
CHAPTER 4

Wetland Programs

Introduction

Various assessments of Georgia's wetlands have identified from 4.9 to 7.2 million acres, including more than 600,000 acres of open water habitat found in estuarine, riverine, palustrine, and lacustrine environments. Estimates of wetland losses since colonial settlement beginning in 1733 and expanding over the next two and one-half centuries are between 20-25% of the original wetland acreage.

Georgia has approximately 100 miles of shoreline along the south Atlantic, with extensive tidal marshes separating the barrier island sequences of Pleistocene and Holocene age from the mainland. Georgia's coastline and tidal marshes are well preserved compared to other South Atlantic states.

Georgia's interior ranges in elevation from sea level to 4,788 feet at Brasstown Bald in the Blue Ridge Mountain Province. At the higher elevations, significant, pristine cool water streams originate and flow down steep to moderate gradients until they encounter lower elevations of the Piedmont Province. Many of the major tributaries originating in the mountains and piedmont have been impounded for hydropower and water supply reservoirs. These man-made lakes constitute significant recreational resources and valuable fishery habitat. At the fall-line, streams flowing southeasterly to the Atlantic, or south-southwesterly to the Gulf, have formed large floodplains as each encounters the soft sediments of the upper Coastal Plain.

Other significant wetlands found in the state are associated with blackwater streams originating in the Coastal Plain, lime sink-holes, spring heads, Carolina bays, and the great Okefenokee Swamp, a bog-swamp measuring approximately one-half million acres in south Georgia and north Florida. The swamp drains to the east by the St. Marys River into the Atlantic, and to the west by the Suwannee River into the Gulf.

The lower Coastal Plain has frequently been referred to as Atlantic Coastal Flatwoods, where seven tidal rivers headwater in the ancient shoreline terraces and sediments of Pleistocene age. Scattered throughout the flatwoods are isolated depressional wetlands and drainageways dominated by needle-leaved and broad-leaved tree species adapted to long hydroperiods.

Due to considerable variation in the landscape in topography, hydrology, geology, soils, and climatic regime, the state has one of the highest levels of biodiversity in the eastern United States. The state provides a diversity of habitats for nearly 4,000 vascular plant species and slightly less than 1,000 vertebrate species. Numerous plant and animal species are endemic to the state. Many of the rarer species are dependent upon wetlands for survival.

Extent of Wetland Resources

Assessments of wetland resources in Georgia have been carried out with varying degrees of success by the USDA Natural Resources Conservation Service, the USFWS National Wetland Inventory, and the state Department of Natural Resources. The extent and location of specific tidal marsh types have been reported in numerous scientific papers and reports. Estimates of other specific wetlands types, such as bottomland hardwood swamps, are also reported in studies on a regional scale.

Hydric soils as mapped in county soil surveys are useful indicators of the location and extent of wetlands for the majority of Georgia counties with complete surveys. The dates of photography from which the survey maps are derived vary widely across the state. There is an ongoing effort by NRCS to develop digital databases at the soil mapping unit level, but most of these data sets are not yet available. However, soil surveys have proven useful in wetland delineation in the field and in the development of wetland inventories. County acreage summaries provide useful information on the distribution of wetlands across the state.

The National Wetland Inventory (NWI) of the U.S. Fish and Wildlife Service utilizes soil survey information during photo-interpretation in the development of the 7.5 minute, 1:24,000 scale products of this nationwide wetland inventory effort. Wetlands are classified according to the Cowardin system, providing some level of detail as to the characterization of individual wetlands. Draft products are available for the 1,017 7.5 minute quadrangles in the state of Georgia, and many final map products have been produced. All of these quadrangles are available in a digital format, and an effort is underway to combine them into a single, seamless database for Georgia. Although not intended for use in jurisdictional determinations of wetlands, these products are invaluable for site surveys, trends analysis, and landuse planning.

A complementary database was completed by Georgia DNR in 1991 and is based on classification of Landsat TM satellite imagery. Due to the limitations of remote sensing technology, the classification scheme is simplified in comparison to the Cowardin system used with NWI. Integration of this digital information with

Geographic Information System technology is straight-forward. The inclusion of other upland landcover classes adds to the utility of this database in environmental analysis and landuse planning.

A summary of wetland acreages derived from this database is as follows: open water = 647,501; emergent wetlands = 351,470; scrub/shrub wetlands = 387,793; forested wetlands = 3,194,593; salt marshes = 241,242; brackish marshes = 91,951; and tidal flats/beaches = 14,750. The total wetland acreage based on Landsat TM imagery is 4,929,300 acres or 13.1% of Georgia's land area. This data underestimates the acreage of forested wetlands in the Piedmont and Coastal Plain, where considerable acreage may have been classified as hardwood or mixed forest. The data overestimates emergent and scrub/shrub wetlands in the pine flatwoods because of wet surface soils associated with clear-cuts or young pine plantations. The data under-estimates the tidal marshes and tidal flats because of a high tide stage that flooded considerable acreage. The targeted accuracy level for the overall landcover assessment using Landsat imagery was 85%. However, the classification error was not necessarily distributed equally throughout all classes.

Georgia reported landcover statistics by county in 1996 that included acreage occurrences for 15 landcover classes derived from early spring Landsat TM satellite imagery from 1988-1990. This document (Project Report 26) and accompanying landcover map of the state at a scale of 1:633,600 (1 inch = 10 miles) are available to the public from the Georgia Geologic Survey, Map Sales office.

Similar Landsat-based landcover databases have been produced with more recent imagery. The Federal government completed mapping in Georgia using imagery from the mid-1990s as part of the National Landcover Database. The Georgia Gap Analysis Program, supported in part by Georgia DNR, has completed an 18-class database using imagery from 1997-1999. Both these databases include wetland landcover classes.

Wetland Trends In Georgia

The loss of wetlands has become an issue of increasing concern to the general public because of associated adverse impacts to flood control, water quality, aquatic wildlife habitat, rare and endangered species habitat, aesthetics, and recreation. Historically, we have often treated wetlands as "wastelands" that needed "improvement". Today, "swamp reclamation" acts are no longer funded or approved by Congress and wetland losses are in part lessened. However, we still lack accurate assessments for current and historic wetland acreages. For

this reason, we have varying accounts of wetland losses, which provide some confusion in the public's mind as to trends.

The most recent (1991) and precise measure of Georgia's wetland acreage has been developed by the U.S. Fish and Wildlife Service's National Wetland Inventory efforts. This statistically sound study was based upon 206 sample plots of four (4) square miles each that were delineated and measured from 1975 and 1982 aerial photography. The total acreage of wetlands for Georgia was estimated at 7,714,285 acres in 1982 as compared to earlier estimates of 5.2 million acres. This estimate is considerably higher than the total shown in a 1984 trend study and is due in part to better quality photography.

Georgia's total wetland area covers an estimated 20 percent of the State's landscape. This total (7.7 mil. ac.) includes approximately 367,000 acres of estuarine wetlands and 7.3 million acres of palustrine wetlands (forested wetlands, scrub-shrub, and emergents). A net wetland loss due to conversion of approximately 78,000 acres was estimated for the seven (7) year period, while 455,000 acres were altered by timber harvesting. These latter estimates are less reliable than the total acreage and are slightly higher than the 1984 study. Regardless of the method used to measure total acreage or wetland losses, Georgia still retains the highest percentage of pre-colonial wetland acreage of any southeastern state. The state lacks the resources to conduct an independent monitoring program on the frequency of wetland alterations by class or type.

All dredge and fill activities in freshwater wetlands are regulated in Georgia by the U.S. Army Corps of Engineers (COE). Joint permit procedures between the COE and DNR, including public notices, are carried out in tidally influenced wetlands. Separate permits for alterations to salt marsh and the State's waterbottoms are issued by the Coastal Marshlands Protection Committee, a State permitting authority. Enforcement is carried out by the State, COE and EPA in tidal waters, and by the COE and EPA in freshwater systems. Normal agricultural and silvicultural operations are exempted under Section 404 regulations with certain conditions.

Integrity of Wetland Resources

Wetland Use Support. In Georgia, wetland uses are tied to both the state water quality standards through the definition of "water" or "waters of the state", and to established criteria for wetlands protection (Chap. 391-3-16-03) associated with the Comprehensive Planning Act of 1989 (O.C.G.A. 12-2-8).

The definition of "water" or "waters of the State" (Chap. 391-3-6) means "any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, wetlands, and all other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the state which are not entirely confined and retained completely upon the property of a single individual partnership, or corporation". The waters use classifications and general criteria for all waters are discussed elsewhere in this report.

The Comprehensive Planning Act requires all local governments and regional development centers to recognize or acknowledge the importance of wetlands for the public good in the landuse planning process. All local governments (municipalities and county governments) were required, beginning in 1990 and ending in 1995, to meet minimum criteria for wetland use and protection. Each government is required to map wetlands using DNR or NWI maps, and describe how wetlands will be protected from future development.

The wetlands protection criteria define freshwater "wetlands" as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 32.93)". This definition is not intended to include "coastal marshlands" or tidal salt marshes as defined by the Coastal Marshlands Protection Act. The minimum area of wetlands to be identified in landuse planning is not to exceed five acres.

The categories of freshwater wetlands and aquatic habitats to be identified, defined and mapped by the State and included in landuse planning are open water, non-forested emergent, scrub/shrub, forested and altered wetlands. Landuse plans must address at least the following considerations with regard to wetland classes identified in the database:

- Whether impacts to an area would adversely affect the public health, safety, welfare, or the property of others.
- Whether the area is unique or significant in the conservation of flora and fauna including threatened, rare or endangered species.
- Whether alteration or impacts to wetlands will adversely affect the function, including the flow or quality of water, cause erosion or shoaling, or impact navigation.

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- Whether impacts or modification by a project would adversely affect fishing or recreational use of wetlands.
 - Whether an alteration or impact would be temporary in nature.
 - Whether the project contains significant state historical and archaeological resources, defined as "Properties On or Eligible for the National Register of Historic Places".
 - Whether alteration of wetlands would have measurable adverse impacts on adjacent sensitive natural areas.
 - Where wetlands have been created for mitigation purposes under Section 404 of the Clean Water Act, such wetlands shall be considered for protection.

The mapping of altered wetlands defined as "areas with hydric soils that have been denuded of natural vegetation and put to other uses, such as pasture, row crops, etc., but that otherwise retain certain wetland functions and values" has not been completed due to a lack of resources. It is unlikely that there will be any significant resources committed at the state or federal levels for monitoring wetland alterations and conversions in the near future.

The acceptable uses of wetlands without long term impairment of function were identified in wetland protection criteria as the following:

Timber production and harvesting. The socio-economic value of wetlands for consumptive uses such as timber and wood products production is extremely high. High quality hardwoods are produced along the major river corridors throughout the state. There are established "best management practices" for harvesting in wetlands; the level of compliance with these voluntary standards is monitored by the Georgia Forestry Commission in cooperation with the DNR-EPD.

Wildlife and fisheries management. Wetlands are an invaluable resource, both ecologically and economically. They are among the state's most biologically productive ecosystems and are crucial as habitats for wildlife. Wetlands function as essential breeding, spawning, nursery, nesting, migratory, and/or wintering habitat for much of the migratory and resident fauna. More than 40% of the state threatened and endangered plant and animal species depend heavily on wetlands. Coastal wetlands function as nursery and spawning grounds for 60-90% of commercial fin and shellfish catches. In addition, high levels of plant productivity in coastal wetlands contribute to corresponding levels of invertebrate

organisms upon which fish and other animals feed. Plant decomposition in wetlands is also important for waterfowl production, which contributes to the economy through hunting-related expenditures.

Water Quality Protection. Wetlands help to maintain water quality and improve degraded water by removing, transforming, or retaining nutrients; processing chemical and organic wastes and pollutants; and reducing sediment loads. Wetlands function as sediment, toxic substance, and nutrient traps, performing functions similar to a waste treatment plant. Wetland vegetation filters and retains sediments which otherwise enter lakes, streams, and reservoirs, often necessitating costly maintenance dredging activities. Wetlands may also perform similar purification functions with respect to ground water. Those wetlands hydrologically connected to ground water could also be a source of recharge for underground water supplies, in which case the natural settling and filtering of pollutants would increase the purity of the water resource. As with any filter, wetlands can be damaged, overloaded, or made nonfunctional. Wetlands conservation and careful management of point and non-point pollutants can provide good wetland filtration of materials.

Recreation. The non-consumptive uses of wetlands may contribute most significantly and positively to quality of life, yet these uses are often undervalued or unrecognized altogether. Wetlands are areas of great diversity and beauty and provide open space for recreational and visual enjoyment. They support a myriad of recreational activities including boating, swimming, birdwatching, and photography. In addition, tidal, coastal, and inland wetlands provide educational opportunities for nature observation and scientific study.

Natural water quality treatment or purification. (See wastewater treatment above). Maintaining the biological and ecological integrity of wetlands is essential to the capitalization of these natural systems for the improvement of water quality and quantity. The polluting, filling, silting, channelizing, draining, dredging, and converting to other uses of wetlands are destructive to the ecological functions of wetlands.

Other uses permitted under Section 404 of the Clean Water Act. Such uses must have an overwhelming public interest. Unacceptable uses of wetlands include:

- Receiving areas for toxic or hazardous waste or other contaminants.
- Hazardous or sanitary waste landfills.
- Other uses unapproved by local governments.

The criteria established by the State for freshwater wetlands are designed to assist in the identification and protection of wetlands, and do not constitute a state or local permit program. The protection of coastal marshlands, seashores, and tidal waterbottoms is described under the Estuary and Coastal Assessment section of this report.

Wetland Monitoring. The state maintains monitoring and enforcement procedures for estuarine marshes under authority of the Coastal Marshlands Protection Act of 1970. Monthly or bimonthly over-flights are made of the Georgia coastline for potential violations. Restoration and penalties are provided for in the Act.

The State does not maintain a specific monitoring program for freshwater wetlands because of the size of the area (>37 million acres), lack of resources, and weak public support for a state-managed regulatory program. At this time no assessment of costs has been made for establishing any monitoring of wetland changes for the entire state.

Additional Wetlands Protection Activities

Georgia is protecting its wetlands through aggressive land acquisition, public education, land use planning, regulatory programs, and wetland restoration. Since 1987, the state has acquired roughly 200,000 acres through program expansion and the Preservation 2000 and RiverCare 2000 acquisition efforts. Additional protection to wetlands is provided either directly or indirectly by several statutes listed below, but described elsewhere in this report. These state laws are as follows:

- Coastal Marshlands Protection Act
- Shore Protection Act
- 401 Water Quality Certification
- Water Quality Control Act
- Ground Water Use Act
- Safe Drinking Water Act
- Erosion and Sedimentation Control Act
- Metropolitan Rivers Protection Act

Land Acquisition. Recent land acquisition activities that represent significant protection of wetland acreage include Chickasawhatchee Swamp WMA in southwest Georgia, where combined wetland and upland acreage totals 19,680 acres. In the Altamaha River basin, a total of 3,600 acres containing significant floodplain acreage is jointly managed by DNR and The Nature Conservancy at

Moody Forest Natural Area. Preservation by DNR of a Carolina bay at Big Dukes Pond NA added 1,220 acres, including a wood stork rookery site. Other wetland acres have recently been protected through the establishment of Conasauga River Natural Area in northwest Georgia.

Education And Public Outreach. WRD has one full-time person involved in aquatic education, providing training for educators in wetland values and acting as a resource person for developing and coordinating teaching materials. The Aquatic Education Program consists of three key components: Youth Education, Adult Education, and Kids Fishing. Youth Education involves training educators to use Aquatic Project Wild (APW), which consists of instructional workshops and supplementary conservation curriculum materials for teachers of K-12 grade age children. About 1,000 educators are trained annually to use APW in the classroom. Adult Education consists primarily of producing educational materials such as the annual Freshwater and Saltwater Sport Fishing Regulations, Reservoir and Southeast Rivers Fishing Predictions, Small Georgia Lakes Open to Public Fishing, Introduction to Trout Fishing, news releases, brochures, radio Public Service Announcements, videos, and staff presentations to sportsmen and civic organizations, as well as large events. The purpose of Kids Fishing Events (KFEs) is to introduce youth and their families to the joys of recreational fishing. The Aquatic Education Program touches tens of thousands of youths and adults each year, bringing these people closer to the environment, and teaching them conservation principles that are important to sustaining wetlands and healthy fish populations.

State Protected Species in Wetlands. With assistance from the USFWS, Section 6 Federal Aid Program, and USDA-FS Stewardship Program, WRD developed and published a descriptive handbook of Georgia's 103 protected plant species that include endangered, threatened, unusual, and rare plant species found in the state. Forty percent of the protected species are dependent on wetland or aquatic habitats in the vast majority known occurrences. The "Protected Plants of Georgia" book includes illustrations, descriptions, threats to species or their habitats, range in adjoining states, historical notes, and recommendations for management of protected species habitats. The protected plant book has been distributed to all DNR personnel and wildlife biologists involved in the management of state properties. It has been distributed to the Georgia Forestry Commission, USDA-Natural Resource Conservation Service, Forest Service, USFWS, Corps of Engineers, US EPA, major utility companies, forest products corporations, consulting biologists, educators, and private citizens. The book calls the public's attention to the need to protect wetlands on private property as well as public property in the state. In addition, the following species are subjects of continuing research funded through Section 6 USFWS grant-in-aid programs:

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- Loggerhead sea turtle - nest survey and protection, educational material
 - Wood stork - aerial surveys of rookeries and educational material
 - Bald eagle - nest surveys, monitoring, and management
 - Manatee - comprehensive management plan implementation, investigate and analyze habitat use and movements
 - Wood stork - ecology of coastal colonies
 - Listed aquatic species - Conasauga River corridor identification and mapping of essential habitats
 - Listed animal species - protected animal book for the State of Georgia (111 species)
 - Goldline darter - life history and status in Coosawattee River system
 - Tennessee Yellow-eyed Grass - surveys for undocumented populations
 - Whorled Sunflower - habitat management plan development
 - Pitcherplant Bogs - habitat management plan development
 - Swamp Buckthorn - status survey

Federal funds made available through USFWS were used to complete an assessment of Carolina bays in Georgia. A combination of aerial photography and field surveys were used to prioritize these wetlands for value in protecting wetland functions and in providing significant habitat to support wetland-dependant ecosystems. A final report on this effort will be available in 2004.

Managing Wetlands on State WMAs, PFAs, Parks, Heritage Preserves, and Natural Areas. M.A.R.S.H. Project. Georgia DNR-WRD has a cooperative agreement with Ducks Unlimited (DU) for the purpose of acquiring, developing, restoring, or enhancing waterfowl habitat. A major aspect of this agreement is the M.A.R.S.H. program (Matching Aid to Restore States Habitat). Under the MARSH program, 7.5% of the money raised by DU in Georgia is made available as matching funds for work to develop, improve, or restore waterfowl habitat.

Since 1985, 1.2 million dollars have been spent on habitat projects in the state of Georgia involving thousands of acres of wetlands. Completed projects include:

Altamaha WMA - 4,500 acres	Arrowhead - 28 acres
Ansley-Hodges Memorial Marsh - 42 acres	Blanton Creek WMA - 50 acres
B.F. Grant WMA - 45 acres	Clark Hill - 70 acres
Crockford-Pigeon Mtn WMA - 35 acres	Dyar Pasture - 60 acres
Fishing Creek WMA - 50 acres	Grand Bay WMA - 8,730 acres
Horse Creek WMA - 110 acres	Joe Kurz WMA - 50 acres

Mayhaw WMA - 45 acres
 Rum Creek WMA - 25 acres

Oconee WMA - 150 acres
 West Point WMA - 20 acres

Assessment of DNR-Managed Wetlands. In 1990, while developing a state wetland conservation plan and strategy for mitigation of impacts from water supply reservoirs and public fishing lakes, Georgia DNR/WRD made an assessment of wetlands on DNR-managed state-owned lands. As part of this assessment, an effort was made to identify degraded wetland acreage suitable for mitigation. Degraded wetlands were identified as having potentials for restoration or enhancement of wetland functions and values.

Table 4-1 summarizes DNR-managed lands (as of 1990) by various categories. This plan was developed by DNR and Law Environmental, Inc. to mitigate potential impacts from future development of regional water supply reservoirs and public fishing areas. DNR still has under study and evaluation a potential regional water supply reservoir in the Tallapoosa River basin. To date there has been implementation of mitigation on state lands at a mitigation site at Horse Creek WMA for wetlands losses associated with the construction of the Dodge County PFA. Mitigation is being pursued for wetland impacts associated with the development of a public fishing area at Ocmulgee WMA.

**TABLE 4-1
 ASSESSMENT OF DNR LANDS (1990).**

Categories	Total Acreage	Total Wetland Acreage	Acreage Suitable for Mitigation	
			Restoration	Enhancement
WMA/PFA Sites	128,106	38,754	1,782	9,749
Park Sites	43,850	6,158	509	86
Other Sites*	58,712	12,126	83	2,322
	230,668	57,038	2,374	12,157

*Includes natural areas, heritage preserves, and some barrier islands (Ossabaw, Sapelo)

CHAPTER 5

Estuary and Coastal Programs

Background

The Georgia Department of Natural Resources (DNR) Coastal Resources Division (CRD) primarily conducts monitoring and management of Georgia's coastal environments. The CRD operates the Coastal Management program and the Shellfish Sanitation program; manages recreational and commercial fisheries; and reviews applications for permits under the Coastal Marshlands Protection Act and Shore Protection Act. CRD also oversees several EPA wetland protection development grants. The DNR Wildlife Resources (WRD) and Environmental Protection Divisions (GAEPD) each play additional roles in this effort and interact with various agencies on management of Georgia's coastal areas. The Georgia University System conducts research on estuarine and coastal habitats from Skidaway Oceanographic Institute in Savannah and the University of Georgia Marine Institute on Sapelo Island.

Water Quality Monitoring

The GAEPD monitors estuarine water quality as part of its long-term trend-monitoring network. Additional intensive surveys have been conducted with major studies for the North River, Satilla River, Brunswick/ Turtle Rivers, North Newport River, and Savannah River and several estuarine sites have been included in the GAEPD toxics monitoring projects. Monitoring of estuaries and coastal waters is also being conducted, as these areas are the focus of monitoring efforts associated with the River Basin Management Planning Program.

The GAEPD monitoring programs have included sampling for the presence of potentially toxic materials in water, sediment, fish, oysters, shrimp, and blue crabs. To date, only one site sampled as part of the toxics monitoring has revealed metals or organic compounds at problem concentrations. Based on the sampling at this site near Brunswick, a seafood consumption advisory was issued. This advisory is noted in Chapter 6.

The CRD provides enhanced water quality monitoring through implementation of the Comprehensive Coastal Monitoring Project. CRD staff monitor water, sediment, and biological tissue quality for both non-point and point source contaminants in estuarine and near shore coastal waters. Four distinct

monitoring programs are administered by CRD staff to accomplish the goals of the comprehensive Coastal Monitoring Program. Two programs, Shellfish Sanitation and Beach Monitoring, are concerned with public health. The other two programs, Nutrient Monitoring and the National Coastal Assessment are designed to generate baseline monitoring data for trends.

Shellfish Sanitation Program

CRD's Shellfish Sanitation Program monitors the quality of Georgia's shellfish waters for harmful bacteria that might affect the safety of shellfish for human consumers. Nine (9) harvest areas are designated for the recreational picking of oysters and clams by the general public. An additional seventeen (17) harvest areas are designated for the commercial harvest of oysters and clams.

**TABLE 5-1
LOCATION AND SIZE OF AREAS
APPROVED FOR SHELLFISH HARVEST**

County	Approved	Leased	Public
Chatham	2,903 acres	25	1,403 acres
Bryan/Liberty	Classification in progress	Classification in progress	Classification in progress
McIntosh	20,277 acres	15,157 acres	5,120 acres
Glynn/Camden	17,511 acres	9902 acres	7,609 acres

The Shellfish Sanitation Program is funded by the state of Georgia and consists of water quality monitoring, permitting shellfish harvesters, sanitary surveys, and reports to the Food and Drug Administration. The Program is administered under the authority of OCGA 27-4-190, which specifically details the law as it pertains to shellfish harvest.

The National Shellfish Sanitation Program requires that states show that shellfish harvest areas are "not subject to contamination from human and/or animal fecal matter in amounts that in the judgment of the State Shellfish Control Authority may present an actual or potential hazard to public health." National standards further require the state to regularly collect water samples from each approved

harvest area and to perform certain analytical procedures to ensure that the area is below the established fecal coliform threshold. Waters approved for shellfish harvest must have a geometric mean that does not exceed the threshold set forth by the FDA.

Water Quality sampling occurs monthly at eighty-two (82) stations in five (5) counties on the coast including Chatham, Liberty, McIntosh, Glynn, and Camden counties. These stations are located to give good coverage of all the approved harvest areas along the coast.

Permitting is required for all leaseholders and pickers engaging in the commercial harvest of shellfish in the state of Georgia. Additionally, certification of shellfish seed suppliers is done by CRD to ensure that all products entering the State for mariculture purposes has been tested by a pathology laboratory for a variety of common shellfish diseases.

Beach Monitoring Program

The Beach Monitoring Program was developed to protect swimmer health. CRD monitors Georgia's popular swimming beaches on Tybee, St. Simons, Jekyll, and Sea Island for fecal coliform bacteria. In April 2004, CRD began monitoring the beaches for enterococcus bacteria, in response to the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000.

The BEACH Act is an amendment to the Federal Clean Water Act. The Act requires states to: 1) identify and prioritize their coastal recreational beaches; 2) monitor the beaches for the presence the bacterial indicator enterococcus; 3) notify the public when the EPA threshold for the enterococcus bacteria has been exceeded; and 4) report the location, monitoring, and notification data to EPA.

The coastal recreational beaches were identified and reported to EPA. See the table below. The beaches were prioritized into 3 tiers, based on use and proximity to potential pollution sources. Tier 1 beaches are high use beaches. Tier 2 beaches are lower use beaches. Tier 3 beaches are lowest use or low in potential pollution.

In April 2004, CRD began beach monitoring and public notification based on EPA's recommended levels of Enterococcus bacteria for marine recreational waters. CRD monitors for the indicator bacteria enterococcus. The notification procedures are activated when the laboratory reports that a beach sample has exceeded the EPA mandated enterococcus thresholds of 104 per 100 ml for a single sample, or a geometric mean of 35 per 100ml. The Tier 1 beaches are monitored weekly year-round. Tier 2 beaches are monitored monthly from April

through November. Tier 3 beaches are not monitored. Beaches under permanent swimming advisory are monitored quarterly.

EPA ID	Beach Name	Tier	County
GA154978	St. Simons 12 th St. Goulds Inlet	1	Glynn
GA431870	St. Simons East Beach Old Coast Guard Station	1	Glynn
GA613921	Massengale on St. Simons	1	Glynn
GA375764	5 th St Crossover on St. Simons	1	Glynn
GA776618	Lighthouse on St. Simons	1	Glynn
GA688687	Jekyll Clam Creek	1	Glynn
GA521101	Jekyll North at Dexter Lane	1	Glynn
GA129645	Jekyll Captain Wylly	1	Glynn
GA339359	Jekyll Convention Center	1	Glynn
GA202139	Jekyll South Dunes	1	Glynn
GA895834	Jekyll 4H Camp	1	Glynn
GA216208	Jekyll St. Andrews	1	Glynn
GA136053	Tybee Polk St	1	Chatham
GA378874	Tybee North at Gulick	1	Chatham
GA736216	Tybee Middle	1	Chatham
GA319508	Tybee Strand	1	Chatham
GA881548	Tybee South	1	Chatham
GA958433	Blythe Island Sandbar	2	Glynn
GA997306	Reimolds Pasture in Buttermilk Sound	2	Glynn
GA954033	Sea Island North	2	Glynn
GA910170	Sea Island South	2	Glynn
GA109786	Contentment Bluff Sandbar	2	McIntosh
GA551809	Dallas Bluff Sandbar	2	McIntosh
GA649062	Ossabaw Bradley	2	Chatham
GA405484	Ossabaw South	2	Chatham
Ga994539	Skidaway Narrows	2	Chatham
GA583441	Kings Ferry	2	Chatham
GA543512	Cumberland	3	Camden
GA781891	Little Cumberland	3	Camden
GA740854	Pelican Spit off Sea Island	3	Glynn
GA922112	Rainbow Bar	3	Glynn
GA381139	Wolf Island	3	McIntosh
GA364044	Sapelo Cabretta	3	Mcintosh
GA221111	Sapelo Nanny Goat	3	McIntosh
GA642495	Blackbeard Island	3	McIntosh
GA541863	St. Catherines Island	3	Liberty
GA713371	Ossabaw Middle	3	Chatham
GA182760	Wassaw Island	3	Chatham
GA365682	Williamson Island	3	Chatham
GA708259	Little Tybee Island	3	Chatham

For the notification component, CRD has worked in partnership with local governments, the Jekyll Island Authority, and the Coastal Health District to develop procedures to notify the public about elevated bacteria levels. The Coastal Health District issues a press release for a swimming advisory for the affected beach. The local governments activate advisory signage at access points to the affected beach. CRD places beach information on their web site, <http://crd.dnr.state.ga.us> and has partnered with the nonprofit organization Earth911 to show current beach conditions on their web site, <http://www.earth911.org/waterquality/default.asp?cluster=2>. Earth911 has a free automatic e-mail service to which users can subscribe. The subscribers then receive an e-mail anytime a beach advisory is issued.

CRD reports Georgia's beach data annually to EPA through the EPA Central Data Exchange (CDX). Monitoring data is loaded into the modernized STORET. Notification data is loaded into the BEACON database and can be viewed at http://oaspub.epa.gov/beacon/beacon_national_page.main

Nutrient Monitoring Program

The Nutrient Monitoring Program is an effort funded by the state of Georgia to assess the nutrient loads in our sounds and estuaries. High nutrient loads have been linked to outbreaks of harmful algal blooms in other states and can result in large kills of fish and other marine life as well as human sickness. Nutrient monitoring began on March 1, 2000 and is a continuous program designed to establish trends for nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, total dissolved phosphorus, ortho phosphate, and silicate. Nutrient samples are collected in three major coastal rivers (Ogeechee, Altamaha, and St. Marys) at six sites in each river. This sampling occurs monthly and provides data for the upper estuary, lower salinity environments. Moving seaward, nutrient samples are collected at 30 of the 82 shellfish sample sites. This provides nutrient and fecal coliform bacteria data from 30 sites in our tidal rivers and sounds. To capture nutrient data for our lower sounds, samples are collected at 24 sites in conjunction with the monthly shrimp and crab assessment. The Altamaha and Doboy Sounds, which are not routinely sampled on the shrimp and crab assessment, are sampled at twelve (12) stations in conjunction with the Altamaha River. Sample collection for nutrients occurs monthly at 84 stations on the coast and is creating a baseline dataset for nutrients in the coastal waters of Georgia.

National Coastal Assessment

The final coastal monitoring program administered by CRD is the most comprehensive. The National Coastal Assessment Program (NCA), formerly known as the National Environmental Monitoring and Assessment Program (EMAP), was created in 1988 by the U.S. EPA in cooperation with other federal agencies to provide basic answers relating to environmental problems impacting the Nation's ecological resources. Coastal Resources Division acquired funding from the EPA in 2000 to begin a five year pilot study in which 50 selected sites are sampled each year on the Georgia coast for a core suite of indicators including water quality parameters, sediment chemistry, sediment toxicity, benthic community composition, fish community composition, fish pathology, and contaminants in fish. EPA randomly selects these sample sites and the sampling occurs during the months of July and August each year. This specific time frame, sample site design, and sampling protocol allows each state to view a comparable "snapshot" of environmental conditions. The purpose of this monitoring initiative is to establish a baseline of environmental conditions in estuaries of the coastal states as part of a national survey of estuarine environmental health. The first two-year federal report on this program was completed during the spring of 2004. Currently, CRD is continuing work with the EPA NCA program through another phase II grant. The following proposal will extend NCA activities on the Georgia coast for an additional two years. The project will be conducted in FY 2005-2006 and will build upon and expand the processes and data developed during the preceding five-years.

A Comprehensive Monitoring and Assessment Study for Georgia Coastal Wetlands

The effective management of Georgia's coastal resources is becoming more dependent on a thorough understanding of the functions of the resources being managed. Tidal wetland habitats are being altered as development pressures increase. There is an overwhelming need to better understand the diversity and productivity of estuarine wetland species and their interactions with various habitat conditions.

Coastal Resources Division will evaluate wetland health by sampling nekton, juvenile fish and crustaceans in various habitat conditions in three river basins in coastal Georgia. Habitat conditions sampled will be categorized as pristine, moderately impaired and impaired, based on vegetative edge plant density. Nekton samples will be taken using a drop ring sampler at the vegetated edge. A trawl in the adjacent waterbody will collect juvenile fish and crustaceans. Water quality parameters will be collected at the trawl locations.

Vegetative edge density and biotic composition correlated with water quality parameters will give coastal resource managers a more holistic approach to wetland function. These data will provide a tool in which resource management decisions can be based.

Commercial and Recreational Fisheries

The CRD has several projects whose purposes are to determine the status of exploited stocks of commercially and recreationally important fish, crustaceans, and mollusks. The Ecological Monitoring Surveys Project conducts monthly assessment trawls (blue crabs, shrimp, and beginning in 2003, finfish) in the Wassaw, Ossabaw, Sapelo, St. Simons, St. Andrew and Cumberland Sound systems. This sampling is used to evaluate the abundance, size composition, reproductive status of penaeid shrimp and blue crab for the opening and closing of fishing seasons and areas. In addition, information collected on finfish and other invertebrate species since 2003, provides a broad ecologically based evaluation of species' abundance, distribution, and diversity in these sound systems. Information is also obtained on the commercial landings by species of fish and shellfish harvested each month in Georgia's coastal waters. The Marine Sportfish Population Health Study conducts stock assessments on selected marine sport fish (i.e. spotted sea trout and red drum) and conducts fishery-independent monitoring of estuarine species. The Fisheries Dependent Work Unit conducts the intercept portion of the Marine Recreational Fisheries Statistics Survey in cooperation with the National Marine Fisheries Service.

Total annual commercial landings in Georgia have ranged from 7.40 to 18.11 million pounds of product during the period from 1994 to 2005, with an annual average of 10.87 million pounds. Penaeid shrimps are the most valuable catch in Georgia commercial landings, typically totaling over 17 million dollars (4.23 million pounds of tails) in unadjusted, ex-vessel value during recent years. Catches are composed primarily of white shrimp (*Litopenaeus setiferus*) during the fall, winter and spring, and brown shrimp (*Farfantepenaeus aztecus*) during the summer. These shrimp spawn in oceanic waters, but depend on the salt marsh wetlands to foster their juvenile and sub-adult stages. White shrimp landings have varied over the last 40 years with no overall trend. Research has shown that densities of spawning stock, and to a lesser extent fall harvest, respond strongly to cold air outbreaks during the early winter which produce wide scale kills of white shrimp, and to a suite of environmental variables impacting the salt marsh ecosystem which produce a range of growing conditions. Winter kills have been associated with freezes 1984, 1989, and 2000. With favorable environmental conditions and short maturation period, the stocks rebounded each time within 18 months.

A disease called black gill, caused by a ciliated protozoan, has impacted shrimp in several recent years. It was first observed in 1996 in the southern portion of the state and was speculated to be caused by freshets associated with Hurricane Fran and Tropical Storm Josephine. The disease has occurred each year since with the exception of 1997, 1998, and 2001. The disease appears to progress from north to south, first appearing in Wassaw Sound in August and being most prevalent in September. The disease seems to dissipate by December. Annual infection rates in 2002 were the highest ever recorded, with the coast-wide annual rate at 18.1%. The life cycle of this protozoan is not completely understood, and its impact on shrimp survival is uncertain. However, in 2002, spring white shrimp catches were above normal through August and after the disease outbreak dropped 50% below the long-term average. Although catch rates from fisheries independent monitoring surveys appear to have a negative relationship with infection rates, this relationship is not statistically significant. Research is needed to understand this organism's life cycle and the environmental factors that cause it to proliferate in some years but not others.

Trends in the brown shrimp fishery present a different picture. While recent landings and experimental catches have varied with no apparent pattern, the long term (40 year) trend in brown shrimp landings has been downward. Several alternative hypotheses bear examination. Reported declines in brown shrimp production may reflect the effects of a shrinking range due to land use practices, and climatological changes. Conditions for juvenile growth and survival may have been altered by a changing climate or direct and indirect alteration to nursery grounds (losses or changes in the quality of fresh and salt water wetlands). Additionally, possible misclassification of brown shrimp by Port Agents may be a factor in the earlier time series of the reported landings. Although highly unlikely with current fishing technology and economic conditions, over fishing of the spawning stock may be resulting in poorer recruitment to Georgia's nursery grounds. Some combination of factors may be influencing stock abundance. Economic conditions in all domestic shrimp fisheries are declining, primarily due to low unit prices kept down by high volumes of imported product, and by increasing costs of operation.

Reported annual blue crab (*Callinectes sapidus*) 2005 landings have recovered to near the 10-year average 4.9 million pounds (2005 = 3.7 million pounds). This, after a severe drought from 1998 to 2002 reduced annual harvest 80% of the long-term average of 7.99 million pounds. Blue crabs live longer than penaeid shrimps (3-4 years versus 1-2 years), and also exhibit less extreme fluctuations in annual abundance from one year to the next. The drought caused major shifts in the estuarine salinity regime - increasing salinity. This shift resulted in (1) higher predation by coastal predators, (2) increased prevalence of

the fatal disease *hematodinium*, (3) loss of habitat, (4) recruitment failure. Although, the drought ended with several tropical storms in the fall of 2002, a recover was not noticeable until the late 2004.

Total finfish landings have increased over time. This has been affected by the re-establishment of an offshore fleet in Georgia during the late 1970's. Snapper, grouper, porgy, king mackerel, sharks, wreckfish, and associated species have contributed to the trend. Some of these species are currently in an over-fished state and are under intensive management. Others, such as king mackerel, have responded positively to state and federal management. American shad populations in the Altamaha River have fluctuated over the past 30 years. Research conducted in 1967 and 1968 generated population size estimates, and the shad run of 1.9 million fish in 1968 was the largest of the time series examined. Additional research conducted since 1982 has been able to provide updated population estimates and has shown Altamaha shad runs quadrupling from 70,396 fish in 1991 to 272,556 in 1997. This rebound may be attributable to a statistically significant decrease in commercial fishing effort that occurred from 1982 to 1991. Apparently, as older fishermen have left, there have been few new entrants into the fishery. No effort estimates are available since 1991. Regulations have remained fairly constant over the past 15 years. The only two modifications were a 15-day season extension in 1983, and commercial fishing regulations in 1984 to clarify open and closed areas on the Altamaha River. No changes were made to shad sportfishing regulations. While the increases in landings and stock size during the early 1990's was significant, they still represent only a fraction of the 1968 run.

Total landings of bivalve mollusks have fluctuated greatly over the last 30 years. During the 1970's landings were totally dominated by oysters (*Crassostrea sp.*), generally over 50,000 pounds of raw meats per annum. During the early 1980's fishermen were increasingly focused on hard clams (*Mercenaria sp.*) due to stock declines in other areas along the east coast and their market value. This combined with increasing acreages available for harvest activities due to water quality certifications, allowed the replacement of oysters by clams as the premier species from 1986-1988. From 1988-1992 clam landings again declined and oyster landings grew. Since 1990, the clam landings have shown a general increase in contrast to the oyster fishery that, after large catches from 1989-92, have shown a steady decline since. In 2005, clam harvest was 106,032 pounds. Oyster harvest in 2005 was only 1,588 pounds – 20% above the ten-year average. Labor costs have effected this change in combination with temporary inaccessibility to some grounds because of conflicts over harvest rights. No acreage has been lost to deteriorating water quality. Current research is focusing on improvements in stock genetics (growth and appearance enhancements), cultch substrate comparisons, and establishing new populations.

The Research and Surveys Program (RSP) is responsible for collecting fisheries dependent and independent information necessary for managing Georgia's sportfish populations and enhancing saltwater sport fishing opportunities. Utilizing fish trawls, gillnets, trammel nets and hook and line gear, program personnel conduct monthly sampling activities to monitor Georgia's most popular marine sport fish. Fishery biologists conduct creel surveys of over 2000 anglers annually to estimate recreational angler effort and catch by species. Ongoing population monitoring efforts, life history investigations, and periodic stock assessments of these species allow managers to determine if fish populations are healthy and not being over-fished. Since the mid-1980's, regulations establishing seasons, creel limits, and size limits have been implemented or revised for 17 species to preserve sport fish stocks and reduce fishing mortality.

The Constituent Services Program is responsible for developing and improving public access to fishing areas through construction of fishing piers, boat ramps and boating service docks.

Sapelo Island National Estuarine Research Reserve

The Sapelo Island National Estuarine Research Reserve (SINERR) is one of 22 estuarine sites nationwide in the National Estuarine Research Reserve Program. Georgia began efforts to designate the Duplin Estuary as an estuarine sanctuary in 1975 and received designation from the Department of Commerce in 1976.

The SINERR has two primary functions: to protect natural and cultural resources and to allow scientists to investigate how such estuarine systems function. Of the 16,000 acres that make up Sapelo Island, SINERR occupies nearly one third. The DNR, which manages SINERR, also manages more than one half the island as the Richard J. Reynolds Wildlife Management Area and another 2,732-acre tract designated as the Natural Area. Hog Hammock, a 434-acre tract, is privately owned.

The DNR has instituted protective management practices while promoting visitor activities including guided interpretive tours, hunting, fishing, and nature study. DNR activities include managing wildlife and forest resources, enforcing conservation laws, operating the ferry and visitor use facilities, presenting educational programs for visitors, and assisting in scientific monitoring.

The University of Georgia Marine Institute largely carries on the research function of SINERR. The Marine Institute employs full-time scientists, technical, and support staff. Its research is centered on how salt-marsh estuaries function. Fully 80% of the Marine Institute research is conducted within the SINERR.

Coastal Zone Management

Recognizing the economic importance of environmentally sensitive coastal areas, the Federal Coastal Zone Management Act of 1972 encourages states to balance sustainable development with resource protection in their coastal zone. As an incentive, the federal government awards states financial assistance to develop and implement coastal zone management (CZM) programs that fulfill the guidelines established by the Act. As further incentive, states with federally approved CZM programs are granted "federal consistency" authority whereby any federal activity that may impact resources within a state's coastal zone must be consistent with the enforceable policies of that state's federally approved CZM program. Thus, states with approved programs have a voice in federal activities such as harbor projects; federal permits, federal fisheries management plans, and federally financed construction projects.

To achieve approval, state CZM programs must address the protection of natural resources and fish and wildlife, coastal development, public access to the coast for recreational purposes, and other aspects of coastal management. State programs must also include public and local government participation in coastal management decision making. States must submit CZM programs to the National Oceanic and Atmospheric Administration (NOAA) for approval in order to receive federal implementation funds. The annual amount of implementation funding available to each state with an approved program is based upon a formula factoring in the linear miles of coastline with coastal population. Georgia's approved Coastal Management Program is eligible for more than \$2 million annually.

The Georgia Coastal Management Program is a networked program implemented by the CRD and other state agencies with management authority in the coastal area. As lead agency for the program, the CRD conducts numerous functions including managing saltwater fisheries, monitoring water quality, administering Coastal Marshlands Permits and Shore Permits, providing technical assistance, reviewing federal activities for consistency with the state laws that comprise the Coastal Management Program, and other activities. Other state, local, and federal agencies continue to administer their respective authorities, and cooperate with the CRD on coastal issues. Acting as a strategic plan for the coastal area, the Program relies on existing state laws and authorities to fulfill federal resource protection guidelines. The jurisdiction of the Program extends over the first and second tier of coastal counties to encompass all tidally influenced waters. This eleven-county area includes: Brantley, Bryan, Camden, Charlton, Chatham, Effingham, Glynn, Liberty, Long, McIntosh, and Wayne.

The Georgia Coastal Management Program seeks to balance economic development in Georgia's coastal zone with preservation of natural, environmental, historic, archaeological, and recreational resources for the benefit of Georgia's present and future generations. The Program offers Coastal Incentive Grants to local communities to promote grassroots solutions to coastal issues. The Program promotes interagency cooperation through regular meetings and technical assistance. A CRD satellite field office was opened at Richmond Hill in 2004 to better serve the public in the northern portions of the coast. Finally, the Program conducts a comprehensive environmental education program, operates the Coastal Ark mobile classroom and hosts the Coast Fest, an annual coastal environmental education festival.

The GAEPD has been an active participant in Coastal Management Programs throughout the development and implementation of the initiative. The agency has provided guidance and technical assistance in efforts to improve coastal water quality in general, and in the development of a Coastal NonPoint Source Control Program in particular. Under the Coastal Zone Act Reauthorization Amendments of 1990, Congress added a section entitled "Protecting Coastal Waters." That section directs states with federally approved CZM programs to develop a Coastal NonPoint Source Program. To that end, the GAEPD is assisting the CRD in 1) identifying land uses which may cause or contribute to the degradation of coastal waters, 2) identifying critical coastal areas adjacent to affected coastal waters, 3) identification of appropriate measures related to land use impacts to achieve and maintain water quality standards and designated uses, and 4) identifying management boundaries to more effectively manage land use impacts and water uses to protect coastal waters.

CHAPTER 6

Public Health/Aquatic Life Issues

Fish Consumption Guidelines

Background. Fishing is a valuable activity to Georgia's citizens. The ways in which people participate in fishing varies widely. To some people, fishing is an activity associated with family. Teaching children to catch bream off a dock or taking a group of campers at a scout camp for an afternoon of bank fishing are both memorable experiences. Some people participate in fishing purely for the challenge of competition, either competing in an organized club tournament or just competing with the fish to bring to creel and release a limit. Catching fish for the dinner table is also a valuable activity. No matter how a person participates in fishing it should be a fun and safe activity. This also includes eating the fish.

Unfortunately, some fish from a few waterbodies contain substances, which prohibit the safe consumption in unlimited quantities. The Wildlife Resources Division (WRD), the Coastal Resources Division (CRD), and the GAEPD of the Georgia Department of Natural Resources (DNR) work cooperatively to collect and analyze fish samples to provide information for Georgia fishermen.

Fish Monitoring Program. Georgia has more than 44,000 miles of perennial streams and more than 421,000 acres of lakes. It is not possible for the DNR to sample every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs, which make up more than 90% of the total lake acreage. These lakes will continue to be sampled as part of a five year rotating schedule to track any trends in fish contaminant levels. The DNR has also made sampling fish in rivers and streams downstream of urban and/or industrial areas a high priority. In addition, DNR focuses attention on public areas which are frequented by a large number of anglers.

The program includes testing of edible fish and shellfish tissue samples for the substances listed in Table 6-1. Of the 43 constituents tested, only PCBs, dieldrin, DDT and its metabolites, and mercury have been found in fish at concentrations above what may be safely consumed at an unlimited amount or frequency.

**TABLE 6-1
PARAMETERS FOR FISH TISSUE TESTING**

Antimony	Mercury	a-BHC	4,4-DDT	Heptachlor	PCB-1248
Arsenic	Nickel	b-BHC	Dieldrin	Heptachlor Epoxide	PCB-1254
Beryllium	Selenium	d-BHC	Endosulfan I	Toxaphene	PCB-1260
Cadmium	Silver	g-BHC (Lindane)	Endosulfan II	PCB-1016	Methoxychlor
Chromium, Total	Thallium	Chlordane	Endosulfan Sulfate	PCB-1221	HCB
Copper	Zinc	4,4-DDD	Endrin	PCB-1232	Mirex
Lead	Aldrin	4,4-DDE	Endrin Aldehyde	PCB-1242	Pentachloroanisole
					Chlorpyrifos

The use of PCBs, chlordane, DDT and dieldrin have been banned in the United States, and, over time, the levels are expected to continue to decline. Currently there are no restricted consumption recommendations due to chlordane. One water segment has a restriction in consumption recommended for one species due to dieldrin residues, and one pond has restrictions recommended due to DDT/DDD/DDE residues.

Mercury is a naturally occurring metal that cycles between the land, water, and the air. As mercury cycles through the environment it is absorbed and ingested by plants and animals. It is not known where the mercury in Georgia's fish originates. Mercury may be present due to mercury content in natural environments such as in South Georgia swamps, from municipal or industrial sources, or from fossil fuel uses. It has been shown that mercury contamination is related to global atmospheric transport. The EPA has evaluated the sources of mercury loading to several river basins in Georgia as part of TMDL development, and has determined that 99% or greater of the total mercury loading to these waters occurs via atmospheric deposition. States across the southeast and the nation have detected mercury in fish at levels that have resulted in limits on fish consumption. In 1995, the USEPA updated guidance on mercury, which documented increased risks of consuming fish with mercury. The DNR reassessed all mercury data and added reduced consumption guidelines in 1996 for a number of lakes and streams, which had no restrictions in 1995. The Georgia guidance for 2005 reflects the continued use of the more stringent USEPA risk level for mercury.

Evaluation Of Fish Consumption Guidance for Assessment Of Use Support. USEPA guidance for evaluating fish consumption advisory information for 305(b)/303(d) use support determinations has been to assess a water as fully supporting uses if fish can be consumed in unlimited amounts; as partially supporting if consumption needs to be limited; and, as not supporting if no consumption is recommended. Georgia followed this guidance in evaluating the fish consumption guidelines for the 2000 and earlier 305(b)/303(d) lists. This assessment methodology was followed again in developing the 2002 305(b)/303(d) List for all fish tissue contaminants except mercury. Mercury in fish tissue was assessed and a segment or waterbody was listed if the trophic-weighted fish community tissue mercury was in excess of the new USEPA water quality criterion (*Water Quality Criterion for the Protection of Human Health: Methylmercury*, EPA-823-R-01-001, January 2001). For mercury, waters were placed on the partial support list if the calculated trophic-weighted residue value was greater than 0.3 µg/g wet weight total mercury, and less than 2 µg/g wet weight, and on the not support list if the value was greater than or equal to 2 µg/g wet weight. For contaminants other than mercury (PCBs, dieldrin, DDT/DDD/DDE) waters were placed on the not support list if the assessment indicated any no consumption of fish, or placed on the partial support list if the assessment indicated any need for reduced consumption rates. The USEPA criterion represents a national approach to address what mercury levels are protective for fishing waters. The existence of risk-based recommendations to reduce consumption were used with respect to other contaminants detected in fish tissue. EPD formally adopted the 2001 EPA national human health

criterion for methylmercury as a human health standard for total mercury in fish tissue in the Georgia water quality rules in December 2002.

Risk-Based Assessment For Fish Consumption. In 1995, Georgia began issuing tiered recommendations for fish consumption. Georgia's fish consumption guidelines are "risk-based" and are conservatively developed using currently available scientific information regarding likely intake rates of fish and toxicity values for contaminants detected. One of four, simple, species-specific recommendations is possible under the guidelines: No Restriction, Limit Consumption to One Meal Per Week, Limit Consumption to One Meal Per Month, or Do Not Eat. In 2005, 58.5% of recommendations for fish tested in Georgia waters were for No Restriction, 26.8% were to Limit Consumption to One Meal Per Week, 13% were to Limit Consumption to One Meal Per Month, and 1.7% were Do Not Eat Advisories. Eighty-five percent of the recommendations available in 2005 were for no, or only minor restrictions (allowing more than 50 meals to be consumed per year). It should be noted that the dramatic increase of waters not fully meeting designated uses as related to fish consumption was a result of converting to a conservative risk-based approach for evaluating contaminants data in 1995, and not a result of increased contaminant concentrations in Georgia's fish.

General Guidelines to Reduce Health Risks. The following suggestions may help to reduce the risks of fish consumption:

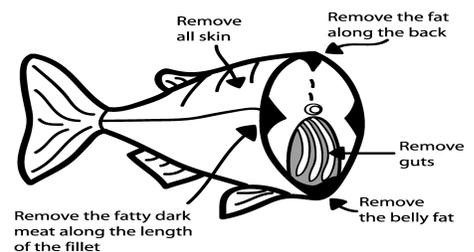
Keep smaller fish for eating. Generally, larger older fish may be more contaminated than younger, smaller fish. You can minimize your health risk by eating smaller fish (within legal size limits) and releasing the larger fish.

Vary the kinds of fish you eat. Contaminants build up in large predators and bottom-feeding fish, like bass and catfish, more rapidly than in other species. By substituting a few meals of panfish, such as perch, sunfish and crappie, you can reduce your risk.

Eat smaller meals when you eat big fish and eat them less often. If you catch a big fish, freeze part of the catch (mark container or wrapping with species and location), and space the meals from this fish over a period of time.

Clean and cook your fish properly. How you clean and cook your fish can reduce the level of contaminants by as much as half in some fish. Some chemicals have a tendency to concentrate in the fatty tissues of fish. By removing the fish's skin and trimming fillets according to the diagram, you can reduce the level of chemicals substantially. Mercury is bound to the meat of the fish, so these precautions will not help reduce this contaminant.

Remove the skin from fillets or steaks. The internal organs (intestines, liver, roe, and so forth), and skin are often high in fat and contaminants.



Trim off the fatty areas shown in black on the drawing. These include the belly fat, side or body fat, and the flesh along the top of the back. Careful trimming can reduce some contaminants by 25 to 50%.

Cook fish so fat drips away. Broil, bake or grill fish and do not use the drippings. Deep-fat frying removes some contaminants, but you should discard and not reuse the oil for cooking. Pan frying removes few, if any, contaminants.

Specific Waterbody Consumption Guidelines. These guidelines are designed to protect you from experiencing health problems associated with eating contaminated fish. It should be noted that these guidelines are based on the best scientific information and procedures available. As more advanced procedures are developed these guidelines may change.

PCBs, chlordane, dieldrin, DDT and methylmercury build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which would affect your health. It is important to keep in mind that these guidelines are based on eating fish with similar contamination over a period of 30 years or more. These guidelines are not intended to discourage people from eating fish. They are intended to help fishermen choose safe fish for the table.

Table 6-2 lists the lakes and streams where the fish have been tested and found to contain little or no contamination. There are no problems with eating fish from these water bodies.

Tables 6-3 and 6-4 list the lakes and streams where consumption guidance has been issued by the DNR. This information is provided annually in Georgia's Freshwater and Saltwater Fishing Regulations, which is available from DNR and also supplied with each fishing license purchased. This information is also updated annually in the DNR publication *Guidelines for Eating Fish From Georgia Waters*.

Special Notice For Pregnant Women, Nursing Mothers, and Children. If you plan to become pregnant in the next year or two, are pregnant now, or are a nursing mother, you and your children under 6 years of age are especially sensitive to the effects of some contaminants. For added protection, women in these categories and children may wish to limit consumption to a greater extent than recommended in Tables 6-3 and 6-4.

Fish tissue consumption guidelines are discussed in detail in the DNR publication *Guidelines for Eating Fish from Georgia Waters-2005 Update* that is reproduced in Appendix C.

Development Of New Risk Communication Tools For Women of Child-bearing Age and Children. In 2003, new approaches to spatial analyses were used to assess fish tissue contaminants by species and trophic level, and across distinct geographic areas including hydrologic unit codes, river basins, and hydrogeologic provinces of Georgia. The analyses were used to generate simple brochures with specific information targeting

TABLE 6-2. NO CONSUMPTION RESTRICTIONS - 2005

LAKES	RIVERS	
Allen Creek WMA Ponds A & B Bowles C. Ford Lake Brasstown Valley Kid's Fish Pond Carters City of Adairsville Pond Clayton Co. Water Auth. Lakes Blalock, Smith and Shamrock Dodge County PFA Fort Yargo State Park Lake Hard Labor Creek (Rutledge) High Falls Hugh M. Gillis PFA Juliette Ken Garden Mayer McDuffie PFA East Watershed Ponds Nancy Town Lake Oconee Olmstead Paradise PFA (Patrick & Horseshoe 4) Payton Park Pond Seed Sinclair Shepherd CEWC Varner Walter F. George	Alcovy River Boen Creek (Rabun Co.) Brasstown Creek (Town's Co.) Broad River Buffalo Creek (Carroll Co.) Butternut Creek (Union Co.) Cane Creek (Lumpkin Co.) Chattahoochee River (Chattahoochee, Early, & Stewart Cos.) Chattanooga Creek Chattanooga River (NW Ga.) Chickasawhatchee Creek Coleman River Conasauga River in Cohutta Forest Daniels Creek (Cloudland Canyon State Park) Dukes Creek East and South Chickamauga Creek Flint River (Dougherty, Baker & Mitchell Cos.) Goldmine Branch Jacks River Jones Creek Little Dry Creek (Floyd Co.) Little Tallapoosa River Little Tennessee River Middle Oconee River Mill Creek (Whitfield Co.)	Moccasin Creek (Lake Burton Trout Hatchery) Mud Creek (Cobb County) Nickajack Creek North Oconee River Noonday Creek (Cobb Co.) Ocmulgee River (Butts, Monroe, Houston & Pulaski Cos.) Oconee River (Below Barnett Shoals to Lake Oconee, & Laurens Co. & Milledgeville to Dublin) Ogeechee River (Ft. McAllister) Olley Creek Ponder Branch (Walker Co.) Proctor Creek Sewell Mill Creek Slab Camp Creek (Oconee Co.) South River (Butts Co., Hwy. 36) Spirit Creek Stamp Creek (Pine Log WMA) Stekoa Creek Tallulah River Upatoi Creek Yahoola Creek Yellow River

**TABLE 6-3
GUIDELINES FOR LIMITING THE FISH YOU EAT
LAKES – 2005**

Albany By-Pass Pond	Redear	LMB, Catfish	Carp
Acworth	Bluegill, LMB < 16"	LMB > 16"	
Allatoona	Carp, Crappie, Spotted bass < 16", LMB 12-16", CCF, White bass < 12", G. redbreast	Spotted bass > 16", LMB > 16", HB > 16"	
Andrews	CCF	LMB > 12"	
Banks	Bluegill		LMB > 12"
Bartlett's Ferry	Blk crappie < 12", LMB < 16", Spotted bass < 12"	HB & Striped bass & LMB > 16", CCF, Blk crappie & Spotted bass > 12"	
Bear Cr. Reservoir	Sunfish	LMB < 12", CCF > 12"	
Bennett CEWC PFA		LMB > 12"	
Black Shoals (Randy Poynter)	CCF < 12", Redear	LMB 12-16", CCF > 12", Blk crappie	
Blackshear	CCF < 12"	CCF > 12", LMB > 12"	
Big Lazer PFA	LMB 12-16", CCF	LMB > 16"	
Blue Ridge	CCF < 16", LMB < 12"	White bass & LMB 12-16", CCF > 16"	
Burton	LMB < 16", CCF, Bluegill, White catfish	LMB > 16", Spotted bass 12-16"	
Pond N. Bush Field, Augusta	Bluegill, LMB < 12"	LMB 12-16"	
Chatuge	LMB > 12", CCF > 12"	Spotted bass 12-16"	
Clarks Hill	CCF, Black crappie, Redear, White perch, Striped bass, Spotted sucker, HB, LMB < 16"	LMB > 16"	
Evans County PFA	CCF, LMB 12-16"	LMB > 16"	
Goat Rock	Blk crappie, LMB 12-16", Spotted sucker, Bluegill	HB < 12", CCF 12-16"	CCF & LMB > 16", HB > 12", White bass
Hartwell (Tugaloo Arm)	Black crappie, Hybrid/Striped bass < 12", CCF < 16"	LMB < 16", Carp > 16"	HB/Striped bass 12-16"
	DO NOT EAT Hybrid and Striped bass > 16 inches in length		CCF & LMB > 16"
Hartwell - main body of lake	DO NOT EAT Hybrid and Striped bass (S C Dept. Health and Environmental Control 1-888-849-7241)		LMB, CCF
Jackson	Black crappie, Redear sunfish, Catfish < 16"	Catfish > 16", LMB	
Lanier	CCF & Striped bass < 16", Bluegill, Black crappie, White catfish	Striped bass, Carp & CCF > 16", LMB, Spotted bass	
L. Ocmulgee St. Pk.		Brown bullhead 12-16"	LMB > 16"
McDuffie PFA, West	CCF	LMB	
Nottely	CCF, Black crappie	LMB > 12", Striped bass > 16"	
Oliver	Hybrid bass < 12", CCF < 16", Redear, Bluegill	LMB > 12"	CCF > 16"
Rabun	LMB 12-16", Bluegill, White catfish < 16"	White catfish & LMB > 16"	
Reed Bingham S.P.			LMB > 12", Catfish > 16"
Richard B. Russell	Crappie, Bluegill, White perch, Catfish	LMB > 12"	
Seminole	CCF, Spotted sucker, Blk crappie, Redear	LMB > 12"	
Stone Mountain	Catfish	LMB > 16"	
Tobesofkee	CCF, LMB 12-16"	LMB > 16"	
Tugaloo	White catfish 12-16", Bluegill		LMB > 12"
Tribble Mill Park Pond Gwinnett Co.	Black Crappie, Bluegill, LMB < 12"	LMB 12-16"	
West Point	LMB, Carp, Spotted bass, Crappie, CCF & HB < 16"	CCF & Hybrid bass (HB) > 16"	
Worth	CCF > 12"	LMB > 12"	
Yonah	Bluegill	LMB 12-16", catfish 12-16"	

Abbreviations: < means less than, > means more than, LMB = largemouth bass, HB = Hybrid bass, CCF = Channel catfish, Blk = Black

**TABLE 6-4
GUIDELINES FOR LIMITING THE FISH YOU EAT
RIVERS – 2005**

RIVERS/CREEKS	NO RESTRICTIONS	1 MEAL PER WEEK	1 MEAL PER MONTH
Alapaha River	Redbreast sunfish	Spotted sucker	LMB, Bullhead
Alapahoochee River		Bullhead	
Allatoona Creek, Cobb Co.		Spotted bass, Alabama Hog Sucker	
Altamaha River	Bluegill (US 1), CCF (below US 25)	Flathead catfish, LMB, CCF	
Apalachee River	CCF	LMB	
Beaver Creek (Taylor Co.)			Yellow bullhead
Brier Creek (Burke Co.)		Spotted sucker	LMB
Canoochee River		Redbreast	LMB, CCF
Casey Canal	LMB, Bluegill	Striped mullet	
Chatooga River (NE Ga., Rabun County)		Northern Hog Sucker, Silver Redhorse	
Chattahoochee River (Helen to Lanier)	CCF	Redeye bass, Bullhead, Redhorse	LMB
Chattahoochee River (Buford Dam to Morgan Falls Dam)	Brown trout, Carp, Rainbow trout	LMB	
Chattahoochee River (Morgan Falls Dam to Peachtree Creek)	Brown trout, LMB, Bluegill	Jumprock sucker	Carp, Striped bass
Chattahoochee River (Peachtree Creek to Pea Creek)	CCF, White sucker	Bluegill	Striped bass, Carp
Chattahoochee River (Pea Creek to West Point Lake, below Franklin)	CCF	LMB, Spotted bass	Striped bass
Chattahoochee River (Oliver Dam to Upatoi Creek)		Bullhead catfish	LMB
Chattahoochee River (West Point dam to I-85)	LMB, Bullheads	Spotted bass	
Chickamauga Creek (West)	Redbreast sunfish	Spotted bass	
Conasauga River (below Stateline)		Spotted bass	White bass, Buffalo
Coosa River (Rome to Hwy 100, Floyd Co.)		Spotted bass	LMB, Striped bass, Blue catfish
	DO NOT EAT SMALLMOUTH BUFFALO		
Coosa River (Hwy 100 to State line, Floyd Co.)	Spotted bass	LMB	Striped bass, CCF, Buffalo
Etowah River (Dawson County)		Blacktail Redhorse	
Etowah River (above Lake Allatoona)	Golden redhorse	Spotted bass	
Etowah River (below Lake Allatoona)	CCF, Striped bass, Bluegill	Spotted bass, LMB	Smallmouth buffalo
Flint River (Spalding/Fayette cos.)	Spotted sucker	LMB	
Flint River (Meriwether/Upson/Pike cos.)	CCF, Flathead catfish	Shoal bass	
Flint River (Taylor co.)	CCF, Shoal bass	LMB	
Flint River (Macon/Dooley/Worth/Lee cos.)	CCF	LMB	
Gum Creek (Crisp Co.)	Carp	LMB	
Ichawaynochaway Creek	Spotted Sucker	LMB	
Kinchafoonee Creek (above Albany)		LMB, Spotted sucker	
Little River (above Clarks Hill Lake)	Spotted sucker, Silver Redhorse	LMB	

Little River, (above Ga. Hwy 133, Valdosta)	Spotted sucker	LMB	
Muckalee Creek (above Albany)		LMB, Spotted sucker	
Ochlockonee River (near Thomasville)	Redbreast sunfish	Spotted sucker, White catfish	LMB
Ocmulgee River (below Macon, Bibb co.)	CCF	LMB	Flathead catfish
Ocmulgee River (Telfair/Wheeler cos.)	CCF	Flathead catfish, LMB	
Oconee River (above Barnett Shoals)		Silver redhorse, LMB	
Ogeechee River (all to Ft. McAllister)		Redbreast sunfish, CCF, Spotted sucker, Snail bullhead	LMB
Ohoopsee River (Emanuel/Toombs cos.)		Spotted sucker, Redbreast	LMB
Okefenokee Swamp (Billy's Lake)		Flier	Bowfin
Oostanaula River, Hwy. 156, Calhoun	Bluegill	Smallmouth buffalo	
Oostanaula River, Hwy 140, to Coosa River	Bluegill	LMB, CCF, Spotted bass, Buffalo	
Patsiliga Creek (Taylor Co.)		Suckers, Chain Pickerel	Bass
Pipemaker Canal		LMB	
Satilla River (Waycross, Ware/Pierce cos.)		Redbreast sunfish, CCF	LMB
Satilla River (near Folkston, Camden Co.)			LMB, Redbreast
Savannah River (above & below New Savannah Bluff Lock & Dam)	Redear, Redbreast	Spotted sucker, LMB	
Savannah River (Chatham/Scriven cos.)	CCF, Redear sunfish	LMB	
Savannah River (Effingham Co.)	CCF, Redbreast sunfish	White catfish	LMB, Bowfin
Savannah River (Tidal Gate)	Red drum	White catfish	
Short Creek (Warren Co.)		Sunfish	
South River (Henry Co., Snapping Shoals)	Silver redhorse, CCF	LMB	
Spring Creek (Seminole/Decatur/Miller Cos)	Spotted sucker	LMB	
St. Marys River (Camden Co.)	Redbreast, Striped mullet		LMB
St. Marys River (Charlton Co.)	Redbreast sunfish		LMB
Suwannee River		Bullhead, Chain pickerel	LMB
Swamp Creek (Redwine Cove Road)		Redeye bass	
Talking Rock Creek		Redeye bass	
Tallapoosa River	Bluegill	Blacktail Redhorse	
Trib. To Hudson River, Alto, Banks Co.	Brown bullhead	Redeye bass	
Withlacoochee River (Berrien/Lowndes cos.)		Redbreast sunfish	LMB

COASTAL RIVERS & CREEKS	NO RESTRICTIONS	1 MEAL PER WEEK	1 MEAL PER MONTH	DO NOT EAT
Turtle River System (Purvis, Gibson Crs.)		Black & Red drum, Flounder	Shrimp, Blue crab, SST, SKF, Sheepshead, Spot	STM, ACR, Bivalves*
Turtle & Buffalo Rivers (upriver Hwy 303)	White Shrimp	Red drum, Blue crab, Flounder, SST	SKF, BDR, ACR, Spot, Sheepshead	Striped Mullet, Bivalves *
Turtle River (Hwy 303 - Channel Marker 9)	White Shrimp	Red drum, Flounder	Blue crab, ACR, BDR, SST, SKF, Sheepshead	Spot, STM, Bivalves *
Turtle River (C. Marker 9 & So. Brunswick River to Dubignons & Parsons creeks)	White Shrimp, Flounder	Blue crab, BDR, RDR, SST, Sheepshead	ACR, STM, SKF, Spot	Bivalves *
Terry Creek South of Torras Causeway to Lanier Basin	Spot, STM, Shrimp, ACR, SST, SKF, Blue crab	Yellowtail (Silver perch)		Bivalves *
Terry and Dupree Creeks North of Torras Causeway to Confluence w/ Back River	Blue crab, Shrimp		STM, ACR, SST, SKF	Spot, Bivalves *
Back River One mile above Terry Creek to Confluence with Torras Causeway	STM, Shrimp, ACR, SST, SKF, Blue crab		Spot	Bivalves *
Back River South of Torras Causeway to St. Simons Sound	Spot, STM, Shrimp, ACR, SST, SKF, Blue crab			Bivalves *
Floyd Creek	Blue crab, Southern			

Academy Creek	kingfish			
	Blue crab			
* Bivalves are all clams, mussels and oysters; Shellfish ban under National Shellfish Sanitation Program; Species codes used above are: SST = Spotted Seatrout; ACR = Atlantic Croaker; SKF = Southern Kingfish (whiting); STM = Striped Mullet; BDR = Black Drum; RDR = Red Drum; SHH = Sheepshead				

King Mackerel Special Joint State Guidance Issued by Georgia, North Carolina, South Carolina and Florida For South Atlantic Ocean	
Size Range (Fork Length, Inches)	Recommendations for Meal Consumption of King Mackerel Caught Offshore Georgia Coast
24 To Less Than 33 Inches	No Restrictions
33 To 39 Inches	1 meal per month for pregnant women, nursing mothers and children age 12 and younger meal per week for other adults
Over 39 Inches	Do Not Eat

women of child-bearing age and children for distribution through health and nutrition related outlets. Brochures were generated for four distinct areas of Georgia, and English versions were released in November 2003, followed by publication of Spanish brochures in March of 2004. The College of Family and Consumer Sciences, Cooperative Extension Services, University of Georgia and the Chemical Hazards Program, Georgia Division of Public Health collaborated in the development of the brochures. The information will be updated as needed, and all brochures are currently available on the DNR website.

Bathing Area Monitoring

The U.S. Army Corps of Engineers has conducted fecal coliform monitoring at its bathing beaches in Georgia. Tennessee Valley Authority (TVA), Georgia Power, the U.S. Forest Service, the National Park Service, Georgia State Parks, and counties and cities throughout the state have also conducted some sampling. The City of Acworth closed a swimming beach on Lake Acworth in the early 1990s. In 1994-1995, a water quality investigation of Lake Acworth and its watershed was conducted by Kennesaw State College under a contract with Cobb County. Based on the results of the study, Cobb County developed and implemented portions of an action plan for water quality improvements. In 1997 the City of Acworth and Cobb County conducted monitoring on Lake Acworth. The City of Acworth reopened the beach in June 1998.

Shellfish Area Closures

The potential shellfish growing areas on the Georgia coast are classified as "Approved", "Restricted", or "Prohibited" in accordance with the criteria of the National Shellfish Sanitation Program. Shellfish growing areas are closed as a precaution to shell fishing because of the proximity to a marina or a municipal or industrial discharge. Georgia's one hundred linear mile coastline contains approximately 700,000 acres of potential shellfish habitat. Only about 10% of that area, however, actually produces viable shellfish stocks. Lack of suitable clutch, tidal amplitudes, littoral slope, and other geomorphological features contribute to the limited occurrence of natural shellfish resources along the Georgia coast. Most shellfish in Georgia grow in the narrow intertidal zone and are exposed between high water and low water tide periods. Georgia maintains approximately 32,000 acres approved for the harvest of shellfish for commercial and/or personal consumption. Georgia currently has three harvest areas comprised of commercial leases and public recreational plots. Only those areas designated as Public Recreational Harvest or those areas under commercial lease are classified as "Approved". "Approved" areas are monitored regularly. All other waters of the state are classified as "Prohibited", are not monitored and are closed to the taking of shellfish due to the presence of human activities that may potentially create a problem. Even though some of these areas meet the

criteria to allow harvesting, they were classified as "Prohibited" so that a safe zone can be maintained in the event of an accidental spill. Additionally, another 179,000 acres of the potential shellfish growing area is classified as "Prohibited" due to the lack of available water quality data.

Pollution-Related Fish Kills

During the 2004-2005 period, a total of 28 fish kill events were reported, with 17 attributable to some pollutant entering a stream, lake, or reservoir. These events, including the suspected pollutant, its source, and estimated number of fish killed are presented in Table 6-5. Depending on the location, the first responders to a fish kill event are the DNR Wildlife Resources Division or Coastal Resources Division. GAEPD personnel typically augment the investigation. Depending on the circumstances causing the fish kill, GAEPD may issue a consent or administrative order and assess a civil penalty.

**TABLE 6-5
Pollution-Caused Fish Kills - 2004-2005**

Name of Waterbody	County	Date	Pollutant of Concern	Source(s) of Pollutants	Comments
Tributary to Snapfinger Creek	DeKalb	01/9 & 21/2004	Untreated Sewage	Blocked sewer pipe causing overflow	150 dead fish in private pond
Unnamed tributary to Nancy Creek	DeKalb	03/03-04/2004	F-500 Multi-Purpose Encapsulator Agent	DeKalb Co. Fire & Rescue Services	274 dead fish
Bull Creek	Muscogee	03/19-22/2004	Epoxy 6 (2-ethylhexyl glycidyl ether), spill	Kemira, Columbus	22,535 dead fish, plus other
Stacy and Drowning Bear Creeks	Whitfield	04/12-15/2004	Allyl alcohol spill	MFG Chemicals, Inc.	3,143 dead fish, plus other
Tanyard Branch and Almand Creek	Rockdale	05/26-28/2004	Chlorine (from stored pool chemicals)	Bio-Lab; runoff from fire fighting at site	7,360 dead fish (public only)
Unnamed tributary to Nancy Creek	Fulton	07/07-08/2004	Unknown	Unknown	546 dead fish
Pigeon Creek	Meriwether	07/8-15/2004	Dissolved Oxygen depletion; LAS pond discharge	City of Manchester LAS collection pond draining	68 dead fish, plus other
Unnamed tributary to Nash Creek	Fayette	08/03-04/2004	Dissolved Oxygen depletion from raw sewage spill	City of Fayetteville sewer overflow/lift station failure	653 dead fish
Unnamed tributary to Sweetwater Creek	Douglas	08/23/2004	Unknown	Unknown	18 dead fish
Cabin Creek	Spalding	08/30-31/2004	Unknown	Unknown	932 dead fish, plus other
Mill Creek	Paulding	09/01/2004	Unknown	Unknown	345 dead fish
Willacoochee Creek	Ben Hill	09/02/2004	Dissolved Oxygen deficiency	Construction of pipeline	490 dead fish
Impounded Unnamed tributary to Seventeen-Mile River; stormwater retention pond, City of Douglas	Coffee	09/30-10/01/2004	Dissolved Oxygen depletion/deficiency	Unknown	4,868 dead fish in pond
Unnamed tributary to Oothcalooga Creek	Gordon	10/04/2004	Unknown; suspected fire fighting chemicals	Unknown; suspected tire freight fire prior to kill	346 dead fish
Swift Creek	Bibb	10/27/2004	Surfactant	Spill; tractor-trailer accident	42 dead fish
Spirit Creek	Richmond	12/14-27/2004	Fuel oil spill	Fort Gordon energy plant	1,506 dead fish
Chalker Bridge Creek	Cobb	01/22-23/2005	Normal propyl acetate	Railroad car spill @ Brenntag Inc.	446 dead fish
Unnamed tributary to Jester Creek	Clayton	02/07-08/2005	Petroleum	Unknown	371 dead fish
Beaver Dam Ditch	Richmond	03/24-25/2005	Unknown	Unknown	2,506 dead fish
Hiawassee River headwaters	Towns	04/28/2005	Diesel/gasoline spill	Fuel tanker truck overturn	66 dead fish, plus other
Tributary to Mud Creek	Lowndes	5/20/2005	Unknown	Fire @ pecan processor	361 dead fish
Unnamed tributary to Chattahoochee River	DeKalb	06/03/2005	Unknown	Unknown	397 dead fish
Unnamed tributary to Rubes Creek	Cobb	06/25/2005	Fire fighting runoff/ incl. foam	Runoff from response to CVS bldg. fire fighting	565 dead fish
Ison Branch	Spalding	07/23/2005	Dissolved Oxygen deficiency	Unknown	197 dead fish
St. Augustine Creek	Chatham	09/23/2005	pH	Construction/pumping	106 dead fish
Goldens Creek	Warren	09/27-28/2005	Dissolved Oxygen deficiency from wastewater discharge	City of Warrenton wastewater treatment ponds	8266 dead fish
Tributary to Roach Branch	Dodge	10/30-31/2005	Dissolved Oxygen depletion from broken sewer line	City of Eastman sewer line	92 dead fish
Unnamed drainage canal	Pierce	12/16/2005	Unleaded gasoline spill	Fuel truck accident at Dixon Service Ctr., Blackshear	137 dead fish, plus other