estuaries during one or more life stages. Among other functions, estuaries provide important habitat for the juveniles of many fishery species, as well as for the prey base supporting those species. Studies suggest that shallow seagrass beds, tidal creeks, emergent marsh vegetation, and mangrove prop roots serve as primary juvenile habitat for many species.

Several fishery species, including clams and oysters, spend their entire life cycles within estuarine systems. Others, such as shrimp, migrate as larvae from offshore areas to estuarine nursery habitat, developing into sub-adults before returning to deeper waters to complete their life cycles. Some of Florida's best known estuarine-dependent species include spotted seatrout, striped mullet, striped bass, red drum, snook, mangrove snapper, and tarpon. Spawning occurs offshore for many of these, with larvae or early juveniles moving into estuaries to feed and mature. Tampa Bay alone provides important nursery habitat for approximately twenty major offshore commercial species.

An important factor in maintaining the biological health of an estuary is the salinity regime, which is primarily affected by the quantity, timing and distribution of freshwater inflow from rivers, creeks and groundwater. At various times in the life cycle of many species of fish and shellfish, they are dependent on estuarine habitat, particularly the dynamic habitat (favorable salinity regime) which overlaps favorable physical habitat. Freshwater inflow from rivers and creeks is also important in furnishing detrital nutrients, transporting sediments into estuaries, and

in maintaining circulation patterns. Dry season inflow is very important in avoiding stressful hypersaline conditions in an estuary.

This report examines several regulatory programs and planning initiatives addressing the maintenance of freshwater inflow to estuaries. Many human activities have the potential to influence inflow conditions in estuaries, including the consumptive use of groundwater and surface water, and instream and offstream impoundments. In parts of Florida, estuarine resources have been significantly affected by the impoundment, channelization and consumptive uses of water. Other parts of the state are expected to experience similar effects in the near future. The primary legislative authorization addressing the impacts of freshwater inflow alteration is the Florida Water Resources Act of 1972 (Ch. 373, Fla. Stat.), which replaced common law principles for determining water rights with a comprehensive administrative system for the regulation and allocation of water. The Act assigns responsibility for consumptive use permitting decisions, water shortage planning, and other planning initiatives to the state's five water management districts.

Though one policy of the Act is to preserve natural resources, fish and wildlife, and though criteria used in the consumptive use permitting (CUP) process allow for the protection of such values, it is not clear that the protection of estuarine salinity regimes plays a role in most permitting decisions. Water shortage plans and restrictions appear to assign very little weight to the maintenance of dry season inflows to estuaries. Planning requirements under the Act have been met to varying degrees by the different water management districts, with certain districts allocating more resources to the problem of maintaining adequate timing and quantity of inflow to critical estuarine habitats.

Another important approach to the pressures facing Florida's estuaries is the Surface Water Improvement and Management (SWIM) Act (Section 373.451 *et seq.*, Fla. Stat.), which requires the water management districts to develop lists of prioritized waterbodies in need of attention. Each district must prepare a plan for the research of and correction of problems faced by each surface waterbody on the district's prioritized list. The Act recognizes that surface waters serve several functions, including the provision of habitat for native plants, fish and wildlife. Water quantity and timing issues are not specifically addressed in the Act, however evaluations of the nature and extent of conditions adversely affecting each waterbody must include consideration of its biological condition, physical conditions and fish and wildlife values,

which in turn can be affected by alterations in freshwater inflow. Though there are exceptions, generally, the districts have not utilized their authority under the SWIM Act to give careful consideration to issues concerning timing, quantities and distribution of freshwater inflow.

Other states have enacted legislation requiring consideration of riverine and estuarine inflow needs in the permitting of many activities with potential effects on fishery habitat. The improvement of Florida's approach to the problem can benefit from analysis of several of the elements within those programs. Some of the most important recommendations for program modification in Florida include: increase research and funding commitments in the area of estuarine freshwater needs and reduce the financial burden on districts with less funding capability; mandate consideration of and protection of fishery habitat values in the establishment of minimum flows and levels; establish specific state policy to restore, maintain and protect optimum freshwater inflows to estuaries for fishery habitat purposes; mandate consideration of minimum flows and levels in the consumptive use and water shortage planning process; require that water supply needs and sources analyses include consideration of water inflow needs of estuaries and potential effects of surface and groundwater withdrawals on estuarine habitat; require that SWIM plans and programs address the long-term effects of inflow alterations on estuarine habitat.

This report is one of two researched and written under Project Number R/FDNR-3A with the Florida Department of Natural Resources and Florida Sea Grant College. The second report, "Legal and Policy Options to Minimize Adverse Effects of Mosquito Control Practices on Florida's Saltwater Fisheries," by John C. Tucker, has also been published as a Sea Grant Technical Paper.

Please note that the research for and writing of this document were completed September 6, 1991, thus the report does not reflect changes in plans, policies and regulations as of that date.

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INTRODUCTION

Its reputation as a fishing mecca is one of the most important images that Florida projects. Commercial and recreational fisheries represent a significant component of the state's revenues. Over the period of 1953-1982, total commercial marine landings in Florida ranged from 163 million to 215 million pounds annually.[1] A 1982 study calculated that saltwater sport fishing alone contributes approximately $2 billion per year to the economy.[2] However, despite continuing increases in the numbers of commercial fishing trips, and the establishment of fish hatcheries, total harvests of fish and shellfish have been generally declining since the mid-1960s.[3] As a result, the state's well deserved image may be in jeopardy. One factor in this decline has been the loss or degradation of estuarine fishery habitat.

Estuaries are features of the coastal landscape where the mainland, barrier islands, or vegetation semi-enclose a waterbody made brackish by the mixing of salt and fresh water.[4]

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[1] Comp and Seaman, *Estuarine Habitat and Fishery Resources of Florida*, in FLORIDA AQUATIC HABITAT AND FISHERY RESOURCES (Bill Seaman, ed.) 337-435, 376, American Fisheries Society (1985).

[2] BELL, SORENSEN AND LEEWORTHY, THE ECONOMIC IMPACT AND VALUATION OF SALTWATER RECREATIONAL FISHERIES IN FLORIDA, Florida Sea Grant Report No. 47 (1982).

[3] Comp and Seaman, *Estuarine Habitat and Fishery Resources of Florida*, in FLORIDA AQUATIC HABITAT AND FISHERY RESOURCES (Bill Seaman, ed.) 337-435, 376, American Fisheries Society (1985). During the first fifteen years of the period between 1953-1982, total landings averaged 195 million pounds, while during the last fifteen years of the period, total landings averaged 181 million pounds. *Id.* Statewide, fish and shellfish landings in 1988 totalled about 163 million pounds. 1990 FLORIDA STATISTICAL ABSTRACT (Anne Shermyen, ed.) 288, Bureau of Economic and Business Research (1990). Commercial finfish landings peaked in Tampa Bay in 1964, while shellfish landings peaked in 1965. TAMPA BAY SWIM PLAN, 28, Southwest Florida Water Management District (1988).

[4] Estevez, Hartman, Kautz and Purdum, *Ecosystems of Surface Waters*, in WATER RESOURCES ATLAS OF FLORIDA (Fernald and Patton, eds.) 92-107, 102, Institute of Science and Public Affairs, Florida State University (1984). *See also*, CLARK, COASTAL ECOSYSTEM MANAGEMENT, 29, Conservation Foundation (1983). Estuarine systems generally include protected bays, sounds, lagoons, bayous and tidal rivers and streams. *Id.*

Among other functions, estuaries provide important nursery habitat for the juveniles of many fishery species, as well as for the prey base supporting those species.[5] Approximately 95% of Florida's commercial fisheries species,[6] and approximately 70% of recreational species,[7] depend on estuaries during one or more life stages.[8] Studies suggest that shallow seagrass beds, tidal creeks, emergent marsh vegetation, and mangrove prop roots serve as primary juvenile habitat for many species.[9] Seagrasses play several roles in the ecology of an estuary, including: habitat, food source, nutrient buffer, and sediment trap.[10] The grasses act as nursery grounds for juvenile stages of some fish species; refuge for molting blue crabs, other invertebrates and finfish; as a substrate for epiphytic plants and animals; and as habitat for all fauna subsisting

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[5] Browder, Tashiro, Coleman-Duffie, Rosenthal and Wang, *Documenting Estuarine Impacts of Freshwater Flow Alterations and Evaluating Proposed Remedies*, in PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM: WETLANDS AND RIVER CORRIDOR MANAGEMENT (Kusler and Daly, eds.), 300-318, 300 (1989).

[6] *Id.*

[7] Lewis, Gilmore, Crewz and Odum, *Mangrove Habitat and Fishery Resources of Florida*, in FLORIDA AQUATIC HABITAT AND FISHERY RESOURCES (Bill Seaman, ed.), 281-336, 316, American Fisheries Society (1985).

[8] It has been estimated that "at least two-thirds of the animal populations in the oceans spend an essential portion of their life cycle in estuarine waters or are dependent upon species that do." U.S. COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL QUALITY: FIRST ANNUAL REPORT, 175-78 (1970). *See also*, Boynton, W., *Some Relationships Between River Flow, Estuarine Characteristics, and Economics in a Florida Coast Region*, in FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA (Seaman and McLean, eds.), 171-215, Florida Sea Grant Report No. 22 (1977).

[9] Browder, J., *Watershed Management and the Importance of Freshwater Flow to Estuaries*, in PROCEEDINGS, TAMPA BAY AREA SCIENTIFIC INFORMATION SYMPOSIUM 2 (BASIS 2) (Treat and Clark, eds.), 7-22, Tampa Bay Regional Planning Council (1991).

[10] *See generally*, ZIEMAN AND ZIEMAN, THE ECOLOGY OF THE SEAGRASS MEADOWS OF THE WEST COAST OF FLORIDA: A COMMUNITY PROFILE, U.S. Minerals Management Service, U.S. Fish and Wildlife Service, Biological Report 85(7.25) (September 1989); THE FUTURE OF TAMPA BAY, 1-23, Tampa Bay Regional Planning Council (1985).

directly on seagrasses and its epiphytes, or detritus derived from them.[11] Freshwater inflow is directly related to favorable salinities and nutrient transport necessary for healthy seagrass beds.

Submerged aquatic vegetation is eaten directly by some species, but its primary role is in the detritus-based food web, where it adds to and accumulates detrital food for invertebrates such as shrimp, which are in turn consumed by finfish.[12] In some estuaries, it appears that submerged aquatic vegetation serves as a nutrient buffer by absorbing excess nutrients during periods of high inflow, then releasing them later as detrital material, helping to moderate phytoplankton blooms.[13] Seagrasses also baffle water movement, enhancing the settling and binding of sediment, and reducing turbidity, thereby stabilizing bottom sediments and reducing shoreline erosion.[14]

In addition to the physical habitat they provide, estuaries and tidal reaches of coastal rivers normally provide a range of favorable salinities, known as dynamic habitat, which are extremely important to the growth and survival of juvenile fish, shellfish and invertebrates. Salinity has been recognized as the single most influential parameter in an estuary.[15] Generally, organisms of different sizes within species appear to follow the salinity gradient within estuaries, with the smallest individuals inhabiting the areas of lowest salinity.[16] Juveniles of many species depend on lower salinities to avoid predators at important points in their life cycles, while lower salinity regimes tend to protect oysters from predation. The three species of economically

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[11] THE FUTURE OF TAMPA BAY, 1-23, Tampa Bay Regional Planning Council (1985).

[12] *Id.*

[13] *Id.*

[14] *Id.*

[15] Beaumariage and Stewart, *The Estuary--What's It To You?*, in FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA (Seaman and McLean, eds.) 133, Florida Sea Grant Report No. 22 (1977).

[16] Browder and Moore, *A New Approach to Determining the Quantitative Relationship Between Fishery Production and the Flow of Fresh Water to Estuaries*, in PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON FRESHWATER INFLOW TO ESTUARIES, VOL. I (Cross and Williams, eds.), 403-430, 406, U.S. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-81/04 (1981).

important shrimp respond to extremely slight salinity differences, becoming active in higher salinity water and settling to the bottom at lower salinities. This allows the small juveniles of these species to travel two or three miles on each flood tide when entering an estuary. Postlarval and juvenile shrimp are so responsive to salinity differences that there appears to be a direct correlation between commercial catches and an index of previous fresh water runoff to the coast.[17]

The flow of freshwater from tidal creeks and rivers is an important factor in maintaining natural salinity gradients in estuarine ecosystems, also contributing to the protective function provided by reduced salinities in upstream sections of an estuary. Freshwater inflow is also important in bringing detrital nutrients into estuaries, and sustaining proper circulation patterns, thereby contributing to the health of seagrass habitat, and maintaining the transport mechanism used by postlarval and juvenile invertebrates to find favorable habitat. Estuarine salinities may be particularly sensitive to changes in dry season flows, with small variations in freshwater inflow during the dry season strongly affecting estuarine salinities.[18] Thus, the relative magnitude of dry season flows may be more critical to fisheries than that of wet season flows, with both shrimp and oyster production rates shown to be positively related to volume of freshwater flow during dry seasons two and three years prior to harvest.[19]

A growing source of concern to scientists studying fishery declines is the effect of alterations in the quantity, timing and location of freshwater inflow on estuarine habitat. Estuaries which experience extended or permanent changes in salinity become biologically

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[17] Browder, J., *Relationship Between Pink Shrimp Production on the Tortugas Grounds and Water Flow Patterns in the Florida Everglades*, 37 BULLETIN OF MARINE SCIENCE 839-856 (1985). *See also*, Beaumariage and Stewart, *The Estuary--What's It To You?*, in FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA (Seaman and McLean, eds.), Florida Sea Grant Report No. 22 (1977).

[18] Browder, J., *Watershed Management and the Importance of Freshwater Flow to Estuaries*, in PROCEEDINGS, TAMPA BAY AREA SCIENTIFIC INFORMATION SYMPOSIUM 2 (BASIS 2) (Treat and Clark, eds.) 7-22, 15, Tampa Bay Regional Planning Council (1991).

[19] *Id. See*, Browder, J., *Relationship Between Pink Shrimp Production on the Tortugas Grounds and Water Flow Patterns in the Florida Everglades*, 37 BULLETIN OF MARINE SCIENCE 839-856 (1985); Wilbur, D., *Associations Between Freshwater Inflows and Oyster Harvests in Apalachicola Bay*, (in prep.), Northwest Florida Water Management District.

stressed. Altering inflows not only affects the health of seagrasses and other physical habitat, but reduces the important overlap between physical habitat and dynamic habitat (proper salinity gradients). Effects may include: (1) the loss of some entire fisheries, (2) decreased dominance of euryhaline species (tolerant of wide salinity ranges), and increased dominance of stenohaline species (tolerant of narrow salinity ranges), with selection favoring species adapted to new conditions, (3) increases in salt tolerant mosquito and other insect populations, and (4) destruction of salt marshes, mangroves and seagrass beds.[20] When estuaries are deprived of fresh water, effects include:

(1) nearshore waters become more saline and mixing due to salinity differences is diminished;

(2) salt wedges may develop farther inland and saltwater intrusion in coastal water supplies can result;

(3) exchanges of material between the water and substratum are affected and sediment chemistry is adversely impacted;

(4) patterns of sediment erosion, deposition, and littoral drift are altered;

(5) the estuary is starved of nutrients of terrestrial origin;

(6) salt marshes, mangrove forests, and seagrass beds deteriorate under constantly elevated salinity;

(7) certain fisheries decline or disappear for a variety of reasons related to fresh water;

(8) other species and communities develop in response to new conditions; and

(9) populations of nuisance species increase.[21]

Several types of human activities can affect the quantity and timing of freshwater inflow to estuaries, including: instream and offstream diversions for consumptive use; dams for

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[20] SNEDAKER, DE SYLVA, AND COTTRELL, A REVIEW OF THE ROLE OF FRESHWATER IN ESTUARINE ECOSYSTEMS, Final Report to Southwest Florida Water Management District (1977).

[21] Estevez, Hartman, Kautz and Purdum, *Ecosystems of Surface Waters*, in WATER RESOURCES ATLAS OF FLORIDA (Fernald and Patton, eds.) 92-107, 105, Institute of Science and Public Affairs, Florida State University (1984).

irrigation and power; stormwater collection and treatment systems; increased impervious surface from urban development; upland drainage canals; and deforestation, including clearcutting.[22] By removing fresh water that would otherwise help maintain salinity regimes and transport nutrients, the diversion of water for consumptive uses has obvious potential to negatively affect habitat values in estuaries and tidal creeks. The dams used to impound instream flows for consumptive use also block anadromous fish from moving into upstream areas of an estuary which are important breeding and nursery habitat for these species. The operation of dams and schedules of releases during times of high and low flows can have profound effects on estuarine habitat.

Development in the river basin of an estuary typically involves several activities with impacts on the estuary. Removing the vegetative cover reduces uptake of water by vegetation and impairs the process by which overland flow is slowed and aquifers replenished. As a result, natural hydroperiods are altered, with higher than normal flow into the river and estuary during wet periods and lower base flow during dry periods. Drainage of areas for construction activity, or for agricultural, silvicultural or other farming activities, also alters the normal quantities and timing of flows into rivers and estuaries. The increased amounts of impervious surface associated with residential and commercial development, and most stormwater collection and treatment systems, have effects similar to, though greater than, those which result from the removal of vegetative cover.

This report analyzes Florida's consumptive use permitting process, water shortage planning process, and the several planning initiatives required under the Water Resources Act of 1972 and the Surface Water Improvement and Management Act. Emphasis is placed on the regulatory and planning programs controlling withdrawals of water and the degree to which they address potential impacts on estuarine fisheries habitat. Administrative programs for allocating water in other states are summarized and analyzed for their potential use in recommending revisions to Florida's current approach.

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[22] *See*, Browder and Moore, *A New Approach to Determining the Quantitative Relationship Between Fishery Production and the Flow of Fresh Water to Estuaries*, in PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON FRESHWATER INFLOW TO ESTUARIES, VOL. I (Cross and Williams, eds.), 403-430, U.S. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-81/04 (1981).

FLORIDA WATER RESOURCES ACT OF 1972

I. Overview of the Act

One of Florida's primary legislative authorizations for addressing the impacts of freshwater inflow alteration is the Water Resources Act of 1972.[23] The Act was adopted in 1972 following a severe drought in South Florida, and was designed to provide for comprehensive state regulation of the state's water resources, including consideration of hydrological boundaries and the interrelationship of all forms of water in the hydrologic cycle.[24] The Act was based largely on A MODEL WATER CODE, authored by Dean Frank Maloney and several colleagues at the University of Florida College of Law.[25]

The Water Resources Act provides for the management of state's water resources by the Department of Environmental Regulation (DER) and the five water management districts. Though primary legislative authority was vested in the DER, delegation to the districts is encouraged,[26] and has resulted in a shared responsibility in the regulation of water resources. The DER has "general supervisory authority" over the districts,[27] and authority to appeal district decisions to the Land and Water Adjudicatory Commission.[28]

Water management district boundaries were set to conform closely to watershed boundaries. The districts have the authority to build and operate water management structures such as the Central and Southern Florida Flood Control Project.[29] They may regulate the use of

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[23] FLA. STAT. §§ 373.013-373.443 (1989).

[24] Maloney, Capehart & Hoofman, *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?*," 21 U. FLA. L. REV. 253 (1979).

[25] Page proofs of A MODEL WATER CODE were made available to the Florida legislature before the drafting of the legislation, thus the Model Code's commentary on the intent of its sections is evidence of legislative intent in the passage of the Act.

[26] FLA. STAT. §§ 373.016(3), 373.026, 373.046 (1989); FLA. ADMIN. CODE Rule 17-101.040 (11), (12) (June 1991).

[27] FLA. STAT. § 373.026(7) (1989).

[28] FLA. STAT. § 373.114 (1989).

[29] FLA. STAT. § 373.086 (1989).

district works,[30] and may purchase and manage land for water management purposes.[31] They also have extensive regulatory authority over the consumptive uses of water,[32] artificial recharge facilities,[33] and the construction and operation of facilities for surface water management.[34] The districts' sources of financing include ad valorem taxation, direct state appropriations, collection of permit fees, and limited authority to issue bonds.

The Water Resources Act authorizes or requires research and data collection for the management of water and related lands, and requires several related planning efforts. The DER is directed to develop an "integrated, coordinated plan for the use and development of the waters of the state."[35] This state water use plan is to be a functional element of the state comprehensive plan, and together with the state's water quality standards and classifications, constitutes the Florida Water Plan. The Act also directs the water management districts to develop groundwater basin resource availability inventories,[36] provide extensive technical assistance to local governments in the preparation of their comprehensive plans,[37] develop surface water improvement and management plans,[38] "engage in planning" to help local

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[30] FLA. STAT. § 373.085 (1989). Defined as projects and works, including, but not limited to, structures, impoundments, wells, streams, and other watercourses, together with the appurtenant facilities and accompanying lands, which have been officially adopted by the governing board of the district as works of the district. FLA. STAT. § 373.019(15) (1989).

[31] FLA. STAT. §§ 373.086, 373.139, 373.59 (1989).

[32] FLA. STAT. §§ 373.175, 373.203-.249 (1989).

[33] FLA. STAT. § 373.106 (1989).

[34] FLA. STAT. § 373.403-.443 (1989).

[35] FLA. STAT. § 373.036 (1989).

[36] FLA. STAT. § 373.0395 (1989).

[37] FLA. STAT. § 373.0391 (1989).

[38] FLA. STAT. § 373.451-.459 (1989).

governments and regional water supply authorities meet water supply needs,[39] and set minimum flows and levels.[40]

II. Protection of Natural Systems in the Common Law of Water Allocation

The Water Resources Act was intended to supersede common law doctrines for the allocation of water rights. The criteria for making allocation decisions, however, are based on common law concepts. Thus, an understanding of how instream uses of water are protected under the common law of riparian rights is helpful in interpreting the provisions of the Act.

A. The Natural Flow Doctrine

The common law which originally developed in England and the more humid eastern United States was primarily concerned with maintaining the natural flow of streams and rivers for the sole benefit of abutting riparian land. Under the natural flow doctrine, all owners of riparian land are entitled to receive the full flow of the stream, undiminished in either quality or quantity.[41] Upper riparian owners are generally prohibited from altering the natural flow of the stream, except for domestic uses.[42]

Though, in its original context, the natural flow doctrine was not directly concerned with instream flows related to habitat, the doctrine developed during a period when the primary uses people made of watercourses were for drinking, bathing, navigation and water power, all of which depended on maintaining flow. Application of the rule for these purposes had the additional effect of maintaining natural flows to sustain environmental, recreational and aesthetic values.

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[39] FLA. STAT. § 373.1961(1) (1989).

[40] FLA. STAT. § 373.042 (1989).

[41] An early English decision articulating the natural flow doctrine is Shury v. Piggot, 3 Bulstrode 339, 81 Eng. Rep. 280 (1626), in which the court said, "A watercourse begins *ex jurae naturae*, and, having taken a certain course naturally, cannot be diverted." For early U.S. decisions, see Tyler v. Wilkinson, 24 F. Cas. 472 (C.C.D.R.I. 1827), Evans v. Merriweather, 4 Ill. 492, 494 (1842). *See also*, Omerod v. Todmorden Mill Co., 11 Q.B. 155 (1883); Hendrix v. Roberts Marble Co., 175 Ga. 389, 165 S.E. 223 (1932); Stein v. Burden, 24 Ala. 130 (1854); Burden v. Stein, 27 Ala. 104 (1855); Stein v. Burden, 29 Ala. 127 (1856) (natural flow doctrine, with natural use exception).

[42] *See* Harris v. Brooks, 225 Ark. 436, 283 S.W.2d 129 (Ark. 1955); Prather v. Hoberg, 24 Cal.2d 549, 150 P.2d 405 (1944); Evans v. Merriwether, 4 Ill. (3 Scam.) 492 (1842).

Most natural flow cases involve the protection of the flows necessary to provide water power to downstream mills. The conflict is often between a riparian who has diverted or impounded a stream to supply power for a mill and lower riparians who depend on the flow to supply their own mills or for consumptive uses. In Collens v. The New Canaan Water Co., 355 Conn. 477, 234 A.2d 825 (1967), the court was more directly concerned with protecting less utilitarian uses. The water company had diverted most of the flow of the Noroton River by means of ditches and wells. The plaintiff riparian owners were thus unable to use the stream for recreational activities such as swimming, boating and fishing. Fish kills had occurred, and the scenic value of riparian lands was diminished. In ruling for the plaintiffs, the court simply stated they were "entitled to the natural flow of the water of the running stream through or along their land, in its accustomed channel, undiminished in quantity or unimpaired in quality."[43]

B. Reasonable Use Rule

During the industrial revolution, the common law evolved to permit alteration of the natural flow resulting from the "reasonable use" of water.[44] This development in the common law was carried forth in the water law of the eastern states.[45] Under the reasonable use rule, all

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[43] 355 Conn. 477, 486 (1967).

[44] Tyler v. Wilkinson, 24 F.Cas. 472 (C.C.D.R.I. 1827).

> Every proprietor of lands on the banks of a river has naturally an equal right to the use of the water which flows in the stream adjacent to his lands, as it was wont to run (currere solebat), without diminution or alteration. No proprietor has a right to use the water, to the prejudice of other proprietors, above or below him, unless he has a prior right to divert it, or a title to some exclusive enjoyment....Though he may use the water while it runs over his land as an incident to the land, he cannot unreasonably detain it, or give it another direction, and he must return it to its ordinary channel when it leaves his estate. Without the consent of adjoining proprietors, he cannot divert or diminish the quantity of water which would otherwise descend to the proprietors below, nor throw the water back upon the proprietors above....This is the clear and settled general doctrine on the subject, and all the difficulty that arises consists in the application. *Id.*

[45] In contrast, the water law of most western states evolved from a doctrine known as "prior appropriation," in which a primary criterion in determining water rights was the chronological

(continued...)

riparians are entitled to make reasonable use of water, limited only by a prohibition on interfering with the reasonable uses of other riparians. If the amount of available water is insufficient to meet all demands, the courts must balance and reconcile the competing riparian interests in making a decision on allocation.

Environmental values supported by levels and flows of water are directly addressed under the reasonable use doctrine. Though the rule primarily reconciles competing human uses, the protection of environmental conditions that benefit humans is implicitly a factor in several ways. The first is that all uses of water are subject to protection, not just consumptive withdrawals. The reasonableness of instream or inplace uses such as fishing, swimming and boating by riparians must be balanced against the reasonableness of other uses.[46] The scenic and aesthetic values of water to riparians must also be considered, particularly where they enhance the value of riparian land.[47]

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[45](...continued)
order in which the water was originally appropriated. Riparian ownership was not considered necessary to the right to make withdrawals. A fundamental principle of western water law is that the water be used for a "beneficial use." In the western states, determination of beneficial use now requires consideration of the purpose for which the use is being made and of the manner and efficiency of the use. Thus, in many ways, the beneficial use doctrine has come to resemble that of reasonable use. Maloney, Capehart & Hoofman, *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?*," 21 U. FLA. L. REV. 253, 265 (1979).

[46] Taylor v. Tampa Coal Co., 46 So.2d 392 (Fla. 1950); Litka v. Anacortes, 167 Wash. 259, 9 P.2d 88 (1932) (withdrawal from nonnavigable lake by municipality interfered with use by riparian owner for domestic use, irrigation, mooring boats, fishing, swimming etc.); Harris v. Brooks, 225 Ark. 436, 283 S.W.2d 129 (1955) (withdrawal or water from lake to irrigate rice crop interfered with the rights of other riparians to make reasonable use of water for fishing, boating and the operation of a commercial fish camp); Hoover v. Crane, 362 Mich. 36, 106 N.W.2d 563 (Mich. 1960) (boating and swimming recognized as riparian rights of cottage and resort owner and balanced against withdrawal by orchard irrigator); Bouris v. Largent, 94 Ill. App. 251, 236 N.E.2d 15 (1968) (impoundment caused lowering of lake level and interfered with riparian rights to use lake for recreational and pleasure); Martha Lake Water Co. v. Nelson, 152 Wash. 53, 277 P. 382 (1929) (lowering lake levels and causing the water's edge to recede held to damage owners of summer houses who used lake for bathing, boating, swimming and fishing); Valparaiso City Water Co. v. Dickover, 17 Ind. App. 233, 46 N.E. 591 (1897) (waterworks diverted water from lake and caused recession of water's edge from beach of land used for summer resort).

[47] Sturtevant v. Ford, 280 Mass. 303, 182 N.E. 560 (Mass. 1932); Los Angeles v. Aitken, 10 Cal.App.2d 460, 52 P.2d 585 (1935).

Second, the factors used by the courts in determining the reasonableness of competing uses encompass consideration of the effects of each use on instream or inplace uses, as well as consideration of the effects on the ecosystem. Commentators have identified several factors used by the courts in determining whether a particular use is reasonable.[48] These include: (1) purpose; (2) suitability of the use for the waterbody; (3) economic value; (4) social value; (5) extent of harm; (6) practicality of avoiding harm; (7) practicality of adjusting the quantity; (8) protection of existing values; and (9) whether the user causing the harm is bearing the loss.[49]

The official comments to the Restatement (Second) of Torts, discuss the relevance of environmental, aesthetic and nonconsumptive uses in evaluating several of these factors. A use may be unsuitable for a particular stream segment, for example, because it degrades recreational and environmental values downstream.[50] In evaluating economic factors, the comments point out the necessity of considering the economic values added to land by the presence of water and the potential for recreational scenic uses.[51] The social value of a use may be diminished by adverse effects on others or the public interest.[52] The extent of harm to environmental, instream or inplace values is thus relevant to a consideration of reasonableness. Only the amount of water needed to support those values, not the natural flow or level, however, may be protected.

Florida's leading common law consumptive use case, Taylor v. Tampa Coal Co.,[53] involved a conflict resulting from the withdrawal of irrigation water from a shallow, 26 acre lake. Another riparian owner, the Taylor Coal Company, used the lake as a place for employees to swim, fish, boat and picnic, and alleged the withdrawal lowered water levels to such an extent

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[48] RESTATEMENT (SECOND) OF TORTS § 850A (1979); Maloney, Capehart & Hoofman, *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?*," 21 U. FLA. L. REV. 253, 256 (1979).

[49] RESTATEMENT (SECOND) OF TORTS § 850A (1979).

[50] *Id.* at 225.

[51] *Id.*

[52] *Id.* at 226.

[53] 46 So.2d 392 (Fla. 1950).

as to interfere with those uses. A third riparian, Hays, who had a residence and fernery on the lake, alleged that lowering the level of the lake would interfere with the growth and productive capacity of the trees and ferns on his land. There was evidence that the lake level was 49 inches below normal and that continuing irrigation was causing it to drop at a rate of one-half inch per day, in addition to the one-half inch it was falling because of natural causes. On these facts, the Supreme Court of Florida upheld an injunction that prohibited withdrawals whenever the lake level was below normal.[54] The court held that all riparians had an equal right to make reasonable use of the water. It specifically rejected the notion that an artificial use such as irrigation enjoyed a superior right over recreational uses that depended on the maintenance of minimum lake levels for swimming, boating, fishing and aesthetics. The court also implicitly recognized the right of Hays to the maintenance of that minimum lake level and related groundwater level necessary to maintain the soil moisture needed by his trees and ferns.

A subsequent groundwater case, Koch v. Wick,[55] also upheld the rights of landowners to protection from unreasonable interference with soil moisture levels. In this case, the owner of a large tract of land alleged that an adjoining four acre wellfield would drain moisture from his land, reducing its productivity to such an extent that it would become a "desert waste." The court held these allegations were sufficient to state a cause of action. As in Taylor, harm to the general environmental condition of the land was held to be an actionable injury to the extent that it depended on certain levels of water.[56]

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[54] *Id.* at 294.

[55] 87 So.2d 47 (Fla. 1956). The use of groundwater in Florida is also subject to a common law rule of reasonable use. Tampa Waterworks v. Cline, 37 Fla. 586, 20 So. 780 (1896).

[56] *See also*, Cason v. Florida Power Co., 76 So. 535, 536 (Fla. 1917) ("Where a riparian owner by erecting and maintaining a dam across a stream raises the level of the stream so that the flow of percolating waters from the adjoining lands of another owner are obstructed, and because of the dam the waters from the stream percolate through the land of the riparian owner into such adjoining land, causing its subsurface waters to rise and remain so near the surface as to injure the land and the improvements and crops thereon, such use by the riparian owner of the land and waters may be unreasonable with reference to the rights of the adjoining landowner, and the party erecting and maintaining the dam may be liable in damages for such injuries to the adjoining property as are proximately caused by the dam....")

C. Classification as a "Watercourse" or as "Diffused Surface Water"

The common law rules for resolving disputes over the consumptive use of water may vary depending on whether the water at issue is classified as "diffused surface water," or as part of a "watercourse," or other defined waterbody.[57] Florida has not addressed the issue, but most jurisdictions do not protect downstream landowners from consumptive use of diffused surface water.[58] The emphasis, instead, is on determining whether to protect an owner from flooding, erosion or other property damage caused by the impoundment, diversion or channelization of diffused surface water that increases the burden on the estate.[59] All of the Florida decisions defining a watercourse arise from this type of controversy.

For example, in Davis v. Ivey,[60] the Supreme Court of Florida determined the circumstances under which a railroad could be liable for constructing an embankment that impounded water and caused flooding of the plaintiff's property. The railroad would be liable for obstructing or diverting the flow of a natural watercourse. The structure at issue crossed a number of connected ponds and swamps, separated by ridges of higher ground. As the court noted, these features, known as "strands...to all hunters, cattlemen, and woodsmen in

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[57] *See generally*, MALONEY, PLAGER AND BALDWIN, WATER LAW AND ADMINISTRATION §§57.2, 71, University of Florida Press (1968).

[58] *Id.* See cases collected in note 4, Davis, *Law of Diffused Surface Water in Eastern Riparian States*, 6 CONN. L. REV. 227-245 (1973). *See also*, Dolson, *Diffused Surface Water and Riparian Rights: Legal Doctrines in Conflict*, 1966 WIS. L. REV. 58; Note, *The Ownership of Diffused Surface Water in the West*, 20 STAN. L. REV. 1205 (1968). If the common law remained in effect in Florida, the validity of such approaches is doubtful. The unity of the hydrologic cycle, and the failings of the older classifications are now more widely accepted. A similar rule of absolute ownership of groundwater has been widely rejected. It would be more consistent to apply the rule of reasonable use to any interference with surface water, whether it is diffused or in a watercourse, and whether the interference involves increasing or decreasing flow on lower lands.

[59] *See generally*, 5 POWELL, LAW OF REAL PROPERTY §731; 5 CLARK, Ch.26. In Florida, the upper owner does have a right to increase the amount of water draining into a natural watercourse. Edason v. Denison, 142 Fla. 101, 194 So. 342 (1940).

[60] 93 Fla. 387, 112 So. 264 (Fla. 1927).

Florida...form the natural water courses for...large areas of land."[61] A natural watercourse, the court held, is properly defined in Florida as:

> a natural stream bed having bottom and sides in which water usually flows in a defined bed or channel. It is not essential, to constitute a natural water course, that the flowing should be uniform or uninterrupted. The other elements existing, a stream does not lose its character or cease to be a natural water course because in time of drought the flow may be diminished or temporarily suspended. It is sufficient if it is usually a stream of running water.[62]

The court also held that where ponds and swamps are connected and drain large areas, they are properly treated as natural watercourses under the law.[63]

This conclusion is consistent with other cases. In Libby, McNeil & Libby v. Roberts,[64] although the court was not required to determine if an area known as Little Everglades was a watercourse, as distinguished from a surface water,[65] it quoted with approval the following definition:

> [T]he distinguishing characteristic of a watercourse is the existence of a stream of water flowing for such a time that its existence will furnish the advantages usually attendant on streams of water; it is the condition created by a stream having a well-defined and substantial existence. A source, a current and a place of discharge are implied.[66]

Thus, case law suggests that common law rules controlling the allocation and diversion of water would apply to many types of slowly flowing, or irregularly flowing surface waters.

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[61] 112 So. 264.

[62] 112 So. 269.

[63] 112 So. 271.

[64] 110 So.2d 82 (Fla. 2d DCA 1959).

[65] The applicable rule applied if the Little Everglades was either a watercourse or diffused surface water, so long as it was not a lake.

[66] 110 So.2d at 84, *quoting* 56 Am.Jur., Water §6. In Birdwell v. Moore, 439 N.E.2d 718 (Ind. App. 1982), the court similarly explained how something other than a typical stream could be a watercourse. A channel, banks and bed are only indicia of a watercourse, the court held. The essential characteristics are: substantial existence and unity, regularity, and dependability of slow along a definite course. *See also*, People v. Weaver, 197 Cal. Rptr. 521, 147 C.A.3d Supp. 23 (Cal. Super. 1983) (normally dry wash held to be a watercourse).

III. Consumptive Use Permitting

A. Overview

The Florida Water Resources Act of 1972 preempted the common law for allocating water, and in its place substituted a comprehensive administrative system for creating and apportioning water rights.[67] All water in Florida is now subject to regulation, whether diffused or defined, on the surface or below the ground, percolating or flowing in defined channels.[68] The water management districts are authorized to require permits for any consumptive use of water except individual domestic use.[69] The districts can impose reasonable conditions on permits to ensure the use is "consistent with the overall objectives of the district" and "not harmful to the water resources of the area."[70] The permit applicant must establish that the proposed use is a "reasonable-beneficial"[71] one, that will not interfere with any presently existing legal use of water, and that is consistent with the public interest.[72]

The permit criteria requiring reasonable-beneficial use and consistency with the public interest incorporate consideration of ecosystem needs. The districts are also authorized to reserve water from use by permit applicants for the protection of fish and wildlife[73] and are required to establish minimum flows and levels.[74] Numerous other planning requirements can affect the district's assessment of the availability of water and its determination of where the public interest lies.

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[67] FLA. STAT. § 373.217 (1989).

[68] FLA. STAT. § 373.019(8) (1989).

[69] FLA. STAT. § 373.219(1) (1989).

[70] FLA. STAT. § 373.219(1) (1989).

[71] FLA. STAT. § 373.019(4) (1989).

[72] FLA. STAT. § 373.223(1) (1989).

[73] FLA. STAT. § 373.223(3) (1989).

[74] FLA. STAT. §§ 373.042; 373.415(3) (Wekiva River) (1989).

Water use permits are issued for fixed terms, assuring that uses are subject to periodic reallocation.[75] If insufficient water is available to meet the needs of competing applicants, the use that best serves the public interest will be favored.[76] Water use may also be restricted during times of water shortage.[77]

B. Protection of Natural Systems in Permitting Criteria

One policy of the Act is "to preserve natural resources, fish and wildlife."[78] The criteria utilized in the consumptive use permitting process evidence concern for the protection of the quantity and timing of water deliveries to natural ecosystems.[79]

1. Reasonable-Beneficial Use

The criterion of reasonable-beneficial use is unique to the Act,[80] which defines it as "the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest."[81] According to the authors of A MODEL WATER CODE, the standard is intended to combine the best features of the riparian and prior appropriation systems, including consideration of the rights of the

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[75] FLA. STAT. § 373.236 (1989). Permits may be granted for any period of time up to twenty years, though governing boards or the DER may authorize a permit for up to fifty years for municipalities, other governmental bodies, or public works or public service corporation where necessary to provide for retirement of construction bonds for waterworks and waste disposal facilities. *Id.*

[76] FLA. STAT. § 373.223 (1989).

[77] FLA. STAT. § 373.246 (1989).

[78] FLA. STAT. § 373.016(2)(3) (1989).

[79] *See, e.g.*, Pinellas County v. Lake Padgett Pines, 333 So.2d 472 (Fla 2d DCA 1976) (Chapter 373, Florida Statutes, requires consideration of the overall environmental effects of a prospective use, and not simply its effect on the water resource).

[80] *See generally*, MALONEY, AUSNESS AND MORRIS, A MODEL WATER CODE, 170-173 (1972); Maloney, Capehart & Hoofman, *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?*, 31 U. FLA. L. REV. 253-283 (1979).

[81] FLA. STAT. § 373.019(4) (1989); FLA. ADMIN. CODE Rule 17-40.210(12) (October 1990).

general public as well as those of riparian owners, and requiring efficient economic use of water regardless of available quantities.[82]

The first part of the definition is derived from the beneficial use limitation on the amount of water that can be appropriated under western water law systems. It limits potential waste of water by requiring a permit applicant to demonstrate that the requested quantity will be used efficiently and economically. The second part of the definition incorporates the common law concept of reasonableness as a limitation on both the purpose and the manner of use. Thus the effect of a withdrawal on usage by other riparians and on environmental systems sustained by that water, is a factor to consider. Finally, the definition specifically incorporates consistency with the public interest as one of the criteria for a reasonable beneficial use. The effect of a proposed use on the environment and on fisheries habitat which supports an important component of Florida's economy, would clearly be a significant factor in determining consistency with the public interest.

Although the reasonable-beneficial use concept is informed by several centuries of common law, its application in this state can benefit from further administrative clarification. There have been no judicial decisions in Florida interpreting the reasonable-beneficial standard. State water policy provides additional guidance,[83] by incorporating the factors identified by the Restatement (Second) of Torts, and the law review article authored by Dean Frank Maloney and colleagues,[84] as well as several factors addressing specific policy concerns. Included in the state water policy rule are the following factors for determining reasonable-beneficial use, which are potentially relevant to the instream and inplace water needs of estuarine fisheries habitat:

(a) the quantity of water requested for the use;
(c) the suitability of the use to the source of water;
(e) the extent and amount of harm caused;
(g) whether the impact of the withdrawal extends to land not owned or legally controlled by the user;
(m) the extent of water quality degradation caused;
(o) whether the proposed use would significantly induce saltwater intrusion;

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[82] MALONEY, AUSNESS AND MORRIS, A MODEL WATER CODE, 86-87 (1972).

[83] FLA. ADMIN. CODE Rule 17-40.110 (October 1990).

[84] Maloney, Capehart & Hoofman, *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?*, 31 U. FLA. L. REV. 253-283 (1979).

(p) the amount of water which can be withdrawn without causing harm to the resource;
(r) other relevant factors.[85]

Considering these criteria, a proposed use could be found not to meet the reasonable-beneficial standard if the requested withdrawal of surface or ground water would alter the timing or quantity of inflows necessary to maintain an adequate estuarine salinity regime at important times of the year. This is particularly clear if the withdrawal was from a surface water source that provided the majority of inflow to an estuary, or if the withdrawal was from a groundwater source with strong hydrological connections to an estuary or to a surface watercourse feeding an estuary.

2. Existing Uses

The common law standard protected riparians who made nonconsumptive use of water for fishing, swimming or boating from unreasonable use by other parties. The Water Resources Act requires applicants to demonstrate that a proposed use "will not interfere with any presently existing legal use of water."[86] There is no regulatory definition of what constitutes an existing legal use, thus it can be questioned whether existing nonconsumptive uses can be protected under the Act. From the consumptive use perspective, it appears that the section only protects those who actually withdraw water from the system for use.[87]

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[85] FLA. ADMIN. CODE Rule 17-40.401(2) (October 1990).

[86] FLA. STAT. § 373.223(1)(b) (1989). *See also*, Sarasota v. Harloff, DOAH Case No. 89-0574 (Recommended Order, December 5, 1989) (Final Order, No. 90-01, Southwest Florida Water Management District, January 5, 1990) *aff'd*, 575 So.2d 1324 (Fla. 2d DCA 1991) (upholding district authority to limit withdrawal which would otherwise damage pre-existing public wellfield); West Coast Regional Water Supply Authority v. Gardinier, DOAH Case Nos. 85-0599, 85-0602 (Recommended Order, June 11, 1986) (Final Order, No. 86-04, Southwest Florida Water Management District, September 3, 1986).

[87] FLA. STAT. §§ 373.219, 373.226 (1989). *See*, West Coast Regional Water Supply Authority v. Southwest Florida Water Management District, DOAH Case Nos. 87-4644, -4645, -4657, 88-1169 (Recommended Order, July 10, 1989); Final Order No. 89-20, Southwest Florida Water Management District (August 30, 1989).

The issue of what constitutes an existing legal use was addressed in West Coast Regional Water Supply Authority v. Southwest Florida Water Management District,[88] which dealt with the effect of two public wellfields on a rancher's use of ambient water. The rancher relied on natural surface water to water his cattle, and on existing soil moisture, sustained by groundwater, to grow crops, but he did not utilize pumps or other facilities to withdraw the water. Though there were problems of proof with his allegations that the wellfields were causing drawdowns of the surface and ground water, the hearing officer also concluded that the rancher's uses of the water were not in the class of uses protected by the Act. To be protected as an existing use under the Act, a use must be exempt or permitted, and must involve an active withdrawal or diversion of water.[89] According to this interpretation, since freshwater inflows that support estuarine fisheries habitat do not involve active withdrawals or diversions, they would not constitute an existing legal use requiring protection under the Act.

Potential uses of water that would conflict with existing uses may not be permitted, except during the permit renewal process, when a use that better serves the public interest may be permitted instead of, or along with an adjusted existing use.[90] The Act specifies that when two applicants compete for a source of water that is inadequate to supply both uses, a renewal application will receive preference only if it serves the public interest as well as the initial application.[91] The potential exists under this provision for monitoring and evaluating the effects of existing legal uses on freshwater inflows. Competing uses that involve less harm to estuarine values may be given preference if, by protecting the resource from harm, they are determined to better serve the public interest. If harm to existing water users only becomes apparent after the

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[88] DOAH Case Nos. 87-4644, -4645, -4657, 88-1169 (Recommended Order, July 10, 1989); Final Order No. 89-20, Southwest Florida Water Management District (August 30, 1989).

[89] *Id.* at 23-25.

[90] FLA. STAT. § 373.223(1) (1989).

[91] FLA. STAT. § 373.233(2) (1989).

new use has been permitted, state water policy allows for modification of the permit to "curtail or abate the adverse impacts."[92]

3. Public Interest

The requirement that a prospective consumptive use be "consistent with the public interest" reiterates that component of the reasonable-beneficial use standard which requires that the use be "for a purpose and in a manner which is both reasonable and consistent with the public interest." In combination, the two criteria indicate significant support for the protection of environmental and habitat values in the consumptive use permitting process.[93] The Act also requires consideration of the public interest in determining which of two otherwise equal competing applications should be permitted,[94] and in deciding whether to allow for transport of water beyond overlying lands, outside of a watershed or across county boundaries.[95]

There is little direct interpretation of what constitutes the public interest, however statutory and regulatory language provides some direction. The policy provisions of the Act include support "to preserve natural resources, fish and wildlife,"[96] and protect public lands.[97] The Act also directs the DER, in formulating a state water use plan, to give due consideration to "existing and contemplated needs and uses of water for protection and procreation of fish and wildlife"[98] and "careful consideration to the...protection and procreation of fish and wildlife."[99]

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[92] FLA. ADMIN. CODE Rule 7-40.401(9) (October 1990). *See also*, FLA. ADMIN. CODE Rule 40C-2.381(2)(a)5 (October 1990).

[93] The commentary to A MODEL WATER CODE notes that although the public interest criterion is not an inherent part of the riparian system, in most states with prior appropriation antecedents, consumptive use permits may be denied if the proposed use would be contrary or detrimental to the public interest. Thus, the incorporation of the beneficial use criterion of western water law into the reasonable-beneficial use standard suggests that the public interest is an important consideration in allocating uses of water. A MODEL WATER CODE, at 172.

[94] FLA. STAT. § 373.233(1) (1989).

[95] FLA. STAT. § 373.223(2) (1989). *See also*, FLA. ADMIN. CODE Rule 17-40.402 (February 1991).

[96] FLA. STAT. § 373.016(2)(f) (1989).

[97] FLA. STAT. § 373.016(2)(h) (1989).

[98] FLA. STAT. §§ 373.036(1), (2)(a), (7) (1989).

General state water policies include reserving from use "that water necessary to support essential non-withdrawal demands, including navigation, recreation, and the protection of fish and wildlife,"[100] and establishing "minimum flows and levels to protect water resources and the environmental values associated with marine, estuarine, freshwater, and wetlands ecology."[101]

Another approach to defining the public interest is taken in Rule 17-40.402, F.A.C. (Water Policy), concerning factors to be considered in determining whether a proposed transfer of water across water management district boundaries is in the public interest.[102] Both affected districts must approve the transfer, considering the extent to which:

(1) comprehensive water conservation and reuse programs are implemented and enforced in the area of need;

(2) the major costs, benefits, and environmental impacts have been adequately determined, including the impact on both the supplying and receiving areas;

(3) the transport is an environmentally and economically acceptable method to supply water for the given purpose;

(4) the present and projected water needs of the supplying area are reasonably determined and can be satisfied even if the transport takes place;

(5) the transport plan incorporates a regional approach to water supply and distribution including, where appropriate, plans for eventual interconnection of water supply sources; and

(6) the transport is otherwise consistent with the public interest based upon evidence presented.[103]

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[99](...continued)
[99] FLA. STAT. § 373.036(7) (1989).

[100] FLA. ADMIN. CODE Rule 17-40.310(2) (October 1990).

[101] FLA. ADMIN. CODE Rule 17-40.310(11) (October 1990).

[102] FLA. ADMIN. CODE Rule 17-40.402 (February 1991). *See also*, FLA. STAT. § 373.223(2) (1989).

[103] *Id. See also*, Osceola County v. St. Johns River Water Management District, 504 So.2d 385 (Fla. 1987) (Florida Supreme Court upheld DER's statutory authority to promulgate rules for interdistrict water transfers).

Other than the general purposes and policies of the Water Resources Act,[104] State Water Policy,[105] and the elements listed above, there is no additional direction in Florida's statutes or administrative rules to aid in understanding what factors should be considered in determining when a consumptive use is in the public interest. To a certain extent, public interest considerations are inherent in the structure and processes established by the Act. Water management district governing boards are composed of lay persons, who make subjective, case by case determinations of the public interest in the permitting process, a process which allows for input from the public and the consideration of a potentially broad number of factors.

However, more specific guidelines for determining the public interest would assist governing boards in making these decisions, particularly so as pressure increases for consumptive use of the resource. Information gained through district research initiatives concerning water needs and sources, and minimum flows and levels should be incorporated into consumptive use permitting rules, in the form of appropriate criteria for determining the public interest. Several of these research and planning initiatives are discussed in later sections of this report.

C. Reservation of Instream and Inplace Water Needs in Consumptive Use Permitting and Water Shortage Planning

Clearly, one component of the reasonable-beneficial use standard involves the integrity of natural systems and fish and wildlife habitat. The Act addresses protection of instream and inplace freshwater needs for habitat purposes by authorizing the DER and each district governing board to reserve from permitted uses "water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety."[106] Provision for such reservations must be made by rule or regulation and must be subject to periodic review and revision in light of any change in conditions.

Similarly, as a basis for its review of district programs, the DER rule on State Water Policy asserts that, district programs, rules and plans shall "seek to (r)eserve from use that water

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[104] FLA. STAT. § 373.016 (1989).

[105] FLA. ADMIN. CODE Rule 17-40 (February 1991).

[106] FLA. STAT. § 373.223(3) (1989).

necessary to support essential non-withdrawal demands, including navigation, recreation, and the protection of fish and wildlife."[107] As part of the consumptive use permitting process, "(w)ater shall be reserved from permit use in such locations and quantities, and for such seasons of the year, as in the judgment of the Department or District may be required for the protection of fish and wildlife or the public health or safety."[108] More research and regulatory attention would be devoted to the freshwater inflow needs of estuaries if the discretionary nature of these rule requirements was removed, and replaced with mandates for the consideration and protection of fishery habitat values in the consumptive use permitting process.

The water management districts have addressed policies requiring consideration of riverine and estuarine habitat values to varying degrees in their consumptive use permitting requirements and water shortage plans. There are also large differences among the districts in the ability to address the impacts of a proposed use on environmental values. Even for those districts with greater resources, sufficient expertise to fully evaluate the impacts of a proposed use on estuarine values in a reasonable amount of time is often lacking. The Water Resources Act does not require that the districts engage in dialogue with, or accept comments or modifications from any other federal or state agency with expertise in environmental matters, as does the state's Surface Water Improvement and Management (SWIM) Act. Such a requirement would clearly allow for more scientifically informed decisions, and provide for better representation of the public interest.

Another weakness in the existing regulatory scheme involves the process by which impoundments and instream water withdrawals are permitted. Generally, the water management districts do not have permit systems addressing dam and reservoir operations. Though occasionally subject to general requirements concerning dam operations, water withdrawals are often permitted without express consideration of the manner in which the dam is operated relative to instream flows. The current approach makes it difficult to separate a diversion's impacts on

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[107] FLA. ADMIN. CODE Rule 17-40.310(2) (October 1990).

[108] FLA. ADMIN. CODE Rule 17-40.401(3) (October 1990).

the downstream river from the more basic, and usually more significant, impact of the dam and reservoir.[109]

1. Southwest Florida Water Management District

a. Consumptive Use Permitting

The district publication, "Water Use Permit Information Manual" (October 1989), incorporated by reference in Rule 40D-2.091, F.A.C. includes several performance standards and presumptions applicable to withdrawals from lakes and streams within the district.[110] The relevant consumptive use permitting requirement is that the proposed use not cause adverse environmental impacts to wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources.[111] Additionally, a proposed use must not cause water levels or rates of flow to deviate from the ranges established in Chapter 40D-8, F.A.C.,[112] or otherwise harm the water resources of the district.[113]

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[109] Letter from Dr. Ernest Estevez, Senior Scientist, Mote Marine Laboratory, Sarasota Florida (March 7, 1991).

[110] BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, Part B, Section 4, Southwest Florida Water Management District (October 1989).

[111] FLA. ADMIN. CODE Rule 40D-2.301(1)(c) (May 1990).

[112] FLA. ADMIN. CODE Rule 40D-2.301(1)(b) (May 1990). *See also*, BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, B-37, Southwest Florida Water Management District (October 1989). Permittees must stop or reduce surface water withdrawals, as directed by the district, if rates of flow in streams fall below the minimum rates established in Rule 40D-8. FLA. ADMIN. CODE Rule 40D-2.381(3)(h) (May 1990).

[113] FLA. ADMIN. CODE Rule 40D-2.301(1)(n) (May 1990). *See also*, BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, B-37, Southwest Florida Water Management District (October 1989). In West Coast Regional Water Supply Authority v. Southwest Florida Water Management District, 10 FALR 4239 (Final Order, May 17, 1988), an earlier district rule was invalidated. The "5-3-1" rule prohibited the permitting of a consumptive use if the withdrawal, measured at the boundary of the applicant's property, would cause more than a five foot lowering of the potentiometric surface, more than a three foot reduction in the water table, or more than a one foot lowering of surface water levels. Though the rule was based partially on a USGS hydrologic report, the hearing officer determined the rule was hydrologically unsound because data on which the report was based were not site-specific and were too short-term, and because the water levels measured by USGS could not be assumed to be representative of those in the rest of the district.

(continued...)

Environmental impacts evaluated by district staff include: surface water bodies, such as lakes, ponds, impoundments, sinks, springs, streams, canals, estuaries, or other watercourses; wetland habitats; onsite environmental features and their relationship to local and regional landscape patterns; habitat for threatened or endangered species; and other environmental features dependent on the water resources of the district.[114]

Impacts to canals, springs and estuaries are evaluated using the criteria applicable to streams. The performance standards require that flow rates must "not deviate from the normal rate and range of fluctuation to the extent that water quality, vegetation, and animal populations are adversely impacted in streams and estuaries."[115] Similarly, flow rates must not be reduced from existing levels of flow to the extent that "salinity distributions in tidal streams and estuaries are significantly altered as a result of withdrawals."[116] Recreational and aesthetic qualities of the water resource must not be adversely impacted by deviations in the flow rate.

Where there is the potential for significant impacts to environmental features, because of the proposed size of a withdrawal, its predicted impact on surface waters or water tables, or the sensitivity of associated environmental features, the district may require monitoring of several types of parameters.[117] For streams, springs, canals, estuaries or other water courses, monitoring parameters may include surface water levels; groundwater levels; rainfall at the site; surface water quality, including salinity distributions in estuaries; biological parameters such as

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[113](...continued)
The district contended that the rule would allow a balancing of net withdrawals and net recharge, thereby maintaining regional water levels. The hearing officer found that this "water crop" approach would be valid as a planning tool, but not as a rule for determining allowable withdrawals from individual parcels. It was also determined there was no relationship between the restrictions of the 5-3-1 rule and harm to water resources, natural systems or other users, since in some locations, compliance with the rule would result in harm, while in others exceeding the limits of the rule would not cause harm. On these bases, the hearing officer determined the rule was arbitrary and capricious.

[114] BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, B-33, Southwest Florida Water Management District (October 1989).

[115] *Id.* at B-36.

[116] *Id.*

[117] *Id.* at C-32.

the abundance and species composition of benthic fauna, fishes, zooplankton, phytoplankton, submersed macrophytes, emergent or intertidal plants, and periphyton; sediment characteristics; aerial photography identifying the distribution of riparian or estuarine vegetation; and hydrographic parameters, such as bathymetry and distribution of bottom features.[118]

Once a permit is granted, the district requires permittees to mitigate any adverse impacts to environmental features which occur, or are imminent, as a result of withdrawals.[119] Adverse impacts which must be mitigated include significant reductions in established levels or flows in lakes, streams and other watercourses, and damage to the habitat of endangered or threatened species.[120] The mitigation effort is based on a mitigation plan required prior to permitting or as an additional condition to an existing permit, when the potential exists for environmental impacts.[121] It is not clear what measures would adequately mitigate significant reductions in levels or flows which help maintain salinity balances for habitat purposes. An existing consumptive use may be revoked if it causes significant adverse impacts to the water resources, environmental systems, or existing legal users, and the permittee does not modify the activity or mitigate the impacts.[122]

In addition to performance and monitoring standards, the district has established the regulatory presumption that a proposed use will not cause unacceptable environmental impacts if, combined with other withdrawals, it does not reduce the rate of daily flow by more than ten percent at any point in the drainage system at the time of withdrawal.[123] The effects of water

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[118] *Id.* at C-34.

[119] FLA. ADMIN. CODE Rule 40D-2.381(3)(m) (May 1990).

[120] *Id.*

[121] BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, B-65, Southwest Florida Water Management District (October 1989).

[122] FLA. ADMIN. CODE Rule 40D-2.341(2)(e) (May 1990).

[123] BASIS OF REVIEW FOR WATER USE PERMIT APPLICATIONS, at B-37. For an explanation of the research history and rationale behind the district's adoption of this approach, see Flannery, M., "Memorandum to David Moore, Re: Part II Rule Revision: Evaluation of Potential Impacts to Streams and Estuaries," Southwest Florida Water Management District (February 28, 1989).

retention in instream impoundments are included in the determination of flow reductions.[124] Scientifically sound, site specific studies may be used to support variances from the ten percent figure.

The ten percent figure also applies to groundwater withdrawals with potential impacts on riverine and estuarine systems, but as yet, such impacts have not been observed in the district, probably due to the hydrological isolation of most streams from the aquifers from which most groundwater is withdrawn. However, in northwest Hillsborough County, Pinellas County and Pasco County, there are well established interconnections between groundwater and many surface water courses, suggesting that in those areas, and possibly others, the consumptive use permitting process for groundwater withdrawals could require consideration of effects on surface water flows.

b. Water Shortage Rules

The Southwest Florida district has adopted rules related to the declaration of water shortages and emergencies, and implementation of restrictions on use.[125] Several water quality and quantity parameters are monitored to determine whether a shortage or emergency should be declared. Among others, these include: levels in surface and groundwaters; flows of surface waters; demand of natural systems; and impacts on fish and wildlife.[126] Current data are periodically compared to historical data to determine whether estimated present and future water supply within any source class will be insufficient to meet estimated human needs, or whether "serious harm to water resources" can be expected.[127]

Factors considered in determining whether serious harm to the water resource may occur include:

(1) the occurrence of or potential for saltwater intrusion or other ground water contamination;

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[124] *Id.*

[125] FLA. ADMIN. CODE Rules 40D-21.011--40D-21.641 (1989).

[126] FLA. ADMIN. CODE Rule 40D-21.401(3) (May 1987).

[127] FLA. ADMIN. CODE Rule 40D-21.221(2) (1989).

(2) significant reductions of stream flow or spring discharge, or significant lowering of the water table;

(3) the occurrence of or potential for adverse impacts on fish and wildlife; and

(4) other factors adversely impacting the water resource.[128]

The Southwest Florida district is one of two districts which expressly include consideration of stream flow, spring discharge and water table levels in its evaluation of serious harm to the resource.[129] It is also one of only two districts which do not qualify the types of adverse impacts to fish and wildlife to be included in the analysis.[130]

For the purposes of water shortage determinations, the freshwater inflow needs of fish and wildlife are not included in the analysis of present and anticipated demands.[131] However, the factors considered in estimating water supplies include, among others: historic, current, and anticipated flows in surface waters; and historic, current, and anticipated demand of natural systems, including losses due to evapotranspiration and seepage.[132]

In deciding whether a water shortage emergency should be declared, the district utilizes the same factors used to evaluate available water supplies for water shortage purposes, including surface water flows and the needs of natural systems.[133] The analysis is to "determine whether present and anticipated future available water supply would be insufficient to protect the public

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[128] FLA. ADMIN. CODE Rule 40D-21.221(2)(c) (1989).

[129] *See also*, "Water Shortage Plan," 11, Suwannee River Water Management District (August 1988).

[130] *See also*, "Water Shortage Plan," 11, Suwannee River Water Management District (August 1988). *Compare*, South Florida Water Management District ("potential for *irreversible* adverse impacts on fish and wildlife"); St. Johns River Water Management District ("potential for *significant* adverse impacts on fish and wildlife, *and the ecology of the area*"); Northwest Florida Water Management District ("potential for *significant* adverse impacts on fish and wildlife, *and the ecology of the area*").

[131] FLA. ADMIN. CODE Rule 40D-21.221(2)(b) (1989).

[132] FLA. ADMIN. CODE Rule 40D-21.221(2)(a) (1989).

[133] FLA. ADMIN. CODE Rule 40D-21.331(3)(a) (May 1987).

health, safety or welfare, or the health of animals, fish or aquatic life, a public water supply, or commercial, industrial, agricultural, recreational, or other reasonable-beneficial use."[134]

The district provides for three types of restrictions to be used in responding to a water shortage declaration or water shortage emergency.[135] These range from a Phase I (moderate) water shortage,[136] to a Phase II (severe) shortage,[137] to a Phase III (extreme) shortage.[138] Restrictions applicable to each phase specify which type of uses must implement cutbacks, and to what degree. For Phase I through Phase III restrictions, the rule states that "(a)ugmentation shall be limited to the minimum necessary to maintain and preserve the long-term integrity of the surface water body and associated habitat for fish and wildlife."[139]

Additional language in the Phase I rule requires that, "(w)here minimum water levels have been established by the District, no augmentation shall occur when water levels are above the applicable minimum water level."[140] Phases II and III require that where minimum water levels have been established, no augmentation shall occur "when water levels are above the extreme low management level."[141] The water shortage and emergency rules do not specifically address minimum flows for watercourses. The district's rules do allow for variances from any restrictions that may be imposed.[142]

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[134] FLA. ADMIN. CODE Rule 40D-21.331(2) (May 1987).

[135] FLA. ADMIN. CODE Rule 40D-21.251 (July 1986).

[136] FLA. ADMIN. CODE Rule 40D-21.621 (May 1987).

[137] FLA. ADMIN. CODE Rule 40D-21.631 (1989).

[138] FLA. ADMIN. CODE Rule 40D-21.641 (1989).

[139] FLA. ADMIN. CODE Rules 40D-21.621(7)(d), 40D-21.631(7)(d), 40D-21.641(7)(d) (1989).

[140] FLA. ADMIN. CODE Rule 40D-21.621(7)(d) (1989).

[141] FLA. ADMIN. CODE Rules 40D-21.631(7)(d), 40D-21.641(7)(d) (1989). Extreme low management levels are operating levels established in Rule 40D-8, F.A.C. for lakes and impoundments.

[142] FLA. ADMIN. CODE Rule 40D-21.291 (1989).

2. South Florida Water Management District

a. Consumptive Use Permitting

The district requires that a proposed consumptive use not cause significant environmental impacts,[143] that it not cause significant inland movement of surface saline water,[144] and that it be consistent with State Water Policy requirements that the districts reserve from use the water necessary to support essential non-withdrawal demands, including protection of fish and wildlife.[145]

Additional technical criteria contained in the district publication, "Basis of Review for Water Use Permit Application" (September 1989), are incorporated by reference. The impacts which are evaluated include environmental features directly related to the water resource, such as: (1) wetland habitat, except wetlands previously affected by drainage, land clearing, earthwork, or those which have been degraded, and (2) natural water bodies.[146] They also include impacts with an indirect relationship to water resources, such as intermittent ponds, and significant habitat diversity support systems, usually consisting of highly productive mixed upland and wetland systems.[147] Other environmental features are evaluated on a case by case basis.[148]

In re: South Dade Agro Homes[149] involved the denial of an agricultural consumptive use permit, based on a finding that it would have caused adverse environmental impacts in a portion of the Everglades. Irrigation water was sought for a 256 acre tomato field created by

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[143] FLA. ADMIN. CODE Rule 40E-2.301(1)(c) (May 1990).

[144] FLA. ADMIN. CODE Rule 40E-2.301(1)(a) (May 1990).

[145] FLA. ADMIN. CODE Rule 40E-2.301(1)(h) (May 1990), *citing* FLA. ADMIN. CODE Rule 17-40.030 (transferred to FLA. ADMIN. CODE Rule 17-40.310).

[146] Section 3.2.1.1.5.1, BASIS OF REVIEW FOR WATER USE PERMIT APPLICATION, A-15, South Florida Water Management District (September 1989).

[147] *Id.* at A-16.

[148] *Id.*

[149] In the matter of: Application No. 03285-F for a Water Use Permit filed by South Dade Agro Homes, Inc., Dade County, Florida, 7 FALR 3645 (Final Order, South Florida Water Management District) (June 13, 1985).

rockplowing, that would have eliminated undisturbed wetlands in the East Everglades serving as critical habitat for the endangered Cape Sable Sparrow. The district evaluated whether there would be compliance with Rule 40E-2.301, F.A.C., requiring a demonstration that the proposed use will not cause adverse environmental effects. It also cited state water policy requiring consideration of the extent and amount of harm caused. In evaluating consistency with the public interest, the rules looked to declarations of policy provided for in Sections 373.016 and .036, Fla. Stat., including the policy "to preserve natural resources, fish, and wildlife."[150] The district determined that the applicant did not demonstrate adequate compliance with the criteria for a reasonable-beneficial use, based on findings that significant adverse environmental effects would result from the proposed use.

With reference to salinity gradients important to estuarine habitat, the district requires that any use of fresh water not: (1) cause significant inland movement of saline surface water, (2) cause significant inland movement of the saline water interface within an aquifer system, or (3) otherwise reduce the amount of potable water because of inland movement of the saline water interface, upconing of saline water that may be beneath the fresh water, or vertical leakage of connate saline water.[151] "Significant movement" is defined as saline water encroachment that adversely affects the applicant, or other existing legal uses, or is otherwise detrimental to the public interest or the public health, safety and general welfare.[152] The applicant is required to submit proof that the proposed use will not cause the listed problems, though in this context, it is not clear that the public interest is meant to include consideration of estuarine salinity regimes and base flows to water courses.

If a proposed use is located near saline water, or if movement of saline water toward the source of water is possible as a result of future withdrawals, staff may recommend that a "saline water intrusion monitoring" program be required as a special condition.[153] Importantly, the

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[150] FLA. STAT. § 373.016(e) (1989).

[151] BASIS OF REVIEW FOR WATER USE PERMIT APPLICATION, A-16, South Florida Water Management District (September 1989). *See* FLA. ADMIN. CODE Rule 40E-2.301(1)(a) (May 1990).

[152] *Id.*

[153] *Id.* at A-17.

rule does not address potential problems involving the cumulative effects of all permitted withdrawals. When taken separately, withdrawals from a basin may not cause significant movement of saline surface water, however when assessed cumulatively, the withdrawals may represent a significant total diversion of freshwater inflow which disturbs estuarine salinity regimes. Rule amendments which required evaluation of potential cumulative impacts would increase the level of protection provided under the district's consumptive use permitting scheme.

b. Water Shortage Rules

The South Florida district's water shortage plan is for the purpose of declaring shortages and restricting water use, in order to maintain minimum flows and levels in the Lake Istokpoga-Indian Prairie area,[154] though the regulatory flows do not appear to be oriented to the freshwater needs of riverine or estuarine fisheries. The district's approach to water shortages and emergencies[155] is similar to, though less inclusive of environmental values than, that of the Southwest Florida Water Management District. In determining whether to declare a shortage or emergency, the district utilizes essentially the same factors as the Southwest Florida district.[156] Its analysis of available water supply includes historic, current and anticipated flows in surface waters, and the historic, current and anticipated demand of natural systems.[157]

One factor in determining whether a shortage exists is whether serious harm to water resources may occur. To evaluate the potential for serious harm to water resources, the district considers: (1) potential for increased saltwater intrusion or other ground water contamination; (2) potential for *irreversible* adverse impacts on fish and wildlife; and (3) other factors adversely impacting the water resource.[158] Thus, its analysis of such harm is less sensitive to the needs of fish and wildlife than that of the Southwest Florida district.

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[154] FLA. ADMIN. CODE Rule 40E-21.132(1) (February 1991). FLA. ADMIN. CODE Rule 40E-22 (1989) establishes regulatory minimum water levels for Lake Istokpoga and the canals within the Indian Prairie Basin, and minimum flows for the canals within the Indian Prairie Basin and Arbuckle Creek and Josephine Creek.

[155] FLA. ADMIN. CODE Rules 40E-21.011--40E-21.691 (April 1991).

[156] FLA. ADMIN. CODE Rule 40E-21.221 (February 1991).

[157] FLA. ADMIN. CODE Rule 40E-21.221(3)(a) (February 1991).

[158] FLA. ADMIN. CODE Rule 40E-21.221(3)(c) (February 1991) (emphasis added).

In deciding whether a water shortage emergency should be declared, the district utilizes the same factors used to evaluate available water supplies for water shortage purposes, including surface water flows and the needs of natural systems.[159] As with other districts, the analysis is to "determine whether any user's or classes of users' estimated present and anticipated available water supply will be insufficient to protect the public health, safety or welfare, or the health of animals, fish or aquatic life, a public water supply, or commercial, industrial, agricultural, recreational, or other reasonable-beneficial use."[160]

The district utilizes four phased water use restrictions, including Phase I (moderate),[161] Phase II (severe),[162] Phase III (extreme),[163] and Phase IV (critical).[164] The restrictions associated with each phase are designed to reduce overall demand by 15% for Phase I, 30% for Phase II, 45% for Phase III, and 60% for Phase IV.[165] The restrictions associated with each phase do not specifically reference the need to protect or augment flows for fish and wildlife habitat, though additional restrictions *may* include provisions designed to maintain minimum flows and levels, and others as are necessary to protect the water resources from serious harm.[166] The district's water shortage rules include provisions for variances from any restrictions that may be imposed.[167]

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[159] FLA. ADMIN. CODE Rule 40E-21.331(3)(a) (February 1991).

[160] FLA. ADMIN. CODE Rule 40E-21.331(3) (February 1991).

[161] FLA. ADMIN. CODE Rule 40E-21.521 (February 1991).

[162] FLA. ADMIN. CODE Rule 40E-21.531 (February 1991).

[163] FLA. ADMIN. CODE Rule 40E-21.541 (February 1991).

[164] FLA. ADMIN. CODE Rule 40E-21.551 (February 1991).

[165] FLA. ADMIN. CODE Rule 40E-21.251(2) (February 1991).

[166] FLA. ADMIN. CODE Rule 40E-21.251(3)(d), (j) (February 1991).

[167] FLA. ADMIN. CODE Rule 40E-21.275 (February 1991).

3. St. Johns River Water Management District

a. Consumptive Use Permitting

The district's conditions for use permits include the requirements that a proposed use be reasonable and beneficial, and consistent with the public interest.[168] A proposed use does not meet these criteria if it will cause surface water levels to be lowered so that stages or vegetation are "adversely and significantly affected on lands other than those owned or controlled by the applicant,"[169] or if it will cause the rate of flow of a surface water course to be lowered below minimum flows established pursuant to Section 373.042(1), Fla. Stat.[170] Additional criteria include prohibitions on significantly inducing "saline water encroachment"[171] or lowering "the water table or surface water level...so that stages or vegetation will be adversely and significantly affected" on other lands.[172] In addition, the criteria provide that "the environmental...harm caused by the consumptive use must be reduced to an acceptable amount."[173]

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[168] FLA. ADMIN. CODE Rule 40C-2.301(2) (October 1989). A "reasonable and beneficial" use is one which has a purpose which is reasonable and consistent with the public interest, which reduces environmental harm to an acceptable amount, and which does not seriously harm the water quality of the receiving body. FLA. ADMIN. CODE Rule 40C-2.301(4) (October 1989).

[169] FLA. ADMIN. CODE Rule 40C-2.301(5)(a)2 (October 1989). *See also*, APPLICANT'S HANDBOOK: CONSUMPTIVE USES OF WATER, 31, St. Johns River Water Management District (October 4, 1989).

[170] FLA. ADMIN. CODE Rule 40C-2.301(5)(a)5 (October 1989).

[171] FLA. ADMIN. CODE Rule 40C-2.301(5)(a) (October 1989).

[172] *Id.*

[173] FLA. ADMIN. CODE Rule 40C-2.301(4)(d) (October 1989). The validity of this standard was among several tested in Zellwood Drainage & Water Control District v. St. Johns River Water Management District, DOAH Case No. 88-5486R (Final Order, May 24, 1989). Petitioners alleged that the adopted standard was vague, had no scientific meaning, did not put an applicant on notice as to what discharge would be permitted, and left too much discretion to the agency. The hearing officer noted that the test for vagueness is more lenient when an administrative rule, rather than a penal statute is being examined, and that the petitioner had cited no cases in which similar rule language had been found vague, arbitrary or capricious. In upholding the validity of the rule, the hearing officer also accepted district staff testimony that the standards are not interpreted in a vacuum, but in the context of many other statutory and regulatory requirements governing the use of water.

The interpretation of these requirements was addressed in Friends of Fort George v. Fairfield Communities,[174] A citizens' group challenged the issuance of a consumptive use permit by the district, which allowed development of a community on a small, relatively undeveloped island north of Jacksonville. Though it was argued that environmental harm would result, the hearing officer determined that, rather than causing environmental harm, the proposed use would in some ways be beneficial. Similarly, the effects of the proposed withdrawal on potentiometric surfaces and saltwater interfaces were reviewed and found to involve no adverse effects. A slight lowering of water tables was expected but, it was determined, would not adversely affect vegetation or wildlife on offsite lands. On these findings, the hearing officer concluded, and the governing board agreed, that the use was reasonable-beneficial.

Proposed amendments to the conditions for consumptive use permits require that, in order to be considered reasonable-beneficial, a consumptive use must not cause water levels or flows to fall below the minimum limits set forth in Chapter 40C-8, F.A.C.[175] The draft amendments state that a proposed use does not meet the criteria for a permit if it will cause the rate of flow of a surface water course to be lowered below a minimum flow which has been established pursuant to Section 373.042(1), Fla. Stat. or Rule 40C-8.624, F.A.C.,[176] or if it will cause the rate of flow of a surface water source to be lowered below a minimum level which has been established pursuant to Section 373.042(2), Fla. Stat. or Rule 40C-8.624, F.A.C.[177]

As of this writing, a draft rule is being considered for the establishment of minimum surface water levels and flows, which posits five categories of regulatory elevations and flow

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[174] 24 Fla. Supp. 2d 192 (Recommended Order, DOAH Case Nos. 85-3537, -3596) (1986).

[175] Draft Rule 40C-2.301(4)(j), F.A.C. (April 29, 1991). At present, a rule establishing minimum flows for points on the Wekiva River and on Blackwater Creek is being developed. Draft Rule 40C-8, F.A.C. (April 29, 1991).

[176] Draft Rule 40C-2.301(5)(a)5., F.A.C. (April 29, 1991).

[177] Draft Rule 40C-2.301(5)(a)6., F.A.C. (April 29, 1991). *See also* Draft Revisions to Applicant's Handbook, Section 9.4.1(d)-(f) (tracking the language of the Draft Rule, and requiring that proposed uses not impact water reserved from use by the governing board).

discharges for watercourses in the district.[178] The draft rule specifies that in establishing minimum flows and levels, the governing board "must consider, and at its discretion may provide for, the protection of non-consumptive uses, including navigation, recreation, and the preservation of natural resources, fish and wildlife."[179] The protection of non-consumptive uses would be enhanced if this factor were made to be non-discretionary, at least with regard to natural resources, fish and wildlife.

Under the draft rule, one category of regulatory elevation or flow is the "minimum average surface water level." This is considered an optimum level for the health of the system, corresponding to approximately the 60 percent of inundation level based on the overall period of record, and approximately 0.3 foot below the floodplain surface.[180] The "minimum frequent low surface water level" is a low water level that may be reached during extended periods of reduced rainfall.[181] The "minimum infrequent low surface water level" is the water level which may be reached during periods of extreme drought.[182]

Water levels and flows above the minimum average surface water level include the "frequent high surface water flood level," and the "infrequent high surface water level." The first of these is the high water level expected to be reached frequently during periods when rainfall is normal,[183] while the second is an infrequent high water level expected to be reached during or immediately after periods of high rainfall with a frequency of approximately one in five years.[184]

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[178] Draft Rule 40C-8, F.A.C. (April 29, 1991). The draft rule is scheduled for presentation to the governing board no sooner than December 1991, with an adoption date of approximately March 1992.

[179] Draft Rule 40C-8.041(1), F.A.C. (April 29, 1991).

[180] Draft Rule 40C-8.021, F.A.C. (April 29, 1991).

[181] *Id.*

[182] *Id.*

[183] *Id.*

[184] *Id.*

In the draft rule, the only watercourses for which regulatory minimum flows are proposed are the Wekiva River and Blackwater Creek.[185] Until minimum flows are established for all water courses and estuaries in the district, including consideration of instream and inplace water needs, the district's consumptive use permitting conditions will not reflect, to a significant degree, the protection of estuarine habitat.

b. Water Shortage Rules

The St. Johns River district water shortage plan[186] is similar to that of the Southwest Florida district. The district includes in its resource monitoring parameters the levels of surface and ground waters, the demand of natural systems, and impacts on fish and wildlife.[187] However, in its monitoring of demands, it also includes data related to the needs of natural systems,[188] a factor not expressly considered by other water management districts under demand monitoring. In estimating present and anticipated available supply, the district considers, among other factors: historic, current and anticipated levels in surface and ground waters; historic, current and anticipated flows in surface waters; and historic, current and anticipated demand of natural systems.[189]

As with other districts, one factor in determining whether a shortage will be declared is the potential for serious harm to the water resource. In evaluating the potential for serious harm to the resource, the district considers: (1) potential for increased saltwater intrusion or other ground water contamination; (2) potential for *significant* adverse impacts on fish and wildlife, and the ecology of the area; and (3) other factors adversely impacting the water resource.[190] Thus,

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[185] *See* Draft Rule 40C-8.624, F.A.C. (April 29, 1991). By March 1, 1991, the district was to have established minimum flows and minimum water levels for surface watercourses in the Wekiva River System and minimum water levels for the groundwater in the aquifer underlying the Wekiva Basin. FLA. STAT. § 373.413(3) (1989).

[186] FLA. ADMIN. CODE Rules 40C-21.001--40C.21.651 (1989).

[187] FLA. ADMIN. CODE Rule 40C-21.401(3) (1989).

[188] FLA. ADMIN. CODE Rule 40C-21.401(4)(c) (1989).

[189] FLA. ADMIN. CODE Rule 40C-21.221(3)(a) (1989).

[190] FLA. ADMIN. CODE Rule 40C-21.221(3)(c) (1989) (emphasis added).

the approach of the St. Johns River district appears to be slightly more sensitive to habitat impacts than that of the South Florida district,[191] and slightly less sensitive than that of the Southwest Florida district.[192]

In deciding whether a water shortage emergency should be declared, the district utilizes the same factors used to evaluate available water supplies for water shortage purposes, including surface water levels and flows, and the needs of natural systems.[193] Similarly to other districts, the analysis is to "determine whether any user's estimated present and anticipated available water supply will be insufficient to protect the public health, safety or welfare, or the health of animals, fish or aquatic life, a public water supply, or meet the minimum needs of commercial, industrial, agricultural, recreational, or other reasonable-beneficial use."[194] In evaluating the potential for such adverse impacts, the district considers the same factors it uses to determine present and anticipated user demands, and the potential for serious harm to the water resource, including potential for "significant adverse impacts on fish and wildlife, and the ecology of the area."[195]

The St. Johns River district has established four water shortage phases,[196] with corresponding restrictions aimed at reducing overall demand by 15% (moderate shortage),[197] 30% (severe shortage),[198] 45% (extreme shortage),[199] and 60% (critical shortage).[200]

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[191] *See supra*, note 158, and accompanying text.

[192] *See supra*, notes 127-130, and accompanying text.

[193] FLA. ADMIN. CODE Rule 40C-21.331(3)(a) (February 1991).

[194] FLA. ADMIN. CODE Rule 40C-21.331(3) (1989).

[195] FLA. ADMIN. CODE Rule 40C-21.331(3)(b) (1989), referencing FLA. ADMIN. CODE Rule 40C-21.221(3)(b), (c) (1989).

[196] FLA. ADMIN. CODE Rule 40C-21.251(2) (1989).

[197] *See* FLA. ADMIN. CODE Rule 40C-21.621 (1989) for specific restrictions applicable to Phase I shortages.

[198] *See* FLA. ADMIN. CODE Rule 40C-21.631 (1989) for specific restrictions applicable to Phase II shortages.

Specific restrictions for the different phases do not reference the need to maintain and preserve the long-term integrity of surface waterbodies and associated habitat for fish and wildlife, however the general water use restrictions which may be imposed include provisions designed to maintain minimum flows and levels established pursuant to Section 373.042, Fla. Stat.[201] The water shortage rules include provisions for variances from any restrictions that may be imposed.[202]

4. Suwannee River Water Management District

a. Consumptive Use Permitting

The district has not yet addressed minimum flows in its planning efforts, nor does it make any specific reference to minimum flows in its permitting regulations. There is oblique reference to minimum flows in its Conditions for Issuance of Use Permit,[203] which require that proposed withdrawals satisfy Section 373.223, Fla. Stat. and comply with the rule on State Water Policy.[204] Section 373.223, Fla. Stat. requires that proposed uses be consistent with the public interest, and authorizes the district governing boards to reserve from use "water in such locations and quantities, and for such seasons of the year, as...may be required for the protection of fish and wildlife or the public health and safety."[205]

For uses in excess of two million gallons per day average daily rate of withdrawal, permit conditions may be added which require analysis and reporting of specified water quality parameters, reporting of water withdrawal, use or discharge at specified intervals and locations,

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[199](...continued)

[199] *See* FLA. ADMIN. CODE Rule 40C-21.641 (1989) for specific restrictions applicable to Phase III shortages.

[200] *See* FLA. ADMIN. CODE Rule 40C-21.651 (1989) for specific restrictions applicable to Phase IV shortages.

[201] FLA. ADMIN. CODE Rule 40D-21.271(3)(c) (1989).

[202] FLA. ADMIN. CODE Rule 40C-21.275 (1989).

[203] FLA. ADMIN. CODE Rule 40B-2.301 (June 1988).

[204] FLA. ADMIN. CODE Rule 17-40 (February 1991).

[205] FLA. STAT. § Section 373.223(3) (1989).

and measurement and reporting of ground and surface water levels and surface water flows at specified intervals and locations.[206]

Among other mandates, the State Water Policy rule requires that water management district programs and rules seek to "reserve from use that water necessary to support essential non-withdrawal demands, including navigation, recreation, and the protection of fish and wildlife."[207] The rule also reiterates the statutory requirement that water be reserved from permit use in locations, quantities and seasons as necessary to protect fish and wildlife or the public health and safety.[208] There has been no case in the district in which a consumptive use permit was denied or modified based on instream or inplace water needs.

b. Water Shortage Rules

The Suwannee River district water shortage plan[209] is fairly consistent with those of the three larger districts. The district's demand monitoring parameters do not include the needs of natural systems.[210] Its resource monitoring parameters include the levels of surface and ground waters; flows of rivers and streams and lake levels; demand of natural systems; and impacts on fish and wildlife, a similarity it shares with the St. Johns River district.[211] In estimating present and anticipated available supply, the district considers, among other factors: historic, current and anticipated levels in surface and ground waters; historic, current and anticipated flows in surface waters; and historic, current and anticipated demand of natural systems.[212]

As with other districts, one factor in determining whether a shortage will be declared is the potential for serious harm to the water resource. In evaluating the potential for serious harm the district considers: (1) the occurrence of or potential for saltwater intrusion, upconing of less

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[206] FLA. ADMIN. CODE Rule 40B-2.381(3) (June 1988).

[207] FLA. ADMIN. CODE Rule 17-40.310 (October 1990).

[208] FLA. ADMIN. CODE Rule 17-40.401(3) (October 1990).

[209] "Water Shortage Plan," Suwannee River Water Management District (August 1988).

[210] *Id.* at 22.

[211] *Id.* at 21-22.

[212] *Id.* at 10.

potable water or other groundwater contamination; (2) significant reductions of stream flow or spring discharge or significant lowering of the water table; (3) the occurrence of or potential for adverse impacts on fish and wildlife; and (4) other factors adversely impacting the water resource.[213] Factor (3) tracks the approach of the Southwest Florida district, which also does not qualify the types of adverse impacts which will be considered.

In deciding whether a water shortage emergency should be declared, the district utilizes the same monitoring parameters and the same factors used to evaluate available water supplies for water shortage purposes, including surface water levels and flows, and the needs of natural systems. Consistent with other districts, the analysis is to "determine whether estimated present and anticipated future available water supply would be insufficient to protect the public health, safety or welfare, or the health of animals, fish or aquatic life, a public water supply, or commercial, industrial, agricultural, recreational, or other reasonable-beneficial use."[214]

The plan includes four water shortage phases related to the reduction in overall withdrawals needed to reduce present and future uses to available supplies and to protect water resources from serious harm. A Phase I shortage (Water Shortage Advisory) is declared when regional potentiometric levels in an aquifer or aquifers fall below the tenth percentile of historical values, or if surface water levels or flows fall below the twenty-fifth percentile of historical values.[215] Subsequent phases are declared based on the severity of the situation.[216]

A Phase I shortage does not require mandatory restrictions on use.[217] All other phases include specific restrictions. Phases II (Moderate Water Shortage), III (Severe Water Shortage) and IV (Critical Water Shortage) include restrictions on "augmentation use."[218] Phases II and III require that augmentation be limited to the minimum necessary to maintain and preserve the

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[213] *Id.* at 11.

[214] *Id.* at 18.

[215] *Id.* at 13.

[216] *Id.*

[217] *Id.* at 29.

[218] Defined as augmentation of natural or man-made surface water bodies to maintain and protect habitat for fish and wildlife, or to provide for recreational or aesthetic values. *Id.* at 27.

long-term integrity of the surface water body and associated habitat for fish and wildlife.[219] For these phases, no augmentation is allowed when water levels are above the twenty-fifth percentile of historical levels or flows for the affected water body.[220] For Phase IV restrictions, no augmentation may occur when such levels are above the tenth percentile of historical figures.[221] As with other districts, the Suwannee River district allows for variances from the restrictions.

5. Northwest Florida Water Management District

a. Consumptive Use Permitting

The Northwest Florida district takes a similar approach in permitting of consumptive uses to that of the Suwannee River district. The district's Conditions for Issuance of Permits[222] track the three criteria of Section 373.223, Fla. Stat. (reasonable-beneficial use, consistent with the public interest, and no interference with existing legal uses). They also require compliance with Subsection 17-40.04 of the Water Policy Rule,[223] which bases reasonable-beneficial determinations on, among other factors:

(c) the suitability of the use to the source of water;

(e) the extent and amount of harm caused;

(g) whether the impact of the withdrawal extends to land not owned or legally controlled by the user;

(m) the extent of water quality degradation caused;

(n) whether the proposed use would cause or contribute to flood damage;

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[219] *Id.* at 37, 45.

[220] *Id.*

[221] *Id.* at 54.

[222] FLA. ADMIN. CODE Rule 40A-2.301 (January 1991).

[223] Transferred to FLA. ADMIN. CODE Rule 17-40.401 (October 1990).

(o) whether the proposed use would significantly induce saltwater intrusion;[224]

(r) other relevant factors.[225]

The district requires a Standard Water Use permit for any proposed surface water withdrawal exceeding 2,000,000 gallons per day, or withdrawing more than ten percent of the base flow of the supplying water body.[226] The rule does not refer to minimum flows, but to "base flow" which is defined as the sustained or fair-weather streamflow. It is the difference between streamflow (total runoff) and direct runoff.[227] No reference is made to protection of water resources, natural seasonal fluctuations, or environmental values of estuarine, aquatic and wetlands ecology, as required by the State Water Policy section on minimum flows and levels.[228] Nor does the district rule address the need to consider cumulative withdrawals in calculating the ten percent figure. Other than this oblique reference, there is no other reference to minimum flows in the permitting conditions.

For Standard Water Use permits, the district's limiting conditions allow the governing board to impose conditions necessary to insure that a withdrawal or use of water will not cause a potentiometric surface or surface water body level to fall below established minimum levels, and that a withdrawal will not be harmful to the water resources of the district.[229] The conditions do not address maintaining minimum flows, and as of this writing, the district has not established regulatory minimum levels. Protecting the "water resources of the district" may be interpreted to include instream and inplace water needs for habitat purposes, but clearer statements of the need

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[224] *Compare*, FLA. ADMIN. CODE Rule 40E-2.301(1)(a) (May 1990) (South Florida Water Management District rule which includes the requirement that a proposed use not cause significant inland movement of surface saline water).

[225] FLA. ADMIN. CODE Rule 17-40.401(2) (October 1990).

[226] FLA. ADMIN. CODE Rule 40A-2.041(3)(d) (August 1989).

[227] FLA. ADMIN. CODE Rule 40A-2.021(4) (August 1989).

[228] FLA. ADMIN. CODE Rule 17-40.405 (February 1991).

[229] FLA. ADMIN. CODE Rule 40A-2.381 (August 1989).

to provide for such needs would assure their protection as minimum flow planning studies are completed.

b. Water Shortage Rules

The Northwest Florida district's Water Shortage Plan is incorporated by reference in its consumptive use permitting rules regarding declarations of water shortage.[230] The district's demand monitoring parameters do not include the needs of natural systems.[231] Among its resource monitoring parameters are included: existing management levels;[232] historic, current and anticipated levels in surface and ground waters; historic, current and anticipated flows in surface waters; and historic, current and anticipated demand of natural systems, including losses due to evapotranspiration and seepage, and needs of fish and wildlife.[233] The district compares current data to historical data to determine whether estimated present and anticipated available water supply will be insufficient to meet the estimated present and anticipated demands, or whether serious harm to the water resources can be expected.[234]

Factors considered in determining whether serious harm may occur include: (a) potential for increased saltwater intrusion or other ground water contamination; (b) potential for *significant* adverse impacts on fish and wildlife, and the ecology of the area; and (c) other factors adversely impacting the water resources.[235] Thus, the Northwest Florida district considers the same factors as does the St. Johns River district in making this determination, an approach which could be considered slightly more sensitive to habitat impacts than that of the South Florida district, and slightly less sensitive than that of the Southwest Florida district.

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[230] FLA. ADMIN. CODE Rule 40A-2.511 (August 1989).

[231] "Water Shortage Plan," 22, Northwest Florida Water Management District (Revised May 1985).

[232] Defined as that potentiometric level or surface water level below which it has been determined that further declines could possibly cause water quality degradation or could interfere with any existing legal uses of water in the area according to the best hydrologic information available. *Id.* at 3.

[233] *Id.* at A-9.

[234] *Id.* at A-9.

[235] *Id.* (emphasis added).

IV. Planning Directives

Several types of planning efforts are mandated by the Water Resources Act, including the requirement that DER establish the state water use plan and state water policy. The districts are required to prepare district water management plans, surface water improvement and management plans and groundwater basin resource availability inventories, perform research to establish minimum flows and levels, and provide technical assistance and information to local governments. Many of the planning elements include references to protection of fish and wildlife habitat, and their consideration in the establishment of more refined water use and water management permitting criteria is critical to the protection of freshwater flows to estuaries.

A. State Water Use Plan

Section 373.036 of the Water Resources Act requires the Department of Environmental Regulation (DER) to "study existing water resources in the state; the means of conserving and augmenting such waters; existing and contemplated needs and uses of water for protection and procreation of fish and wildlife, irrigation, mining, power development, and domestic, municipal, and industrial uses; and all other related subjects...."[236] The DER must cooperate with the Office of the Governor to formulate an "integrated, coordinated plan for the use and development of the waters of the state, based on the above studies."[237] The plan is to be known as the state water use plan, intended to serve as a functional element of the state comprehensive plan,[238]

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[236] FLA. STAT. § 373.036(1) (1989).

[237] *Id.*

[238] The state water use plan, together with the DER's water quality standards and classifications was intended to constitute the State Water Plan. This plan has yet to be formally developed. The state comprehensive plan, Chapter 187, Fla. Stat., includes several policies and goals directly supporting the maintenance of adequate freshwater flows, including: (1) establish minimum seasonal flows and levels for surface watercourses with primary consideration given to the protection of natural resources, especially marine, estuarine, and aquatic ecosystems (§187.201(8)(b)4.); (2) protect and restore long-term productivity of marine fisheries habitat and other aquatic resources (§187.201(9)(b)7.); (3) discourage the channelization, diversion, or damming of natural riverine systems (§187.201(8)(b)7.); (4) reserve from use that water necessary to support essential nonwithdrawal demands, including navigation, recreation, and the protection of fish and wildlife (§187.201(8)(b)14.).

and to aid in the guidance of the district governing boards and other agencies in the administration and enforcement of the Act.[239]

In preparing the state water use plan, the DER must "give careful consideration to the requirements of public recreation and to the protection and procreation of fish and wildlife."[240] On certain designated waterbodies, it may prohibit or restrict other future uses which may be inconsistent with these objectives.[241] The DER must consult with and carefully evaluate the recommendations of concerned federal, state and local agencies, particularly the water management districts.[242] In turn, each district must cooperate with the DER in conducting surveys and investigations of water resources, furnish available technical data, and advise the DER in formulating those parts of the plan applicable to the district.[243]

B. District Water Management Plans

A primary role established for the districts in complying with the requirements of Section 373.036, Fla. Stat. is the research and preparation of district water management plans (DWMPs). Part V of the State Water Policy rule provides direction to the districts for the preparation of the plans.[244] Each district must adopt its plan by November 1, 1994, and plans must be updated every five years.[245] At present, the DWMPs and other planning efforts required of the districts are moving on separate tracks. Recent district efforts have been aimed at incorporating the various planning initiatives into the DWMP process and achieving a consistent format to be followed by all districts in preparing their plans.[246]

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[239] FLA. STAT. § 373.036(10) (1989).

[240] FLA. STAT. § 373.036(7) (1989).

[241] *Id.*

[242] FLA. STAT. § 373.036(3) (1989).

[243] FLA. STAT. § 373.036(4) (1989).

[244] *See* FLA. ADMIN. CODE Rule 17-40.501 (February 1991).

[245] FLA. ADMIN. CODE Rule 17-40.501(6), (7) (February 1991).

[246] *See* Christianson, R., "Memorandum to District Water Management Plan Work Group, Re: Format and Guidelines for DWMPs," St. Johns River Water Management District (June 6, 1991).

Current drafts of the revised schedule call for a standardized DWMP format to be adopted by October 1, 1991, with revised plans of study from each district due on the same date.[247] First drafts of each district's DWMP are scheduled for completion on October 1, 1992, based on best available information. Though essentially all planning studies required under the Act may eventually be incorporated into the DWMP process, the following discussion will treat the topics separately.

Opportunities for protection of freshwater flows exist in several plan requirements. By November 1, 1991, each district must adopt by rule designated areas with water supply problems which have, or are anticipated to become critical within the next twenty years.[248] Within these critical water supply areas, a reasonable amount of reuse of reclaimed water from domestic wastewater treatment facilities must be required, unless economically, environmentally or technically infeasible.[249] Based on analysis of these factors, the plans must also include a course of remedial or preventive action for each current or anticipated future critical problem,[250] and provide for identifying areas where data collection, resource investigations or regulatory programs are needed to prevent water resource problems from becoming critical.[251] Critical water supply problem area designations must be updated within one year after DWMPs are updated.[252]

A primary tool in the designation of critical water supply problem areas is an assessment of water needs and sources. The districts are required to perform an assessment of water needs

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[247] *Id.*

[248] FLA. ADMIN. CODE Rule 17-40.401(5) (February 1991).

[249] *Id.*

[250] FLA. ADMIN. CODE Rule 17-40.501(2) (February 1991). Remedial or preventive measures include but are not limited to: water resource projects, water resources restoration projects (Section 403.0615, F.S.), purchase of lands; conservation of water; enforcement of district or DER rules; and actions by local governments under a local comprehensive plan, ordinance or zoning regulation. FLA. ADMIN. CODE Rule 17-40.501(3) (February 1991).

[251] FLA. ADMIN. CODE Rule 17-40.501(4) (February 1991).

[252] FLA. ADMIN. CODE Rule 17-40.401(5) (February 1991).

and sources for the next twenty years, as part of each DWMP.[253] At present, the districts are at different stages in the preparation of the water needs and sources studies. Given the prominent role assigned to protection of environmental and habitat values in the Act, the freshwater needs of estuarine fisheries habitat could be considered an important part of each water needs and sources assessment, though generally, such habitat-based needs are not being addressed by the districts. In some districts, analysis of the effects of withdrawals on sources of supply does include consideration of the effects of the withdrawals on habitat values, at different times, places and withdrawal rates.

1. Southwest Florida Water Management District

The major categories of water need addressed by the district in its needs and sources assessment include public supply and other potable demands, agricultural water use, industrial water use, mining water demands and recreational water needs.[254] The instream and inplace needs of estuarine dependent fisheries are not included in the needs assessment. Primary sources of water include ground water and surface water. Though in parts of the district, ground water is important to the maintenance of riverine flows during periods of low rainfall, the effects of large ground water withdrawals on the base flow of surface watercourses are not discussed within the water sources analysis.[255] However, the potential effects of withdrawals from surface watercourses on instream and estuarine habitats are considered within Section 5.3 of the draft needs and sources document.[256]

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[253] FLA. ADMIN. CODE Rule 17-40.501(1) (February 1991).

[254] WATER SUPPLY NEEDS & SOURCES: 1990-2020 (DRAFT), 247-253, Southwest Florida Water Management District (April 29, 1991). The draft sections explaining potential needs and sources, and the policies used to define acceptable withdrawals, are expected to remain essentially unchanged in the final draft document, which will be transmitted to the district governing board for approval in December 1991. (Phone interview with David Moore, Southwest Florida Water Management District, August 1991).

[255] In that part of the Southwest Florida district with the highest levels of groundwater withdrawal, potable aquifers are hydrologically separated from surface water flows by impermeable aquicludes.

[256] WATER SUPPLY NEEDS & SOURCES: 1990-2020 (DRAFT), 236-238, Southwest Florida Water Management District (April 29, 1991). The district has also developed "Water Resource

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The district currently has several creeks and rivers from which water is taken for municipal water supplies and other consumptive uses. These include the Peace River, Shell Creek, Myakkahatchee Creek-Big Slough, Manatee River, Braden River, Little Manatee River, and Hillsborough River.[257] Some watercourses are being considered for the expansion of existing withdrawals or creation of new withdrawals. The needs and sources document section on surface water supply emphasizes that rivers, springs, lakes and estuaries are among the state's most valuable assets, from an aesthetic and ecological perspective, but also from an economic perspective, based on the role they play in tourism, sport and commercial fishing, real estate development, and quality of life.[258] Thus, the utilization of surface water bodies for water supply purposes should be based on a multi-purpose management scheme which accounts for the water needs of the natural resource for ecological functions, aesthetic qualities and recreational use.[259]

The general guideline established for withdrawals from water courses is that, combined with all other withdrawals from that drainage basin, any proposed use should not reduce the existing ambient stream flow more than ten percent at any point in the system.[260] To increase cost-effectiveness and to maximize yields, the document encourages that withdrawals be done in the lower river reaches, sufficiently upstream of brackish tidal influence, thus preserving ambient flows in upstream, freshwater environments.[261] The ten percent threshold is considered a

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[256](...continued)
Assessment Projects" (WRAPs) for each county in its jurisdiction, which provide more specific information and assessment of the existing and potential sources of water supply.

[257] *Id.* at 247-253.

[258] *Id.* at 236.

[259] *Id.*

[260] *Id.*, section 4.2.C.2., at B-37. *See* Flannery, M., "Memorandum to David Moore, Re: Part II Rule Revision: Evaluation of Potential Impacts to Streams and Estuaries," Southwest Florida Water Management District (February 28, 1989) (discussion of supporting studies and rationale behind the ten percent rule).

[261] WATER SUPPLY NEEDS & SOURCES: 1990-2020 (DRAFT), 238, Southwest Florida Water Management District (April 29, 1991).

guideline which can be modified by site specific information demonstrating for example, that greater withdrawals would not cause unacceptable environmental impacts. Such information can also be used to justify a lesser rate of withdrawal in order to sustain environmental values.[262]

The needs and sources assessment bases its analysis of dependable yields on the ten percent figure, since the likelihood of greater withdrawals is uncertain. The resulting yields are considered a conservative estimate of supply for a given period, allowing additional investigations into the possibility of increasing stream diversions or maximizing water storage, developing alternate sources of supply, or improving water use efficiency.[263] It is noted that the ten percent diversion figure is exceeded to various degrees in five streams which were impounded earlier in this century. These include the Hillsborough, Manatee and Braden rivers, and Shell and Myakkahatchee creeks. Additionally, a sliding scale of allowed percentages of withdrawal, from ten to fifteen percent, is being considered for the Peace River near Ft. Ogden, based on ambient level of streamflow.[264] Thus, during higher levels of flow, higher rates of withdrawal might be considered acceptable.

For most streams in the region, the majority of flow occurs during the summer rainy season, with long periods of low flow common during the dry season.[265] For these streams, particularly the Myakka, Peace and Little Manatee rivers, some form of water storage is necessary before they could be dependable water supplies. Though instream reservoirs have been constructed and used for municipal supplies on the Hillsborough, Manatee and Braden rivers, and on Shell Creek, the report notes that many resource managers have concluded that such reservoirs have serious drawbacks. Instream reservoirs are typically very shallow, with small storage volumes, requiring large surface areas in order to achieve adequate volume. The large surface area, however, allows high evaporative water loss. The reservoirs also tend to

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[262] *Id.* at 239.

[263] *Id.*

[264] *Id.*

[265] *Id.* at 240.

accumulate pollutants and sediments, impacting fish and wildlife, and making withdrawals less inherently safe.[266]

Importantly, the report recognizes that instream reservoirs can cause severe environmental impacts to riverine ecosystems. These include loss of valuable wetlands, excessive algal and macrophyte growth in the reservoir, and flow reductions and water quality changes in downstream river and estuarine environments.[267] An example is the Manatee River, on which a dam and reservoir reduce the river's flow by approximately 90% about 80% of the year.[268] Offstream reservoirs, as an alternative to instream reservoirs, have the advantage of leaving the stream channel and wetlands intact, and minimizing impacts to water quality. They are also less susceptible to pollutant accumulation, and can be constructed deeper to maximize storage and minimize evaporative loss.[269]

The negative downstream effects of reservoirs on estuarine or riverine habitat may in the future be mitigated by increasing the volume of the reservoirs, thus allowing an increase in dry season releases, and supplying more control over large volume releases of freshwater during wet seasons.[270] The report notes that existing percentages of withdrawal at several reservoirs would require downward adjustments if additional withdrawals were permitted at upstream

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[266] *Id.*

[267] *Id.*

[268] Estevez, Dixon and Flannery, *West-Coastal Rivers of Peninsular Florida*, in THE RIVERS OF FLORIDA (Robert Livingston, ed.), 187-221, 215, Springer-Verlag: N.Y. (1991).

[269] *Id.* A 4000 acre offstream reservoir is currently used on the Little Manatee River by Florida Power and Light Corporation, and an 80 acre offstream reservoir on the Peace River is used by General Development Utilities for municipal supply.

[270] Phone interview with Sid Flannery, Southwest Florida Water Management District (August 1991). The recent permit renewal for an existing consumptive use at an instream reservoir on the Manatee River required additional modeling and study in order to investigate the effects and feasibility of adding reservoirs or increasing the size of the existing reservoir, in order to increase yield and allow for better quantity and timing of freshwater inflows. Similar approaches are being taken for permitted instream withdrawals on the Hillsborough River. *Id.*

locations.[271] The potential for creating or expanding withdrawals on eligible water courses is evaluated, based in part on the potential effects to estuarine and riverine habitat.[272]

The report recommends that hydrological and ecological monitoring of water resources should continue, in order to detect short- and long-term trends and apply the data to future water resource projects. It states that emphasis should be placed on collecting data for the Withlacoochee, Hillsborough, Manatee, Little Manatee, Braden, Myakka, and Peace Rivers, and Shell Creek, to ensure that surface water diversions are optimized while maintaining the integrity of the riverine and estuarine ecosystems.[273]

2. South Florida Water Management District

The district has completed a draft report of its water needs and sources assessment, based on urban and agricultural demands for 1990 and projected demands for the year 2010.[274] Needs and sources are designated for sixteen counties, or parts of counties which are not wholly within the district's jurisdiction. Environmental demands are not quantified in the draft assessment.[275] Environmental concerns and issues are discussed for each county, and as stated in the document, a special working group has been formed to delineate environmentally sensitive areas and assess environmental needs.[276] The goal of the working group is to develop a quantitative and qualitative categorization system for evaluating adverse impacts to key

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[271] WATER SUPPLY NEEDS & SOURCES: 1990-2020 (DRAFT), 248-270, Southwest Florida Water Management District (April 29, 1991).

[272] *Id.*

[273] WATER SUPPLY NEEDS & SOURCES: 1990-2020 (DRAFT), 329-330, Southwest Florida Water Management District (revised section, June 13, 1991).

[274] DRAFT WATER SUPPLY NEEDS & SOURCES: 1990-2010, 1, South Florida Water Management District (June 1991). *See also*, DRAFT WATER SUPPLY POLICY DOCUMENT, South Florida Water Management District (April 1991) (policy-setting document to guide several district activities, including how the district allocates future water supplies, and how it approaches the review and potential reallocation of water rights as existing permits are renewed).

[275] *Id.*

[276] *Id.*

environmental areas, and to approximate relative water needs.[277] Contracts have been executed for aerial photography to update the identification of environmentally sensitive areas, and to conduct a hydroperiod study to evaluate the impact of withdrawals on environmentally sensitive areas.[278] Assessment of environmental water needs will not be available until detailed water supply plans are developed.[279]

The document's discussion of environmental considerations addresses estuarine systems in nearly every coastal county in the district,[280] though as mentioned, the needs of these systems are not quantified. The district shares jurisdiction over Charlotte Harbor with the Southwest Florida Water Management District. In addition to the southern half of Charlotte Harbor, Lee County includes the Caloosahatchee River and San Carlos Bay estuarine system. In Collier County, sloughs, strands, and wet prairies channel freshwater surface flow to productive estuaries in the southwestern part of the county, including one of the largest existing intact mangrove systems, the Ten Thousand Islands. Monroe County also contains large amounts of estuarine habitat, including the Ten Thousand Islands on the west coast, most of Card Sound Sanctuary, Barnes Sound and Florida Bay.

An extensive system of barrier islands and bays lines coastal Dade County, including Biscayne Bay, which originally received freshwater as groundwater seepage, sheetflow across adjacent marshlands and from a series of small rivers that cut through the coastal ridge, draining the Everglades. Broward County was historically also a part of the Everglades system, with open marshland extending westward from the coastal ridges. Forested floodways through the ridges drained the Everglades during high rainfall periods, and mangrove habitat lined the shores of the estuaries. Palm Beach County also contains estuarine ecosystems which have been severely impacted by human activity, including the Loxahatchee River which has experienced significant saltwater intrusion. Establishing a reasonable base flow for the river will involve competition

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[277] *Id.*

[278] *Id.* at 3.

[279] *Id.*

[280] *See generally*, DRAFT WATER SUPPLY NEEDS & SOURCES: 1990-2010, South Florida Water Management District (June 1991).

with other uses. Martin and St. Lucie counties also contain important estuarine areas, including the St. Lucie Estuary and the Indian River Lagoon, both of which have been impacted by drainage and manipulation of freshwater inflows.

For essentially all areas in the district, general demand for potable water is forecast to increase significantly. Though recommendations for demand management and augmentation will mitigate to some extent the pressures on the resource, the district faces difficult decisions in attempting to maintain adequate timing and quantities of freshwater to estuarine areas.

The South Florida district has developed a draft rule on critical water supply problem areas,[281] defined according to the following criteria:

(1) areas that have been designated as a reduced threshold area[282] and identified in Rule 40E-20.302;

(2) areas that are anticipated to experience water supply problems in the next twenty years;

(3) areas of special concern as determined pursuant to criteria contained in the ("Basis of Review for Water Use Permit Application");

(4) areas that have frequently experienced water shortage restrictions;

(5) areas that have been designated as a restricted allocation area[283] pursuant to criteria contained in the ("Basis of Review for Water Use Permit Application");

(6) areas that are experiencing saline water intrusion; or

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[281] Draft Rule 40E-23, F.A.C. (May 22, 1991).

[282] Defined as areas established by the district for which the threshold separating a general permit from an individual permit has been lowered from the maximum limit of 3 MG per month (100,000 gpd) to 600,000 gallons per month (20,000 gpd). These areas are typically resource depleted areas where there has been an established history of sub-standard water quality, saline water movement into ground or surface water bodies or the lack of water availability to meet projected needs of a region. Draft Rule 40E-23.021(2), F.A.C. (May 22, 1991).

[283] Defined as areas designated within the district for which allocation restrictions are applied with regard to the use of specific sources of water. The water resources in these areas are managed in response to specific sources of water for which there is a lack of water availability to meet the needs of the region from that specific source of water. Draft Rule 40E-23.021(3), F.A.C. (May 22, 1991).

(7) other areas with known water supply problems.[284]

The draft rule includes a figure depicting the approximate boundaries of the district's proposed critical water supply problem areas, in relation to the boundaries of the district. The proposed problem areas cover approximately 80-85% of the entire district, including most of the southern part of the state around and below Lake Okeechobee, from the west coast of Florida to the east coast, down to and including the Florida Keys.[285] The final draft rule will be considered for adoption by the district governing board in October, 1991.[286] It is not clear that the criteria include consideration of freshwater inflow needs. As stated in the draft needs and sources assessment, environmental demands have not been quantified, thus it should be assumed that current evaluations of critical water supply areas do not address instream and inplace water needs of the district's estuaries.

3. St. Johns River Water Management District

The district is in the process of developing its water needs and sources assessment, though the only section available at present is a summary of planned and continuing research, which has been included in the "Local Government Technical Assistance Report," published in June 1991.[287] The report states the district's intent to provide assessments of the regional water resource needs and sources by July 1, 1991, as part of its local government assistance data, though as of this writing, it does not appear this goal has been met.

Major components of the projected study include: an inventory of existing and projected water supply needs; inventory of existing and projected water supply sources; evaluation of the impacts of development of water supply sources to meet water supply needs; waste water reuse;

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[284] Draft Rule 40E-23.053, F.A.C. (May 22, 1991). *See also*, DRAFT WATER SUPPLY NEEDS & SOURCES: 1990-2010, 3, South Florida Water Management District (June 1991).

[285] Draft Rule 40E-23, F.A.C. (Figure 1) (May 22, 1991).

[286] DRAFT WATER SUPPLY NEEDS & SOURCES: 1990-2010, 3, South Florida Water Management District (June 1991).

[287] LOCAL GOVERNMENT TECHNICAL ASSISTANCE REPORT, 89-100, St. Johns River Water Management District, Technical Publication No. SJ 91-2 (June 1991).

and a summary of groundwater models.[288] Water use needs are being calculated on data from 1989 and projected for the year 2010, based on surveys of several categories of water need, though not including resource based or habitat-based needs.[289]

Similarly, water supply sources data were collected for the 1989 base year and are projected for the year 2010. Water supply sources information is still being compiled. To evaluate the impacts of water supply source development in 1989 and 2010, regional and sub-regional groundwater and surface water models are being developed. Withdrawal impacts will be considered unacceptable if they meet any one of the following criteria:

1.) significantly induce saline water encroachment; or

2.) cause the water table or surface water level to be lowered so that surface water stages or vegetation will be adversely and significantly affected on lands other than those owned, leased or otherwise controlled by the applicant; or

3.) cause the water table level or aquifer potentiometric surface level to be lowered so that significant and adverse impacts will affect existing legal users; or

4.) require the use of water which pursuant to Ch. 373.223(3), Fla. Stat., and Rule 40C-2.301(6), the Board has reserved from use by permit; or

5.) cause the rate of flow of a surface water course to be lowered below a minimum flow which has been established pursuant to Ch. 373.042(1), Fla. Stat.; or

6.) cause the level of a water table aquifer, the potentiometric surface level of an aquifer source, or the water level of a surface water source to be lowered below a minimum level which has been established pursuant to Ch. 373.042(2), Fla. Stat.[290]

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[288] *Id.* at 91-95.

[289] The categories of water use include: domestic (public and self supply), agricultural (including vegetables, citrus, fruits other than citrus, field crops, ornamental, sod and grass, and improved pasture), commercial/industrial, power generation, and recreational (golf courses). *Id.* at 91.

[290] *Id.* at 93.

Thus, where minimum flows have been adopted by rule, they will be part of the water sources analysis.[291] To the extent that establishment of minimum flows includes consideration of riverine and estuarine habitat needs, the water sources assessment has the potential to improve protection of such inflows. Areas where there are unacceptable impacts will be identified as having inadequate water supplies to meet the projected user demand. The district will develop alternative water supply scenarios allowing development of water supplies at a level with acceptable impacts. Generally, these strategies will involve changing withdrawal points, varying the quantities withdrawn, using advanced treatment methodologies, increasing water conservation, reusing reclaimed water, and other appropriate techniques.[292]

4. Suwannee River Water Management District

The Suwannee River district water needs and sources study is being presented to the district governing board in September 1991 for review and possible adoption. Drafts of the study are unavailable as of this writing. The plan of study for the district's DWMP includes language recognizing that water resources assessments should embrace the needs of natural systems.[293] It appears that the district's research projects will eventually result in identification of minimum flows and levels necessary for the protection of estuarine habitat. The schedule for this program of research projects that studies will not be completed until 1993 or 1994.

The district withdraws most of its potable water from groundwater sources, thus the primary focus of its water sources analysis will be groundwater. The plan of study recognizes that the water needs of human uses for agricultural, industrial, and domestic purposes are easier to quantify than those of natural systems[294] and identifies minimum flows and levels studies for surfacewater bodies as a mechanism to provide for the needs of natural systems.[295] One project

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[291] At present, no surface water flows have been adopted, though the district is considering a draft rule setting minimum flows on the Wekiva River, at two points, and on Blackwater Creek. Draft Rule 40C-8, F.A.C. (April 29, 1991).

[292] *Id.*

[293] PLAN OF STUDY FOR THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT WATER MANAGEMENT PLAN, 5, Suwannee River Water Management District (1989).

[294] *Id.* at 11.

[295] *Id.*

under the plan's water use element specifically addresses the ecological roles played by the freshwater discharge from the Suwannee River.[296] However, the program of research only addresses the relationship between groundwater and surface water flows in the Suwannee River basin.[297]

The plan of study asserts that almost all of the projects listed in the groundwater and surface water elements will contribute to a definition of natural system needs.[298] One project under the groundwater resources element states that based on natural resource and economic considerations, the governing board will determine the criteria for minimum groundwater levels in preparation for the development of minimum levels and flows standards.[299] However, the project does not refer to the need to consider the importance of groundwater levels in maintaining minimum flows for surface watercourses other than those in the Suwannee River basin.

Two surface water assessment projects are geared to understanding the impacts of water resource development on the hydrology and water quality of the watercourses. The first of these recognizes that surface water flows in the Suwannee River Basin are highly influenced by groundwater inflows, and proposes to examine current and projected groundwater withdrawals to determine their effects on surfacewater and groundwater quantity and quality.[300] The second project is also specific to the Suwannee River basin, and will evaluate the need for the development and implementation of water quantity and quality models. According to the plan of study, modelling could be used to calculate watershed runoff quantity and quality, and to simulate major physical processes, salinity changes, and pollutant concentrations in estuarine waters due to changes in freshwater inflow quantity and quality.[301] According to the plan of study, the

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[296] *Id.*

[297] *Id.* at 9-10.

[298] *Id.* at 11.

[299] *Id.* at 6.

[300] *Id.* at 9.

[301] *Id.*

schedule for implementation of such models, and the scale at which they can be implemented depend on several variables, including availability of funds and trained personnel.

Staff has indicated that no critical water supply problem areas will be identified in the draft study.[302]

5. Northwest Florida Water Management District

As with most of the its programs, budgeting constraints have limited the degree to which the district is able to pursue the research and planning agenda expressed in the 1989 plan of study.[303] Research projects addressing water needs and sources are still in the planning stage.[304] The water needs and sources analysis will involve subdividing the district into discrete planning units, for which population and related water use projections will be developed.[305] Where industrial and agricultural uses are significant, projection for such uses will be included with those of public supply for planning and management purposes. The document states that, "(w)here pertinent, recreational, navigational and other in-stream uses of water will be considered. This may entail environmental assessments, such as the ongoing freshwater needs analysis for Apalachicola Bay."[306]

For its water resources availability analysis, the district plans to focus on groundwater, since this is the principal source of potable water in the district. The primary exception is Deer Point Lake, which serves as a source of potable water for a large part of Bay County. Earlier

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[302] Phone interview with Marvin Raulston, Suwannee River Water Management District (August 1991).

[303] The primary source of district funding is ad valorem taxation. The Northwest Florida district is constitutionally limited to a maximum ad valorem tax rate of .05 mills, as compared to a maximum rate of 1.0 mills for the other districts. FLA. CONST. art. VII, § 9. Current legislatively set maximum millage rates are: Northwest Florida district (.05 mills), Suwannee River district (.75 mills), St. Johns River district (.6 mills), Southwest Florida district (1.0 mills), South Florida district (.8 mills). FLA. STAT. § 373.503 (1989).

[304] Phone interview with Doug Barr, Northwest Florida Water Management District (August 1991).

[305] "District Water Management Plan: Plan of Study," 8, Northwest Florida Water Management District (1989).

[306] *Id.*

studies have been completed as part of the district's ground water basin resource availability inventory, and additional hydrogeological studies will be instituted where population and water use projections are high. Groundwater models are scheduled for development in order to determine levels of sustainable withdrawal without impacting the resource or existing uses of the aquifer. That part of the district with strong connections between groundwater and surface watercourses includes the Jackson County area, bordering Georgia's Chattahoochee River (Apalachicola River in Florida). Though the potential exists for high groundwater withdrawals to affect the Apalachicola River in the Jackson County area, it is not expected to experience high consumptive use demand in the foreseeable future.[307]

Research plans include surface water availability studies utilizing hydrologic models and flow frequency analyses.[308] The document anticipates that "(a)n outcome of the needs and sources assessment will be the establishment of minimum flows and levels for both surface and ground water bodies."[309] The district's designation of critical water supply areas will focus on existing areas which have previously been designated as "areas of water resource concern." These include the coastal margins of Santa Rosa, Okaloosa and Walton counties, where saltwater intrusion is a continuing problem.[310]

C. Minimum Flows and Levels

One of the most important sections of the Water Resources Act requires DER or the water management districts to establish minimum flows for all surface watercourses,[311] and minimum levels for all aquifers and lakes.[312] Minimum flows must be set at the limit at which

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[307] Phone interview with Doug Barr, Northwest Florida Water Management District (August 1991). Lake Seminole, part of the Chattahoochee/Apalachicola River system which borders Jackson County, is not a source of significant surface water withdrawal for the county.

[308] *Id.* at 9.

[309] "District Water Management Plan: Plan of Study," 10, Northwest Florida Water Management District (1989).

[310] FLA. ADMIN. CODE Rule 40A-2.802 (April 1991).

[311] FLA. STAT. § 373.042(1) (1989).

[312] FLA. STAT. § 373.042(2) (1989).

further withdrawals would be significantly harmful to the water resources or ecology of the area.[313] Minimum levels are those groundwater and surface water levels at which further withdrawals would be significantly harmful to the water resources of the area.[314] Calculations of minimum flows and levels must be made using the best available information.[315]

The DER and water management districts must also consider, and may *at their discretion* provide for, the protection of nonconsumptive uses in the establishment of minimum flows and levels.[316] In this context, nonconsumptive uses include the instream and inplace water needs of estuarine fisheries habitat. The protection of such uses is crucial to the restoration and maintenance of Florida's fisheries, and should not be approached as a discretionary factor. Statutory changes mandating the protection of nonconsumptive uses related to minimum flows and levels would increase the likelihood of restoring and maintaining proper freshwater inflows to estuaries.

The State Water Policy section addressing minimum flows and levels requires that consideration be given to the protection of water resources, natural seasonal fluctuations in water flows or levels, and environmental values associated with coastal, estuarine, aquatic, and wetlands ecology, including:

(1) recreation in and on the water,
(2) fish and wildlife habitats and the passage of fish,
(3) estuarine resources,
(4) transfer of detrital material,
(5) maintenance of freshwater storage and supply,
(6) aesthetic and scenic attributes,
(7) filtration and absorption of nutrients and other pollutants,
(8) sediment loads,
(9) water quality, and
(10) navigation.[317]

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[313] FLA. STAT. § 373.042(1) (1989).

[314] FLA. STAT. § 373.042(2) (1989).

[315] FLA. STAT. § 373.042 (1989).

[316] *Id.*

[317] FLA. ADMIN. CODE Rule 17-40.405(1) (February 1991).

Where minimum flows and levels are established, they must be considered in the construction and operation of water resource projects[318] and works of the district,[319] and the permitting of consumptive uses and management and storage of surface waters.[320] Importantly, minimum flows and levels must also be considered in the declaration of water shortages, and the procedures followed in responding to water shortages.[321] Since estuarine fisheries are much more sensitive to salinity changes during the dry season, it is crucial that dry season minimum flows be established that reflect their relative importance to fisheries, and that such instream and inplace needs be more seriously considered in determining when the restrictions associated with water shortage declarations will be necessary to help preserve proper salinity regimes in an estuary.

The districts have addressed these requirements to varying degrees, depending on the numbers of surface water withdrawals in the district, the relationship between groundwater withdrawals and surface water flows, population pressures, amount of estuarine acreage and numbers of rivers and creeks, pressures on the fisheries, and funding capabilities. Generally, there is a need to increase the amounts of research being devoted to nonconsumptive minimum flow values, and to incorporate the findings into the districts' permitting processes at every level.

1. Southwest Florida Water Management District

The Southwest Florida Water Management District is one of two districts to have adopted minimum *levels* in its rules at present.[322] An approach to establishing minimum *flows* for planning purposes is utilized at the staff level, but it has not been formally adopted, nor have regulatory minimum flows been established using the approach. Data sources for the

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[318] FLA. ADMIN. CODE Rule 17-40.405(2)(a) (February 1991).

[319] FLA. ADMIN. CODE Rule 17-40.405(2)(b) (February 1991).

[320] FLA. ADMIN. CODE Rule 17-40.405(2)(b) (February 1991).

[321] FLA. ADMIN. CODE Rule 17-40.405(2)(c) (February 1991). *See*, FLA. STAT. § 373.246 (1989) for water shortage plan requirements, and FLA. STAT. § 373.175 for procedures applicable to declaration of water shortages or emergencies.

[322] *See* FLA. ADMIN. CODE Rule 40D-8 (March 1991). South Florida Water Management District has also established certain minimum flows and levels. *See infra*, notes 332-336, and accompanying text.

establishment of flows and levels include technical publications, topographic maps, USGS reports, aerial mapping, hydrographs, bottom contour maps, stage-duration curves, precipitation data, and field investigation of marks and vegetation. For many lakes and impoundments with water control structures, the district has established non-regulatory operating levels which include a "high operating level" and a "low operating level," and a prescribed schedule for operation of such lakes and impoundments, including time sequences.[323]

For those lakes and other impoundments which have been addressed, regulatory minimum levels include a low management level and an extreme low management level.[324] The low management level is intended to be the applicable minimum water level on that lake or impoundment until four consecutive years pass without a natural fluctuation to the extreme low management level. At that point, the extreme low management level becomes the applicable minimum water level until the actual water level recedes to or below the extreme low management level. When that occurs, the minimum water level is reset to the low management level, and the cycle continues.[325] The approach is intended to allow fluctuations necessary for the preservation of natural resources, fish and wildlife, and for the protection of nonconsumptive uses.[326]

In the mid-1970s, the district adopted a rule addressing the process for setting minimum flows, though it has not used the rule to establish regulatory flows for any watercourses. Under

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[323] FLA. ADMIN. CODE Rule 40D-8.621 (February 1988). Both levels are set by the governing board, considering public testimony and best surface water management practices in the design, construction, operation and maintenance of structures or devices. "Best surface water management practices" require consideration and evaluation of long- and short-term effects of the activity on water resources, based on (a) conservation and proper utilization of surface water, (b) prevention of damage from floods, soil erosion, and excessive drainage, (c) preservation of natural resources, fish, and wildlife, (d) storage for aquifer recharge, and (e) non-consumptive uses, including, but not limited to, navigation, recreation, and aesthetics. FLA. ADMIN. CODE Rule 40D-8.021 (February 1988).

[324] FLA. ADMIN. CODE Rule 40D-8.605 (February 1988); *see also*, FLA. ADMIN. CODE Rule 40D-8.624 for listing of ten year flood warning levels, minimum flood levels and minimum water levels for many lakes and impoundments in the district.

[325] FLA. ADMIN. CODE Rule 40D-8.605(2) (February 1988).

[326] FLA. ADMIN. CODE Rule 40D-8.605(1) (February 1988).

this process, unless otherwise deemed appropriate by the board, minimum rates of flow on streams and other watercourses would be established for each month of the year. For each month of the year, the five lowest monthly mean discharges for the preceding twenty years are averaged. The minimum rates of flow for streams and watercourses are established as 70% of those values for the four wettest months (July through October), and 90% of those values for the remaining eight months.[327]

The older approach has been largely abandoned, and based on more recent hydrological and biological studies on the Peace River and the South Prong of the Alafia River, the district has taken a new approach to minimum flows. For resource planning purposes and as a general guideline in the permitting process, minimum flow is now established at the 90 percent exceedance flow (the level of streamflow which has been exceeded 90 percent of the time for the period of record), or at 10 cubic feet per second (cfs), whichever is greater.[328] The only specific exception to this approach is on the Peace River, at the General Development Utilities withdrawal, where regulatory minimum flows have been established seasonally at 100 to 130 cfs.[329] Though its studies indicate that this approach protects freshwater inflows to estuaries, the district recognizes that optimally, selection of minimum flows should be done using site specific information for each stream. There is no specific program for restoring historic optimal flows to estuaries, based on conditions existing prior to large scale water development projects.

2. South Florida Water Management District

In its technical criteria manual, "Basis of Review for Water Use Permit Application" (September 1989), incorporated by reference in its permitting rules, the district recognizes that certain withdrawals will be subject to limitations because of minimum surface or groundwater levels defined in district rules, operation schedules, management plans, or prior district

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[327] FLA. ADMIN. CODE Rule 40D-8.041(2) (1989).

[328] WATER SUPPLY NEEDS & SOURCES: 1990--2020 (DRAFT), 241-242, Southwest Florida Water Management District (April 29, 1991).

[329] *Id.* The two streamflow levels have been exceeded about 92 percent and 88 percent of the time, respectively, at a nearby gaging site.

permits.[330] According to the manual section, the geographic coverage of these levels can vary, and will change as new permits are issued and old permits cancelled.[331]

The district has established minimum flows and levels for certain lakes, creeks and canals in the Lake Istokpoga/Indian Prairie Area, and the St. Lucie County Agricultural Area.[332] These include minimum levels for Lake Istokpoga and sections of several canals in the Agricultural Area, and minimum flows for several canals in the Indian Prairie Basin, Arbuckle Creek, Josephine Creek and several water control structures in the Agricultural Area.[333] The rule states that the restrictions on water use associated with levels and flows in the Lake Istokpoga/Indian Prairie are established to assure that water resources within that Area will not suffer serious harm.[334] Though the district's water shortage plan[335] includes consideration of "irreversible adverse impacts on fish and wildlife" in its evaluation of serious harm to water resources,[336] it is not clear that prevention of such impacts is a primary goal of these levels and flows. The rule section addressed to the St. Lucie County Agricultural Area does not include any goals or purposes behind the establishment of levels and flows.

Most of the district's research efforts in this area address the need to set minimum aquifer levels, in order to adequately protect a crucial source of drinking water from excessive consumptive use.[337] At present, three estuarine systems are being studied, with one goal being to define the biologically based freshwater needs of the estuaries. The Loxahatchee estuarine system study is scheduled for completion by January of 1992. The approximate completion date

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[330] Section 3.2.1.1.8, BASIS OF REVIEW FOR WATER USE PERMIT APPLICATION, A-17, South Florida Water Management District (September 1989).

[331] *Id.*

[332] *See* FLA. ADMIN. CODE Rule 40E-22 (1989).

[333] *Id.*

[334] FLA. ADMIN. CODE Rule 40E-22.132(1) (1989).

[335] FLA. ADMIN. CODE Rule 40E-21 (1989).

[336] FLA. ADMIN. CODE Rule 40E-21.221(3)(c)2 (February 1991).

[337] Phone interview with Dan Haunert, South Florida Water Management District (August 1991).

for a study of the St. Lucie estuary will be May of 1992, while a study of the Caloosahatchee/San Carlos Bay system will not be completed until approximately August of 1992.[338] It is anticipated that eventually, these studies may become part of the district's water use planning process, and be translated into minimum flows and levels for use in consumptive use permitting conditions, though there is no schedule or plan of study for the process.[339]

3. St. Johns River Water Management District

The district's course of research is designed to eventually result in a computer model which will help regulate the consumptive uses of water in relation to the instream and inplace needs of lakes and rivers. The fresh water needs of estuarine systems are not being studied at present, though it is anticipated that the district will eventually include such considerations in its research program, and in its permitting criteria.[340] The district's research program recognizes the close relationship between groundwater levels and minimum surface water flows and levels in the St. Johns River district. One of the research strategies is to determine what aquifer levels are necessary to maintain environmentally sound surface water levels and flows. The research is ongoing, with no planned deadline, however if incorporated into the DWMP process, minimum flows addressing estuarine habitat should be adopted, at the latest, by November 1994.

The district has focused primarily on lakes, with newer riverine studies only developed within the past year. There are several sub-components to the research project, including: minimum flows and levels criteria development; lake analysis and characterization; stream analysis and characterization; and wetland functions and hydrology.[341] The purpose of the minimum flows and levels criteria development sub-component is to develop and test ecologically sound criteria on which minimum flows and levels can be determined for lotic (lake) and lentic

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[338] *Id.*

[339] A very tentative projected date for adoption of minimum flows and levels is the third quarter of 1992, according to staff. *Id.*

[340] Phone interview with Cliff Neubauer, St. Johns River Water Management District (August 1991).

[341] LOCAL GOVERNMENT TECHNICAL ASSISTANCE REPORT, 112, St. Johns River Water Management District, Technical Publication No. SJ 91-2 (June 1991).

(river) systems.[342] The purpose of the lake analysis and stream analysis sub-components is to collect physical, chemical and ecological data from several "classes" of lakes and streams, to be used in testing the criteria developed in the minimum flows and levels criteria development component.[343] For the wetland functions sub-component, a long term study site was established at Hopkins Prairie, in the Ocala National Forest, to investigate the effects of fluctuating water levels on wetland ecological functions.[344]

The stream analysis and characterization studies include data collection on: depths of streams at selected cross-sections, vegetation transects (with elevations) across wetlands adjacent to streams and rivers, and water quality sampling.[345] The wetland functions and hydrology studies include: mapping of vegetation communities; determination of juvenile fish community composition; monitoring changes in water quality with changing hydrology; determining water quality and sediment nutrient interactions as a function of hydrology; determining the effects of wetland hydrology on macrophyte primary production and litter decomposition; and investigating changes in microinvertebrate populations with changing hydrology.[346]

Minimum levels for lakes and streams are to be subdivided into five categories, recognizing the need of such systems to fluctuate in order to maintain ecological health. A "minimum infrequent low surface water level (or flow)" is the lowest level to which a lake will be allowed to fall, before curtailing all withdrawals. It is an acutely low water level or flow which may occur during periods of extreme drought and below which there will be a significant negative impact on the biota of the surface water and associated wetland systems.[347]

The "minimum frequent low surface water level (or flow)" is a level at which there will be some ecological impacts to the system, such as those from boat props and canoe paddles

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[342] *Id.*

[343] *Id.*

[344] *Id.*

[345] *Id.*

[346] *Id.*

[347] *Id.* at 115.

destroying emergent vegetation and at which voluntary restrictions on water use would be encouraged. This is a chronically low water level or flow that is normally expected to be exceeded except during periods of reduced rainfall such that the following will not be deleteriously affected: composition and structure of floodplain soils, species composition and structure of floodplain and instream biotic communities, and the linkage of aquatic and floodplain food webs.[348]

As a surface water level starts declining from the frequent towards the infrequent minimum low level, a four-step series of phased water restrictions will be applied, based on 30-day mean levels and flows. Under this amendment to the district water shortage plan, a phase 1 reduction will cut overall water use in the basin by 15%, phase 2 by 30%, and phase 3 by 45%, while a phase 4 reduction will cut water use by 60%.[349] The minimum frequent low surface water level (or flow), minimum infrequent low surface water level (or flow), and the four intermediate levels for the district water shortage plan are regulatory levels, since the district takes specific actions when the levels are reached.

The level or flow around which a system is designed to fluctuate will be known as the "minimum average surface water level (or flow)" though the term is not meant to imply an averaging of water levels. It is the minimum water level or flow necessary over a long period for maintenance of the integrity of hydric soils and wetland plant communities.[350] On the high side of this level will be two additional management levels, which the system occasionally should be allowed to reach to prevent significant ecological harm from occurring.[351]

The "minimum frequent high surface water level (or flow)" is a chronically high water level (or flow) expected to be reached or exceeded approximately annually that allows the following to occur: inundation of the floodplain at a depth and duration sufficient for maintenance of wetland vegetation and soils, linkage of aquatic and floodplain food chains, and fish spawning

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[348] *Id.*

[349] Phone interview with Cliff Neubauer, St. Johns River Water Management District (August 1991).

[350] LOCAL GOVERNMENT TECHNICAL ASSISTANCE REPORT, 115, St. Johns River Water Management District, Technical Publication No. SJ 91-2 (June 1991).

[351] *Id.* at 115.

on the floodplain.[352] The "minimum infrequent high surface water level (or flow)" is an acutely high water level (or flow) expected to be reached during or immediately after periods of high rainfall with a frequency, no less than nor significantly greater than that prescribed, such that the following processes can occur: inundation of a floodplain at a depth and duration sufficient for the maintenance of biota; the exchange of nutrients and detrital material; the dispersal of plant seeds and propagules; and the passage of aquatic organisms onto and throughout the wetlands of the floodplain.[353]

4. Suwannee River Water Management District

The Suwannee River district has not established minimum flows or levels for rivers or estuaries within its jurisdiction. The 1989 plan of study for the district's DWMP is organized into three major issue areas, including: water resources availability, water use, and water resources allocation and management.[354] One of the projects in the water use issue is a natural system water needs assessment, which states that understanding the water needs of natural systems is critical to the maintenance of healthy river, lake and estuarine systems.[355] As explained in the project description: "An understanding of the ecology of the Suwannee River estuary and the ecological roles played by the freshwater discharge from the river will be an important component of the minimum flows and levels determinations."[356] The project's activity schedule requires that recommendations on water requirements of natural systems be made in conjunction with minimum flows and levels criteria, and be submitted for approval in the first quarter of fiscal year 1992-93.[357]

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[352] *Id.* at 114-115.

[353] *Id.* at 114.

[354] "Plan of Study for the Suwannee River Water Management District Water Management Plan," 5, Suwannee River Water Management District, Live Oak, Florida (1989). A revised plan of study is scheduled for adoption in October, 1991.

[355] *Id.* at 11.

[356] *Id.*

[357] *Id.* at 12.

The resource allocation and management issue of the plan of study includes a water use permitting project, which recognizes that a review of district rules will be needed to assess the need for additional policies regarding transfer of water from one district to another and that these policies must reflect minimum flows and levels standards when available.[358] The concern addressed in this section is that, as the consumptive water needs of other districts increase, relatively untapped waterbodies in the Suwannee River district will be seen as potentially productive sources of potable water, with less consideration for the instream and inplace needs of fish and wildlife. The Suwannee River estuary, particularly, supports an important oyster fishery which would be subject to severe disruption if adequate freshwater inflows were not maintained.

As stated in the project description, the standards for minimum flows and levels should establish a point beyond which the district will not allow a reduction in the flow of a stream or river or in the level of an aquifer that would result in permanent harm to water and related resources.[359] Based on natural resource and economic considerations, the governing board is scheduled to determine the criteria for levels and flows during the first quarter of fiscal year 1992-93, and adopt minimum flows and levels standards during the fourth quarter of the same fiscal year.[360] It is not clear that funding will be available to properly carry out and complete the necessary research on this schedule. To assure the consideration of habitat values in setting minimum levels and flows criteria, the instream and inplace needs of the district's estuarine dependent fisheries should be specifically included in the process.

5. Northwest Florida Water Management District

The Northwest Florida district has not established an approach to setting minimum flows and levels, nor has it adopted regulatory flows or levels in its rules. As with many of its research agendas, the district is limited to a certain extent by funding restrictions. There are several estuarine systems in the district for which the establishment of minimum flows will be necessary in order to properly address the permitting of consumptive uses and surface water management systems.

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[358] *Id.* at 12.

[359] *Id.* Recent drought conditions have given staff the opportunity to gather data on low flow conditions applicable to the Suwannee River and its estuary.

[360] *Id.* at 12-13.

The district will be addressing the freshwater inflow needs of the Apalachicola River and estuary as part of its contribution to a comprehensive interstate study of the Apalachicola/ Chattahoochee/Flint River system.[361] Funding for the project will be shared by the district and the Army Corps of Engineers. A biological component of the study will establish the salinity ranges necessary to reduce predation and favor oyster productivity, while hydrodynamic modelling will be used to determine freshwater inflow requirements consistent with maintaining the salinity ranges.[362]

Growing pressures on riverine and estuarine systems in the Northwest Florida district make it necessary that research programs be funded and completed in the near future, in order to establish freshwater inflow needs and protect the fishery habitat values of those systems.

D. Groundwater Basin Resource Availability Inventories

Section 373.0395 of the Act requires the water management districts to develop groundwater basin resource availability inventories, covering those areas deemed appropriate by the governing board. The inventory must include, but is not limited to the following:

(1) a hydrogeologic study to define the groundwater basin and its associated recharge areas,

(2) site specific areas in the basin considered prone to contamination or overdraft from current or projected development,

(3) prime groundwater recharge areas,

(4) criteria to establish minimum seasonal surface and groundwater levels,

(5) areas suitable for future water resource development within the basin,

(6) existing sources of wastewater discharge suitable for reuse as well as the feasibility of integrating coastal wellfields,

(7) potential quantities of water available for consumptive uses.[363]

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[361] The district study is being included in the 1991-92 fiscal year SWIM planning budget.

[362] APALACHICOLA BAY FRESHWATER NEEDS ASSESSMENT: SCOPE OF WORK, 2, 16, Northwest Florida Water Management District (January 1991).

[363] FLA. STAT. § 373.0395 (1989).

Copies of the completed inventories must be submitted to each affected local government and regional planning council, to be reviewed for consistency with local comprehensive plans. The information must be considered in future revisions of comprehensive plans.[364] As defined, the required categories of information do not directly contemplate consideration of minimum flows and freshwater needs of habitat, though several would allow such concerns to be addressed. Research required to complete these inventories is being incorporated into the district water management planning process, and the water supply needs and sources analysis.

E. Planning for Water Supply Needs

Section 373.1961 of the Act requires districts to "engage in planning" to assist local governments and regional water supply authorities in meeting water supply needs, with priority given to encouraging conservation and reducing adverse environmental effects of improper or excessive withdrawals.[365] The districts are addressing this requirement under the auspices of the needs and sources technical research being performed for district water management plans.[366]

F. Technical Assistance to Local Governments

By July 1, 1991, the districts are required to have prepared and disseminated extensive amounts of technical information to local governments for use in the preparation, implementation and revision of local comprehensive plans.[367] Among the required types of information and data are included:

> (1) information reflecting the minimum flows for surface watercourses to avoid harm to water resources or the ecosystem and information reflecting the minimum water levels for aquifers to avoid harm to water resources or the ecosystem,
>
> (2) a description of regulations, programs, and schedules implemented by the district,
>
> (3) identification of regulations, programs, and schedules undertaken or proposed by the district to further the State Comprehensive Plan,

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[364] *Id.* The revision process for local comprehensive plans in Florida occurs every five years, on a phased basis, with the first set of revised plans due in 1993.

[365] FLA. STAT. § 373.1961(1) (1989).

[366] *See supra*, notes 244-310, and accompanying text.

[367] 373.0391(2)

(4) a description of surface water basins, including regulatory jurisdictions, flood-prone areas, existing and projected water quality in district operated facilities, surface water runoff characteristics and topography regarding floodplains, wetlands and recharge areas,

(5) a description of groundwater characteristics, including existing and planned wellfield sites, existing and anticipated cones of influence, highly productive groundwater areas, aquifer recharge areas, deep well injection zones, contaminated areas, assessment of regional water resource needs and sources for the next twenty years, and water quality.[368]

All water management districts are providing the required information to local governments as that information is developed and analyzed. To varying degrees, the Southwest Florida, South Florida and St. Johns River districts have performed technical studies to establish minimum flows and levels as of this writing.[369]

Due primarily to budgetary constraints, the Suwannee River and Northwest Florida districts have not progressed as far in their research programs to establish minimum flows. The Suwannee River district DWMP activity schedule requires that minimum flows and levels criteria include recommendations on the water requirements of natural systems, and be submitted for approval in the first quarter of fiscal year 1992-93.[370] The Northwest Florida district has begun some preliminary hydrodynamic modeling and data analysis related to inflows to the Apalachicoloa Bay estuary, though planned research on other estuarine systems is tentative.

V. Surface Water Improvement and Management Plans

The Surface Water Improvement and Management Act[371] was adopted in 1987 to help address several problems associated with the state's surface waters. Among the many functions of surface waters recognized by the Act are included: (a) providing aesthetic and recreational pleasure, (b) providing habitat for native plants, fish, and wildlife, including endangered and

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[368] FLA. STAT. § 373.0391(2) (1989).

[369] *See, e.g.*, LOCAL GOVERNMENT TECHNICAL ASSISTANCE REPORT, St. Johns River Water Management District, Technical Publication No. SJ 91-2 (July 1991).

[370] "Plan of Study for the Suwannee River Water Management District Water Management Plan," 12, Suwannee River Water Management District, Live Oak, Florida (1989).

[371] FLA. STAT. §§ 373.451--373.4595 (1989).

threatened species, (c) providing safe drinking water, and (d) attracting visitors and accruing other economic benefits.[372] Factors contributing to the decline in these values include point and nonpoint sources of pollution, and destruction of the natural systems which purify surface waters and provide habitat.[373]

The Act requires the water management districts to develop prioritized lists of water bodies in need of restoration or protection, with the highest needs for water quality restoration. Criteria for evaluating waterbodies include consideration of water quality standards violations, nutrients entering the waterbody and its trophic state, existence or need for aquatic weed control, biological condition of the waterbody, reduced fish and wildlife values, and threats to public water supplies.[374]

Once priority lists are established and approved by the DER, the districts are required to develop surface water improvement and management (SWIM) plans for each listed waterbody. The plans must include a wide range of information involving:

(a) the history and hydrology of the waterbody,
(b) applicable regulatory jurisdictions,
(c) land uses within the drainage basin and those of important tributaries,
(d) a list of pollution sources and their owners,
(e) a description of the existing and potential strategies for restoring or protecting the waterbody to Class III standards or better,
(f) listings of existing and planned studies of the waterbody,
(g) the research and feasibility studies to be performed to determine the necessary restoration strategies,

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[372] FLA. STAT. § 373.451(2) (1989).

[373] FLA. STAT. § 373.451(4) (1989).

[374] FLA. STAT. § 373.453(1)(b) (1989). *See also*, FLA. ADMIN. CODE Rule 17-43.030 (May 1990). Criteria used in preparing the lists include: (a) the degree to which water quality standards are violated, (b) the nature and extent of the conditions adversely affecting the waterbody, including biological and physical conditions, and reduced fish and wildlife values, (c) threats to water supplies, particularly agricultural and urban supplies, and recreational opportunities, (d) threats to or need for protection of exceptional or outstanding waterbodies which are currently in good condition, (e) extent to which local plans, ordinances and policies are consistent with the district's efforts to restore or protect the waterbody, (f) feasibility of monitoring the success of restoration or protection efforts, and (g) economic and environmental feasibility of accomplishing the restoration or protection goals. FLA. ADMIN. CODE Rule 17-43.030(1) (May 1990).

(h) measures needed to manage and maintain the waterbody once it has been restored,
(i) a schedule for restoration and protection of the waterbody, and
(j) estimates of the funding needed to carry out restoration or protection strategies.[375]

Before presentation to the water management district governing board for approval, a proposed SWIM plan must be submitted to the DER, the Department of Agriculture and Consumer Services, the Department of Community Affairs, the Florida Game and Fresh Water Fish Commission, the Department of Natural Resources, and local governments.[376] After considering the comments and recommendations of these agencies and the public, the governing board must approve the plan and submit it to the DER for a final review, to assure consistency with the State Water Policy and the State Comprehensive Plan. The changes which DER recommends in order to achieve consistency may or may not be adopted by the governing board. If they are adopted, the district must publish notice of adoption of the approved plan. If the recommendations are not adopted, the plan must state the reasons for not adopting them.[377] Plans must be updated every three years.[378]

Water quantity and timing issues are not specifically addressed in the Act, however evaluations of the nature and extent of conditions adversely affecting the waterbody must include consideration of its biological condition, physical conditions, and reduced fish and wildlife values,[379] which in turn are affected by the location, quantity and timing of freshwater flow. Freshwater inflows are closely related to issues of water quality, point and nonpoint source pollution, nutrient inflows and trophic states, all of which are essential components of healthy estuarine habitat.[380] There are also questions involving the potential treatment of an imbalanced

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[375] FLA. STAT. § 373.453(2) (1989). *See also*, FLA. ADMIN. CODE Rule 17-43.035 (May 1990) (including the requirement for a listing and current status of active restoration or protection projects for the waterbody).

[376] FLA. STAT. § 373.455 (1989).

[377] FLA. STAT. § 373.456(5)(b) (1989); FLA. ADMIN. CODE Rule 17-43.035 (May 1990).

[378] FLA. ADMIN. CODE Rule 17-43.035(5) (May 1990).

[379] FLA. ADMIN. CODE Rule 17-43.030(1)(c) (May 1990).

[380] *See* FLA. ADMIN. CODE Rule 17-43.030(1)(a), (b) (May 1990).

salinity regime as a water quality issue to be addressed because of its effect on fish and wildlife values.

In some cases, the districts have included consideration of freshwater inflow timing, quantity and distribution in the SWIM planning process for estuarine systems. Some plans discuss the importance of such factors, yet fail to include specific projects addressing the factors, or fail to provide adequate funding for the completion of such projects. In other plans, freshwater inflow timing and quantity are not discussed, though this may be because the issue is not considered important for the estuary at present. Statutory and regulatory amendments should require that such factors be considered, since they promote the legislative intent to provide habitat for native plants, fish, and wildlife, prevent destruction of the natural systems which provide habitat, and maintain the biological health of the estuary. Additionally, estuarine systems should be carefully considered for higher priority treatment under the Act, with all estuaries eventually included in the SWIM planning process.

Funding is a critical component of the process by which problems are studied and rectified. State and water management district commitment to restoring and maintaining proper freshwater inflow to estuaries must be expressed in the level of financial support provided for inflow related projects. The Florida legislature recently changed the percentage of matching funds required from the water management districts for projects funded out of the Surface Water Improvement and Management Trust Fund. The former percentage of required match was 20% for the districts, with the DER funding 80% for such projects.[381] As of July 1, 1991, the percentage of required match from the districts is 40%, with the DER funding 60% of the total.[382] The increase in required matching funds will be a significant burden on the districts. The two districts with less ability to raise revenue, the Northwest Florida district and the Suwannee River district, will be effectively prohibited from planning or completing projects that require higher amounts of funding, even if those projects are necessary to understanding and correcting essential problems identified in SWIM plans.

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[381] FLA. STAT. § 373.459 (1989); FLA. ADMIN. CODE Rule 17-43.060 (May 1990).

[382] 1991 Fla. Laws 79, § 14. (to be codified at FLA. STAT. § 373.459).

A. Southwest Florida Water Management District

The district currently has eight waterbodies on its ranked priority list, with Tampa Bay and Charlotte Harbor/Placida Harbor as the only two estuaries.[383] The **Charlotte Harbor/Placida Harbor** SWIM plan is currently being researched and written. According to staff, it is close to final draft form, and is expected to be submitted for approval in November 1991.

Tampa Bay, the state's largest open water estuary,[384] is the number one priority for the district.[385] The **Tampa Bay** SWIM plan covers a large area including the estuary and its watershed. Coverage extends from the barrier beaches of Boca Ciega Bay and Anna Maria Sound to upland areas where freshwater vegetation predominates.[386] As defined, the estuary encompasses a 398 square mile area of open water and surrounding wetlands.[387] The defined watershed area includes most rivers and tributaries feeding into Tampa Bay: the Hillsborough, Alafia, Little Manatee, Manatee, and Braden rivers; Bullfrog Creek; Lake Tarpon and Lake Seminole.[388] The plan states that the most critical use of Tampa Bay is as a protected nursery for more 270 species of fish.[389] The great variety of species is due in part to the salinity regime of the bay.[390] The plan also recognizes that freshwater flows from the rivers and tributaries contribute to salinity balances which are vital to bay plants, fish, and animals.[391]

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[383] Other listed waterbodies include Rainbow River (Blue Run), Banana Lake, Crystal River/Kings Bay, Lake Panasoffkee, Lake Tarpon, and Lake Thonotasassa.

[384] TAMPA BAY SWIM PLAN, 10, Southwest Florida Water Management District (1988)

[385] *Id.*

[386] *Id.* at 5.

[387] *Id.*

[388] *Id.* at 6.

[389] *Id.* at 22.

[390] *Id.*

[391] *Id.* at 27.

Residential development along the rivers and tributaries is a major threat to the habitat of estuarine species.[392] As residential development along the rivers and tributaries increases, the freshwater flows into the bay carry increased pollutants caused by the development. Existing habitats are lost by dredging and filling required to development the property.[393] Moreover, the damming of freshwater flows in order to meet consumptive use needs of the communities creates imbalances in salinity regimes and changes in natural water levels which are necessary for the development of many estuarine species.[394]

As presented in the district's Tampa Bay SWIM plan, there are three major goals for the bay:

(1) to reverse the environmental degradation of the Tampa Bay estuarine system,

(2) to optimize water quality and other habitat values, thereby promoting the sustained existence or re-establishment of thriving, integrated biological communities, and

(3) to insure the maintenance ad infinitum of a productive, balanced ecosystem complementary with human needs and uses of the resource.[395]

Eighteen priority programs have been targeted to address these goals. One of the programs is the protection and restoration of freshwater flows.[396] The program aims at characterization of existing flows and protection of natural inflows, and suggests establishment of criteria for optimum flows, based on instream and estuarine effects.[397]

A list of priority projects were developed to meet the aims of the priority programs. Among the priority projects is one for the development of a predictive model of ecosystem functions and responses to changes within the estuary.[398] Such a project provides no immediate

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[392] *Id.*

[393] *Id.*

[394] *Id.*

[395] *Id.* at 45.

[396] *Id.* at 64.

[397] *Id.* at 55.

[398] *Id.* at 84.

protection of natural inflows essential to the growth and propagation of estuarine species, but may provide a foundation for setting minimum flows that will be adequate to protect the ecosystem in the future. Other priority projects will focus on restoration of habitat,[399] reduction of agricultural contaminants in stormwater runoff,[400] and the development of model ordinances to promote establishment of a productive ecosystem.[401]

As a complement to the modeling project, several short-term research projects will be conducted to address questions related to species of plants, fish, and animals indigenous to the bay's ecosystem.[402] The studies will look at the specific needs of certain species as well as the success of restoration projects, and will analyze the distribution of wildlife and use of habitat throughout the study area. The Tampa Bay SWIM plan which was published in 1988 is currently being revised as required by the Act,[403] and will be submitted for adoption in December 1991. It is anticipated that the revised plan will be substantially similar to the original 1988 plan, but will provide a progress report on each of the priority projects.

B. South Florida Water Management District

The district has prepared SWIM plans for three important estuaries: the Indian River Lagoon, Biscayne Bay, and that section of the Everglades plan which includes Florida Bay. The **Indian River Lagoon** SWIM plan was developed in cooperation with the St. Johns River Water Management District, which shares jurisdiction over the lagoon with the South Florida district. The plan is addressed below under the discussion of SWIM plans prepared by the St. Johns River district.

An extensive system of barrier islands and bays lines coastal Dade County, including Biscayne Bay. Originally, freshwater entered these bays as groundwater seepage, sheetflow across adjacent marshlands, and from a series of small rivers that cut through the coastal ridge, draining the Everglades. There have been drastic alterations in the quantities, distribution and

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[399] *Id.* at 75.

[400] *Id.* at 77.

[401] *Id.* at 80.

[402] *Id.* at 83.

[403] FLA. ADMIN. CODE Rule 17-43.035(5) (May 1990).

timing of inflows to the estuaries, with most freshwater inflow concentrated at the mouths of canals, containing nutrients and other contaminants from urban and agricultural drainage. Pulses of stormwater drainage seriously stress aquatic communities during wet periods.

The area covered by the **Biscayne Bay** SWIM plan extends south from Dumfoundling Bay to the A1A causeway across Barnes Sound. The area includes the intracoastal waterway north to the Broward County line and is bounded on the west by the L-30, L-31 and C-111 canal/levee systems.[404] Freshwater enters the bay through canals, rivers, tributaries and groundwater seepage.[405]

The plan is organized around three groups of issues: those affecting the entire bay, those related to specific areas of the bay, and those specified in the SWIM legislation and DER rule on SWIM plans.[406] Freshwater flows[407] and habitat resources[408] are recognized as bay-wide concerns. Salinity balance related to the alteration of freshwater flows is also recognized as a specific problem in the South Bay,[409] Card Sound and Barnes Sound[410] segments of the study area.

Before the construction of a series of drainage canals in 1932, freshwater entered the bay through sheets of upland runoff and groundwater seepage.[411] Since the installation of the canals, freshwater is collected and channeled out to the Bay when water levels in the canals reach certain stages.[412] The use of canals as a water management tool has resulted in an alteration of

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[404] SURFACE WATER IMPROVEMENT AND MANAGEMENT (SWIM) PLAN FOR BISCAYNE BAY, 4, South Florida Water Management District (1989).

[405] *Id.* at 8.

[406] *Id.* at 40.

[407] *Id.* at 44.

[408] *Id.* at 45.

[409] *Id.* at 61.

[410] *Id.* at 62.

[411] *Id.* at 44.

[412] *Id.* at 45.

natural hydroperiods in coastal areas. The canal discharge releases freshwater at varying intervals which often do not coincide with the natural hydroperiods. Further, the channelized releases dump large volumes of freshwater in localized areas, causing tremendous reduction in salinity levels at the discharge points. Conversely, salinity levels rise where sheet flow is collected before it reaches the bay and is diverted into drainage canals.

The alteration of quantity and timing of freshwater inflow has had serious impacts on the estuarine communities that require regular seasonal low-salinity levels for growth and development. Though the inflow transports nutrients and detritus from adjacent marshes and uplands into the bay, the rapid reduction in salinity during periods of discharge from the canals destroys marine communities. Yet the reduction is not sustained a sufficient amount of time for estuarine communities to be established based on those salinity levels.[413] The alteration also impacts marshlands and mangroves which provide valuable habitat for invertebrates, juvenile fishes, birds and animals. The mangroves act as a filter for upland runoff and provide nutrients as freshwater flows flush detritus from the mangroves into the bay. The channeling of freshwater flows into canals reduces the effectiveness of the mangroves as natural filters and causes loss of habitat.[414] Marshlands along the shore of the Bay provide habitat for freshwater species. As natural freshwater flows have been diverted through the canals, salt water has intruded farther into shorelines allowing saline vegetation to replace freshwater plants.[415]

Specific problems identified in the South Bay section of the study area include the interruption of sheet flow to the wetland fringe as well as the impacts from the periodic releases of freshwater from the canals.[416] The primary problem in the Card Sound and Barnes Sound area is the occurrence of hypersaline conditions due to reduced circulation and flushing caused by diverted sheet flow. These areas serve as a nursery habitat for many estuarine species.

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[413] *Id.* at 46.

[414] *Id.* at 50.

[415] *Id.* at 51.

[416] The South Bay section of the study area extends from Rickenbacker Causeway south to Arsenicker Key. *Id.* at 61.

Moreover, Card Sound and Barnes Sound are critical habitats for a number of Florida's threatened and endangered species.[417]

The plan recommends management of canal flows and structural changes to the canal system to allow freshwater and sheet flows to occur which more closely approximate the natural hydroperiod.[418] Specific projects recommended to effect this goal include:

(1) Analysis of impacts of freshwater discharges from canals and mitigation of adverse impacts.

(2) Evaluation of methods to restore sheet flow to South Bay, Card Sound, and Barnes Sound areas.[419]

(3) Redistribution of canal discharges into adjacent marshlands in South Bay to improve flushing and restore natural salinity gradients in the coastal marshes.[420]

(4) Development and implementation of methods to restore wetland and upland habitats which may include restoring water flow through previously drained areas.[421]

(5) Inclusion of Barnes Sound in the existing Biscayne Bay/Card Sound Aquatic Preserve Area.[422]

The plan categorizes its priority efforts as: medium, high and very high. Ranked third on the Very High Priority list is the "protection of existing resources of South Bay, especially Biscayne National Park, Card Sound, Barnes Sound, including restoration of marshlands and development of a management plan for Card Sound and Barnes Sound."[423] Other Very High Priority efforts are retrofitting of stormwater systems, continuation and expansion of monitoring

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[417] *Id.* at 63.

[418] *Id.* at 47.

[419] *Id.* at 89.

[420] *Id.* at 47.

[421] *Id.* at 91.

[422] *Id.* at 93.

[423] *Id.* at 104.

programs, and development of a computerized land use database. The priority list does not indicate how these priorities correspond with proposed budgeted projects. For example, the management of canal discharges to improve the estuary on a baywide basis is not designated as a priority, yet canal discharge redistribution does appear as a proposed budgeted project.[424]

The proposed budget, which indicates the anticipated funding for specific projects, is not consistent with the emphasis placed on the protection and restoration of resources of South Bay, Card Sound, and Barnes Sound. No funding was proposed in the first two years for bay management programs except for a Miami River Committee project which is designated a medium priority effort.[425] Specific projects related to planning for bay preservation/restoration and management of Card Sound and Barnes Sound are among the least funded of all priority projects. The specific program to improve circulation and flushing was proposed to receive funding after the first year, but the total amount of the funding is less than half of the amount budgeted for other very high priority efforts.[426]

Florida Bay is a triangular, tropical lagoon/bay which occupies a shallow, rocky trough between the relic, exposed barrier reefs of the Florida Keys and a series of mangrove-lined bays and sounds at the southern end of the Florida peninsula.[427] Florida Bay is functionally a part of the Everglades system, and is addressed in the **Everglades** SWIM plan.[428] The eastern coastal edge of the planning area is the border between Barnes Sound (including Manatee Bay) and Card Sound. The western coastal edge lies just south of the 10,000 Islands area on Florida's lower Gulf Coast. Western portions of Florida Bay, particularly, are of vital importance to the survival of many fishery species, including snook, tarpon, redfish, pink shrimp, spotted seatrout and spiny

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[424] *Id.*

[425] *Id.*

[426] *Id.*

[427] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. III, (FINAL DRAFT), III-346, South Florida Water Management District (September 28, 1990).

[428] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. I, (FINAL DRAFT), I-5, 11, South Florida Water Management District (September 28, 1990).

lobster.[429] The Everglades SWIM plan covers a broad area of the state, as well as a large number of complex issues. The following discussion does not address all issues related to Florida Bay, but attempts to summarize the primary concerns and projects related to freshwater inflow.

The Everglades ecosystem originally covered approximately 4,000 square miles from Lake Okeechobee to the Gulf of Mexico. The area between Lake Okeechobee and Florida Bay included pond apple swamp, sawgrass swamp, wet prairies, sloughs, tree islands, emergent marshes, pine-forested uplands, hardwood hammocks and cypress swamps.[430] Water would generally flow southward in a continuous sheet from Lake Okeechobee, ultimately discharging into brackish estuaries which lay between the freshwater Everglades and the higher salinity waters of Florida Bay and the Gulf of Mexico.[431]

In the late nineteenth and early twentieth century private and public interests constructed canals designed to drain the Everglades, by moving water out of inland marshes, past coastal communities, to tidal waters.[432] During dry periods, the canals overdrained interior wetlands, causing extensive fires and coastal saltwater intrusion. The Central and Southern Florida Project for Flood Control and Other Purposes (C&SF Project) was constructed in the mid-twentieth century to improve flood control and water supply, correct hydrologic deficiencies, protect remaining wetlands and reduce saltwater intrusion.[433] Additions to the project have resulted in

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[429] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOLS. II, III, (FINAL DRAFT), II-65, III-369, 370, 371, South Florida Water Management District (September 28, 1990). There appears to be a strong positive relationship between quarterly landings of pink shrimp on the Tortugas fishing grounds and an index of freshwater levels discharged to Florida Bay during the previous quarter. Browder, J., *Relationship Between Pink Shrimp Production on the Tortugas Grounds and Water Flow Patterns in the Florida Everglades*, 37 BULL. MAR. SCI. 839-856 (1985).

[430] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. I, (FINAL DRAFT), I-7, South Florida Water Management District (September 28, 1990).

[431] *Id.* at I-5, 11.

[432] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL.II, (FINAL DRAFT), II-48, South Florida Water Management District (September 28, 1990).

[433] *Id.*

a complex, highly managed, artificial system of canals, impoundments, levees, pumps and water control structures.[434] The plan notes that operation of the C&SF Project to meet flood control and water supply needs has altered the timing, quantity and distribution of freshwater flows into the Water Conservation Areas (WCAs), Everglades National Park (ENP), and Florida Bay.[435]

Within Florida Bay, the most important environmental parameters are the quantity, quality, distribution and timing of freshwater runoff from the Florida mainland.[436] Generally, changes in coastal estuaries, including Florida Bay, are due in part to overall reductions in quantities of freshwater flow through the Everglades, effects of constructing levees and canals near the coast to provide drainage and flood protection (WCAs), and the problems with lower groundwater levels along the southeast coast. The primary freshwater source for Florida Bay is Taylor Slough, which receives its freshwater from local rainfall; overland sheet flow originating from the Shark River overflow and Tamiami Canal between levees 30 and 67A; and pump station S-332.[437] Since 1960, construction of the C-111 canal and increased development in the upland retention areas affecting Taylor Slough, such as the "Frog Pond," have slowly lowered freshwater discharges from the system.[438] The alteration of freshwater inflow from Shark River Slough to the ENP and Florida Bay is also implicated in the decline of fisheries in the Bay.[439]

The Everglades SWIM plan identifies central Florida Bay as one of several critical areas having known or potential water quality/quantity problems. In recent years, Manatee Bay, Barnes Sound, Card Sound and the central portions of Florida Bay have experienced hypersaline

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[434] *Id.*

[435] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. I, (FINAL DRAFT), I-11, South Florida Water Management District (September 28, 1990).

[436] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. III, (FINAL DRAFT), III-344, South Florida Water Management District (September 28, 1990).

[437] *Id.* at III-339.

[438] *Id.*

[439] *Id.* at III-378.

conditions resulting from reduced freshwater flow.[440] Seagrass and fish die-offs have been reported in Florida Bay as a result.[441] The plan includes four principal management areas, including the Water Conservation Areas (WCAs), Everglades National Park (ENP), the C-111 Basin, and Florida Bay.[442] Overall goals for the Florida Bay area are to "(p)rotect and improve natural surface water quality, quantity, distribution and timing of flows through ENP, C-111 and Florida Keys in order to maintain the ecosystem integrity and habitat diversity of Florida Bay."[443]

Three of the plan's seven sets of priority issues for the Everglades system have importance for the inflow needs of Florida Bay. These include: (1) water quantity, distribution and timing, (2) environmental resource management, and (3) water supply.[444] The following discussion addresses each of these priority issues. Regional management issues related to *water quantity, distribution and timing* recognize that the C&SF Project has altered necessary inflows to Florida Bay.[445] Under this category, specific issues with effects on Florida Bay include reduction of inflows, reduced variation of water levels, impacts of construction of canals, levees, and impoundments, regulation schedules and Everglades water resources, minimum deliveries, rainfall plans and baseflow requirements.[446] Florida Bay is also discussed under hydroperiod management issues. While water delivery plans based on rainfall patterns are effective in modifying wet season distribution of water supply, it is not known if such plans will provide

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[440] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. II, (FINAL DRAFT) II-50, South Florida Water Management District (September 28, 1990).

[441] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. III, (FINAL DRAFT), III-350, 356, South Florida Water Management District (September 28, 1990).

[442] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. I, (FINAL DRAFT), I-11, South Florida Water Management District (September 28, 1990).

[443] *Id.*

[444] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. II, (FINAL DRAFT), II-47, 63, South Florida Water Management District (September 28, 1990).

[445] *Id.* at II-48.

[446] *Id.* at II-48, 49, 50.

adequate baseflow conditions to meet requirements of Florida Bay, Whitewater Bay and other estuaries.[447]

Management options for water quantity, distribution and timing discuss the lack of information related to the water needs of the Everglades system. As a result, urban and agricultural areas generally have first priority for water management during flood or drought conditions.[448] The plan states that it "should *eventually* address the need for policies or strategies to allow for 'shared adversity' between human and natural needs when there is insufficient or surplus water."[449] Primary management options for restoring appropriate hydroperiod conditions are to implement structural changes or modifications to the WCA regulation schedules to provide for reflooding of overdrained wetlands, restore sheet flow and provide appropriate seasonal water level fluctuations to protect the integrity of tree islands and wetland systems.[450]

Regional management options for this issue include modifications of water management practices to maximize historical sheet flow characteristics within the WCA marshes where practical, instead of moving water rapidly through the system via canals. The intent would be to restore historical flow patterns, connections and circulation between upland marshes and downstream estuaries, "including restoration of natural flow conditions into ENP and Florida Bay through historic channels such as Taylor Slough and Shark River Slough."[451] Concern is also expressed that the C-111 Basin, which empties into Barnes Sound, is overdrained. In addition to options aimed at establishing minimum dry season water levels, the district, in conjunction with the U.S. Fish and Wildlife Service, has proposed to restore sheet flow of freshwater through marshes west of Highway U.S. 1 into Florida Bay, as part of the C-111 Basin interim plan.[452]

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[447] *Id.* at II-51.

[448] *Id.* at II-51, 52.

[449] *Id.* at II-52 (emphasis added).

[450] *Id.* at II-52.

[451] *Id.*

[452] *Id.* at II-53.

The plan identifies goals, objectives and strategies for addressing the issues in each management area. As mentioned above, the overall management goal for Florida Bay is to "(p)rotect and improve natural surface water quality, quantity, distribution and timing of flows through ENP, C-111 and Florida Keys in order to maintain the ecosystem integrity and habitat diversity of Florida Bay."[453] The regional goal, under the category of water quantity, distribution and timing, is to protect and restore natural functions of the system by constructing, modifying and operating water management facilities in a manner that will simulate natural hydrologic conditions to meet the needs of native ecosystems, including estuaries.[454] Objectives for water quantity, distribution and timing include: improve timing and distribution of flow; avoid unnatural hydroperiods, salinity fluctuations or discharges; restore sheet flow; protect adjacent wetlands, monitor and document hydroperiod impacts; and define historic and present flows.[455] Under these categories of objectives, there is a network of strategies that may have potential impacts on inflows to Florida Bay, and several are specific to the needs of the Bay. The first of these is to have the district, DNR, ENP and the Corps of Engineers (COE) work together to define the appropriate freshwater/salinity balance required to maintain optimal productivity and diversity of Barnes Sound and its estuaries, and to evaluate district operations and management methods to provide appropriate minimum, maximum and spatially-distributed patterns of water delivery.[456] Similarly, a second strategy is to have the district, DNR, and COE assess and develop operations and management methods to provide optimal water deliveries and maintain appropriate salinity balances and ranges to protect the productivity and diversity of Florida Bay.[457]

A third strategy is to have the district and COE consider operational and structural changes to facilities in order to restore more natural sheet flow into ENP and Northeast Shark

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[453] *Id.* at II-86.

[454] *Id.* at II-87.

[455] *Id.*

[456] *Id.* at II-88.

[457] *Id.*

River Slough, thus providing more flow to Taylor Slough.[458] A fourth is to have the district, National Park Service (NPS), DNR and Florida Game and Fresh Water Fish Commission (FGFWFC) develop and implement biological studies and monitoring programs to document responses of plant and animal communities to changes implemented in the physical delivery system.[459] The fifth strategy is to define Florida Bay hydrology, by developing and implementing data collection programs for parameters such as freshwater inflow, temperature, salinity, bathymetry, hydrodynamic relationships, water quality and impacts of district facilities.[460] Related to this is a sixth strategy, which is to have the district and NPS initiate a cooperative effort by 1996, for data collection and analysis to develop hydrologic and hydrodynamic models for the ENP/C-111/Florida Bay system. The intent would be to define the hydrologic needs of the southeastern panhandle of ENP and Manatee Bay, and determine the hydrologic interactions of the western C-111 basin, Barnes Sound and the ENP panhandle.[461]

Initial plan elements addressing water quantity, timing and distribution include three new programs for the C-111 basin: (1) spoil removal to improve sheet flow from the canal into the marshes of the Everglades panhandle and into Florida Bay; (2) the Taylor Slough rainfall project to assess the relationship between rainfall and pre-development runoff to Taylor Slough, in order to determine appropriate water supply to Taylor Slough from the C-111 basin; and (3) begin planning, design, and evaluation necessary to modify the C-111E canal and divert additional waters to lands already purchased under the Save Our Rivers (SOR) program. This would be a demonstration test for a comprehensive program to divert stormwater from C-111 and reduce direct discharges to Manatee Bay and Barnes Sound.[462] This set of projects was scheduled for funding during fiscal years 1992-94, with an assumption that the district would be responsible for 20% of the total. Recent changes in the SWIM project funding formula may result in less

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[458] *Id.* at II-89.

[459] *Id.*

[460] *Id.* at II-90.

[461] *Id.*

[462] *Id.* at II-115.

support for these projects, if available district funds are reallocated to cover what may be considered more important projects.

The second set of priority issues with implications for inflows to Florida Bay concerns environmental resource management. *Environmental resource management* issues include hydroperiod concerns, which recognize that changes in hydrology have impacted the natural growth and reproductive cycles of Everglades vegetation, fish and wildlife. The plan states that the impacts of water management activities in upper parts of the Everglades system on the extreme downstream reaches of Florida Bay are not presently known, and that changes in hydrology and the volume of freshwater inflows through ENP "have the potential" to affect critical salinity balances for estuarine organisms in Florida Bay.[463] The primary management option for this category of issues is to improve hydroperiod conditions and restore water quality, with regional options including structural or operational changes to restore overdrained or degraded wetland communities. One concern is how to achieve optimal habitat for one species without damaging or eliminating habitat for another.[464]

Environmental resource management goals and objectives include managing the WCAs to provide "adequate quantity and quality of water to maintain environmental values of downstream systems including ENP and coastal estuaries, to the extent these goals are compatible."[465] The objective most applicable to fisheries is to "maintain the spatial complexity, diversity and productivity of Everglades plant and animal communities."[466] Under this objective the most applicable strategy for saltwater fisheries is to restore, maintain or enhance healthy native sport fisheries and other animal populations in the Everglades. The district would pursue this by cooperating with the DNR and Marine Fisheries Commission, to develop and implement a saltwater fisheries resource management plan which would identify research and management needs. Research would be aimed at developing a detailed understanding of saltwater fisheries,

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[463] *Id.* at II-63, 64.

[464] *Id.* at II-67.

[465] *Id.* at II-96.

[466] *Id.*

particularly the relationship between nutrient cycling and the maintenance of appropriate benthic and planktonic communities necessary for the support of fisheries and fish communities.[467]

Under environmental resources, the SWIM plan identifies essentially one initial element related to estuarine resources. That project involves gathering data on salinity, water temperature, dissolved oxygen, pH and tide levels for Barnes Sound and Florida Bay. The information may be used to determine the relationship between operation of water control structures and salinities in Barnes Sound and Manatee Bay, for example.[468] Biological studies are also suggested to identify the impacts of water management on lower food chain organisms and prey availability in Florida Bay.[469] The estuarine investigations and assessments project is funded from fiscal years 1990-94, with an assumption that 72% of the funding will be available from SWIM funds and 2% from the ENP.[470] As with assumptions for water quantity and timing projects, recent changes in the SWIM project funding formula may result in less support for these projects, if available district funds are reallocated to cover what may be considered more important projects.

The last set of priority issues with implications for freshwater inflow to Florida Bay is that which concerns *water supply*. The discussion refers to the district's water supply planning initiative which began in October 1988, in order to develop comprehensive water supply plans for all counties in the district. District policies will be included in the District Water Supply Document, which will serve as the basis for development of water supply plans for regions of the district with similar water resources and demands. The district's Basis of Review for water use permits will be revised to incorporate criteria and policies developed to address water supply issues in each of four separate planning districts. The Everglades SWIM planning area is included within the Lower East Coast Water Supply Planning Area.[471] Dade, Broward and Palm Beach counties will each have individual county plans prepared by the district.

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[467] *Id.* at II-97.

[468] *Id.* at II-123.

[469] *Id.* at II-124.

[470] *Id.* at II-151.

[471] *Id.* at II-68.

The Draft Water Supply Policy Document[472] states that water supply policies and regional plans must be coordinated with goals, objectives and strategies of district SWIM plans, and should reflect the water quantity, environmental and other related goals of the SWIM plans.[473] Certain revisions to the district's Basis of Review are proposed in the draft document for 1991, including urban and agricultural demand management and reuse of reclaimed water. Environmental allocations, including minimum flows and levels for natural systems, is one of several other areas suggested for future revisions.[474]

The Draft Water Supply Policy Document includes several policies related to environmental protection in the regional water supply planning process, including: (1) determine environmental water supply needs in terms of stage, duration, timing and distribution of water for surface systems, and in terms of minimum levels for groundwater systems; (2) establish minimum flows and levels for natural surface and groundwater systems, to result in reserving from allocation that supply required to maintain healthy natural systems; (3) establish criteria defining the allowable impacts of water level drawdowns on natural systems, consistent with the minimum flows and levels required to maintain healthy environmental systems; (4) consider erosion, structural damage to water control structures, navigation and protection of fish and wildlife habitat in establishing minimum flows and levels.[475]

The Everglades SWIM plan section on water supply states that minimum allocations/base flows for natural systems including the WCAs and ENP will be "taken off the top" before allocations are made for other uses.[476] A water supply amendment to the Everglades SWIM plan will be completed during 1992, after completion of the Lower East Coast water supply

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[472] DRAFT WATER SUPPLY POLICY DOCUMENT, South Florida Water Management District (April 10, 1991).

[473] *Id.* at 8.

[474] *Id.* at 8.

[475] *Id.* at 21.

[476] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR THE EVERGLADES, VOL. II, (FINAL DRAFT), II-69, South Florida Water Management District (September 28, 1990).

plan.[477] Water supply plans are scheduled for completion during the 1990-93 period. Regional plans will be updated every five years to coincide with revisions to local comprehensive plans under the Growth Management Act.[478]

One of the plan objectives under water supply protection is to reserve water to protect vegetation, soils, fish and wildlife. The primary strategy for achieving the objective is to reserve water in the Everglades system, as required, as part of the consumptive use permitting process and the development of the Water Supply Planning Initiative process. The district will define minimum water levels for the WCAs, and for releases to estuaries where appropriate, below which further withdrawals would cause significant harm.[479] The second strategy is to continue with the water supply planning process, which will provide the technical basis to develop a water supply element for the Everglades SWIM plan. Both planning processes will work together to develop water supply requirements, minimum flows and water table management criteria for wetland systems and estuaries for incorporation into the SWIM plan water supply element.[480] The Water Supply Planning Initiative process appears to be funded from other sources, thus funding is not identified in the Everglades SWIM plan.

C. St. Johns River Water Management District

The St. Johns River district has five prioritized waterbodies, with plans developed for four of the waterbodies. The district's prioritized list includes the St. Johns River lower basin, the Indian River Lagoon, Lake Apopka, the upper Oklawaha River basin, and Lake George. The first two of these are estuaries, and both have approved SWIM plans. Other approved plans are for Lake Apopka and the upper Oklawaha River.

The Indian River Lagoon is a system of three interconnected estuarine lagoons which extends 155 miles from Ponce de Leon Inlet in Volusia County southward to the Jupiter Inlet in Palm Beach County. The Indian River Lagoon SWIM Plan, was developed, and is being implemented jointly with the South Florida Water Management District. It identifies three major

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[477] *Id.* at II-112.

[478] *Id.* at II-69.

[479] *Id.* at II-99.

[480] *Id.* at II-100.

issues relative to the estuary: water and sediment quality, habitat alteration and loss, and interagency management.[481] The matching goals are: to attain and maintain water and sediment of sufficient quality to support a healthy, macrophyte based, estuarine lagoon ecosystem; to attain and maintain a functioning macrophyte based ecosystem which supports endangered and threatened species, fisheries, and recreation; to achieve heightened public awareness and coordinated interagency management of the lagoon ecosystem that results in the accomplishment of the preceding goals.[482]

The SWIM plan addresses freshwater inflows under its water and sediment quality issue. The plan recognizes that extreme, undesirable salinity fluctuations can occur as a consequence of unregulated or improperly regulated freshwater inflows,[483] and that significant reductions in freshwater discharges to the lagoon may occur during extended dry periods because of artificially lowered water tables.[484] Both scenarios can have drastic effects on salinity gradients, nutrient and suspended matter loadings, sedimentation rates, and biotic communities distribution.[485]

The primary plan objective applicable to inflows is to manage freshwater inflows from point and nonpoint sources to minimize their negative impacts on the lagoon salinity structure.[486] As stated, the first step is to quantify (monitor) freshwater discharges from major streams, canals, and other point and nonpoint sources throughout the lagoon basin, particularly in critical sub-basins.[487] The discharge data, along with climatological, tide and salinity data, will

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[481] INDIAN RIVER LAGOON SWIM PLAN, i, St. Johns River Water Management District (Revised September, 1989).

[482] *Id.*

[483] *Id.* at 19.

[484] *Id.* at 20.

[485] *Id.*

[486] *Id.* at 35.

[487] *Id.*

be used to refine a gross water budget developed in 1986,[488] and to calibrate a hydrodynamic/ salinity model for the Indian River Lagoon.[489] The detailed water budget and calibrated model will allow assessment of freshwater impacts on the lagoon's salinity structure, spatially and temporally.[490] The results will be used to develop comprehensive resource management plans, to regulate discharges from water control structures in a manner that mimics pre-development seasonal and storm event hydrologic patterns, and to improve water quality, habitat and fisheries.[491]

Twelve geographical areas were recognized as significant problem areas,[492] including five designated as "critical sub-basins," based on factors such as water and ecological quality, environmental significance, land use and demographic trends, and public interest and use.[493] Those designated as critical are: Turkey Creek Sub-basin; Sebastian River Sub-basin; Lagoon segment between Melbourne and Sebastian; Manatee Pocket; and Moores Creek/Virginia Avenue Canal Sub-basin.[494] These critical sub-basins are receiving priority for hydrologic, climatological, and hydrodynamic monitoring.

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[488] *Id. See* Glatzel, K. & Da Costa, S., *The Role of the Climatic Water Budget in the Environmental Framework of the Indian River Lagoon, Florida: Implications for Management and Planning*, in CONFERENCE ON CLIMATE AND WATER MANAGEMENT, Asheville, N.C. (August 4-7, 1986).

[489] *Id. See*, Sheng, Y. & Peene, S., "Numerical Modeling of Hydrodynamics and Transport in the Indian River Lagoon," Coastal and Oceanographic Engineering Department, University of Florida, Gainesville (April, 1989).

[490] INDIAN RIVER LAGOON SWIM PLAN, 35, St. Johns River Water Management District (Revised September, 1989).

[491] *Id.* at 37.

[492] These include: Turkey Creek Sub-basin; Sebastian River Sub-basin; Lagoon segment between Melbourne and Sebastian; Manatee Pocket; Moores Creek/Virginia Avenue Canal Sub-basin; Vero Beach Vicinity; Crane Creek Sub-basin; Eau Gallie River Sub-basin; Cocoa/Rockledge and southern Banana River Lagoon; Titusville Vicinity; Five-Mile and Ten-Mile Creek Sub-basins; Mosquito Lagoon. *Id.* at 34.

[493] *Id.* at 33.

[494] *Id.* at 32.

Data collection for the Turkey Creek Sub-basin was completed in 1991, with a hydrologic model and feasibility analysis of management options projected for completion soon after culmination of data collection. A management plan is scheduled for consideration by local, regional and state agencies by 1993.[495] A similar process for the Sebastian River Sub-basin is scheduled for completion approximately one year after completion of the Turkey Creek plan.[496] Approaches to other critical sub-basins are not specifically addressed in the plan.

The **Lower St. Johns River Basin** SWIM plan covers the river from its mouth at Mayport, near Jacksonville, to slightly southwest of Deland. The river is an elongated estuary with low gradient and an extensive floodplain. Along with its principal tributary, the Oklawaha River, the St. Johns drains about 12,400 square miles, or about one-sixth of the total area of the state.[497] Tides affect the entire lower river along with the lower reaches of its tributaries. Movement of water in the river is influenced by the interaction of tide, wind, freshwater inflows, and the confines of the river banks and bottom.[498]

The estuary is known as an important nursery for commercially valuable species of macroinvertebrates, including blue crabs, which mate in the shallow upstream reaches, and whose juvenile stages return from hatching in offshore areas, to mature in the river.[499] The river is also vital to the development of three commercially important species of penaeid shrimp, including white shrimp, brown shrimp and pink shrimp.[500] Of the 170 species of finfish reported in the river, most occur within the lower reach, and include such saltwater species as

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[495] *Id.* at 38.

[496] *Id.* at 38.

[497] SWIM PLAN FOR THE LOWER ST. JOHNS RIVER BASIN, 9, St. Johns River Water Management District (Revised November 1989).

[498] *Id.* at 9-10.

[499] *Id.* at 12.

[500] *Id.*

snapper, spotted seatrout and sheepshead.[501] Among species designated as requiring special protection are included the shortnose sturgeon, Atlantic sturgeon, and common snook.[502]

The SWIM plan identifies several major groups of problems in the estuary, including: point and nonpoint source pollution; destruction of natural systems; limited public awareness and environmental education; and insufficient interagency coordination and management.[503] Under the first group of problems, the plan discusses the detrimental effects of abnormally high peak stormwater flows on native fisheries. It also recognizes the damage that excessive low flows, combined with point and nonpoint source pollution, can cause to aquatic communities. Low flows are associated with drought, excessive groundwater withdrawal and surface water diversions.[504] As stated in the report: "The cumulative and synergistic influences of contaminated discharges from point and nonpoint sources, combined with varying salinity, temperature and flow regimes, can cause a decline in species diversity, productivity and overall health of aquatic communities."[505]

In discussing the general problem category of natural system destruction, the plan defines "natural systems" as referring to wetlands, nursery areas of indigenous aquatic life, and special habitats. Nursery areas of indigenous aquatic life are defined as "any bed of the following aquatic plants either in monoculture or mixed:...(pondweed),...(wigeon grass),...(arrowhead),... (manatee grass),...(turtle grass),...(eel grass), or any area used by the early-life stages, larvae and post-larvae, of aquatic life during the period of rapid growth and development into the juvenile states."[506] Special habitats are natural areas "that support unique functions related to fish and wildlife resources and economic and recreational values," including such areas as

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[501] *Id.* at 13.

[502] *Id.* at 13-14.

[503] *Id.* at 35.

[504] *Id.* at 36-37.

[505] *Id.* at 37.

[506] *Id.* at 43.

wetlands, nursery areas, shellfish beds, or aquatic environments with important physical features.[507]

The SWIM plan describes several existing and new projects with the potential to consider inflow effects on estuarine habitat. Under the point and nonpoint source program, these include a research project with the USGS to establish continuous stream flow monitoring stations on major tributaries in order to evaluate impacts on the St. Johns River,[508] and a hydrologic basin assessment of several tributary subbasins, in order to simulate the tributary systems' physical behavior with respect to water quantity and quality.[509] The objective of a third project is to recommend and develop evaluation tools with potential use for quantitatively dealing with the impacts of discharges into tributaries and into the main stem of the lower St. Johns River.[510] The primary thrust of these projects, however, is to aid in evaluating and managing stormwater impacts and evaluating the effectiveness of restoration and management strategies prior to implementation. The first and third of these projects are scheduled for completion sometime after the end of fiscal year 1991-92, while a report is due on the second project in mid-1992, with additional work to be developed.

Under its natural systems program, the plan includes another two projects with the potential to consider the freshwater inflow needs of estuarine habitat. The first of these is a study to identify special habitats within the lower basin, in order to facilitate their protection. The project is a lightly funded general literature search and review, scheduled for an interim report in late 1992.[511] A second study is designed to identify significant nursery areas for indigenous aquatic life within the main stem and tributaries of the river, for use by resource

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[507] *Id.*

[508] Project SJ-1-113-D; *see id.* at 91.

[509] Project SJ-1-114-D; *see id.* at 92.

[510] Project SJ-1-115-D; *see id.* at 94.

[511] Project SJ-2-202-D; *see id.* at 115.

managers to protect those habitats and identify areas where restoration activities may be needed. The scope of work for the study was in development as the SWIM plan went to press.[512]

The Lower St. Johns River Basin SWIM plan recognizes the potential effects of uncontrolled pulses of fresh water on estuarine habitats, and includes investigations aimed at understanding and managing these effects. It does not appear to address concerns related to the potential effects of low flows on riverine and estuarine habitat.

D. Suwannee River Water Management District

The Suwannee River district has placed six waterbodies on its ranked priority list, including two estuarine systems, the Suwannee River System (including Suwannee River estuary), and the Waccasassa River System (including Waccasassa Bay).

The **Suwannee River System** SWIM plan describes six habitat types within the estuary, including brackish marsh, salt marsh, estuarine flats, submergent vegetation beds, estuarine open water areas, and oyster reefs and bars.[513] The first four of these are of particular importance as fisheries habitat.[514] One goal of the plan is to protect the ecological integrity of natural surfacewater systems and to enhance their environmental, aesthetic, scenic and recreational values. Another is to preserve habitat for native plants, fish, and wildlife, including threatened and endangered species.[515]

Policies supporting these goals include: enforcing rules regarding the use and disposition of surface waters and related ground waters of the basin, and assisting any agency in the protection of the natural resources of the basin; periodically reviewing district rules relating to use, management or disposition of surface and ground waters to ensure their effectiveness in protecting the water resources of the basin; and developing a tracking system for periodic review of permitted activities which could potentially impact the Suwannee River system.[516] Other

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[512] Project SJ-2-203-D; *see id.* at 116.

[513] SUWANNEE RIVER SYSTEM: SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN (DRAFT), 25-26, Suwannee River Water Management District (November 29, 1990).

[514] *Id.*

[515] *Id.* at 7.

[516] *Id.* at 9.

than a commitment to additional studies of the system, the plan's general policies for the Suwannee River system contain no reference to habitat-based inflow needs.[517]

The Suwannee River System SWIM plan specifies eight priority issues, including two evidencing potential concern with instream and inplace water needs of the estuary. One issue is surfacewater/groundwater interaction, which recognizes the need for more study of the immensely complex relationship between surface flows and the base flows provided by groundwater, springs and seeps, providing a basis for establishment of low flow standards and regulations relating to water quantity concerns.[518] The issue includes consideration of both amounts and quality of water, and recognizes that the effect of increased groundwater withdrawal in inland areas hydrogeologically connected to the river system must be calculated before increased demand adversely affects the system by reducing base flow.[519]

A second priority issue, "Suwannee River Estuary and Coastal Management," specifically refers to the needs of the estuary in terms of water quality and water quantity. Changes in the influx of fresh water from the river can represent a threat to the health of the estuary. Too much fresh water, from overdrainage, storm events or hydrologic alterations, may drive marine organisms further into the Gulf as a result of salinity changes, while too little fresh water, from excessive withdrawals or drought, may alter salinity enough to harm organisms or habitat, or allow marine predators to prey on estuarine organisms.[520] The issue statement concludes that, "(d)elivery of the proper quantity and quality of fresh water to the estuary is an important management issue."[521]

Though recognizing the importance of understanding and managing fresh water inflows to the estuary, the Suwannee River System SWIM plan does not appear to take any further steps to address these concerns in the research components or management efforts specified in the plan.

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[517] *Id.* at 10.

[518] *Id.* at 44.

[519] *Id.*

[520] *Id.* at 45.

[521] *Id.*

The Waccasassa River System SWIM plan covers the river from its origins in Levy County, Florida to its estuary in the Big Bend Coastal area on the Gulf of Mexico. Though the river flows through basically undisturbed areas entirely within Levy County, the river basin includes portions of Gilchrist and Alachua counties. Coastal aquatic habitats in the basin include estuaries and adjacent coastal marine waters. Major estuarine habitat types include oyster reef habitats, brackish water submerged vegetation beds, salt and brackish marshes, seagrass beds and unvegetated flats.[522]

The basin is sparsely populated, and the economy of the area is based primarily on forestry and agriculture, with commercial and sport fishing and tourism centered in the Cedar Key area.[523] Several species of fish and shellfish are caught in Cedar Key and Waccasassa Bay, including spotted seatrout, mullet, blue and stone crabs, scallops and bait shrimp. Crabs, oysters and shrimp are the principal species of value.[524] Silviculture is the predominant land use in the basin, representing 73 percent of the land area in Levy County.[525] Surface waters of the Waccasassa are used primarily for recreational fishing and boating. Water for consumptive use is derived from wells tapping the Floridan Aquifer, with the greatest use of water being for agricultural and irrigation uses.[526]

Priority issues for the Waccasassa River Basin are to: (1) define existing conditions; (2) identify and reduce impacts of point and nonpoint sources of pollution and minimize the degradation of aquatic habitats; and (3) maintain the ecological integrity of the natural systems associated with the aquatic ecosystems of the basin.[527] Basinwide management issues include: (1) impacts on basin surfacewater resources from point and nonpoint source pollution, and from hydrologic alterations related to land use activity; and (2) impacts to fish and wildlife and their

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[522] WACCASASSA RIVER SYSTEM SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN, 16, Suwannee River Water Management District (April 1991).

[523] *Id.* at 20.

[524] *Id.* at 21.

[525] *Id.* at 20.

[526] *Id.* at 22.

[527] *Id.* at 25.

habitats from destruction of aquatic habitats.[528] Specific management issues that may be identified from a basinwide assessment include: sedimentation impacts from forestry operations; future agricultural and dairy impacts from operations surrounding Waccasassa Flats; agricultural impacts from Devil's Hammock area; and stream band erosion from boat traffic and development along the river corridor.[529] It appears that the primary focus of the plan of research is on point and nonpoint pollution, and the effects of changes in land use on the physical habitats of the basin.

One issue with the potential to consider inflow impacts to the estuary is that which concerns hydrologic alterations, including the effects of increased impervious surfaces, alteration of vegetation cover, and ditching and channelization. The plan also identifies "additional 'water quantity' questions which must be considered as basin management issues." These include: flood control and stormwater management efforts in Cedar Key, and hydrologic changes due to groundwater withdrawals from agricultural operations (irrigation and dairies) and forestry operations. The plan notes that wetland vegetation community changes due to deep groundwater withdrawals have been documented in other areas of Florida, and that the possibility and extent of such changes should be examined in this basin.[530]

The management issue concerned with aquatic habitat protection identifies protection of seagrass beds as the principal need in this area, however it does not appear to be related to inflow alterations. Concerns related to this issue include: navigation channel dredging; impacts from recreational activities, including prop scarring; impacts from commercial fishing operations, including baitshrimpers; and water quality protection.[531] The issue recognizes the importance of instream habitats such as snag and shoal areas to the production of benthic invertebrates, and thus, to fisheries production. It also identifies small tidal creeks as critical nursery habitat for

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[528] *Id.*

[529] *Id.*

[530] *Id.* at 28-29.

[531] *Id.* at 31.

juvenile fish and shellfish.[532] However, in neither case does the discussion include the importance of maintaining proper salinity regimes.

No other issue or project directly addresses inflow alterations, though the plan identifies several areas in which additional research would be helpful, including: sediment transport processes and movement along the coast, and hydrodynamic studies; productivity of various wetland communities such as tidal and brackish marshes; the interaction of ground and surface water, including the extent to which drawdown of groundwater levels may affect river flows and lake levels.[533]

The plan's restoration and protection strategies include three general areas: resource monitoring, resource planning, and program implementation. Resource monitoring appears to be the largest component of this effort at present. The first project under this category is aimed at water quality and biological monitoring of several rivers and coastal areas, including Waccasassa River. This baseline monitoring program is designed to monitor long-term changes in amounts of freshwater inflow, sediment transport, or other water quality component from land use activities in the basin; nonpoint effects and shoreline alterations associated with development; and "to assist in correlating water quality with quantity of flow for determination of minimum flows in rivers and minimum levels in lakes."[534] Though it recognizes the "salt wedge" effect of vertical stratification of salinities in estuaries, and will include this among its parameters, the project is relatively small, involving only three monitoring stations, with none located in Waccasassa Bay until the monitoring network is expanded.[535] Funding totals for all project tasks in this category, covering three years of research, are under $78,000.[536]

A second resource monitoring project will be aimed at better understanding and quantifying the relationship between surface and ground water in the basin; understanding the relationship between river flow and water quality in streams of the basin; understanding

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[532] *Id.* at 31-32.

[533] *Id.* at 33.

[534] *Id.* at 41-42.

[535] *Id.* at 42-44.

[536] *Id.* at 72ff. (Program Budget).

watershed hydrologic responses for the streams of the basin and determining the impacts of land use/land cover alteration on these responses; and understanding sediment transport and movement by rivers in the basin.[537] The total three year budget for this project is $33,000.[538] A related project will monitor wetland vegetation communities, with a total budget under $19,000.[539]

E. Northwest Florida Water Management District

The Northwest Florida district has completed four plans, covering five waterbodies, which include Apalachicola River, Apalachicola Bay/St. George Sound, Lake Jackson, Deerpoint Lake, and Pensacola Bay. Two of these, the Apalachicola Bay/St. George Sound and Pensacola Bay are estuarine systems, and both have had SWIM plans developed. The Apalachicola Bay plan is currently undergoing revision.

The three principal issues identified in the **Pensacola Bay System** SWIM plan include water and sediment quality in bays and bayous, declines in habitat quality, and intergovernmental/ interagency management issues.[540] The plan recognizes that the loss of seagrass beds, wetlands, and emergent vegetation communities has resulted in fisheries declines,[541] though it does not specifically relate any of these developments to loss of freshwater inflows. Three primary goals for the bay system are to: minimize undesirable impacts on the system from adjacent upland portions of the watershed, attain and maintain water and sediment quality at levels that allow for the recovery and perpetuation of healthy estuarine systems, and achieve greater public awareness of and coordinated management of the bay system and resource protection programs.[542]

The Pensacola Bay SWIM plan is organized around five specific programs including: nonpoint source program; point source program; habitat preservation, restoration and

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[537] *Id.* at 49.

[538] *Id.* at 72ff. (Program Budget).

[539] *Id.* at 50, 72ff. (Program Budget).

[540] PENSACOLA BAY SYSTEM SWIM PLAN, E-1, Northwest Florida Water Management District (November 1990).

[541] *Id.*

[542] *Id.* at E-2.

conservation program; administration, planning and coordination program; and public awareness program.[543] Of these, the habitat program is the only one with components which can be said to address fresh water flow.

The most important habitat-related issue in the Pensacola Bay system has been a widespread decline in submerged aquatic vegetation (seagrass beds) and wide swings in the productivity of the fish and shellfish industry, including disease losses among oysters and various fish kills.[544] The reasons for the losses are unclear, though the SWIM plan recognizes that variations in salinity are probably among the stresses which have contributed collectively to the problems.[545] Despite the relationship between fresh water flows, salinity regimes, and the health of benthic populations, seagrass habitat and estuarine-dependent fish and shellfish species, the Pensacola Bay system plan makes no direct reference to the need to study and control such flows. Three circulation study projects within the habitat preservation, restoration and conservation program have indirect relationships to instream and inplace water needs. An emphasis of the projects is to characterize the location, direction, and magnitude of flows throughout the bay, in order to quantify constituent transport, flushing times, and assimilation rates of the bay.[546]

The first of these studies, a review of existing literature on the water quality, sediment quality and physical processes of the bay system, has been completed.[547] The second, an initial hydrodynamic modeling effort for the bay system, is ongoing, but is not projected for final calibration until additional data are developed under the third study.[548] The third study is an

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[543] *Id.*

[544] *Id.* at 119.

[545] *Id.* *See also*, *id.* at 127 (variations in communities of benthic macroinvertebrates due in part to variations in salinity regime). *Id.* at 129 (influxes of low salinity water as partial cause of shrimp mortality).

[546] *Id.* at B-47.

[547] *Id.* at B-48, B-50. "Review of Scientific Literature of the Pensacola Bay System (HA-03.1)."

[548] *Id.* at B-48--B-50. "Initial Hydrodynamic Model Application (HA-03.2)."

exploration of circulation patterns in the bay system. Salinity data collection is to be included in the study, increasing the potential for consideration of the role of freshwater inflows, though this is not included in the discussion of research goals or products.[549] This study is not scheduled for completion until after the 1992-93 fiscal year, and as of the plan's publication date, no funds had been appropriated for its completion.[550]

The **Apalachicola River and Bay** SWIM plan covers the entire the Apalachicola River, its floodplain, and the Bay estuary. The Apalachicola River forms the lower portion of the Apalachicola-Chattahoochee-Flint river system, and runs 107 miles from the state line to the bay. Its freshwater flow into the bay plays a critical role in maintaining the salinity regime of the estuary.[551] The headwaters of the river are impounded by Jim Woodruff Lock and Dam to aid in navigation of the Chattahoochee and the Flint and to provide electric power.[552] Because transport of detritus from upriver sources is blocked by the dam, the primary source of detrital input to the bay is from river's floodplain.[553]

The bay estuary covers 212 square miles and is bounded by four barrier islands: St. Vincent, St. George, Cape St. George, and Dog islands.[554] The bay is used primarily for commercial fishing of oysters, shrimp, blue crab and fin fish. In the past ten years, 90% of the state's oyster harvest has come from the bay.[555] The surrounding economy relies heavily on the bay with 65%-85% of the jobs in adjacent Franklin County related to the commercial fisheries industry.[556] The estuary serves as a nursery and feeding ground to a variety of fish

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[549] *Id.* at B-49. "Circulation Studies of the Pensacola Bay System (HA-03.3)."

[550] *Id.* at B-50.

[551] SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN FOR APALACHICOLA RIVER AND BAY, 6, Northwest Florida Water Management District (1988).

[552] *Id.*

[553] *Id.* at 16.

[554] *Id.* at 6.

[555] *Id.* at 84.

[556] *Id.* at 84.

including striped mullet, flounder, speckled sea trout, and redfish. Other species often found in the bay include the large mouth bass, Alabama shad, flooding bluegill and the Gulf sturgeon.[557] When salinity levels are high, marine fish such as shark and small grouper may also be present.[558]

The estuary habitat is dependent upon nutrient flows from the river floodplain. Annual flooding increases the amount of nutrients transported which, in turn, increases the productivity of the bay.[559] Another key factor in the composition and productivity of the estuary is the salinity balance. The salinity of the bay varies according the volume of river flow and the wind direction. Low flows and southerly winds in the late summer and fall result in high salinities throughout the bay. The volume of river flow increases in the winter and spring. Freshwater from the river spreads across the surface, generally lowering salinities. However, stratification of salinity does occur across much of the bay.[560]

The Apalachicola Bay plan does not cite specific problems relating to freshwater flows, but recognizes the critical importance of preservation of existing flows in the protection of the estuary and the fishing industry. The plan outlines ongoing federal research projects as well as two specific SWIM projects related to minimum flows. The two federal research projects addressing freshwater flows are being conducted within the river and bay basin by the U.S. Army Corps of Engineers (COE) and the Florida Department of Environmental Regulation. One ongoing project is an evaluation of the impact of Sikes Cut on the salinity regime of the bay. Sikes Cut is a narrow pass between Cape St. George and St. George Island. The information will be used to determine what action should be taken for the long-term maintenance of Sikes Cut.[561]

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[557] *Id.* at 74.

[558] *Id.* at 75.

[559] *Id.* at 79.

[560] *Id.* at 61.

[561] *Id.* at 139.

A second federal research project is titled "Evaluation of Minimum Freshwater Inflow Needs of the Apalachicola Estuary."[562] The project is part of the COE's "308" study which is a series of research initiatives in the Apalachicola-Chattahoochee-Flint (ACF) River basin.[563] The "308" study is a cooperative effort among the COE, Florida, Georgia, and Alabama. The aim of the study is to develop a water budget and alternative water management strategies for the ACF system, and to recommend appropriate coordination mechanisms.[564] The freshwater inflow assessment portion of the "308" study is designed to define the seasonal freshwater needs of the estuary. A hydrodynamic model of the bay will be developed to determine the effects of varying the salinity regime.[565]

The SWIM plan proposes as one of its projects the participation of the district in the COE's "308" study.[566] Though the plan indicates that no funding is available in fiscal year 1988-1989 for the district to participate, some investigations related to freshwater flows have been completed. The freshwater inflow assessment study began in 1985. The district had served as a member of the Bay Water Needs Working Group which was organized to develop a scope of work for the study. An evaluation of the effect of various inflows and salinity regimes based on a hydrodynamic model was released in 1988. The plan indicates additional studies to be conducted by the Working Group would include an evaluation of impacts of these various inflows on the natural resources of the bay.[567]

Another proposed SWIM project related to freshwater flows is a hydrologic appraisal of the Apalachicola drainage basin. The COE has proposed and funded the development of a hydrodynamic model as a part of its "308" study. The project proposed by the district will review information gathered for the "308" study and will address deficiencies the model may

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[562] *Id.*

[563] *Id.* at 140.

[564] *Id.* at 154.

[565] *Id.* at 140.

[566] *Id.* at 153.

[567] *Id.*, Appendix VIII-1-9.

have. The plan indicates that the proposed COE model may not adequately assess the effects of salinity stratification because the model will be two-dimensional. The purpose of the district's appraisal is to assess freshwater needs and determine the effect of flow changes on the bay and basin. The information will be used for water allocation and management.[568] Though the SWIM plan supports the need for such a study, the proposed hydrologic appraisal by the district was not a funded project.

[568] *Id.*, Appendix VIII-VI-2.

OTHER STATES' PROGRAMS FOR MAINTAINING OPTIMUM FRESHWATER FLOWS TO ESTUARIES

Although a number of states have attempted to protect minimum flow levels in streams and rivers, among the coastal states, few have specifically considered the need to provide minimum flows to bays and estuaries for the protection of fisheries habitat. Rather, concern has been directed towards maintaining a variety of water dependent functions including energy production, protection of municipal water supplies, navigation, water quality and upstream fisheries and wildlife values. However, as a result of the minimum flow protection afforded river systems upstream, bays and estuaries have necessarily benefited, albeit indirectly.

The following summaries and analyses include the programs of Connecticut and three western states, Texas, California and Oregon. Legislation in the western states is informed by western water law concepts of prior appropriation and beneficial use. The common law of most eastern states utilizes the reasonable use doctrine. In many ways, however, the administrative structures for controlling allocation of water that have been developed in eastern and western states have tended to evolve toward one another. Florida's Water Resources Act utilizes a reasonable-beneficial use standard that is in part, an amalgam of the eastern reasonable use doctrine and the western beneficial use standard. Thus, it should not be assumed that regulatory approaches taken in western states can have no application in an eastern jurisdiction.

I. Texas

Texas has specifically addressed the issue of maintaining minimum stream flows to bays and estuaries in legislation. In the late 1960s the Texas Legislature became aware of problems associated with reservoirs and the maintenance of freshwater flow to bays.[569] The Texas Water Development Board (the Board) was charged with conducting a series of studies aimed at determining the quantities of fresh water necessary to sustain and enhance estuarine ecology.[570] The results of these first studies were inconclusive,[571] and in 1985 the legislature passed

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[569] Phone interview with Mr. Al Green, Texas Parks and Wildlife Department, Austin, Texas (August 15, 1991).

[570] *Id.*

[571] *Id.*

additional legislation authorizing the Texas Water Development Board and the Texas Department of Parks and Wildlife (the Department) to "establish and maintain on a continuous basis a bay and estuary data collection and evaluation program and to conduct studies and analyses to determine bay conditions necessary to support a sound ecological environment."[572] The studies were to be completed no later than December 31, 1989, and submitted for comment to both the Board and the Department for comment.[573] The results from this second set of studies are now being finalized and are to help serve as the basis for future policy decisions and legislation, if current legislation proves too narrow to accomplish bay and estuary protection.[574]

Currently, when evaluating applications for permits to appropriate water, the Texas Water Commission (the Commission) is required to consider the effects of a permit on associated bays and estuaries, instream uses, water quality, and fish and wildlife habitats.[575] The Commission must send a copy of all permit applications to the Parks and Wildlife Department and must consider all information presented by the Department before granting any permit.[576] For permits issued within two hundred river miles of the coast (beginning at the mouth of the river and proceeding inland), the Commission must "include in the permit, and to the extent practicable when considering all public interests, those conditions considered necessary to maintain beneficial inflows[577] to any affected bay and estuary system."[578] When making the

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[572] TEX. WATER CODE §16.058(a) (1991).

[573] TEX. WATER CODE §16.058(d) (1991).

[574] Phone interview with Mr. Al Green, Texas Parks and Wildlife Department, Austin, Texas (August 15, 1991).

[575] TEX. WATER CODE §11.147 (1991).

[576] TEX. WATER CODE §11.147(f) (1991). If the Department chooses not to participate in the permit hearing, the Commission is not relieved of the requirements of this section. TEX. WATER CODE §11.147(g) (1991).

[577] Beneficial inflows are defined as "a salinity, nutrient, and sediment loading regime adequate to maintain an ecologically sound environment in the receiving bay and estuary system that is necessary for the maintenance of productivity of economically important and ecologically characteristic sport or commercial fish and shellfish species and estuarine life upon which such fish and shellfish are dependent." TEX. WATER CODE §11.147(a) (1991).

[578] TEX. WATER CODE §11.147(b) (1991).

determination to include conditions in a permit the Commission must consider the following factors:

(1) the need for periodic freshwater inflows to provide nutrients, modify salinity, and to preserve the environment of the bay or estuary;

(2) the ecology and productivity of the affected system;

(3) the expected effects on public welfare if conditions are not included in the permit;

(4) the quantity and proposed use of the water requested by the applicant, and the needs of those who would be served by the applicant;

(5) the expected effects on the public welfare of denying all or part of the permit; and

(6) the statutory declarations as to preferences for competing uses of water.[579]

In addition, five percent of the annual firm yield of water[580] in any reservoir within two hundred river miles of the coast, constructed after September 1, 1985 with state participation "is appropriated to the Parks and Wildlife Department for use to make releases to bays and estuaries and for instream uses...."[581]

Although the use of permit conditions can be an effective tool for estuarine protection, the Commission is not obligated to place conditions on any permits other than those for appropriations within two hundred river miles of the coast.[582] Most of the protection which may be afforded estuaries is at the discretion of the Commission, and it must consider proposed

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[579] TEX. WATER CODE §11.147(c) (1991). The legislature has declared that it is the public policy of Texas that in appropriating state water preference shall be given the following uses in order of listing: (1) domestic and municipal uses, (2) industrial uses, (3) irrigation, (4) mining and recovery of minerals, (5) hydroelectric power, (6) navigation, (7) recreation and pleasure, and (8) other beneficial uses. TEX. WATER CODE §11.024 (1991).

[580] Generally defined as a conservative estimate of the amount of water in a reservoir that can be counted on under most conditions. Phone interview with Mr. Al Green, Texas Department of Parks and Wildlife, Austin, Texas (August 16, 1991).

[581] TEX. WATER CODE §15.3041(a), §16.1331 (1991).

[582] Kaiser & Kelly, *Water Rights for Texas Estuaries*, 18 TEX. TECH L. REV. 1121, 1137 (1987).

water uses according to a list of statutory preferences.[583] Recreation and environmental uses are last on the preference list, and estuarine protection is not specifically mentioned at all.[584] Also, releases ordered by the Commission pursuant to permit conditions may be delayed by hearings on the application for the release, and disagreements between agencies concerning the need for the release.[585] "In sum, Texas law mandates consideration of inflow protection but neither grants a water right nor requires maintaining the historic productivity of estuaries."[586] Thus, efforts by any group or agency to protect estuaries can require a considerable investment of time and money since they must be repeated each time a new appropriation is considered.

II. California

California has also sought to preserve minimum flows to protect instream uses including the protection of fisheries and wildlife habitat. The California Constitution provides that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable ... and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare."[587] The California Legislature has declared that "[t]he use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water."[588]

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[583] *Id.* at 1153.

[584] *Id.*

[585] *Id.*

[586] *Id.* at 1138.

[587] CAL. CONST. art. X, § 2.

[588] CAL. WATER CODE §1243 (Deering Supp. 1991).

The State Water Resources Control Board (the Board)[589] has broad authority to protect instream uses directly through its grants of water rights permits, and indirectly through its regulation of existing water rights.[590] The Board is authorized to regulate instream uses of water within three categories of its jurisdiction: (1) the granting of permits and licenses; (2) the regulation of permittees and licensees; and (3) the consideration of petitions to change the terms of an existing permit.[591]

Before the Board may grant a permit, it must notify the California Department of Fish and Game of the permit application.[592] The Board must consider any recommendations by the Department of Fish and Game regarding the amounts of water necessary for the preservation and enhancement of fish and wildlife resources.[593] The Board must also determine how much water is available for appropriation taking into account "whenever it is in the public interest, the amounts of water required for recreation, and the preservation and enhancement of fish and wildlife resources,"[594] and the amounts of water required to remain in the source for the protection of any uses specified in any relevant water quality control plan.[595] Finally, the Board must weigh the relative benefits of the proposed appropriation against the benefits of alternative uses of the water including the preservation and enhancement of fish and wildlife and

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[589] The Board was created in 1967 and "is the primary agency charged with managing the water rights system for appropriations of surface water, administering the federal and state water pollution control laws, and ensuring that all uses of California's water resources comply with California's constitutional requirement of reasonable and beneficial use." Gray, *A Reconsideration of Instream Appropriative Water Rights in California*, 16 ECOLOGY L.Q. 667, 668 note 9 (1989).

[590] *Id.* at 669.

[591] *Id.* at 672.

[592] *Id.*

[593] *Id.* "The Board shall notify the Department of Fish and Game of any application for a permit to appropriate water. The Department of Fish and Game shall recommend the amounts of water, if any, required for the preservation and enhancement of fish and wildlife resources and shall report its findings to the board." CAL. WATER CODE §1243 (Deering Supp. 1991).

[594] CAL. WATER CODE §1243 (Deering Supp. 1991).

[595] Gray, *supra* note 589, at 672 (citing CAL. WATER CODE §1243.5 (Deering Supp. 1991)).

"any uses specified to be protected in any relevant water quality control plan."[596] The California Public Resources Code requires the Department of Fish and Game to "identify and list those watercourses throughout the state for which minimum flow levels need to be established in order to assure the continued viability of stream-related fish and wildlife resources."[597] If the river from which the appropriation is sought is one for which the Department of Fish and Game has established stream flow standards, the Board must also consider those standards.[598]

If the Board decides to grant an application to appropriate water it may include terms and conditions to protect instream uses.[599] Typical terms may require the applicant to: "(1) bypass water under specified flow conditions for the protection of fish and wildlife, (2) release water to augment natural stream flows downriver of the project, and (3) release relatively large quantities of water, usually during periods of high water supply, to cleanse the riverbed of accumulated sediment."[600]

The Board is also "the state water pollution control agency for all purposes stated in the Federal Water Pollution Control Act."[601] Pursuant to its authority,[602] the Board may

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[596] Gray, *supra* note 589, at 673 (citing CAL. WATER CODE §1257 (Deering Supp. 1991)).

[597] CAL. PUB. RESOURCES CODE §10001 (Deering Supp. 1991). "Upon completion of the proposed streamflow requirements for any individual stream or watercourse, the Director of Fish and Game shall transmit these proposed requirements to the State Water Resources Control Board. The State Water Resources Control Board shall consider these requirements within a stream as set forth in §1257.5 of the Water Code." CAL. PUB. RESOURCES CODE §10002 (Deering Supp. 1991). The Department of Fish and Game must initiate studies in each fiscal year to develop streamflow requirements for streams or watercourses for which funds have been appropriated. Studies must be completed on the stream or watercourse within 3 years. It is the legislatures intent that the department develop a program that will initiate studies on at least 10 streams in each fiscal year. CAL. PUB. RESOURCES CODE §10004 (Deering Supp. 1991).

[598] Gray, *supra* note 589, at 673.

[599] *Id.*

[600] *Id.*

[601] CAL. WATER CODE §13160 (Deering Supp. 1991).

[602] *See* Porter-Cologne Act of 1969, CAL. WATER CODE §§13100-13389.

establish water quality control plans and regulate point and nonpoint sources that contribute to water pollution.[603]

The Board has used its water quality jurisdiction to protect instream uses in establishing water quality standards as part of the Board's Water Quality Control Plan for the San Francisco Bay and the Sacramento-San Joaquin Delta and Suisun Marsh.[604] The goal of the Board is to protect the instream and consumptive beneficial uses of water in the Delta, and the Bay-Delta estuary, from the adverse effects of upstream diversions, which damage water quality by diminishing freshwater flow into the Delta, and from point and nonpoint sources of pollutants in and upstream of the Delta.[605] To accomplish its goal, the Board may impose additional conditions on the water rights of major upstream appropriators from the Bay-Delta system, and limit the amount of pollutants that can be discharged into the system.[606]

The California Court of Appeals has reviewed[607] and for the most part upheld the Boards' Water Quality Control Plan for the Delta.[608] The court determined that in its water quality role the Board's task was not to protect water rights, but to protect beneficial uses.[609] "Thus, if beneficial uses--including instream uses such as recreation, fisheries, and wildlife--require more water than needed by riparians and senior appropriators in the Delta, the Board must order upstream water rights holders to release flows sufficient to provide reasonable protection for beneficial uses."[610]

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[603] Gray, *supra* note 589, at 678.

[604] *Id.* A series of hearings (the Bay-Delta hearings) to establish water quality standards were begun in 1987 and are expected to continue through 1991. *Id.*

[605] *Id.* at 679.

[606] *Id.* at 679.

[607] United States v. State Water Resources Control Board, 182 Cal. App. 3d 82, 227 Cal. Rptr. 161 (1986) (hereinafter Delta Water Cases).

[608] Gray, *supra* note 589, at 680.

[609] *Id.* (citing Delta Water Cases, 182 Cal. App. 3d at 116, 227 Cal. Rptr. at 178).

[610] *Id.*

The Board also has considerable indirect jurisdiction over all water users, including riparians and pre-1914 appropriators,[611] for the purpose of protecting instream flows and other beneficial uses.[612] Although riparian and pre-1914 rights are not based on permits issued by the Board, they must conform to the constitutional and statutory requirements of reasonable and beneficial use.[613] Thus if the Board finds that a water use is unreasonable because of adverse effects on instream uses it may condition the water right to supplement stream flows or reallocate water from a consumptive use to an instream use.[614]

The California Legislature has also enacted a Wild and Scenic Rivers Program which provides instream flow protection by declaring "that certain rivers which possess extraordinary scenic, recreational, fishery, or wildlife values shall be preserved in their free-flowing state...for the benefit and enjoyment of the people of the state."[615] State agencies and departments are precluded from assisting "by loan, grant, license, or otherwise," any federal or, state, or local governmental entity "in the planning or construction of any dam, reservoir, diversion, or other water impoundment facility that could have an adverse effect on the free-flowing condition and natural character" of a designated river.[616] The legislature has also declared that the inclusion of a river in the Wild and Scenic Rivers Program is the "highest and most beneficial use and is a reasonable and beneficial use of water within the meaning of Section 2 of Article X of the California Constitution."[617]

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[611] The Board has direct jurisdiction over all appropriative water rights acquired subsequently to December 19, 1914. *Id.* at 671.

[612] *Id.* at 675.

[613] *Id.* at 675.

[614] *Id.* at 676.

[615] CAL. PUB. RESOURCES CODE §§5093.50-5093.69 (Deering Supp. 1991).

[616] Gray, *supra* note 589, at 682 (citing CAL. PUB. RESOURCES CODE §5093.56 (West Supp. 1989)).

[617] Gray, *supra* note 589, at 683 (citing CAL. PUB. RESOURCES CODE §5093.50 (West 1984)).

The potential inadequacy of the California system to fully protect instream flows appears to primarily depend upon the broad discretion of the Board in the exercise of its authority to regulate water rights and water quality issues.[618] "Neither the water rights system nor the water quality laws require the Board to provide any certain protection of instream uses."[619] With each new application the Board must decide on a case-by-case basis the same questions with respect to instream uses: "(1) Should stream flows reserved to protect fish, wildlife and recreational uses be reduced in order to facilitate the new appropriation?[620] (2) In view of the new consumptive use, what constitutes reasonable protection of instream beneficial uses?[621] (3) Considering the current needs of the state, what balance should be struck between consumptive and public trust uses of the available water? and (4) What is the relative benefit to be gained from all the beneficial uses of the water concerned[622]. Instream uses are particularly susceptible to this continual reevaluation process, especially during periods of water shortage when the Board must attempt to reallocate water among existing uses to meet increasing water demand.[623]

III. Oregon

The Oregon Legislature has declared that it is the public policy of Oregon "that establishment of minimum perennial stream flows is a high priority of the Water Resources Commission (the Commission) and the Water Resources Department."[624] Although not directly related to estuarine protection, the Oregon Department of Environmental Quality or the Department of Fish and Wildlife may apply to the Water Resources Commission for the

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[618] *See* Gray, *supra* note 589, at 685,

[619] *Id.* at 685.

[620] CAL. WATER CODE §1243 (Deering Supp. 1991).

[621] CAL. WATER CODE §1243.5 (Deering Supp. 1991).

[622] CAL. WATER CODE §1257 (Deering Supp. 1991).

[623] Gray, *supra* note 589, at 693.

[624] ORE. STAT. §536.235 (1989).

establishment of minimum perennial stream flows.[625] The applications must "include data on the quantities of water necessary to support fish life or to minimize pollution and other information specified by the Commission."[626] In determining the flow needs of a stream, the Department of Fish and Wildlife can incorporate estuarine needs into the proposed flow levels.[627] Minimum flow standards are converted into instream water rights,[628] having as a priority date "the date the application for the minimum perennial stream flow was filed, or, if no application has been filed, the date the commission initiated action to consider the minimum perennial stream flow."[629] If Oregon courts uphold the conversion of minimum flow standards to instream water rights,[630] Oregon may be able to avoid some of the problems associated with the case-by-case permit evaluation procedures to protect minimum flows existing under the Texas and California water codes.

Under certain conditions the Water Resources Commission may withdraw any unappropriated water from appropriation for any or all uses, including exempt uses.[631] The Commission must find that such action is necessary to "insure compliance with the state water resources policy or that it is otherwise necessary in the public interest to conserve the water resources of [the] state...."[632] Because minimum perennial stream flows have been recognized by the legislature as an important water policy goal,[633] this provision could afford limited

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[625] ORE. STAT. §536.325 (1989).

[626] *Id.*

[627] Phone interview with Mr. Al Miratti, Oregon Department of Fish and Wildlife, Newport, Oregon (August 16, 1991).

[628] *Id.*

[629] ORE. STAT. §536.325(3) (1989).

[630] This issue has not yet been addressed by Oregon courts. Phone interview with Mr. Al Miratti, Oregon Department of Fish and Wildlife, Newport, Oregon (August 16, 1991).

[631] ORE. STAT. §536.410(1) (1989).

[632] *Id.*

[633] ORE. STAT. §536.235 (1989).

protection to stream flows and estuaries during times of water emergencies or shortages, assuming unappropriated water is available for withdrawal.

Oregon has also established a scenic waterways program that provides protection of stream flows for designated waterways. The legislature has declared that "many of the free-flowing rivers of Oregon ... and lands adjacent to such ... rivers possess outstanding scenic, fish, wildlife, geological, botanical, historic, archaeologic, and outdoor recreation values of present and future benefit to the public."[634] The legislature has also found that the policy of permitting construction of "dams and other impoundment facilities at appropriate sections of the rivers of Oregon ..." requires a complementary policy affording protection to selected rivers in a free-flowing condition.[635] The highest and best use of waters within designated scenic waterways are recreation, fish and wildlife uses.[636] The free-flowing character of these waterways must be maintained in quantities necessary for recreation, fish and wildlife uses.[637]

The Oregon Department of Parks and Recreation is directed to undertake a continuing study and submit periodic reports, with the concurrence of the Water Resources Commission, to the Governor recommending the designation of additional rivers or segments of rivers as scenic waterways.[638]

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[634] ORE. STAT. §390.815 (1989).

[635] *Id.*

[636] ORE. STAT. §390.835(1) (1989).

[637] *Id.* "No dam, or reservoir, or other water impoundment facility shall be constructed or placer mining permitted on waters within scenic waterways. No water diversion facility shall be constructed or used except by right previously established or as permitted by the Water Resources Commission, upon a finding that such diversion is necessary to uses designated in ORS 536.310(12), and in a manner consistent with the policies set forth under the [Scenic Waterways Act]." *Id.*

[638] ORE. STAT. §390.855 (1989). The Department of Parks and Recreation is directed to consider the following criteria when making its reports:

(1) The river or segment of river is relatively free-flowing and the scene as viewed from the river and related adjacent land is pleasing, whether primitive or rural-pastoral, or these conditions are restorable.

(continued...)

IV. Connecticut

Connecticut primarily regulates stream flow through the addition of minimum flow requirement conditions to the permits necessary for a variety of activities affecting the state's water resources. For example, the Connecticut Siting Council (the Council), a subdivision of the State Public Utilities Control Authority, is responsible for siting power production and hazardous waste facilities in the state.[639] The Council must issue a certificate of environmental compatibility and public need prior to siting any regulated facility.[640] The Council may not issue a certificate unless it determines "the nature of the probable environmental impact, including a specification of every significant adverse effect, whether alone or cumulatively with other effects, on and [in] conflict with the policies of the state concerning the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, forests and parks, air and water purity, and fish and wildlife."[641] Consideration of the environmental impacts, including water resource issues, of siting power and hazardous waste facilities allows for the incorporation of instream flow values into the certification process.[642]

Other activities requiring permits afford additional opportunities for the inclusion of minimum flow requirement conditions. A permit from the Connecticut Department of Environmental Protection is required for any diversion of water in excess of 50,000 gallons per

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[638](...continued)

(2) The river or segment of river and its setting possess natural and recreation values of outstanding quality.

(3) The river or segment of river and its setting are large enough to sustain substantial recreation use and to accommodate existing uses without undue impairment of the natural values of the resource or quality of the recreation experience. *Id.*

[639] CARNEY AND MICHAEL, OPPORTUNITIES TO PROTECT INSTREAM FLOWS AND WETLAND USES OF WATER IN NEW HAMPSHIRE AND CONNECTICUT, 45, U.S. Fish and Wildlife Service Biol. Rep. 87(6) (1987) (hereinafter CARNEY).

[640] CONN. GEN. STAT. §16-50k(a) (1990).

[641] CONN. GEN. STAT. §16-50p(a) (1990). There are also other findings and determinations the Council must make in addition to environmental impacts. *See* CONN. GEN. STAT. §16-50p(a) (1990).

[642] CARNEY, *supra* note 639, at 44.

day under the "Connecticut Water Diversion Policy Act" (the Act).[643] The Act defines "diversion" as "any activity which causes, allows or results in the withdrawal from or the alteration, modification or diminution of the instantaneous flow of the waters of the state."[644] An applicant must include in the permit application information regarding "the effect of the proposed diversion on public water supplies, water quality, wastewater treatment needs, flood management, water-based recreation, wetland habitats, waste assimilation, agriculture, fish and wildlife, and low flow requirements."[645] When determining whether to issue the permit the Commissioner of the Department of Environmental Protection (the Commissioner) is directed to consider, among other factors, "the effect, including thermal effect, on fish and wildlife as a result of flow reduction, alteration or augmentation caused by the proposed diversion."[646] Although these provisions may allow the inclusion of minimum flow requirements in permits, a permit approach to protecting instream flows is precarious in that it depends on the discretion of the Commissioner, and instream values are reevaluated with each permit application.

Connecticut also provides for minimum flow standards in streams stocked with fish by the Department of Environmental Protection.[647] Legislation requires the Commissioner to promulgate instantaneous minimum flow standards for all stocked river and stream systems after "recognizing and providing for the needs and requirements of public health, flood control, industry, public utilities and water supply," as well as recognizing and providing for "stream and river ecology, the requirements of aquatic life, natural wildlife and public recreation...."[648] It is unclear from the statutory language whether a priority exists between the competing values to be considered by the Commissioner in establishing minimum flow standards. Recognition of the requirements of aquatic life may need be considered only after provision is made for other uses.

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[643] "The Connecticut Water Diversion Policy Act," CONN. GEN. STAT. §§22a-365 - 22a-378 (1990).

[644] CONN. GEN. STAT. §22a-367(2) (1990).

[645] CONN. GEN. STAT. §22a-369(7) (1990).

[646] CONN. GEN. STAT. §22a-373(6) (1990).

[647] CONN. GEN. STAT. §26-141a (1990).

[648] CONN. GEN. STAT. §26-141b (1990).

However, the protection afforded instream minimum flows by this provision is clearly limited to those river and stream systems included in the Department of Environmental Protection's stocking program.

CONCLUSIONS AND RECOMMENDATIONS

FUNDING, RESEARCH AND INFORMATION DISTRIBUTION

Most of Florida's water management districts have not progressed far in their research of and sensitivity to the effects of surface and ground water withdrawals on riverine and estuarine habitat. At staff level in most districts, there is apparent support for greater research into the freshwater inflow needs of estuarine systems, and for increased consideration of such needs in the permitting process. However, the overall level of funding for staff positions and outside contracts related to this need appears to be inconsistent with efforts to establish in-depth and coordinated research programs for regulatory purposes. The Northwest Florida and Suwannee River districts, particularly, are less capable of funding such projects at levels necessary to address all issues. At present, few district governing boards appear to be taking a leadership role on the issue. Greater educational efforts by staff and academics in the field, combined with greater input to governing boards from interested parties, should help bring these issues to the forefront of the debate over proper use of the state's water resources.

Recommendation #1

Increase the state's commitment to comprehensive understanding of riverine and estuarine conditions in Florida, through increased funding for research. Funded projects should include those related to: minimum freshwater inflows and levels needed by estuarine systems, impacts of consumptive use withdrawals and impoundments, impacts of other human activities on river basins and estuaries, salinity regimes and other water quality variables related to fishery habitat, hydrodynamic studies, groundwater/surfacewater relationships, etc.

Recommendation #2

Establish a permanent, statewide monitoring program in tidal rivers and estuaries to determine the status and trends of key indicators such as salinity regimes, plant community distribution, and the distribution and abundance of selected animal species. Participating agencies should include the water management districts, DER, statewide marine research laboratories, DNR, FGFWFC, and university departments involved in marine and hydrological research.

Recommendation #3

Designate a permanent, statewide "clearing house" for collection, publication and dissemination of research findings and monitoring data, for use by agencies charged with regulating potential impacts to estuaries.

Recommendation #4

Revise Section 373.459, Fla. Stat., to reduce the percentage of SWIM planning and project implementation costs which must be paid by Northwest Florida Water Management District and Suwannee River Water Management District as matching funds to those from the Surface Water Improvement and Management Trust Fund.

MINIMUM FLOWS/LEVELS

Establishing minimum flows and levels that reflect the proper timing, quantity and distribution of freshwater inflows to estuaries is a critical factor in the process by which regulatory and planning programs might work to protect estuarine habitat. Though the importance of minimum flows is recognized in several planning documents and rules, most water management districts have not devoted adequate funding and staff to the supporting research necessary for the establishment of such flows. It is also vital that minimum flows and levels reflect the nonconsumptive, instream and inplace freshwater needs of estuarine systems, that the analysis include consideration of groundwater/surfacewater interactions, and that these values be expressly considered in regulatory and planning programs.

Recommendation #5

Include language in state water policy that historically impounded streams will have a minimum flow established to tidal waters, using the best scientific methods available, considering the constraints of maintaining water supply, flood control or other single mission goals.

Recommendation #6

Amend Section 373.042, Fla. Stat. to ***mandate,*** *not authorize, consideration of seasonal freshwater needs of estuaries in the establishment of minimum flows and levels, in order to help protect critical dry season flows.*

Recommendation #7

Amend Section 373.042, Fla. Stat. to ***require,*** *not authorize, provisions for the protection of nonconsumptive uses, including the timing, quantity and distribution of instream and inplace freshwater needs of estuaries, in setting minimum flows and levels. Amend Chapter 17-40, F.A.C., to include protection of such needs in the establishment of minimum flows and levels.*

Recommendation #8

Amend Chapter 17-40, F.A.C. to specifically recognize the connections between groundwater and surface watercourse baseflow in many areas of the state, and to require consideration of this fact in the establishment of minimum flows and levels.

CONSUMPTIVE USE PERMITTING

The regulatory structure addressing human impacts on wetlands provides fairly good protection from the impacts of development on the physical or structural habitat of fisheries, yet pays little or no attention to the potential effects of inflow alterations on dynamic habitat (favorable salinity regime), which is equally as important as physical habitat. Water management districts are the primary permitting agencies for consumptive uses with environmental impacts on such freshwater dependent resources. There are questions involving how well the districts perceive and/or respond to the problems of maintaining adequate quantities, timing and distribution of inflow in the consumptive use permitting process. Included among these concerns are: the effects of groundwater withdrawals on surface watercourse base flows; the amount of expertise districts are capable of focusing on the habitat-based needs of estuarine systems; whether cumulative consumptive use impacts are being properly considered; whether proper consideration is being given (1) to the effects of impoundment structures on the ability of fish and prey to move within estuarine systems, and (2) to the effects of instream and offstream diversions of freshwater on salinity regimes and fishery habitat.

Recommendation #9

Amend the Water Resources Act to include specific legislative and regulatory language concerning the importance of maintaining proper timing, quantity and distribution of freshwater inflows to estuaries. Require that these considerations be reflected in Rule 17-40.310, F.A.C., and specifically included in water management district criteria by which consumptive use permit applications are assessed.

Recommendation #10

Develop specific criteria to help district governing boards determine the public interest in consumptive use permitting decisions, giving full recognition to the freshwater needs of estuarine systems and the potential interconnections between estuaries, surface watercourses and groundwater. Amend Chapter 17-40, F.A.C. and water management district rules to include these public interest criteria.

Recommendation #11

Consider methods of adjusting the permits for surface water withdrawals of major, grandfathered consumptive uses, at the time of permit renewal, in order to better serve the public interest by reducing estuarine impacts from improper quantities and timing of withdrawals. Permit revisions should reflect instream and inplace freshwater needs of estuarine habitats, as established in minimum flows. Amend Section 373.233, Fla. Stat., Rule 17-40.310, F.A.C. and water management district rules to reflect this approach.

Recommendation #12

Amend Section 373.223(3), Fla. Stat. and Rule 17-40.401(3), F.A.C. to ***require****, not authorize, governing boards and DER to reserve from use water in such locations and quantities, and for such seasons of the year, as may be required for the protection of fish and wildlife habitat.*

Recommendation #13

Amend the Water Resources Act to include a formal process of review and comment by appropriate federal and state agencies with expertise related to the effects of prospective consumptive uses on freshwater inflows to estuaries, and resultant impacts on fishery habitat.

Recommendation #14

Amend Chapter 17-40, F.A.C. to specifically recognize the influence that groundwater levels exert on surface watercourse baseflow in many areas of the state, and to require consideration of this relationship in the consumptive use permitting process.

Recommendation #15

Require consideration of cumulative impacts in the consumptive use permitting process, as applied to all withdrawals from surface waters in a basin feeding an estuary, and to all withdrawals from groundwaters, in cases where research has shown a relationship between groundwater levels and base flows into estuaries.

Recommendation #16

In the permitting process, separate consideration of the impoundment of water in rivers from the extraction of water from impoundments, to increase the attention given to downstream impacts. Apply the same process to offstream impoundments. Revise Chapter 17-40, F.A.C. to require consideration of potential harm to the water resource in this process, and include such factors as are used to determine whether stormwater impoundments will harm the water resource. Among others, these include: impact of the facilities on fish and wildlife; wetlands, floodplains, and other environmentally sensitive lands; and minimum flows and levels. (See Rule 17-40.420(3)(b), F.A.C.)

SWIM PLANS

Some of the primary goals of the Surface Water Improvement and Management Act are to provide habitat for native plants, fish and wildlife, prevent destruction of natural systems which provide habitat, and maintain the biological health of surface waterbodies. Proper salinity regimes and other processes supported by freshwater inflow are vital to the fishery habitat values of estuarine systems, yet the Act does not specifically include consideration of such factors. Recent revisions to the ratio of district matching funds to state funds for planning and implementation purposes will put the two districts with less funding capability at a distinct disadvantage in researching and correcting surface water problems under the Act.

Recommendation #17

Amend Section 373.453 of the Surface Water Improvement and Management Act to include specific legislative and regulatory language concerning the importance of maintaining proper timing, quantity and distribution of freshwater inflows to estuaries, in order to promote the Act's goals of providing habitat for native plants, fish and wildlife, preventing destruction of natural systems which provide habitat, and maintaining the biological health of surface waterbodies.

Recommendation #18

Estuaries in the state should be re-evaluated for higher priority in the SWIM planning process. All estuaries should eventually be addressed under the Act.

Recommendation #19

Require that research findings on minimum flows and freshwater needs of estuarine systems be incorporated into all SWIM plans and implementing projects with potential effects on estuarine systems.

Recommendation #20

Require consideration of salinity regime as a factor in assessing water quality in SWIM plans for estuaries, since maintenance of "dynamic habitat" is essential to the Act's goals of providing fish habitat and maintaining the biological health of estuarine systems.

Recommendation #21

Revise Section 373.459, Fla. Stat., to reduce the percentage of SWIM planning and project implementation costs which must be paid by Northwest Florida Water Management District and Suwannee River Water Management District as match to funds from the Surface Water Improvement and Management Trust Fund. (See Recommendation #4).

WATER SUPPLY NEEDS AND SOURCES

Each district must adopt by rule designated areas with water supply problems which have, or are anticipated to become critical within the next twenty years. The plans must also include a course of remedial or preventive action for each current or anticipated future critical problem, and provide for identifying areas where data collection, resource investigations or regulatory programs are needed to prevent water resource problems from becoming critical. A primary tool in the designation of critical water supply problem areas is an assessment of water needs and sources. Though the Act assigns a prominent role to protection of environmental and habitat values, generally, the freshwater habitat-based needs of estuarine fisheries are not being addressed by the districts in the analysis of water needs.

Recommendation #22

Amend Rule 17-40.501, F.A.C. to require consideration of freshwater needs of estuarine habitat in the water needs analysis section of the water management districts' needs and sources assessments.

Recommendation #23

Amend Chapter 17-40, F.A.C. to specifically recognize the connections between groundwater and surface watercourse baseflow in many areas of the state. Require more careful analysis of the effects of surface water withdrawals on estuarine habitat, and require consideration of effects of groundwater withdrawals on river base flows as part of water sources analysis.

Recommendation #24

Amend Rule 17-40.501(1)-(4), F.A.C. to expressly include estuarine freshwater needs in the analysis of critical water supply problem areas, in the specification of a course of remedial or preventive action, and in providing for more resource investigations, water resource projects and regulatory programs as necessary to prevent water resource problems from becoming critical.

WATER SHORTAGE PLANS

At present, the water shortage planning process does not seriously consider the freshwater inflow needs of estuaries, or the effects of massive diversions and withdrawals of fresh water on salinity regimes of estuarine systems during times of water shortage.

Recommendation #25

Amend Sections 373.175 and 373.246, Fla. Stat. to require consideration of minimum flows in water management district shortage plans and the water shortage and emergency declaration process. Freshwater inflow needs of riverine and estuarine systems should be allocated "off the top" before analyzing the remaining water needs and sources in the district.

Recommendation #26

Amend Section 373.175, Fla. Stat. and Rule 17-40, F.A.C. to require all water management districts to consider reduced stream flow, spring discharge or lowering of water tables, in analyzing potential serious harm to the resource in the water shortage planning process, as does the Southwest Florida Water Management District (Rule 40D-21.221(2)(c), F.A.C.).

Recommendation #27

Amend Section 373.175, Fla. Stat. and Rule 17-40, F.A.C. to require all water management districts to consider in the water shortage planning process such factors as are used to determine potential harm to water resources from stormwater management systems. These would include impacts on: fish and wildlife; wetlands, floodplains and other environmentally sensitive lands; and minimum flows and levels. (See Rule 17-40.420(3)(b), F.A.C.).