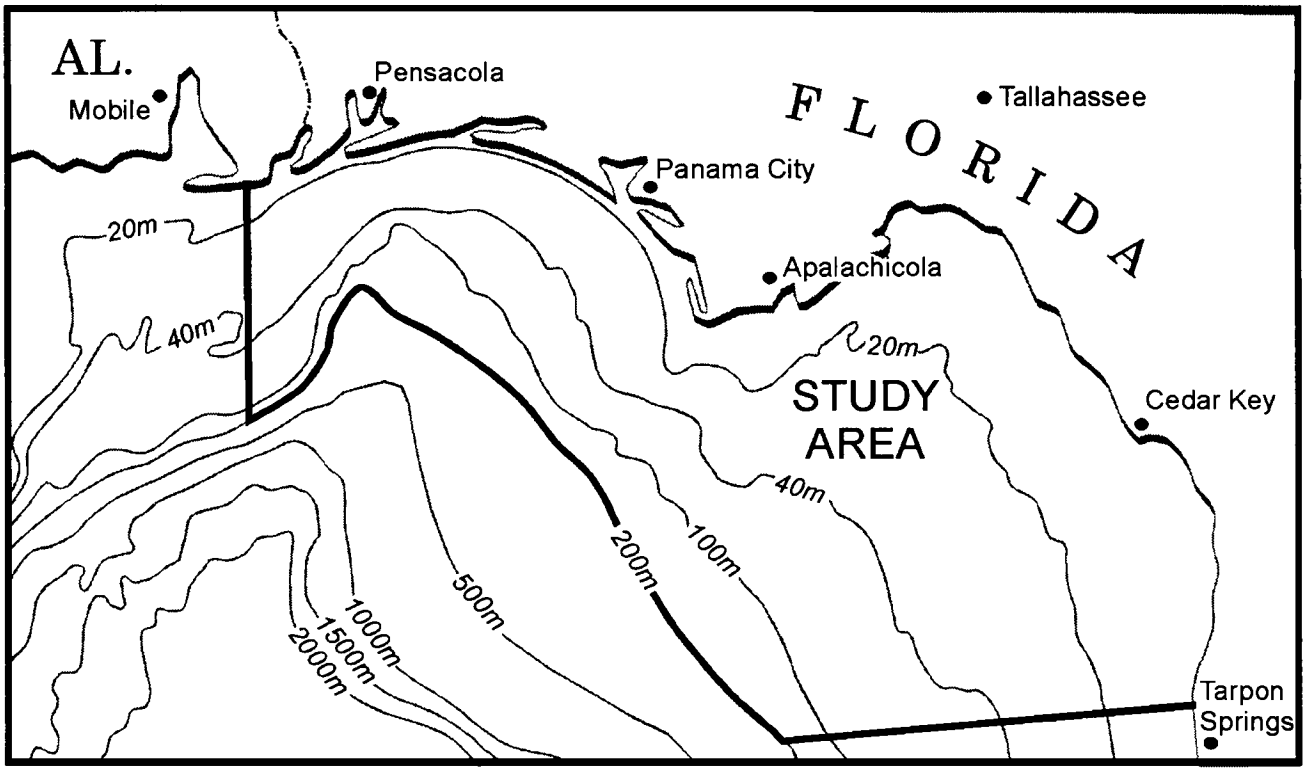
OCS Study
MMS 96-0018
NBS 96-01

Northeastern Gulf of Mexico Coastal and Marine Ecosystem Program: Data Search and Synthesis, Annotated Bibliography

Appendix D: Chemistry



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Minerals Management Service
Gulf of Mexico OCS Region

NBS U.S. Department of the Interior
National Biological Service
Eastern Region

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Thanks are extended to Paul Blankinship whose knowledge of Papyrus was essential to integrating the results of the many different electronic search formats. Those from outside this project who made our job more manageable by locating and sending the requested electronic copies of existing bibliographies include:

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Alphabetic Index

Ahearn, D.G., S.A. Crow and W.L. Cook. 1977. Microbial interactions with pesticides in estuarine surface slicks. Georgia State Univ., Atlant. Dept. of Biology, Environmental Research Lab. Gulf Breeze, FL. 32 pp.

Abstract. Estuarine surface films from Escambia Bay, Florida, and adjacent waters were sampled by using the membrane adsorption technique to enumeratemicrobial populations. Samples of the upper 10 micrometers of estuarine surface films yielded microbial populations. These populations were 10 to 100 times greater than those in underlying waters of 10 cm. Predominant bacteria in surface films as isolated on Marine Agar were motile, non-pigmented, gram-negative rods. Colony-forming units of yeasts and molds on Mycological Agar prepared with 50 per cent seawater were found. A greater proportion of the surface film bacteria, as compared to those at 10 cm depth, were capable of growth on freshwater media. With selective isolation media, amyloytic, and lipolytic bacteria appeared to comprise a more significant proportion of the total population. Twenty-one representative bacteria, yeasts, and filamentous fungi from initial sampling of surface microlayers were tested for the effects of selected pesticides on utilization of various substrates.

Ahearn, D.G., W.L. Cook and S.A. Crow. 1981. Effects of pollutants on microbial activities in estuarine surface films. (EPA/600/4) Georgia State Univ., Atlant. Dept. of Biology, Environmental Research Lab. Gulf Breeze, FL. 28 pp.

Abstract. Samples of inshore surface films from Escambia Bay, Florida and from sites in the North Sea yielded populations of aerobic, heterotrophic microorganisms up to 10 to the 8th power per ml or 1,000,000 per sq. cm. Hydro-carbonoclastic organisms were in relatively low populations. A comparison of species of yeasts prevalent in North Sea waters before and after oil production activities indicated a shift to a more wide spread distribution of hydro-carbonoclastic forms with possible inhibition of anon-hydrocarbon utilizing species. Examination of various hydrocarbons and chlorinated compounds with the potential of being sequestered in natural films indicated that 66% could potentially alter microbial metabolic processes in the slick. In microcosm studies of estuarine systems representative compounds demonstrated a selective effect for microfungi.

Allen, B.P. 1991. Spreadsheet model development for the Apalachicola-Chattahoochee-Flint River Basin. pp. 132-135. *In* Anon., ed. Water Resources Planning and Management and Urban Water Resources. ASCE, New York, NY.

Abstract.In the beginning, water resources personnel scratched out their estimates of how different reservoir operations or system configurations would affect a river using pencil and paper. Many of these computations were easily carried out in tabular form, but were still time consuming and tedious. The advent of computers brought some relief as predictions could now be made more quickly, and the numbers generated were at least more exact, if not more accurate. However, the logic involved in the models developed were often obscured by the 'black box' methods employed in the Fortran programming format. The proliferation of personal computers and spreadsheet software has finally succeeded in bringing our computational methods full circle. The Mobile District Corps of Engineers has developed as spreadsheet model of the Apalachicola-Chattahoochee-Flint River Basin which has been used to emulate the

decision making process identified in the Water Control Plan adopted for the basin. The model was not intended to be a prescriptive model of desired real-time releases and was originally designed to operate on a monthly time scale. The model can be divided into three major components: the minimum release, the navigation augmentation, and the end-of-month conditions summary components. For each step, each project is evaluated twice before deciding its final monthly release. The first time the projects are reviewed in downstream order to determine minimum hydropower, water supply/water quality or excess releases from the projects. After comparing these releases at the most downstream point to certain target flows, another loop of the projects is performed to include additional waters needed from each project to meet the desired flows downstream.

Ankley, G.T., R.A. Hoke, J.P. Giesy and P.V. Winger. 1989. Evaluation of the toxicity of marine sediments and dredge spoils with the Microtox bioassay. Chemosphere. 18(9-10):2069-2075.

Abstract. The Microtox bioassay was used to evaluate the toxicity of sediment and dredge spoil elutriates from several potentially-contaminated sites in Mobile and Pascagoula Bays. Elutriates were prepared using either local seawater or distilled deionized water (osmotically adjusted with NaCl prior to testing), and Microtox assays were performed with the elutriates and three reference toxicants. There were marked differences in the toxicity of several elutriates and reference toxicants in the two different waters, with the seawater generally resulting in the same or lesser toxicity than the osmotically-adjusted distilled deionized water.

Anon. 1970a. Pollution hearing sets a southern landmark. Engineering News-Record. 185(5):13.

Anon. 1970b. Pollution in Alabama. Auburn Univ., Ala. Dept of Civil Engineering. Auburn, Alabama. 144p pp.

Abstract. The water resources of Alabama are nearly four times greater than the national average. With low population and industrial density coupled with vast quantities of water, pollution problems of serious import have arisen in the past two decades. Fish kills in the rivers and Mobile Bay have set national records, the profitable shellfish industry is endangered, recreational use of the waters is threatened and, of course, the recent evidence of large-scale mercury contamination has brought about the closing of tens of thousands of acres of river and lake waters to commercial and sport fishing, with its attendant uncounted economic loss. Air pollution has not yet become a significant statewide problem, but even now the city of Birmingham ranks among the nation's leaders in terms of particulate count, and the incidence of lung disorders is approximately double the rate in the rural areas of Alabama. Land pollution, whether by poor land management, solid-waste disposal, or simply ill-conceived or nonexistent zoning laws, is increasing at an accelerating rate throughout the state. This report presents the results of three months of intensive fact-finding of the present status of pollution in Alabama.

Anon. 1970c. Pollution of the Interstate Waters of the Escambia River Basin(Alabama-Florida) and the Intrastate Portions of the Escambia Basin Within the State of Florida. Proceedings of Conference Held at Gulf

Breeze, Florida on January 21-22, 1970. Volume 2. Vol. Volume 2-See also Volume 1, PB-230 523. Federal Water Pollution Control Administration. Washington, DC. 305 pp.

Abstract. The report is on the pollution of waters of the Escambia River Basin within the state of Florida for 1970. It includes statements, recommendations, and discussions on: Assimilation behavior of certain toxic organic compounds in natural waters; sewage and industrial wastes; Thompson's Bayou salinity; and related information.

Anon. 1972a. Pollution of the Interstate Waters of the Escambia River Basin(Alabama-Florida) and the Intrastate Portions of the Escambia Basins within the State of Florida. Session (3rd) Held at Gulf Breeze, Florida on January 24-26, 1972. Transcript of Proceedings. Environmental Protection Agency. Washington, DC. 676 pp.

Abstract. The report is on the third session of the conference on pollution of the interstate waters of Escambia River Basin and the intrastate portions of the Escambia Basin and Bay within the state of Florida for 1972. It includes statements, discussions, and recommendations on: Station locations Northwest Florida Streams; flow rate; BOD demand; phosphorus; nitrogen; colors; total and dissolved solids; and related information.

Anon. 1972b. Water Quality Comparison Study, Escambia River and Other Northwest Florida Streams. Environmental Protection Agency, Surveillance and Analysis Div. Athens, GA. 14 pp.

Abstract. A limited survey was conducted to produce data for use in comparing water quality (including nutrient quality) of the Escambia River with other streams in the Northwest Florida area. Of particular interest were the relative nitrogen, phosphorus and organic concentrations.

Anon. 1973a. Proposed Construction of a New Coast Guard Station (Destin Station) on the East End of Santa Rosa Island (Draft environmental impact statement). Coast Guard District (8th). New Orleans, LA. 14 pp.

Abstract. The proposed project is to construct a new 26-man US Coast Guard Search and Rescue Station on the east end of Santa Rosa Island in Okaloosa County, Florida. Project work will include construction of a two-story building, waterfront facilities, site work, and dredging of a boat basin and channel. The construction of the proposed rescue station will have a beneficial impact of prevention of loss of life and property. There will be a temporary degradation of aesthetics, water quality, and recreation in the project area during construction and dredging operations.

Anon. 1973b. Proposed Maintenance Dredging of the Channel from U.S. Coast Guard Santa Rosa Station Mooring to Navigable Watershed in Pensacola Bay. (Report No.: ELR-73-2010) Final environmental impact statement; Supersedes report no. EIS-FL-73-0239-D. Coast Guard District (8th). New Orleans, LA. 23 pp.

Abstract. The proposed project provides for maintenance dredging of the channel from the moorings at the U.S. Coast Guard Station Santa Rosa to navigable waters in Pensacola Bay, FL. The channel is 12 feet deep by 100 feet wide and about 300 yards long. Redredging of the channel will insure safe operation of Coast Guard boats to carry out search and rescue missions, pollution surveillance and enforcement operations, and

aids to navigation maintenance. Disposal of the spoil behind retaining levees along the beach will restore the shoreline to its more original condition. Temporary increase in turbidity near the dredging operations will have minimal effects on the environment.

Anon. 1976. Environmental Impact Assessment, Water Quality Analysis Escambia River and Bay (Final rept.). Sponsor: National Commission on Water Quality, Washington, DC. Atlantis Scientific. Tallahassee, FL. 269 pp.

Abstract. A comprehensive water quality analysis and environmental impact assessment at the Escambia River and Bay was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Authors (1) characterized historical and existing water quality and environmental conditions, (2)projected resultant water quality, assuming specific levels of waste water treatment to point source effluents entering the study site, and (3)anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. The site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission.

Anon. 1978. Occidental Chemical Company, Swift Creek Chemical Complex, Hamilton County, Florida. Resource Document. (Draft environmental impact statement). Vol. II. See also Volume 1, PB-286 041 and Volume 3, PB-286043. Environmental Protection Agency, Region IV. Atlanta, GA. 490 pp.

Abstract. This Draft EIS concerns the issuance of an NPDES permit to Occidental Chemical Company for the construction of a new chemical plant in Hamilton County, Florida. The construction of the new Swift Creek Chemical Complex is part of a two-phased plan to increase the super phosphoric acid capacity of the north Florida phosphate fertilizer manufacturing complex. This volume covers the biology and ecology of the area. Basic study units for the biological and ecological characterization include Swift Creek, the upper portion of the Suwannee River and the land area within five miles of the proposed chemical complex. Existing communities are described in terms of their location, extent, species composition, trophic structure and successional status. Ecosystem concepts are introduced and used where appropriate to describe functional interrelationships between communities and between the biotic and physical components of the environment. Identification of ecosystem interrelationships is essential to an assessment of the functional role of biological communities and to indicate potential mechanisms of impact transmission.

Anon. 1980. Other waterways. Environmental Protection Agency Journal. 6(1):21-23,25.

Abstract. The progress in reducing pollution in many US rivers and lakes is described. Examples of gains made in reducing pollution in some of the smaller rivers and lakes are provided. The northern rivers include the Naugatuck River in Connecticut; the Pemigewasset River in New Hampshire; the Stevens Branch of the Winooski River in Vermont; the Kenduskeag stream and the Penobscot River in Maine; the Mohawk River in the Utica-Rome area; the Hackensack River; the Smyrna, St. Jones, and Mispillion rivers, and Silver Lake in Delaware; the Wisconsin River in Wisconsin;

and Wilson's Creek in Missouri. The southern rivers evaluated include the Pearl River in Mississippi, Bogue Lusa Creek in Louisiana, Sope Creek in Georgia, a mountain river in North Carolina, the Neches River in Texas, Tar Creek in Oklahoma, and Little Deep Fork in Oklahoma. Also assessed are the smaller lakes, including Annabessacook Lake in Maine, Lake Minnetonka in Minnesota, and Lake Hamilton and Lake Catherine in Arkansas; and bays and harbors, including Escambia Bay, Pensacola Bay, and East Bay in Florida, Kodiak Harbor in Alaska, and Grays Harbor in Washington. Pollution reduction in man-made waterways, including the Houston Ship Channel in Texas and Dillon Reservoir in Colorado, is also described. Efforts toward preserving the wetlands, especially the Tulalip Landfill in Washington, are discussed.

Anon. 1984a. Exploration and Production of Hydrocarbon Resources in Coastal Alabama and Mississippi. (Report No.: COESAM/PD-EE-84-009) See also Executive summary, AD-A152 060 and Appendices, AD-A152 061. NTIS. Washington, DC. 1006 pp.

Abstract. An analysis has been undertaken of the physical biological and socioeconomic effects of hydrocarbon exploration and production activities in coastal Alabama and Mississippi and adjacent Federal waters of the Gulf of Mexico. The analysis consists of two parts: effects and generic unit actions, and cumulative effects of postulated hydrocarbon-related activities in the region over the next 30 years. Four subregions are considered in the analysis: the forested and seasonally-flooded Mobile-Tensaw River Delta, the shallow coastal estuaries of Mobile Bay and Mississippi Sound, and the Alabama and Mississippi state waters of the Gulf of Mexico. The main short-term adverse environmental effects would be turbidity resulting from well site and pipeline construction activities, and the temporary loss of habitat and biological productivity during pipeline construction and during the drilling period at well sites that are eventually abandoned as dry holes. Long-term adverse environmental effects include the reduction or loss of biological productivity and the alteration of habitat value at producing well sites and along wetland pipeline corridors, which would continue for many years until a well field is abandoned.

Anon. 1984b. Exploration and Production of Hydrocarbon Resources in Coastal Alabama and Mississippi. Executive Summary (Final generic environmental impact statement). Army Engineer District. Mobile, AL. 178 pp.

Abstract. An analysis has been undertaken of the physical biological and socioeconomic effects of hydrocarbon exploration and production activities in coastal Alabama and Mississippi and adjacent Federal waters of the Gulf of Mexico. The analysis consists of two parts: effects and generic unit actions, and cumulative effects of postulated hydrocarbon-related activities in the region over the next 30 years. Four sub-regions are considered in the analysis: the forested and seasonally-flooded Mobile-Tensaw River Delta, the shallow coastal estuaries of Mobile Bay and Mississippi Sound, and the Alabama and Mississippi state waters of the Gulf of Mexico. The main short-term adverse environmental effects would beturbidity resulting from well site and pipeline construction activities, and the temporary loss of habitat

and biological productivity during pipeline construction and during the drilling period at well sites that are eventually abandoned as dry holes.

Anon. 1984c. Final Environmental Impact Statement for South Escambia and Santa Rosa Counties, Florida. Environmental Protection Agency, Region IV. Atlanta, GA. 137 pp.

Abstract. This Final Environmental Impact Statement addresses proposed wastewater facilities for South Escambia and Santa Rosa Counties, Florida. Numerous wastewater management alternatives have been evaluated with particular attention to water quality in the area's surface and groundwater resources and the impacts of projected population growth on the sensitive natural and human resources of the area.

Anon. 1985a. Exxon to step up Mobile Bay search. Oil Gas J. 83(7):66+vp.

Abstract. Exxon Co. USA is moving ahead with plans to accelerate exploration in the prolific Mobile Bay area off Alabama. The company this month asked the US Corps of Engineers for permits to drill wildcats on Alabama State Tracts 91, 92, 93, 96, 97, 98, 117, 119, and 131. In addition, Alabama's Oil and Gas Board issued Exxon a permit to begin exploration work on Tract 114. Also off Alabama, ARCO Oil & Gas Co. plans a four well exploration program on Mobile Block 863 and a two well exploration program on Mobile Block 908. Sohio Petroleum Co. plans a four well exploration program on Mobile Block 821. Farther east, industry has spudded its first wildcat in federal waters off Florida this decade, and another exploration program is on tap.

Anon. 1985b. Mobile Bay yields another significant deep gas discovery. Oil Gas J. 83(6):46.

Abstract. Another significant deep gas discovery has been tested in state water off Alabama. Exxon Co. USA's first test on State Tract 112 flowed 27 MM cfd of gas from two zones in the Jurassic Norphlet below 20,000 ft. The tract is in Mobile Bay. Test data come from an activity report Exxon filed with the State Oil and Gas Board of Alabama. The report said the well flowed 21.2 MM cfd of gas through 22/64 in. choke with 7,330 psi flowing tubing pressure from Norphlet perforations at 21,629-651 ft and 1.4 MM cfd of gas through 5/64 in. choke with 6,253 psi flowing tubing pressure from Norphlet perforations at 21,592-614 ft.

Anon. 1985c. Superfund Record of Decision (EPA Region 4): American Creosote Works, Inc., Pensacola, Florida, September 1985 (Final rept.). Environmental Protection Agency. Washington, DC. 56 pp.

Abstract. The American Creosote Works, Inc. (ACW) site occupies approximately 12 acres in a moderately dense, commercial and residential district of Pensacola, Florida. Wood-preserving operations were carried out at the ACW site from 1902 until December, 1981. Prior to 1950, creosote was exclusively used to treat poles. Use of pentachlorophenol (PCP) started in 1950 and steadily increased in the later years of the ACW operations. During its operations, liquid process wastes were discharged into the two unlined, on set surface impoundments. Prior to 1970, waste waters in these ponds were allowed to overflow through a spillway and follow a drainage course into Bayou Chico and Pensacola Bay. In subsequent years, wastewaters were periodically drawn off the ponds and discharged into

designated 'spillage areas' on site. Additional discharges occurred during periods of heavy rainfall and flooding, when the ponds overflowed the containment dikes.

Anon. 1987. Mobil set to bring Mary Ann Field on stream. Ocean Ind. 22(4):20.
Abstract. Mobil Oil Exploration & Producing Southeast Inc. (MOEPSI) moved a drilling ring into Mobile Bay in the Gulf of Mexico in early April to drill a shallow Miocene well and complete three deeper Norphlet wells that will supply initial production from the Lower Mobile Bay--Mary Ann field--later this year. The Glomar High Island IV jack-up will be moved from a drilling site off-shore Louisiana to begin drilling the shallow 2,500-ft "sweet gas" well 1 1/2 miles north of Fort Morgan in Alabama State Block 77. The drilling of well 77-4 is expected to take less than 30 days. The rig then will be used to complete the first three deep Norphlet wells.

Anon. 1988. Mobil's Mary Ann: Alabama's first offshore production Anon. Ocean Ind. 23(8):31.
Abstract. Mobil Oil Exploration and Producing Southeast Inc. (MOEPSI) leased 5,000-acre Blocks 76, 77, 94 and 95 in shallow Alabama state waters in lower Mobile Bay in Oct. 1969. Discovery well 76-1 was drilled and tested in the Norphlet sand in Dec 1979. By 1984, five other Norphlet wells had been drilled and all but one tested. In Sept. 1984, plans to develop Mary Ann gas field were announced. Initial gas flow started in April 1988. This was the first offshore production for the state of Alabama and the tapping of one of the "most significant natural gas producing regions discovered in the lower 48 states over the last 20 years".

Anon. 1989. Superfund Record of Decision (EPA Region 4): American Creosote Works, Inc., Pensacola, Escambia County, FL (First Remedial Action), (Amendment),September 1989. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 57 pp.
Abstract. The 18-acre American Creosote Works (Pensacola Plant) site, is in a dense moderately commercial and residential area of Pensacola, Florida, approximately 600 yards from Pensacola Bay and Bayou Chico. American Creosote Works, Inc. operated a wood preserving facility on-site from 1902 to 1981. EPA signed a Record of Decision (ROD) in 1985 requiring all on-site and off-site contaminated solids, sludge, and sediment to be placed in an on-site RCRA-permitted landfill. Because the State did concur with the selected remedy, no remedial action was taken. Consequently, a post meridian investigation was conducted in 1988 to characterize the extent of contamination. The ROD is the first of two planned operable units and addresses remediation of contaminated surface soil. The primary contaminants of concern affecting the surface soil are organics including dioxins, carcinogenic PAHs, and PCP.

Anon. 1990a. Health Assessment for Beulah Sanitary Landfill, Escambia, Florida, Region 4. CERCLIS No. FLD 980494660 (Preliminary rept.). Sponsor: Agency for Toxic Substances and Disease Registry, Atlanta, GA. Florida State Dept. of Health and Rehabilitative Services. Tallahassee, FL. 20 pp.

Abstract. The Beulah Landfill proposed National Priorities List (NPL) site is located three miles west of Ensley, Escambia County, Florida. On-site contaminants at probable health concern levels are lead, thallium, chloroform, benzene, polychlorinated biphenyls (PCBs) and chlordane. Based on site conditions, the contaminants found on site could readily migrate off site via surface water or ground water. Off-site migration poses a threat to human exposure through ingestion and dermal absorption of contaminated surface water or animals that live in surface water, groundwater, or soils. To a lesser extent, contaminants may also migrate off site in air, thereby posing a potential threat to human exposure via inhalation of windblown particles and volatilized contaminants. Based upon information reviewed, it is concluded that this site is of potential public health concern because of the risk to human health from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Human Exposure Pathways section, human exposure tochlordane, thallium and PCBs could occur on site via incidental ingestion, inhalation and dermal absorption of the contaminated sludge.

Anon. 1990c. Superfund Record of Decision (EPA Region 4): Harris/Palm Bay Facility, Palm Bay, Brevard County, FL. (First Remedial Action), June 1990. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 112 pp.

Abstract. The 345-acre Harris/Palm Bay Facility site is an electronics manufacturing company in Palm Bay, Brevard County, Florida. Surrounding land use is commercial, residential, and industrial. The site overlies an unconsolidated aquifer, which is used by a public well field located south of and down grading of the site, from the 1950s to 1967. In 1981, EPA identified VOCs in ground water wells located south of the Government Systems facility. Ground water contamination was attributed to several on-site incidents at the Government Systems plant including two fires, which resulted in the dumping of chemical vats, a broken acid/solvent line, and spillage at drum storage areas. The primary contaminants of concern affecting the ground water are VOCs including TCE; metals including chromium and lead; and other in organics including fluoride.

Anon. 1992a. Public Health Assessment for American Creosote Works Inc. (Pensacola), Pensacola, Escambia County, Florida, Region 4. CERCLIS No. FLD008161994 (Final rept.). Sponsor: Agency for Toxic Substances and Disease Registry, Atlanta, GA. Florida State Dept. of Health and Rehabilitative Services. Tallahassee, FL. 49 pp.

Abstract. The American Creosote Works, Inc., National Priorities List (NPL) site is near Pensacola Bay in Pensacola, Florida. American Creosote operated a wood preserving business from 1902 until 1981. Soils, buried sludge, groundwater, sediments, and air are contaminated with numerous of chemicals including; pentachlorophenol, polycyclic aromatic hydrocarbons (PAHs),polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and benzene. Children trespassing on the site are likely to be exposed to pentachlorophenol, PAHs, and PCDDs/PCDFs in the soil via incidental ingestion and may suffer chloracne, liver damage, and an increased risk of cancer. Incidental ingestion of off-site soil by children may also increase their risk of chloracne and liver damage, but actual health effects depend on the

frequency and duration of the exposure. Inhalation of benzene in the on-site air may increase the lifetime risk of cancer for children and other site trespassers. The site is a public health hazard due to the risk of adverse health effects from long term exposure to hazardous chemicals in the air, soil, and ground water.

Anon. 1992b. Superfund Record of Decision (EPA Region 4): Agrico Chemical, Escambia County, Pensacola, FL. (First Remedial Action), September 1992. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 66 pp.

Abstract. The 35-acre Agrico Chemical site is a former fertilizer manufacturing facility located in Pensacola, Escambia County, Florida. In 1920, the production of super phosphate fertilizer began. The source rock used in the process was fluorapatite, which also contained silica and trace levels of aluminum and uranium. The ROD addresses a final remedy for contaminated soil and sludge at the site as OU1 to prevent current or future exposure. The primary contaminants of concern affecting the soil and sludge are VOCs; other organics including PAHs and pesticide residues; metals, including arsenic and lead; and radioactive materials.

Anon. 1993a. Field Evaluation of Residue Prediction Procedures Used in EPA's Guidance: Assessment and Control of Bio-concentratable Contaminants in Surface Waters. The Five Mile Creek Study. 1993 Draft for Appendix 1. Environmental Protection Agency, Office of Water. Washington, DC. 314 pp.

Abstract. Recent advances in environmental sciences, analytical chemistry, and toxicology have permitted the development of a systematic and scientifically defensible procedure for identifying, assessing, and controlling chemicals which form residues in fish and/or shellfish. The report presents results of the first field study conducted on a freshwater site to determine how well tissue residue concentrations can be predicted in field discharge situations using the guidance residue prediction procedure. Further work on the samples from this field site are planned and these efforts will examine a much larger set of chemicals.

Anon. 1993b. Superfund at Work: Hazardous Waste Cleanup Efforts Nationwide, Summer 1993 (Pioneer Sand Company Site Profile, Pensacola, Florida). Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, DC. 6 pp.

Abstract. The Superfund at Work bulletin series profiles hazardous waste cleanup efforts nationwide. This issue profiles the Pioneer Sand Company Site near Pensacola, Florida, where EPA and the State of Florida worked together to reduce the dangers posed by the site by: Removing 20 tons of highly contaminated soil in three days; Stabilizing and immobilizing a liquid contaminant using an innovative technology; and Treating over four million gallons of contaminated water and 7,550 cubic yards of sludge.

Anon. 1993c. Superfund Record of Decision (EPA Region 4): Beulah Landfill Site, Pensacola, FL. September 1993. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 91 pp.

Abstract. The Record of Decision (ROD) presents the US Environmental Protection Agency's (EPA) selected Remedial Action (RA) for the Beulah Landfill Site. The Baseline Risk Assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment at the Site. Therefore, no action is necessary to ensure the protection of human health or this environment.

Anon. 1995a. Public Health Assessment for Agrico Chemical Site, Pensacola, Escambia County, Florida, Region 4. CERCLIS No. FLD980221857. Florida State Dept. of Health and Rehab. Services. Tallahassee, FL. 66 pp.

Anon. 1995b. Superfund Record of Decision (EPA Region 4): Agrico Chemical Co. Operable Unit 2, Pensacola, FL., August 18, 1994. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 112 pp.

Anon. 1995c. Superfund Record of Decision (EPA Region 4): American Creosote Works, Inc., Operable Unit 2, Escambia County, Pensacola, FL., February 3, 1994. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 85 pp.

Abstract. This decision document presents the selected remedial action for Operable Unit 2 at the American Creosote Works, Inc. (ACW) site in Pensacola, Florida. The remedy selected by EPA for the American Creosote Works site will be conducted in two operable units. Operable Unit 1 addresses contaminated soils and sludges which represent the source of contamination at the site. Operable Unit 2, presented in this ROD, will address groundwater contamination at the site. The selected remedy for Operable Unit 2 consists of two phases. The first phase, involving recovery and disposal of dense non-aqueous phase liquids (DNAPLs).

Anon. 1995d. Superfund Record of Decision (EPA Region 4): Harris Corporation/Palm Bay Plant, Brevard County, Palm Bay, FL., February 15, 1995. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington, DC. 113 pp.

Abstract. This decision document presents the selected remedial action for the Harris Corporation/Palm Bay Facility site, in Palm Bay, Brevard County, Florida. The response action described in this document addresses these conditions and final operable unit for the site. This final operable unit addresses soils, sediment, and surface water on the entire site and groundwater at the Semiconductor Sector. Only the groundwater was found to be contaminated at unacceptable risk levels.

Beachler, D.S., D.M. Pompelia and J. Weldon. 1988a. Bay County, Florida waste-to-energy facility air emission test results. pp. 81. *In* APCE, Annual Meeting & Exhibition Dallas, TX (USA) 19-24 Jun 1988. APCA,

Abstract. Air emissions were measured at the Bay Country Waste-to-Energy Plant in Panama City, Florida. Concentrations for particulate and gaseous emissions were measured using test methods established by the US Environmental Protection Agency (EPA) or by using continuous emission monitors. The Bay County Facility is a 510 ton-per-day facility that uses two Westinghouse-O'Connor combustors and boiler trains to recover energy to generate approximately 11.5 MW of electricity. Each water-walled rotary combustor is designed to mass burn 255 tons of municipal

solid waste (MSW)per day or mixture of MSW and wood chips. Each train is equipped with an electrostatic precipitator to remove particulate matter to meet the Florida DER permit conditions. The plant began burning MSW during the spring of 1987. Emission compliance tests conducted in May and June, 1987 showed that the facility met the permit requirements of the Florida Department of Environmental Regulations.

Beachler, D.S., D.M. Pompellia and J. Weldon. 1988b. Bay County, Florida, Waste-to-energy facility air emission tests. pp. 39-46. *In* Anon., ed. Proceedings of National Waste Processing Conference 1988. ASME, New York, NY.

Abstract. Air emissions were measured at the Bay County Waste-to-Energy Plant in Panama City, Florida. Concentrations for particulate and gaseous emissions were measured using test methods established by the US Environmental Protection Agency (EPA) or by using continuous emission monitors. The Bay County Facility is a 510 TPD facility that uses two Westinghouse-O'Connor combustors and boiler trains to recover energy to generate approximately 11.5 MW of electricity. Each water-walled rotary combustor is designed to mass burn 255 tons of municipal solid waste (MSW)per day or a mixture of MSW and wood chips. Each train is equipped with an electrostatic precipitator to remove particulate matter to meet the Florida DER permit conditions. The plant began burning MSW during the spring of 1987. Emission compliance tests conducted in May and June, 1987 showed that the facility met the permit requirements of the Florida Department of Environmental Regulations. (Author abstract).

Beddingfield, S.D., J.B. McClintock, J.P. Grassle, A. Kelsey, E. Oates and P.V. Snelgrove. 1995. Temporal and spatial patterns of dietary resource utilization in the echinoid Lytechinus variegatus. *In* S.D. Beddingfield, J.B. McClintock, J.P. Grassle, A. Kelsey, E. Oates and P.V. Snelgrove, eds. Twenty third benthic ecology meeting 1995. Dept. Biol., Univ. Alabama at Birmingham, Birmingham, AL.

Abstract. Lytechinus variegatus is a widely distributed regular echinoid found in abundance in St. Joseph's Bay, Florida. Field investigations indicate this echinoid inhabits Thalassia, Syringodium and sand/Enteromorpha dominated microhabitats within the bay. Differences occur in growth, reproductive output and recruitment rates of individuals inhabiting these different microhabitats. These factors may be related to differences we have documented in microhabitat-specific temporal and spatial patterns of food availability. In addition, laboratory studies indicate differential growth and nutrient allocation in L. variegatus occurs in response to qualitative characteristics of their natural diets.

Blake, N.J., G.E. Rodrick, M. Tamplin and T.R. Cuba. 1982. Validity of bacteriological standards for shellfish harvesting waters. pp. 311-320. *In* R. Nickelson, ed. 7th. Annual Tropical and Subtropical Fisheries Technological Conference of the Americas, New Orleans, LA (USA), 11 Jan 1982. Texas A&M University, Sea Grant College Program, College Station, TX.

Abstract. This research was undertaken to gain a better understanding of the ecology of Vibrio in Apalachicola Bay, in northwest Florida and to determine the relationship between Vibrio and fecal coliform standards in seawater, oysters, and sediments from both approved and prohibited

shellfishing areas. Results suggest that the four major groups of Vibrio are a part of the normal ecosystem and not of human fecal origin. Non-01 Vibrio cholerae occurred at both approved and prohibited stations and showed little correlation with fecal coliform levels.

Bruenner, B.K., L.J. Bove and G.M. Johnson. 1989. Enhanced Preliminary Assessment. Task Order 2. Cape St. George Reservation, Little St. George Island, Florida (Final rept. Oct-Dec 89). 45 pp.

Abstract. An Enhanced Preliminary Assessment was conducted at the Cape St. George Reservation, Franklin County, Florida. This 6.4 acre facility which is planned for inclusion in the Base Closure Program is located on Little St. George Island which separates Apalachicola Bay from the Gulf of Mexico. The scope of this assessment was restricted to the property held by the Army, excluding a 60 ft. by 60 ft. parcel of land still held by the US Coast Guard on which an historic lighthouse is located. Between 1973 and 1986 the Army utilized this property as a landing area for helicopters to arm weapons systems and clear jams in the event of misfire. No weapon firings, storage of ordnance, or maintenance or refueling of aircraft reportedly occurred on the property. Prior to 1973 the land was owned by the US Coast Guard and was used as an operational lighthouse facility. Cape St. George Reservation is not currently used. Two areas of past practices during Coast Guard ownership were identified as areas of interest: The oilhouse formerly used to store kerosene and the generator building with a former aboveground storage tank. No staining or evidence of past spills was observed and no further action is recommended. One 20 mm. shell casing was found and was assumed to have been dropped during a helicopter layover. A surface sweep of the entire property for ordnance is recommended. The effects on human or environmental receptors would be negligible.

Carlough, L.A. 1994. Origins, structure, and trophic significance of amorphous seston in a blackwater river. Freshwater Biology. 31(2):227-237.

Abstract. 1. The role of suspended organic aggregates in aquatic systems has received much attention, but their origin and function vary between environments and conditions. 2. In the Ogeechee River (Georgia, USA) particles are constructed of clay, organic debris, and microorganisms in a matrix of mucopolysaccharid fibrils. Although these fibrils are probably of bacterial origin, microcosm studies suggest that synthesis of particles from dissolved substances can occur in the absence of microbial processing. 3. Processing of organic material and production of amorphous aggregates occurs through a series of microbial events and follows a well-defined successional cycle that results in a high concentration of protists in sestonic particles. 4. Chemical analyses show that the relatively high protein and fat content of this amorphous material is a valuable food resource for filter-feeding macro-invertebrates that are dense in this system.

Carlough, L.A. and J.L. Meyer. 1991. Bacterivory by sestonic protists in a southeastern blackwater river. Limnology and Oceanography. 36(5):873-883.

Abstract. As part of a study examining the trophic base of secondary production in the Ogeechee River, Georgia, bacterial grazing by sestonic protists was measured directly with fluorescently labeled bacteria. For the period April 1988 through September 1989, flagellates and ciliates

ingested an average of 18.6 (range, 1.7-43) and 314 (range, 25-1,140) bacteria individual-1 h-1. These grazing rates are comparable to those of protists in marine and lentic habitats. When combined with bacterial and protist densities in the river, an average of 15.6% (range, 0.2-59%) of the water column was cleared by protists per day. On the basis of literature values of microbial C content and assimilation efficiencies, this percentage translates to a production rate of 11.7-mu-g C liter-1 d-1. Protist bacterivory can facilitate carbon flow to higher trophic levels by turning bacteria into larger parcels of carbon and nutrients that are then available to a greater portion of the filter-feeding community. The microbial loop in this lotic system differs from pelagic systems; bacteria are derived from external sources, and bacteria and protists are directly consumed by macroinvertebrates.

Chiou, C.T., D.E. Kile, T.I. Brinton, R.L. Malcolm, J.A. Leenheer and P. MacCarthy. 1987. A comparison of water solubility enhancements of organic solutes by aquatic humic materials and commercial humic acids. Environ. Sci. Tech. 21(12):1231-1234.

Abstract. Water solubility enhancements of 1,1-bis(p-chlorophenyl)-2,2,2-trichloroethane (p,p'-DDT), 2,4,5,2'-5'-pentachlorobiphenyl (2,4,5,2'5'-PCB), and 2,4,4'-trichlorobiphenyl (2,4,4'-PCB) by dissolved organic matter have been studied with the following samples: (1) acidic water samples from the Suwannee River, Georgia, and the Sopchoppy River, Florida; (2) a humic extract of a nearly neutral pH water from the Calcasieu River, Louisiana; (3) commercial humic acids from the Aldrich Chemical Co. and Fluka-Tridom Chemical Corp. The calculated partition coefficients on a dissolved organic carbon basis (K_{doc}) for organic solutes with water samples and aquatic humic extracts from this and earlier studies indicate that the enhancement effect varies with the molecular composition of the aquatic humic materials.

Clewell, A.F. 1986. Natural Setting and Vegetation of the Florida Panhandle. An Account of the Environments and Plant Communities of Northern Florida, West of the Suwannee River (Final Rept. 1977-1981). COESAM/PDEI-86/001. Conservation Consultants, Inc., Environmental Biology Div. Palmetto, FL. 786 pp.

Abstract. This report is a comprehensive treatise on the natural setting of the Florida Panhandle including geology, physiology, soils, climate and other physical features which collectively comprise and define the habitats and physical environments. The natural plant communities that are found in these various habitats are described. Ruderal vegetation and other semi-natural communities that have developed in response to disturbance and land management practices are also described. Successional trends are discussed and a number of physical factors are identified which must be maintained if a given plant community is to persist indefinitely. Changes expected in community physiognomy and floristic composition are enumerated which are caused by agriculture and forestry practices, wetlands modifications and other habitat management practices. A limited discussion is also included on paleoecology and endemism in the Florida Panhandle area.

Cochran, C.H. 1994. Environmental enforcement at FERC -- a bird's-eye view. Nat. Resour. Environ. 8(4):14-16.

Abstract. On July 26, 1989, the Federal Energy Regulatory Commission (FERC) issued a $37 million notice of proposed civil penalty against the Transcontinental Gas Pipeline Corporation (Transco). FERC said that, while engaged in construction of a gas pipeline in the vicinity of Mobile Bay, Alabama, Transco had damaged or destroyed numerous archeological sites protected by the National Historic Preservation Act of 1966, an environmental statute incorporated in FERC's regulations and enforced by the Commission. Noting its statutory authority to assess a penalty of up to $5,000 per day for each violation of law, FERC calculated a potential penalty of $325,710,000-- but stated that it decided not to propose the maximum penalty. While FERC is not primarily an environmental agency, FERC's enforcement of environmental requirements, as the Transco case should suggest, can be vigorous and ought to be included in any comprehensive discussion of current environmental regulation and enforcement at the federal level.

Couch, C.A. and J.L. Meyer. 1992. Development and composition of the Epixylic biofilm in a blackwater river. Freshwater Biology. 27(1):43-51.

Abstract. 1. Comparisons of chlorophyll a, bacterial density, frequencies of dividing cells, ash-free dry mass (AFDM) and extra cellular polysaccharide content were made for biofilm developing on wood (Salix) submerged in replicated stream-side flumes exposed to either ambient light (light treatment) or covered to exclude light (dark treatment). Biofilm was sampled on days 3, 6, 9 and 14 during experimental periods occurring in May, September, November and December. 2. There were no significant differences in bacterial cell densities, frequencies of dividing cells, AFDM or extra cellular polysaccharide content between light and dark treatments. Ash content and bacterial biomass was similar to seston, suggesting the importance of seston as a source of material accumulating in the biofilm. 3. Of total epixylic organic carbon 7.2% was estimated to be extra cellular polysaccharide, and 0.8% was bacterial carbon. At least nine times more carbon was contained in extra cellular polysaccharide than in bacterial biomass. 4. In the epixylon of the Ogeechee River, bacterial dynamics appear to be controlled by factors other than the availability of algal substrates.

Couch, J.A. 1985. Prospective study of infectious and noninfectious diseases in oysters and fishes in three Gulf of Mexico estuaries. Dis. Aquat. Org. 1(1):59-82.

Abstract. This study of 3 northern US Gulf Coast estuaries (Pensacola and Escambia Bays in Northwest Florida; Mobile Bay, Alabama; Pascagoula Harbor, Mississippi Sound, Mississippi) investigates: frequencies of known or new diseases, including neoplasms, in oysters, Crassostrea virginica, and fishes at sites among the estuaries; general relations between disease frequency and human activity in influencing disease prevalences in fish and shellfish populations in coastal regions characterized by varying degrees of human impact. One offshore control station was collected quarterly (1979-1980) for fish disease prevalence in comparison with the estuarine stations.

Crance, J.H. 1971. Description of Alabama estuarine areas-cooperative Gulf of Mexico estuarine inventory. Ala. Mar. Resour. Bull. 6:1-85.
Abstract. Physical characteristics of estuarine areas are given; importance as nursery areas are discussed. Maps include: study area, sediment types, pollution sources, oyster beds, isotherms, isohalines, and some economic characteristics. Tabular data include: climate, tides, open water surface area and average depth, tidal marsh, stream discharge, domestic and industrial wastes, navigation channels, and commercial fisheries.

Cronholm, L.S. 1980. Potential health hazards from microbial aerosols in densely populated urban regions. Appl. Env. Microbiol. 39(1):6-12.
Abstract. Aerosolized bacteria were recovered ≤930 m downwind of 3 sewage treatment plants in Jefferson County, Kentucky. This distance includes homes in the proximity of several hundred such plants in that county. Bacterial counts were elevated on foliage near activated sludge tanks; although these counts decreased rapidly, at 48 hr post exposure they were significantly higher than the counts on unexposed leaves. The LD50 of aerosolized Klebsiella pneumoniae was comparable to the LD50 of a virulent clinical isolate, and enteric bacteria were recovered from the respiratory organs of mice after forced inhalation adjacent to an aerated sludge tank. The coliform density in the effluents of the plants tested was inversely related to the airborne bacterial load at those plants. This was attributed to the correlation between effluent quality and extent of aeration of activated sludge. Wind direction and distance influenced the airborne counts, but due to extreme variation in counts, it is not possible to predict emission rates accurately in an open ecosystem. Airborne enteric bacteria were also isolated near a decorative wading fountain. A potential health hazard may be created by the increased probability of inhaling and ingesting microorganisms of fecal origin.

Crozier, G.F. and W.W. Schroeder. 1978. Mobile Bay Turbidity Study (Final Report, 1 Apr. 1976 - 31 Sep. 1977). Marine Environmental Sciences Consortium. Dauphin Island, Alabama. 60 pp.
Abstract. The termination of studies carried on for almost three years in the Mobile Bay area and adjacent continental shelf are reported. The initial results concentrating on the shelf and lower bay were presented in the interim report. The continued scope of work was designed to attempt a refinement of the mathematical model, assess the effectiveness of optical measurement of suspended particulate material and disseminate the acquired information. The optical characteristics of particulate solutions are affected by density gradients within the medium, density of the suspended particles, particle size, particle shape, particle quality, albedo, and the angle of refracted light. Several of these are discussed in detail.

Dawes, C.J. 1984. Determination of 'In situ' Biomass and Energetics in Seagrass Beds on the West Coast of Florida. Topical Report, May 1982-January 1984. University of South Florida. Tampa, FL. 68 pp.
Abstract. The Gulf Coastal region of Florida supports extensive grass beds that almost continuously cover the shallow (1-5m) depths from Apalachicola Bay to Anclote Bay and in Tampa Bay. Attached and drift benthic seaweeds occur as well and may have higher energetic yields than

the seagrasses. The shallow and continuous beds offer a possible source for plant biomass use in methane production, if sufficient material is available throughout the year and the energetics are high enough. Tri-weekly samplings at three sites around Tampa Bay and bimonthly samplings at four sites along the west coast of Florida showed highest biomass occurring during the spring through fall months. The available biomass of combined attached and drift seagrasses and seaweeds was lower than that predicted when compared with terrestrial crops. Naturally occurring seagrass and seaweed beds do not have sufficient biomass to justify harvesting for biogass production, although energetics levels are high.

Demuro, J. and C. Nunley. 1990. Collecting Household Hazardous Wastes at Wastewater Treatment Plants. Case Studies. Environmental Protection Agency, Washington, DC. Office of Municipal Pollution Control. Washington, DC. 39 pp.

Abstract. The report is intended to provide details on the organization, development and implementation of HHW programs related to Wastewater Treatment Plants. It evaluates principle problems and limitations associated with HHW collection.

Donohoe, R. and W. Calhoun. 1982. Synopsis of the Mobile Bay -- Mississippi Sound research review. MASGP-81-026. Mississippi-Alabama Sea Grant Consortium. Ocean Springs, MS. 19 pp.

Abstract. Although many aspects of Mobile Bay and Mississippi Sound have been researched for over a hundred years with efforts increasing dramatically in the past 20 years, some of the results have been lost or outdated. In order to achieve these ends, the Mississippi-Alabama Sea Grant Consortium, in conjunction with the Alabama Sea Grant Advisory Service, sponsored a workshop for researchers of the Mobile Bay-Mississippi Sound Region. Investigators had the opportunity to review the current status of other projects. Such projects as the Tenn-Tom, the deepening of the ship channel, the drilling for natural gas, the industrial and residential growth along the shores, and waste disposal are but some of the problems which need to be addressed and assessed. This review is a significant effort to define status of knowledge in selected disciplines. Coordination of future studies and cooperation in information exchange between researchers is stressed.

Draper, S.E. 1994. Coordinating Water Use Policy and Regulation and Water Quality Policy and Regulation. pp. 323. *In* Effects of Human-Induced Changes on Hydrol Syst Symp, Jackson Hole, WY. AWRA,

Abstract. Water quality and water quantity are inextricably linked through water use: return flows after use can be degraded, and in-stream use can change water quality for downstream users. Water-resources management is described for the Apalachicola-Chattahoochee-Flint (ACF) River Basin as illustration of the relationship between water quantity and quality. The basin, which drains significant portions of Georgia and smaller portions Alabama and Florida, is home to hydropower dams and extensive agriculture, livestock, and silvi-culture programs. The in-stream use of the Chattahoochee River for hydropower and the consequent restrictions on water supply is the basis for serious interstate conflict. As a result, a comprehensive study has been launched of the ACF Basin, which will consider both in-stream and out-of-stream uses. The fragmented water-resources management policies and regulations within the US as a

whole and the ACF Basin specifically are discussed to show that integrated water management is best implemented at the state level. (Full text available from Congressional Information Service.).

Elder, J.F. 1985. Nitrogen and phosphorus speciation and flux in a large Florida river wetland system. Water Resources Research. 21(5):724-732.
Abstract. Hydrologic measurements and analyses of various nitrogen and phosphorus species were made on the Apalachicola River system in northern Florida in 1979 and 1980. Annual outflows of total nitrogen (TN) and total phosphorus (TP) were not substantially different from annual inflows. However, there was significant net import of ammonia and soluble reactive phosphorus and net export of some particulate and organic species. The TN:TP ratio ranged from 12 to 15, but the specific ratio of dissolved inorganic nitrogen to soluble reactive phosphorus was much higher (up to 40) and increased in a downstream direction; this contributed to a phosphorus-limiting situation in Apalachicola estuary. Processes within the flood plain ecosystem accounted for much of the release of organic and particulate species and retention of inorganic species.

Elder, J.F. and H.C. Mattraw. 1984. Accumulation of trace-elements, pesticides, and polychlorinated-biphenyls in sediments and the clam corbicula-manilensis of the Apalachicola River, Florida. Archives of Environmental Contamination and Toxicology. 13(4):453-469.

Elder, J.F. and H.C. Mattraw Jr. 1982. Riverine transport of nutrients and detritus to the Apalachicola Bay Estuary, Florida. Water Resources Bulletin. 18(5):849-856.
Abstract. The Apalachicola River basin in northwest Florida covers an area of 3,100 square kilometers. Fifteen percent of the area is a dense bottom-land hardwood forest which is periodically flooded. The annual leaf-litter fall from the flood-plain trees is a potential source of nutrients and detritus which eventually can flow into Apalachicola Bay. Transport of such material is dependent on the periodic inundation of the flood plain. Flood characteristics, such as prior hydrologic conditions, extent, and timing, are important in determining the amount and forms of materials transported. The 1980 spring flood produced a fourfold discharge increase over the annual mean outflow of 800 cubic meters per second. Nutrient concentrations varied little with discharge, but the 86-day spring flood accounted for 53, 60, 48, and 56 percent of the annual flux of total organic carbon, particulate organic carbon, total nitrogen, and total phosphorus, respectively. In 1980, the flood peaks, rather than rise or recession, accounted for maximum nutrient and detritus transport.

Elder, J.F., S.D. Flagg and H.C. Mattraw. 1988. Hydrology and Ecology of the Apalachicola River, Florida: A Summary of the River Quality Assessment. Geological Survey, Water Resources Div. Reston, VA. 54 pp.
Abstract. During 1979-81, the US Geological Survey conducted a large-scale study of the Apalachicola River in northwest Florida, the largest and one of the most economically important rivers in the State. Termed the Apalachicola River Quality Assessment, the study emphasized

interrelations among hydrodynamics, the flood-plain forest, and the nutrient-detritus flow through the river system to the estuary. The report summarizes major findings of the study.

Faulkner, G.L. 1973. Ground-Water Conditions in the Lower With Lacoochee River Cross-Florida Barge Canal Complex Area (Water-resources investigations (Final)). Sponsor: Corps of Engineers, Washington, DC. Geological Survey, Water Resources Div. Tallahassee, FL. 37 pp.

Abstract. Construction of the westernmost seven-mile reach of the Cross Florida Barge Canal which intersects the lower with Lacoochee River nine miles above its mouth, began in 1965 and completed in 1969. The river channel and the canal penetrate the cavernous limestone of the Floridan Aquifer below the water table. Ground-water levels in a 15-square mile area centered at the canal about 4.5 miles from the Gulf of Mexico are 0.5 foot-15 feet lower than had the canal not been built. In another 0.7 square-mile area surrounding the Inglis Lock bypass channel the ground-water level has been raised 0.5 foot-20 feet above the pre-canal level. The average ground-water contribution to the flow of the lower river is 20%. The fresh water-saltwater zone of diffusion in the aquifer tends to rise in the area where the ground-water levels have been lowered.

Federal Water Pollution Control Administration. 1970a. Effects of Pollution On Water Quality, Escambia River and Bay, Florida. (Athens,, GEORGIA.) Federal Water Pollution Control Administration, Southeast Water Laboratory. Athens, GA. 62 pp.

Abstract. Interstate and intrastate pollution from waste sources entering the Conechu-Escambia River downstream of Brewton, Alabama, and Escambia Bay near Pensacola, Florida was evaluated. An investigation of waste sources in Florida and Alabama and a detailed study of the receiving waters were conducted during the period of September 8-25, 1969 and October 22-30, 1969. The report presents an evaluation of the data collected during these studies.

Federal Water Pollution Control Administration. 1970b. Effects on pollution on water quality, Perdido River and Bay, Alabama and Florida. Southeast Water Lab. Athens, GA. 95 pp.

Abstract. The report evaluates water quality conditions and waste sources in Perdido Bay. An investigation of waste sources and a detailed study of the bay and its major tributaries were conducted during the period of September 9-17, 1969. The report presents an evaluation of the data collected during this study.

Federle, T.W., R.J. Livingston, L.E. Wolfe and D.C. White. 1986. A quantitative comparison of microbial community structure of estuarine sediments from microcosms and the field. Can. Jour. Microbiol. 32(4):319-325.

Abstract. Estuarine soft-bottom sediments in microcosms and the field were compared with regard to microbial community structure. Community structure was determined by analyzing the fatty acids derived from the microbial lipids in the sediments. Fatty acid profiles were compared using a multivariate statistical approach. Experiments were performed using sediments from St. George Sound and Apalachicola Bay, Florida. The community structure of St. George Sound sediments was apparently controlled by epibenthic predators. In Apalachicola Bay, the dominant

influences were physical factors related to the flow of the Apalachicola River. In the St. George Sound experiment, microbial communities in the microcosms differed from those in the field after only 2 weeks, and the degree of this difference increased substantially as time progressed. In the Apalachicola Bay experiment, although microbial communities in the microcosms were detectably different from those in the field, the degree of this difference was not large nor did not it increase with time.

Foldman, L., W. Hosking, T. Lowery and L.A. Skupien. 1987. Mobile Bay: An Update. Executive Summary of the Symposium on the Natural Resources of the Mobile Bay Estuary. Mississippi-Alabama Sea Grant Consortium. Ocean Springs, MS. 28 pp.

Abstract. Contents: Preface; Introduction; Description of Mobile Bay; State of the Bay: Water quality; Wetland losses; Biological diversity; Land acquisition for conservation; Education; Resources and users: Harvest of living resources; Recreation/Tourism; Residential development; Commercial development; Navigation/Industry; Transportation; Waste assimilation; Extraction of non-living resources; Regulatory programs: Harvest of living resources; Waste discharges into Mobile Bay system; Activities in Federal waters; Alabama coastal program; Zoning by local governments; State land leasing; Estuarine management approach; Management/Research recommendations.

Forester, J. 1971. Toxicity and distribution of Aroclor Registered 1254 in the pink shrimp Penaeus duorarum. Mar. Biol. 11(3):191-197.

Forster, C.F., R.W. Crabtree, I.D. Cluckie and C.P. Crockett. 1985. Comparison of two models for predicting river water quality. Effluent & Water Treatment. 25(5):161-164.

Abstract. Two conventional, deterministic water quality models are compared, using data from the Blackwater River in the U.K. water quality constituents simulated with the EPA qual-II model and a U.K. water research centre model are do, BOD, ammonia, and nitrate. The more general EPA model produced predictions which were closer to the actual conditions than those produced by the river-specific model.

Franks, B.J. 1988. Hydrogeology and Flow of Water in a Sand and Gravel Aquifer Contaminated by Wood-Preserving Compounds, Pensacola, Florida (Water-resources investigations). Florida Geological Survey, Water Resources Div. Tallahassee, FL. 79 pp.

Abstract. The sand and gravel aquifer in southern Escambia County, Florida, is a typical surficial aquifer composed of quartz sands and gravels interbedded locally with silts and clays. A potentially widespread contamination problem involves organic chemicals from wood-preserving processes. Because creosote is the most extensively used industrial preservative in the United States, an abandoned wood-treatment plant near Pensacola was chosen for investigation. The report describes the hydrogeology and ground water flow system of the sand and gravel aquifer near the plant. Recharge occurs predominantly in the northern part of the study area, while discharge occurs along the coast and to Pensacola Bay. In the study area, the sand and gravel aquifer, about 100 meters thick, consists of three permeable zones separated by confining units. A three-dimensional simulation of ground water flow in the aquifer was evaluated under steady-state conditions.

Froelich, P.N., G.A. Hambrick and M.O. Andreae. 1983. Geochemistry of inorganic and methyl germanium species in three estuaries. Spring Meeting, American Geophysical Union Baltimore, MD (USA)31 May 1983. EOS, American Geophysical Union Transactions. 64(45):715.

Abstract. The distributions and speciation of germanium were investigated in three very different estuaries: (1) Ochlockonee Bay, a small, pristine, low-productivity estuary in NW Florida (2) Charlotte Harbor, a large, nutrient-rich (N,P), high-productivity estuary in SW Florida, and (3) the Tejo Estuary, a large, industrially-polluted bay near Lisbon, Portugal. In all three estuaries at least three species of germanium were detected: inorganic germanic acid (Ge_i), monometylgermanium (MMGe), and dimethylgermanium (DMGe). The source of Ge_i is weathering of silicate rocks. The sources of MMGe and DMGe are presently unknown, but presumably are oceanic. Trimethylgermanium (TMGe) was detected (trace quantities less than or equal to 5 pM) in the most polluted portion of the Tejo Estuary, and thus may have an anthropogenic source.

Fu, J. 1991. Atmospheric Deposition of Nutrients to North Florida Rivers: A Multi-variate Statistical Analysis. Master's Thesis. Florida State University, Tallahassee, FL. 95 pp

Abstract. Atmospheric nutrient input to the Apalachicola Bay estuary was studied because it has been demonstrated that atmospheric deposition can be a major source of nutrients to eastern US estuaries. Besides the Apalachicola River, the Sopchoppy and the Ochlockonee were also selected for a comparative analysis. Receptor model, absolute principal of component analysis (APCA), and mass balance methods were applied in the study. The results of the study show that nitrogen is probably not a limiting nutrient in the three rivers because their N: P mole ratios are nearly 3 times higher than the Redfield ratio for photosynthesis. The total atmospheric nitrogen depositions in the three river watershed are at least as great as their river fluxes. In the Apalachicola River, the atmospheric source of nitrogen is found to be several times higher than the largest possible input of urban sewage. Atmospheric deposition, therefore, might be the dominant nitrogen source entering the estuary. The results of APCA show that Apalachicola River water is mainly a mixture of components that correspond their compositions to aged rain, ground water, and fresh rain. Atmospheric nitrate deposition is the result of the air pollution, i.e., acid rain. The studies also show that the annual average deposition of nitrate has a narrow range, mainly from 5.8 to 11.5 kg/ha/yr in most of the NADP sites in the 8 southeastern states. Since all the software and date sets employed in the study are accessible nationwide, the methods could be applied in other watersheds.

Gambrell, R.P., L.A. Khalid and W.H. Patrick Jr. 1980. Chemical availability of mercury, lead, and zinc in Mobile Bay sediment suspensions as affected by pH and oxidation-reduction conditions. Environ. Sci. & Technol. 14(4):431-436.

Abstract. Mobile Bay (Alabama) sediment material was incubated at pH 5.0, 6.5, and 8.0 and at redox potentials -150, +50, +250, and +500 mV to determine the effects of these parameters on the chemical form of added labeled Hg and Pb as well as indigenous Pb and Zn. After equilibrating for 2 wk under controlled pH-redox potential conditions, suspensions aliquots were subjected to a chemical fractionation procedure to determine levels of metals in total soluble, noncationic soluble,

exchangeable, reducible, and chelate extractable forms. The soluble and/or exchangeable fractions, representing readily available forms, represented only a small proportion of each metal. A large proportion of each metal was in potentially available forms. An altered physicochemical environment influenced levels of the metals in most of the general chemical forms studied. The responses of metal levels in the selected chemical forms to controlled pH and redox potential conditions tended to differ for the metals studied, indicating that the immobilizing processes do not affect the metals to the same degree. The physicochemical condition of contaminated dredged materials at a disposal site may influence transformations of these metals among readily available and potentially available chemical forms.

Garwood, R.G. 1982. Geology of the Golden Sunlight Golf Mine, Jefferson County, Montana. pp. 17. *In* Anon., ed. Proceedings - International Gold/Silver Conference 2. Nevada Inst of Technology, Reno, Nev.

Ginwalla, A.S. and M.A. Miklta. 1992. Reaction of Suwannee River fulvic-acid with chloramine - characterization of products via N-15 NMR. Environ. Sci. Tech. 26(6):1148-1150.

Abstract. Suwannee River fulvic acid was reacted with aqueous solutions of N-15-labeled chloramine and N-15-labeled ammonia. INEPT N-15-NMR spectra of the lyophilized products from both reactions exhibit major resonances between 90 and 120 ppm, denoting the formation of amides, enaminones, and/or aminoquinones. The striking similarity between spectra suggests that the observed N moieties result from reactions between fulvic acid and ammonia, an expected co-product from the chlorination of the fulvic acid by chloramine. This represents the first evidence for the formation of N-containing compounds from the chloramination of dissolved organic matter in natural waters.

Good, L.L. 1982. Sludge hauling charges float away. Water Eng. & Mgmt. 129(2):40-42.

Abstract. The disposal of aerobically digested activated sludge by tank truck to ranch lands or citrus groves is common practice in Florida. Economics dictate, however, that an effort is made to minimize hauling operations by increasing solids concentration, but only to the point where spreading on land is still easily accomplished. Florida Cities Water Company has made real progress in this area and is now operating a unique dissolved air flotation system (DAF) which concentrates sludge solids from 1.2 to 4.0 percent. Seven sludge truck trips out of every ten have been eliminated. Florida Cities Water company owns and operates five water and five wastewater systems in Florida. The two most modern of the sewerage systems are located in Sarasota County. The Gulf Gate franchise serves an area of about 6 sq. miles and approximately 7,300 customers with a treatment plant of 1.8 mgd capacity.

Graham, F., Jr. 1984. Mystery at Dog Island. Audubon. 86(2):30.

Hagar, R. 1985. Mobile Bay shaping up as major gas producing area. Oil Gas J. 83(2):25+vp.

Abstract. Lessees in Mobile Bay off Alabama expect the area to become one of the most significant gas producing provinces in the US although less than a dozen deep Jurassic Norphlet wells have been completed, lessees

say Mobile Bay reserves may eventually rank with such US giants as Gomez field's 10 trillion cu ft in Pecos County, Tex., the 15 trillion cu ft in New Mexico's San Juan basin, and possibly Prudhoe Bay's 26 trillion cu ft on Alaska's North Slope. The prime objective in Mobile Bay is the Norphlet below 20,000 ft. Reserves assigned to 11 Norphlet gas wells are about 2.5 trillion cu ft.

Hale, K.K., D.P. De Sylva, J.M. Prospero and C.C. Harwell. 1994. History of marine research in the Florida Keys. Bulletin of Marine Science. 54(3):1076-1077.

Hall, C.A.S. and J.W. Day Jr. 1977. Ecosystem Modeling in Theory and Practice: An Introduction with Case Histories. John Wiley & Sons. New York, NY. 684 pp.

Abstract. The scientific and social concepts of environmental modeling are explained clearly and carefully without excessive mathematics using case studies of problems as examples. Introductory chapters cover modeling theory and procedures, circuit language, strategy, mathematical model construction, values, economics energy, and modeling in the context of the law. Natural systems modeled include a forest, a lake, a salt marsh, and a thermal spring food chain. Environmental impact is assessed by ecosystem modeling, biospheric productivity, and simulation of energies. Optimal interactions of man and nature are explored through case histories of natural wetlands, regional planning in Florida, cost benefit analysis applied to power plants, pest management, gradient modeling, population optima, and a simulation model for an estuary. Specific areas studied include the following: Barataria Bay; Castle Lake, California; Hudson River Power Plant; the Baltic Sea; Southern Louisiana; South Vietnam; Delaware estuary; Franklin County, Florida; Apalachicola Bay; Crystal River, Florida; and Narragansett Bay.

Hall, J.S. 1972a. Wastewater Discharges into Pensacola Bay, Escambia Bay and River (Excluding Monsanto, American Cyanamid and Air Products). Environmental Protection Agency, Surveillance and Analysis Div. Athens, GA. 39 pp.

Abstract. The investigation of significant wastewater sources in the Escambia-Pensacola Bay drainage basin consisted of a review of the types of industries in the study area, a review of waste discharge permits on file with the Florida Department of Pollution Control and an on-site investigation of each major potential pollution source. Eight pollution sources discharging directly into Escambia-Pensacola Bay receiving waters were sampled for a 24-hour period. Analyses varied with the types of wastewaters sampled and they are included in the report.

Hall, J.S. 1972b. Wastewater Survey, St. Regis Paper Company, Cantonment, Florida. Environmental Protection Agency, Surveillance and Analysis Div. Athens, GA. 53 pp.

Abstract. The report contains an evaluation of waste treatment at St. Regis Paper Company's integrated pulp and paper mill located at Cantonment, FL. Reported results are from a ten-day study which was requested by the conferees at the Perdido Bay Federal-State Enforcement Conference Progress Meeting held in Gulf Breeze, FL, during January 1972. The study

was designed to determine waste removal effectiveness of treatment facilities serving the paper mill and to characterize the wastes discharged into Elevenmile Creek.

Holligan, P.M. and W.A. Reiners. 1992. Predicting the responses of the coastal zone to global change. Advances in Ecological Research. 22:211-255.

Hood, M.A., G. Ness, G.E. Rodrick and N.J. Blake. 1983. Distribution of Vibrio cholerae in two Florida estuaries. Microb. Ecol. 9(1):65-75.
Abstract. The distribution of Vibrio cholerae was examined in 2 Florida estuaries, Apalachicola and Tampa Bay. V. cholerae serotype non-01 was the most abundant serotype, being isolated from 45% of the oyster samples, 30% of the sediments, 50% of the waters, and 75% of the blue crabs: V. cholerae serotype 01 was isolated from only one oyster sample. Strong linear correlations between V. cholerae and temperature, salinity, or the other physical/chemical parameters measured, Escherichia coli, or fecal coliforms were not observed, but a range of temperatures and salinities appeared relevant to the distribution of the organism. The organism was present in the highest concentrations when salinities were 10 ppt-25 ppt and temperatures were 20 degree C-35 degree C. In vitro growth curves of 95 V. cholerae environmental isolates further supported that 10 ppt-25 ppt was an ideal salinity range for the organisms. The results suggest that V. cholerae is a widely distributed organism in the nutrient-rich warm waters of the Gulf Coast estuaries.

Hsueh, P.W., J.B. McClintock and T.S. Hopkins. 1992. Comparative study of the diets of the blue crabs Callinectes similis and C. sapidus from a mud-bottom habitat in Mobile Bay, Alabama. J. Crust. Biol. 12(4):615-619.
Abstract. Diets of Callinectes similis and C. sapidus collected from the same open bay locality in Mobile Bay, Alabama, were investigated. Fish, bivalve, Brachyuran, and gastropod remains constituted the 4 most common prey items for both species. The cumulative Index of Relative Importance (IRI) of these 4 food groups was 85% in C. similis and 91% in C. sapidus, suggesting that both Callinectes spp. forage primarily on these 4 prey groups. To examine onto genetic shift in diets, individuals of C. similis were sorted into 3 size classes (29-50, 51-80, and 81-111-mm carapace widths) representing juvenile, premature, and sexually mature stages. We found statistically significant differences in the hierarchy and proportions of the main prey types among size classes examined. There was no significant difference in the diet of male and female C. similis .Relatively high percentage of dietary overlap between C. similis and C. sapidus suggests that these crabs probably utilize common resources in areas of habitat overlap in Mobile Bay, Alabama.

Hull, R.W., J.E. Dysart and W.B. Mann IV. 1981. Quality of Surface Water in the Suwannee River Basin, Florida, August 1968 Through Dec 1977 (Water-resources investigations (Final)). Geological Survey, Water Resources Div. Tallahassee, FL. 105 pp.
Abstract. In the 9,950-square mile area of the Suwannee River basin in Florida and Georgia, 17 surface-water stations on 9 streams and several springs were sampled for selected water-quality properties and constituents from August 1968 through December 1977. Analyses from these samples indicate that: (1) the water quality of tributary wetlands controls the water

quality of the upper Suwannee River headwaters; (2) ground water substantially affects the water quality of the Suwannee River basin streams below these headwaters; (3) the water quality of the Suwannee River, and many of its tributaries, is determined by several factors and is not simply related to discharge; and (4) development in the Suwannee River basin has had observable effects on the quality of surface water.

Irwin, G.A. and G.T. Losey. 1979. Water-Quality Assessment of Runoff from a Rural Highway Bridge Near Tallahassee, Florida (Water-resources investigations). Sponsor: Florida State Dept. of Transportation, Tallahassee. Geological Survey, Water Resources Div. Tallahassee, FL. 34 pp.

Abstract. Runoff from a rural highway bridge on US 27 near Tallahassee, Florida, was found to have an insignificant water-quality loading impact on the Ochlockonee River. Potential annual-runoff loads on the bridge surface for virtually all constituents studied were less than one percent of those transported by the river at the study site. The loading rates for some parameters were significantly related to traffic counts, but the regression equations were limited to traffic ranges between 3,800 to 4,200 vehicles per day in 1977-78. Precipitation samples indicated that a significant percentage of the constituent loading to the bridge surface is from atmospheric deposition.

Isphording, W.C. and G.M. Lamb. 1984. Sedimentation, dispersal and partitioning of trace metals in Mobile Bay bottom sediments. pp. 8-9. *In* L. Skupien, ed. Mississippi-Alabama Sea Grant Consortium annual report. January 1, 1980-June 30, 1981.

Abstract. The first year of this two-year project has produced trend surface maps showing the distribution of selected heavy metals and variation of physical and chemical characteristics in Mobile Bay. Effective analytical procedures have been established, refined, and used to process samples and document metal site partitioning.

Iverson, R.L., F.L. Nearhoof and M.O. Andreae. 1989. Production of dimethyl sulfonium propionate and dimethyl sulfide by phytoplankton in estuarine and coastal waters. Limnol. Oceanogr. 34(1):53-67.

Abstract. The authors determined the concentrations of dimethyl sulfide (DMS) and its metabolic precursor, dimethyl sulfonium propionate (DMSP), in water and particulate samples obtained along transects through Delaware Bay, Chesapeake Bay (including the Potomac River), and Ochlockonee Bay (Florida). The Delaware and Chesapeake Bay transects extended into the open ocean. In most cases, the authors observed positive correlations between the concentrations of the biogenic sulfur species and salinity, particularly when the concentrations of the sulfur compounds were normalized to chlorophyll a as a measure of phytoplankton biomass.

Johnsen, P.K., G.J. Knaap and L.J. Smith. 1992. Public perceptions and attitudes toward environmental rehabilitation of the lower Green Bay watershed. Coastal Management. 20(1):9-23.

Abstract. Under the terms of the Great Lakes Water Quality Agreement between the United States and Canada, remedial action plans (RAPs) must be prepared for 42 areas of concern along the shores of the Great Lakes. A plan for the environmental rehabilitation of the Upper Fox River and Lower Green Bay of Lake Michigan was one of the first such plans

prepared. The Green Bay Remedial Action Plan is often cited as one of the more complete and appropriate among RAPs submitted to date. This article examines public perceptions and attitudes toward the Green Bay RAP using survey methods. The survey found the public poorly informed about the RAP but widely supportive of the action items in the plan. Further, the survey found the public unwilling to create a new agency to implement the RAP. Implementation by the Wisconsin Department of Natural Resources was favored instead. Finally, the survey found few and usually small, but some potentially important, differences in attitudes and perceptions between recreational users and nonusers of the area of concern.

Keller, J., E. C., D.K. Werner, R.B. Gerber and A.J. Becker. 1983. Plankton and Benthic Instream-Flow Criteria, Strategy, and Habitat Delination in Acid-Containing Waters (Technical rept.). Sponsor: Office of Water Research and Technology, Washington, DC. West Virginia Univ., Water Research Inst. Morgantown, WV. 89 pp.

Abstract. Eight homogenous river segments were identified, through cluster analysis, in the upper Monongahela River Basin viz, Cheat Lake, Tygart Lake, an acid drainage segment of the middle Cheat, the lower Monongahela (to Pt. Marion, Pa), the upper Monongahela, the upper Cheat, the lower Blackwater River, and the Westfork River (south to Clarksburg, WV). Regression analyses of data from within these segments indicated that in stream flow was highly associated with Total Algal Biomass in several of the segments. Regression analyses also showed that in stream flow had very little association with the Algal General Distribution.

Kiene, R.P. and G. Gerard. 1994. Determination of trace levels of dimethyl sulfoxide (DMSO) in seawater and rainwater. Marine Chemistry. 47(1):1-12.

Abstract. A procedure for the trace analysis of dimethyl sulfoxide (DMSO) in-sea-water and other aqueous solutions has been developed. The method is based on reduction of DMSO to dimethyl sulfide (DMS) by titanium-trichloride ($TiCl_3$) and the subsequent measurement of DMS by gas chromatography. As little as 1 picomole of DMSO could be detected by the method yielding a detection limit of 1 nM for a 1 ml sample. Precision for most natural water samples with 5-20 nM DMSO was better than 10%. Water samples stored in the dark and either frozen (-20 degree C) or acidified(0.05 M HCl; 4 degree C) showed no significant losses or contamination over a 3 week period. The reduction reaction was selective for DMSO, in that other sulfur compounds including methionine, homocysteine, cysteine, glutathione, dimethyl sulfone, methionine sulfoxide, dimethyl sulfoniopropionate (DMSP) and S-methyl methionine did not yield DMS. However, a required basification step in the procedure caused conversion of DMSP to DMS, therefore parallel samples without $TiCl_3$ were used to correct for dissolved DMSP or DMS in the solution analyzed. Tests showed that DMSP was the only compound which yielded DMS during the basification step. Significant analytical blanks were observed if precautions were not taken to minimize air contamination of glassware, reagents and the analyte solution. Detailed information on how to minimize blanks is given. Using the method we measured seawater DMSO concentrations ranging from 1 to 13 nM and rainwater DMSO concentrations ranging from 1 to 26 nM. A preliminary

incubation experiment with water from Mobile Bay, Alabama indicated that added DMSO (50 nM) was consumed over a 5 day period. The method should be useful in studies of DMSO and DMS biogeochemistry.

Landin, M.C. and J.B. Herbich. 1987. The success story of Gaillard Island: A Corps confined disposal facility. *In* Proceedings of the Nineteenth Dredging Seminar.

Leadon, C.J. and O.F. Wetterqvist. 1986. Land acquisition criteria for the Suwannee River Estuary, Florida. Coast. Zone Manage. 14(3):217-239.
Abstract. Land acquisition criteria for evaluating lands important to non-structural water management were formulated for Florida's Save Our Rivers program. Parcels of land are rated according to scientific aspects of primary importance within hydrology, water quality, ecology, and endangerment categories in this system. The regional importance and future resource value of land are emphasized in these practical criteria. The system's scoring range is described by the application of the criteria to the wetlands of the Suwannee River Estuary and three hypothetical tracts in northern Florida.

Leadon, J., G.P. Genoni and F.J.S. Maturo Jr. 1985. Florida's Suwannee River estuary: Long-term benthic invertebrate dynamics. Estuaries. 8(2B):79A.
Abstract. Benthic invertebrate species abundance and water quality samples were sampled monthly in the estuary for 36 months. Monthly benthic invertebrate abundances were inversely correlated with average Suwannee River discharges occurring during the same month. The long-term patterns of river discharges and total organic carbon concentrations are reflected by the pattern of benthic invertebrate abundance 9 months later. The monthly variations in the abundance of the dominant benthic invertebrate, the polychaete Capitella capitata, also reflect the temporal variations in 9 month antecedent total organic carbon concentrations.

Lee, C.K. 1979. Seasonal and spatial study of oyster spat in Mobile Bay and East Mississippi Sound. Master's Thesis. University of South Alabama, Mobile, AL. 90 pp.
Abstract. This study was undertaken to evaluate the seasonal effects of oyster spat settling in Mobile Bay. Stations located near Cedar Point, Whitehouse, and Point Clear Reefs were selected for placement of a 0.1 m^2 settling plates below the surface, near the bottom, and mid-level. Beginning June 1977 and continuing to June 1978, plates were removed every two weeks, and new ones inserted in their place. Four sets of plates were left undisturbed for the duration to continued growth studies. All settling organisms were identified and statistically evaluated. Greatest oyster spat settlement occurred at Cedar Point, while maximum recruitment of oysters was recorded during September, 1977. Overall invertebrate settlement was greatest from May through September.

Lindberg, S.E. 1974. Mercury-organic matter associations in estuarine sediments and interstitial water. Environ. Sci. & Technol. 8(5):459-462.

Livingston, R.J. 1980. The Apalachicola Experiment: Research and Management. Oceanus. 23(4):14-21.

Abstract. Since 1971, a continuous, multidisciplinary research program has been carried out in the Apalachicola Bay system in northern Florida. The project originated as a routine assessment of the estuary, including monthly evaluations of water quality and biological productivity. Initial studies indicated relatively high levels of phytoplankton productivity and virtually no pollution from organochlorine compounds. The delicate hydrologic and nutrient regimes of the bay system were observed. To protect this ecosystem, ecologically sensitive lands were purchased by the state in order to establish sanctuaries.

Livingston, R.J. 1982. Application of research to resource management. Case history, the Apalachicola Estuary. International Symposium on Utilization of Coastal Ecosystems: Planning, Pollution and Productivity Rio Grande (Brazil) 22 Nov 1982. Atlantica. 5(2):72.

Abstract. The Apalachicola River and Bay System is one of the areas under study, and represents an unpolluted, highly productive resource in the Southeastern US This system has been rigorously studied and the scientific data form the basis of an extensive resource planning and management effort for the entire Apalachicola Basin. This research has led to a variety of successful management applications which include the purchase of tens of millions of dollars worth of ecologically sensitive wetlands and barrier islands, and advanced comprehensive land use plans for various local municipalities. The Apalachicola Estuary has been declared the largest estuarine sanctuary in the US, which means it has been set aside, by law, for research and education.

Livingston, R.J. 1983. Resource atlas of the Apalachicola Estuary. Report No. 55. Dept. of Biol. Sci., FL. State Univ., Sea Grant College. Gainesville, FL. 64 pp.

Abstract. The colored charts and LANDSAT photographs in this small resource atlas vividly illustrate the environment, ecology, and potential of this unique coastal area of western Florida (where Alabama and Georgia touch on Florida). The public relations information type of presentation gives, on two-page spreads each, pictorial, topographic, and statistical data with textual summaries on the following subjects: 1) general overview of the river and bay system and the National Estuarine Sanctuary; 2) physical and chemical features of the barrier islands: depths, tides, and currents; temperature and salinity of surface and bottom waters; water quality features; rainfall and river flow; and nutrients and organic detritus; 3) biological features, covering emergent vegetation, submergent vegetation, microbial ecology, zooplankton, benthic macroinvertebrates, oysters, crabs, shrimp, anchovies, spot, croaker, sand seatrout, commercial and sport fisheries, food webs, and community organization; and 4) regional economics and planning of resource management. An extensive bibliography is appended. Seasonal and annual rainfall, river flow, and temperature variations are shown on bar charts and explained in the text.

Livingston, R.J. 1984. Ecology of the Apalachicola Bay System: An Estuarine Profile. FWS/OBS-82/05. Florida State University, Department of Biological Science. Tallahassee, FL. 165 pp.

Abstract. Twelve years of studies in the Apalachicola Bay system are reviewed. Included are data on geography, hydrology, chemistry, geology, and biology. The system is part of a major drainage area including four rivers and associated wetlands in Georgia, Alabama, and Florida. The system is in a relatively natural state, though hardly pristine. But economic development and population growth are beginning to threaten it. The area's economic and ecological importance as a food producer and shelter for diverse species has inspired a movement to protect its natural resources, including State and Federal land-purchase programs, integration of county land-use regulations into a comprehensive development, and creation of the Apalachicola River and Bay National Estuarine Sanctuary.

Livingston, R.J. 1985a. Application of scientific research to resource management: Case history, the Apalachicola Bay system. pp. 103-125. *In* N.L. Chao and W. Kirby-Smith, eds. Proceedings of the International Symposium On Utilization of Coastal Ecosystems: Planning, Pollution and Productivity, 21-27 Nov. 1982, Rio Grande, Brazil. Vol. 1.

Abstract. An account is given of some of the results of a research program conducted in the Northeast Gulf of Mexico, examining applications to resource management. The Apalachicola River and Bay system is one of the areas under study and is an important unpolluted and highly productive resource in the southeastern United States. The extensive scientific data base has been used as the basis of a comprehensive resource planning and management effort for the entire Apalachicola basin. This combination of research and planning has led to a variety of management applications, which include the purchase of ecologically sensitive wetlands and barrier islands and the development of advanced land-use plans at the local, state and federal levels.

Livingston, R.J. 1985b. Periodic hypoxic conditions in the Apalachicola Estuary: Causal relationships and biological response. Estuaries. 8(2B):45A.

Abstract. Long term (13 year) studies of the Apalachicola Bay System indicate that this system remains in a basically unpolluted state. However, recent anthropogenous activities have caused periodic depletion of oxygen in specific areas of the bay. Agricultural activities, storm water runoff from urban areas, and marina development combine with seasonally high temperatures and poor circulation to cause major changes in the dissolved oxygen regime and the distribution of infaunal macro-invertebrates in the estuary.

Livingston, R.J., R.L. Iverson, R.H. Estabrook, V.E. Keys and J. Taylor Jr. 1974. Major features of the Apalachicola Bay System: physiography, biota, and resource management. Fla. Sci. 37(4):245-271.

Abstract. A review was made of various features of the Apalachicola Bay System. Unique physical, chemical, and biological features of this system combine to make it one of the most productive estuarine areas in the state of Florida. Primary productivity and secondary productivity are discussed in relation to various forcing functions (natural and man-induced). Problems associated with development include dredging, sewage effluents, pesticides and a number of up-river activities such as industrialization, cattle ranching, channelization, and damming. The Apalachicola Drainage System is viewed as one of the largest relatively

unpolluted areas in the country. However, it is a neglected resource with little management or control; as such it is presently endangered by a number of activities.

Livingston, R.J., P.S. Sheridan, B.G. McLane, F.G. Lewis III and G.G. Kobylinshi. 1977. The Biota of the Apalachicola Bay System: Functional Relationships. Sponsor: Florida State Univ., Tallahassee.; National Oceanic and Atmospheric Administration, Rockville, Md. Office of Sea Grant. Florida Research Publication No. 26. Florida Univ. Gainesville, FL. 27 pp.

Abstract. Results of a long-term study of the Apalachicola Bay System were discussed with respect to the functional relationships of the biological assemblages of estuarine organisms with the physio-chemical environment. There is a regular seasonal variation in parameters directly related to river flow, including salinity, turbidity, color, and detritus deposition. Thousands of tons (wet weight) of detritus of terrestrial origin such as leaf litter and wood debris are swept into the bay each year by the Apalachicola River. The benthic infauna and epifauna of the Apalachicola Bay System were described with special attention to the dominant species. Organisms such as blue crabs, penaeid shrimp, sea trout, and other commercially important groups utilize this system as a major nursery area. The system is dependent to a considerable degree on river based parameters and influxes of inorganic and organic substances from upland areas.

Livingston, R.J., N.P. Thompson and D.A. Meeter. 1978. Long-term variation of organochlorine residues and assemblages of epibenthic organisms in a shallow north Florida estuary. Mar. Biol. 46(4):355-372.

Abstract. A 4-yr study (1972-76) determined long-term trends of DDT, DDE, DDD, PCBs, and mirex and trawl-susceptible organisms in a shallow, river-dominated estuary in North Florida (Apalachicola Bay). Moderate levels of such compounds were found in various species prior to the restricted use of DDT in 1972. A subsequent precipitous decline in organochlorine residues was attributed to decreased upland usage, major flushing of the river basin in early 1973, and various factors associated with estuarine function. No mirex was found in sediments or aquatic organisms. Apparently, the half-life of organochlorines is relatively short in this bay system. During the study seasonal river flow fluctuations dominated water color, turbidity, salinity, nutrients (NO_3), chlorophyll, and the temporal succession of fish in the bay. Certain long-term trends offish associations were noted; relative dominance of key fish species declined and stabilized while bay-wide species richness and diversity increased with time. Qualitative changes in species representation determined the long-term pattern of community variability. This was consonant with a distinctive fish fauna during the 1st year of sampling. The bay anchovy Anchoa mitchilli was dominant during 9 of the first 12 months of the project; this influenced the time-related changes in community indices. Temporally clustered fish associations reflected the importance of river flow in the estuarine environment. Direct correlation of fish distribution with the rapid disappearance of organochlorine compounds was complicated by a periodic natural phenomena such as storms and river fluctuations.

Lowery, T. 1983. The Jubilee phenomenon. Mississippi-Alabama Sea Grant Consortium. MASGP-83-011:2.

Abstract. The Mobile Bay Jubilee phenomenon has generated a great deal of local interest for years. This interest is in part due to the prospect of gigging hundreds of flounder in a couple of hours, such catches are not uncommon during Jubilees. Unfortunately, the infrequency of the phenomenon makes its occurrence extremely difficult to predict. Jubilees are basically caused by upwellings of oxygen-poor bottom waters which trap bottom-type fish (flounder, stingray, eels) and crustaceans (blue crab, shrimp) at the water's edge. Jubilees occur most often along the Bay's upper eastern shore from Great Point Clear to just above Daphne. They occur occasionally south of Point Clear to Mullet Point and on the western shore at Deer River (now Theodore Industrial Ship Channel) and Dog River.

Lu, J.C.S., B. Eichenberger, M. Knezevic and K. Chen. 1978. Characterization of Confined Disposal Area Influent and Effluent Particulate and Petroleum Fractions (Final rept. Oct 76-Sep 77). University of Southern California Los Angeles. Los Angeles. 187 pp.

Abstract. A detailed analysis of contaminants in influents and effluents from two confined dredged material disposal areas is presented. The sites are located at Pinto Island, Mobile Bay, Alabama, and Grassy Island, Detroit, Michigan. The samples were separated into 0.05-micrometers, 0.45-micrometers, and 8.0-micrometers fractions. The total sample and filtrate were analyzed for metals, nutrients, total carbon, organic carbon, chlorinated hydrocarbons, oil and grease, sulfide, and solids content. The total solids were subjected to a geo-chemical partitioning scheme to determine changes of metal solid phases during confined area disposal. The oil and grease fractions in the samples were analyzed for trace metals. A48-hour settling test was performed to quantify the migration of soil and grease and chlorinated hydrocarbons during resedimentation of dredged material within a confined area. A statistical analysis of the data was performed to determine the significance of variance in terms of pollutant loading between influent and background water; influent and effluent interms of removal efficiency; and effluent and background water in terms of potential water quality impact. Tests for significance at the 95 and 99 percent confidence levels are presented. The results show that, in general, the removal efficiency of total trace metals was very similar to the total solids removal. These results are in agreement with the analytical data which show that approximately 99% of the total trace metals was associated with the solid settleable phase (> 8-micrometers).

Mancini, E.A., R.M. Mink and B.L. Bearden. 1984. Petroleum geology of the Norphlet formation (upper Jurassic), S.W. and offshore Alabama. Oil Gas J. 82(29):147-150.

Abstract. This report briefly outlines the oil and gas activity directed towards the Upper Jurassic Norphlet Formation in S.W. and offshore Alabama. There are five productive Norphlet fields in S.W. Alabama ranging in depth from 14,600 ft to below 20,500 ft. With additional exploration other Norphlet Formation fields should be discovered in the area.

Masini, R.J., J.L. Cary, C.J. Simpson and A.J. McComb. 1995. Effects of light and temperature on the photosynthesis of temperate meadow-forming seagrasses in Western Australia. Aquat. Bot. 49(4):239-254.

Abstract. A technique is described for measuring the metabolic response of seagrasses to different light intensities and water temperatures in the laboratory. The observed depth distribution of the seagrass species can be related to their light requirements and metabolic rates. The photosynthetic efficiency and maximum photosynthetic rates of Amphibolis griffith ii (Black) den Hartog were significantly higher than those of Posidoniasinuosa Cambridge & Kuo and Posidonia australis Hook.f. The optimum temperature range for net photosynthesis of Posidonia sinuosa was 18-23 degree C and photoinhibition occurred at relatively low temperature and high light intensity. Maximum gross photosynthetic rates of P. sinuosa in an attenuated light regime simulating that experienced by plants in the field were higher than in a uniform light field. The respiration rates of the leaves were four to seven times higher than those of the root/rhizome component in the Posidonia species. There was no evidence for physiological adaptation to low light environments, using P. sinuosa from different depths and with different epiphyte loadings.

Mason, W.T., Jr. and J.P. Clugston. 1993. Foods of the Gulf sturgeon in the Suwannee River, Florida. Trans. Am. Fish. Soc. 122(3):378-385.

Abstract. Soft-bodies annelids, arthropods, and occasionally globular molluscs were primary foods of the threatened Gulf sturgeon Acipenser oxyrinchus desotoi collected from the mouth upriver to kilometer 221 of the Suwannee River, Florida, in 1988-1990. In spring, large sub-adults and adults that immigrated from the estuary had fed primarily on lancelets, brachiopods, amphipods and other crustaceans, polychaetes, and gastropods. Small Gulf sturgeons that remained near the mouth of the river during spring fed one pibenthic and hyperbenthic amphipods and grass shrimp and on isopods, oligochaetes, polychaetes, and chironomid and ceratopogonid larvae found in the inter tidal zone. Sub-adults of >5 kg and adults in the freshwater middle river reaches between km 55 and 221 essentially fasted during the summer and fall. Gulf sturgeons in the Suwannee River were indifferent to abundant potential freshwater foods and apparently had stored sufficient nutrient reserves while in the estuary. A presumably young-of-year or year-old Gulf sturgeon captured in summer at the most upriver site (km 221) had fed on aquatic insects and oligochaetes. Most Gulf sturgeons of all sizes had ingested detritus or biofilm.

Mason, W.T., Jr., R.A. Mattson and J.H. Epler. 1994. Benthic invertebrates and allied macrofauna in the Suwannee River and estuary ecosystem, Florida. Fla. Sci. 57(4):141-160.

Abstract. A total of 707 freshwater and estuarine benthic invertebrate taxa and allied macrofauna was collected from the Suwannee River and estuary during five separate surveys between 1979 and 1993. Relative percentages of taxa occupying seven vertical habitat zones were as follows: surface-dwelling, 8%; hyperbenthos, 7%; epibenthos-section I, 14%; epibenthos-section II, 48%; embenthos, 18%; hypobenthos, 1%; and epizoos/parasites, 4%. Arthropoda numbered about 70% of the total taxa, of which, 56% were Insecta of the orders (in descending order of prominence) Diptera, Coleoptera, Hemiptera, Odonata, Ephemeroptera, Trichoptera, and

Plecoptera. The arthropod Crustacea composed 11% of the total taxa, and about one-half of these were Decapoda. Molluscan taxa composed 12% of the total and, of these, the number of Gastropoda taxa was about three times the Bivalvia. Annelid taxa contributed 15% of the total taxonomic richness. The exclusively estuarine taxa, 28% of the total, were split almost evenly among arthropods, molluscs, and annelids; however, in fresh waters, arthropods far exceeded the diversity of the other two phyla. Of the 3% other taxa, one-third were allied macrofauna such as Hemichordata and Chordata. The taxonomic composition is indicative of clean water conditions throughout most of the ecosystem.

Mattraw, H.C., Jr. and J.F. Elder. 1980. Nutrient Yield of the Apalachicola River Flood Plain, Florida: River-Quality Assessment Plan (Water-resources investigations (Interim)). Geological Survey, Water Resources Div. Tallahassee, FL. 28 pp.

Abstract. The Apalachicola River in northwestern Florida is the location of one off our current US Geological Survey National River Quality Assessments. The investigation of the Apalachicola River and flood plain is designed to quantify the organic detritus and nutrient yield to the productive, estuarine Apalachicola Bay. The extensive riverine flood plain is subject to seasonal flooding which transports large quantities of accumulated, decaying leaf litter from the flood plain into the river and ultimately into Apalachicola Bay.

Mattraw, H.C., Jr. and J.F. Elder. 1984. Nutrient and Detritus Transport in the Apalachicola River, Florida. U.S. Geological Survey, Water-Supply Paper. 2196-C:62.

Abstract. The Apalachicola River in northwest Florida flows 172 km southward from Jim Woodruff Dam to Apalachicola Bay on the Gulf of Mexico. The basin is composed of two 3100-km^2 subbasins, the Chipola and the Apalachicola. The Apalachicola subbasin includes a 454-km^2 bottom-land hardwood flood plain that is relatively undeveloped. The flood plain contains >1500 trees/ha which annually produce approx. 800 metric tons of litter fall per square kilometer. Spring floods of March and April 1980 carried 35,000 metric tons of particulate organic carbon derived from litter fall into Apalachicola Bay. The estuarine food web is predominantly detrital based and represents an important commercial source of oyster, shrimp, blue crab, and various species of fish. The water budget of the Apalachicola basin is heavily dominated by streamflow. For a 1-yr period in 1979-1980, 28.6 km^3 of water flowed past the Sumatra gage on the lower river; 80% of this volume flowed into the upper river near Chattahoochee, FL., and 11% was contributed by its major tributary, the Chipola River. Contributions from groundwater and overland runoff were <10%. Streamflow increases downstream were accompanied by equivalent increases in nitrogen and phosphorus transport. The nutrients were released to the river by the flood plain vegetation, but were subject to recycling. The increase in the amount of organic carbon transport downstream was greater than streamflow increases. The flood plain is an important source of organic carbon, especially in detrital form. Several methods for measuring detritus in the river and flood plain were developed and tested. The detritus data from the flood plain added semiquantitative evidence for transport of detritus from the flood plain to the river flow, probably explaining most of the coarse particulate organic material carried by the river.

During the 1-yr period of investigation, June 3, 1979-June 2, 1980, 2.1 x 10^5 metric tons of organic carbon were transported from the river basin to the bay. Nitrogen and phosphorus transport during the same period amounted to 2.2 x 10^4 and 1.7 x 10^3 metric tons, respectively. On an areal basis, it was calculated that the flood plain contributed 70 $g/m^2/yr$ of organic carbon, 0.4 $g/m^2/yr$ of nitrogen, and 0.5 $g/m^2/yr$ of phosphorus. The flood plain acts as a source of detrital carbon, but for the solutes, nutrient release is approximately balanced by nutrient retention.

Mattson, R.A. and M.E. Rowan. 1989. The Suwannee River Estuary: an Overview and Research and Management Needs. pp. 14B-17. *In* AWRA Water: Laws and Management Conf, Tampa, FL. AWRA, Tampa, FL.

Abstract. The drainage basin on the Suwannee River encompasses nearly 25,000 ha, and is the second largest freshwater-discharging river in Florida. The Suwannee River Estuary is one of the most pristine in the state, but has been little studied. The characteristics of the estuary are represented, including physiography, geology, physical processes, water quality, vegetation, habitats, fish and wildlife resources, and research and management needs.

May, E.B. 1973. Extensive oxygen depletion in Mobile Bay, Alabama. Limnol. Oceanogr. 18(3):353-366.

Abstract. Extensive areas of bottom water in Mobile Bay, Alabama, one of the largest estuaries on the Gulf of Mexico, suffer oxygen depletion in summer because of salinity stratification in sinks created by shoals in the lower bay and by spoil from construction of the Mobile Ship channel. When these water masses low in dissolved oxygen are occasionally forced against the beach demersal fishes and crustaceans migrate shoreward in a depressed ormoribund state. In the absence of technical data these popular occurrences called 'jubilees' provide over a century of historical evidence of oxygen depletion. Because of bathymetric changes and modifications which have restricted water circulation, Mobile Bay has exceeded its capacity to assimilate its oxygen demand in summer which has severely affected the biota of the estuary.

McCabe, C. 1985. Operators move to develop Mobile Bay gas fields. Ocean Ind. 20(10):28-33.

Middaugh, D.P., J.G. Mueller, R.L. Thomas, S.E. Lantz, M.H. Hemmer, G.T. Brooks and P.J. Chapman. 1991. Detoxification of pentachlorophenol and creosote contaminated groundwater by physical extraction: Chemical and biological assessment. Archives of Environmental Contamination and Toxicology. 21(2):233-244.

Abstract. Chemical analyses revealed that polycyclic aromatic hydrocarbons (PAHs) and other organic compounds were present in a perennial freshwater stream that flowed through the abandoned American Creosote Works and into Pensacola Bay, Florida. Groundwater pumped from a well depth of 21 m at a location adjacent to the site was heavily contaminated with PAHs and other organics. A study was conducted to determine the efficacy of ultra filtration for removal of organics from groundwater at this US Environmental Protection Agency, Super Fund site. Ultra filtration reduced the concentration of total identified organics from 210.0 mg/L in ground water to 1.5 mg/L in the post-filtration

permeate. Tests for toxicity/teratogenicity in embryonic inland silversides, Menidia beryllina; and Microtox) 15 min EC50's were conducted with: 1) streamwater, 2) untreated groundwater, 3) feedwater used in the ultra filtration system and 4) permeate water that passed through the ultra filtration system.

Millette, J.R., G.F. Craun, J.A. Stober, D.F. Kraemer and H.G. Tousignant. 1983. Epidemiology Study of the Use of Asbestos-Cement Pipe for the Distribution of Drinking Water in Escambia County, Florida. Sponsor: Escambia County Health Dept., Pensacola, FL. Health Effects Research Lab. Cincinnati, OH. 9 pp.

Abstract. Cancer mortality for the population census tracts of Escambia County, Florida, using asbestos-cement (A/C) pipe for public potable water distribution was compared with cancer mortality data collected from census tracts in the same county using other types of piping materials. An analysis of convariance was run to test for differences in Standard Mortality Ratios for 7 cancer sites among 3 potential asbestos exposure groups based on A/C pipe usage. Twelve variables representing non-exposure related influences on disease rates were combined in 4 independent factors and used as covariates in these analyses. No evidence for an association between the use of A/C pipe for carrying drinking water and deaths due to gastrointestinal and related cancers was found.

Moshiri, G.A., D. Brown, P. Conklin, D. Gilbert and M. Hughes. 1974. Determination of a Nitrogen-Phosphorus Budget for Bayou Texar, Pensacola, Florida (Technical completion rept.). Sponsor: Office of Water Research and Technology, Washington, DC. Florida Univ., Water Resources Research Center. Gainesville, FL. 86 pp.

Abstract. The extent of nitrogen and phosphorus inputs and their effects on algal productivity in Bayou Texar, Pensacola, Escambia County, FL, has been under investigation since June, 1971. To date results indicate that there are numerous sources of nutrients into the Bayou, of which Carpenter's Creek and storm water runoff are the major contributors. Other sources are run off from fertilizers applied to lawns, overflow of inadequate sewer lines, and to a much lesser extent, from sources such as rainwater and encroaching Pensacola Bay waters. Ecologically, the Bayou is approaching eutrophicationas is evidenced by highly fluctuating oxygen and primary productivity patterns.

Nelson, D.L., K. Cartwright and R.A. Griffin. 1980. A landfill design for a sensitive environment. pp. 286-301. *In* Presented at Univ of Wisconsin Municipal & Industrial Waste Research & Practice 3rd Conf, Madison, Wisconsin.

Abstract. One of the few sites available to Escambia County, Fla., for use as a sanitary landfill is in a sensitive environmental setting. The site has a good supply of soil resource materials but requires special engineering features to protect nearby water bodies. The proposed land fill design includes drainage of shallow groundwater, use of a liner to filter out contaminants in leachate, and an infiltration limiting cover to reduce the volume of leachate generated. Preliminary studies indicate that sensitive water bodies will not be degraded by operation of this landfill.

Nester, R.D., P.J. Warren and J.B. Herbich. 1987. The effectiveness of a twenty-inch dredge in thin layer disposal. pp. 147-156. *In* Anon., ed. Proceedings of the nineteenth dredging seminar. Texas A&M Univ., College Station, TX.

Abstract. Fowl River is a small coastal stream in the western shore of Mobile Bay in south Mobile County, Alabama. In 1973, the US Army Corps of Engineers constructed an 8- by 100-foot channel for commercial fishing and recreational boating interests. At the time of construction, open water and wetland areas (where diked disposal areas were constructed) were used for dredged material disposal. The Mobile District, in coordination with federal and state regulatory agencies, devised a plan whereby a combination of upland and open water disposal methods would be utilized during maintenance in 1986. The open water methodology involved what is called "thin-layer" disposal and, in this case, the thin lift after disposal was to be no greater than 6 inches. This paper will discuss the actual process of achieving a thin-layer.

Ng, S. and G.C. April. 1976. Water Resources Planning for Rivers Draining into Mobile Bay (Interim Report). Alabama Univ., University Bureau of Engineering Research. Tuscaloosa, AL. 102 pp.

Abstract. A hydrodynamic model describing water movement and tidal elevation is formulated, computed, and used to provide basic data about water quality in natural systems. The hydrodynamic model is based on two-dimensional, unsteady flow equations. The water mass is considered to be reasonably mixed such that integration (averaging) in the depth direction is a valid restriction. Convective acceleration, the Coriolis force, wind and bottom interactions are included as contributing terms in the momentum equations. The solution of the equations is applied to Mobile Bay, and used to investigate the influence that river discharge rate, wind direction and speed, and tidal condition have on water circulation and holdup within the bay. Storm surge conditions, oil spill transport, artificial island construction, dredging, and areas subject to flooding are other topics which could be investigated using the mathematical modeling approach.

Nittrouer, C.A. and L.D. Wright. 1994. Transport of particles across continental shelves. Rev. Geophys. 32(1):85-113.

Pacheco, P.A., D.R.G. Farrow, T. Manuelides and S.O. Rohmann. 1989. Point Source Discharges in Coastal Areas of Alabama: A Summary by Estuarine Watershed for 1987. Final Report. National Ocean Service, Strategic Environmental Assessments Division. Rockville, MD. 38 pp.

Abstract. The report presents an inventory of the 38 major and 153 minor direct-discharge point sources in the National Coastal Pollutant Discharge Inventory (NCPDI) study area in Alabama. It also summarizes estimates of annual wastewater and pollutant discharges from these facilities for 16 pollutants. The estimates reflect discharges for December 1986 through November 1987, and are organized by the five estuarine drainage areas (EDAs) in the study area.

Palacas, J.G., A.H. Love and P.M. Gerrild. 1972. Hydrocarbons in estuarine sediments of Choctawhatchee Bay, Florida, and their implications for genesis of petroleum. AAPG Bulletin. 56(8):1402-1418.

Abstract. Analyses were made on 159 sediment samples from Choctawhatchee Bay, Florida, to determine the distribution and significance of bitumen (benzene-soluble organic substances), particularly the hydrocarbons. Column and gas chromatography was used to characterize the bitumen. Results of this study and related studies show that recent sands contain bituminous substances, including hydrocarbons, in geologically significant amounts. The inference is drawn that, if the bitumen disseminated in large volumes of interconnected sands is converted, even in part, to crude oil and concentrated in pools, the sands themselves may contribute substantial amounts of the petroleum crude oil in sandstone reservoirs.

Parrish, P.R. 1975. Toxicity of Aroclor 1254 and its physiological activity in several estuarine organisms. Archives of Environmental Contamination and Toxicology. 3(1):22-39.

Pulliam, W.M. 1993. Carbon-dioxide and methane exports from a southeastern floodplain swamp. Ecological Monographs. 63(1):29-53.

Abstract. Patterns and rates of generation of CO2 and CH4 by aerobic and anaerobic soil respiration are a significant gap in knowledge of flood plain carbon dynamics. Gaseous and hydrologic exports of CO2 and CH4 from the forested flood plain of the Ogeechee River in Georgia, USA, were studied from July 1987 to September 1989. Net emissions to the atmosphere were measured with short (10-20 min) static chamber incubations. CO2 emissions were highly seasonal, with largest rates during summer, and were strongly correlated with soil temperatures. Annual total CO2 emissions were similar in both years of the study, and averaged 919 g/m^2. The contribution of live root respiration to this total was estimated with in situ incubations of attached roots excavated from the soil. Over 55% of the total CO2 flux appeared to arise from live roots rather than mineralization of soil organic matter. Significant atmospheric CH4 fluxes were found only at flooded sites. CH4 emissions were highly variable, with high rates of release of methane carbon (up to 271 $mg \cdot m^{-2}/d$) occurring irregularly during the warmer months. The temperature effect on CH4 emissions appeared to be a step function. No significant CH4 emissions occurred when soil temperatures were below 15 degrees C; during warmer periods emission rates were generally positive, but showed no additional correlation with temperature. This effect is hypothesized to represent an interaction of the rates of oxygen consumption and replenishment in the soil. Spatial variability in CH4 emissions was also large. Over 90% of the total flood plain CH4 emissions came from the 30% of the flood plain that was most frequently inundated. Annual total fluxes of CH4 carbon from low habitats averaged 17 $g \cdot m^{-2}/yr$. Methane oxidation rates were estimated in floodplain surface waters by in situ bottle incubations. Roughly half of the CH4 that entered the water column was consumed without reaching the atmosphere.

Pulliam, W.M. and J.L. Meyer. 1992. Methane emissions from floodplain swamps of the Ogeechee River - Long-term patterns and effects of climate change. Biogeochemistry. 15(3):151-174.

Abstract. Patterns and rates of wetland methane emissions and their sensitivity to potential climate change are critical components of the global methane cycle. In this study, we use empirical simulation models

to investigate these processes in floodplain swamps of the Ogeechee River in Georgia, USA. We developed statistical models that relate methane emissions to monthly climate and river flow based on field observations of methane emissions from this system made during 1987-1989. Models were then applied to observed climate and hydrograph for 1937-1989 and to simulated altered climates. Altered climates were generated from the present-day climate by changing monthly temperatures by a constant amount and/or changing monthly precipitation by a constant proportion, thus altering long-term averages and preserving year-to-year variation. Under the present-day climate regime, simulated methane emissions were variable between years and responded very strongly to changes in river discharge. The long-term average was 27 g C m^{-2}/yr. with no significant linear trend over the model period. In the altered climate simulations, methane emissions were very sensitive to changes in precipitation amounts, with a 20% decrease in rainfall resulting in 30-43% declines in methane emissions. Predicted effects of temperature changes on methane emissions were less consistent, and were strongly dependent on assumptions made about the response of evapotranspiration to elevated temperatures. In general, hydrologic impacts of changes in evapotranspiration rates (such as may occur in response to temperature shifts) were more important than direct temperature effects on methane production.

Raney, D.C., I. Huang and H. Urgun. 1985. Hydrodynamic and Salinity Model for Apalachicola Bay, Florida. MASGP-84-020; NA81AA-D-00050. Mississippi-Alabama Sea Grant Consortium. Ocean Springs. 190 pp.

Abstract. A hydrodynamic and salinity model has been developed for the Apalachicola Bay System, Florida. The numerical model is based upon a two-dimensional implicit finite difference formulation of the governing equations with a variable size finite difference cell. The model has been calibrated and verified using extensive tidal elevation, velocity, salinity, river inflow and wind prototype data collected in September 1983 and March 1984. The model appears capable of being used as a predictive tool for most normal conditions in the bay despite areas near passes and rivers being stratified at least for certain times in the tidal cycle.

Rogowski, A.S., P.A. Ars, R.M. Khanbilvardi and R.J. Deangelis. 1985. Estimating Erosion on Plot, Field, and Watershed Scales (Soil Erosion and Conservation). Soil Conservation Society of America Report. Unk:149-166.

Abstract. The nature of the erosion problem associated with strip-mining and reclamation in Jefferson County, PA, was examined on plots, fields, and watersheds. A suitable scale to estimate potential and actual erosion was sought. The estimation of erosion on a 1 ha basis will likely lead to the optimum prediction capability, especially on mined and reclaimed lands in Appalachia.

Rostad, C.E. and W.E. Pereira. 1987. Creosote compounds in snails obtained from Pensacola Bay, Florida, near an onshore hazardous-waste site. Chemosphere. 16(10-12):2397-2404.

Abstract. Snails, Thais haemostoma, were collected from 2 areas offshore in Pensacola Bay, Florida, near an onshore hazardous-waste site. Tissue from the snails was extracted to isolate the lipophilic compounds and

analyzed by gas chromatography/mass spectrometry. Along with naturally occurring compounds, the snail tissue contained large concentration of polycyclicaromatic compounds, such as phenanthrene, acridine, dibenzothiophene, dibenzofuran, and benzo(a)pyrene. Many of these compounds were characteristic of creosote contamination associated with the onshore hazardous-waste site.

Sawyer, T.K., T.S. Nerad, P.-M. Daggett and S.M. Bodammer. 1987. Potentially pathogenic protozoa in sediments from oceanic sewage-disposal sites. pp. 183-194. *In* J.M. Capuzzo and D.R. Kester, eds. Oceanic Processes in Marine Pollution. Vol. 1: Biological Processes and Wastes in the Ocean. Robert E. Krieger, Malabar, FL.

Abstract. Free-living amoebae belonging to the genus Acanthamoeba and capable of causing granulomatous amoebic encephalitis in man and animals were isolated from sediments contaminated with sewage sludge. Strains of Acanthamoeba capable of infecting laboratory mice were isolated from the New York Bight dumpsite, Philadelphia--Camden dumpsite, Puerto Rico outfall, the Apalachicola River, Florida, and the Gulf of Mexico seaward from Mobile Bay, Alabama. Seaward from the New York disposal site, amoebae were recovered from sediments that tested negative for fecal bacteria but were contaminated with organic pollutants such as coprostanol and polychlorinated bipenyls. Biochemical analyses of the amoebae enzyme systems (acid phosphatase, leucine aminopeptidase, and propionyl esterase)provided enzyme patterns that showed that certain morphologically similar species differed enzymatically and, therefore, probably represent new species.

Schlautman, M.A. and J.J. Morgan. 1993. Binding of a fluorescent hydrophobic organic probe by dissolved humic substances and organically-coated aluminum-oxide surfaces. Environ. Sci. Tech. 27(12):2523-2532.

Abstract. The binding of perylene by Suwannee River humic substances in the presence and absence of colloidal-sized aluminum oxide particles was examined using a fluorescence quenching technique. Our experiments show that binding is complete within 3 min. and that the fluorescence of perylene associated with dissolved and adsorbed humic substances is fully quenched as evidenced by quantum yields which approached zero for all systems. In the absence of alumina, both humic acid and fulvic acid were able to bind perylene, and the partition coefficients decreased with increasing pH and NaCl concentrations. The presence of Ca^{2+} had little effect on the binding of perylene by either of the dissolved humic substances. The adsorption of humic and fulvic acids onto alumina decreased their ability to bind perylene. For all solution conditions examined, the association of perylene with adsorbed fulvic acid was never detected. In NaCl solutions, partition coefficients for adsorbed humic acid at pH 4 were approximately half the values of those for dissolved humic acid; at pH 7 and 10, alumina-bound humic acid did not bind perylene in NaCl solutions. In contrast to the results observed for dissolved humic acid, the presence of Ca^{2+} greatly enhanced the binding of perylene by adsorbed humic acid. A major effect of solution chemistry is to alter the mechanisms by which humic substances adsorb to alumina, thereby determining how tightly the humic material is bound to the surface. The ability of weakly-adsorbed humic acid to bind perylene approaches that of the dissolved species.

Schropp, S.J., F.D. Calder, G.M. Sloane, K.O. Swanson and J.C. Carlton. 1991. Report on Physical and Chemical Processes Affecting the Management of Perdido Bay: Results of the Perdido Bay Interstate Project. Final Report. Florida Department of Natural Resources. Tallahassee, FL. 333 pp.

Abstract. Resource managers need system-wide water chemistry, circulation and sediment information on estuaries to judge effects of present activities and future coastal development. The study describes physical and chemical processes affecting dissolved and particulate nutrients and suspended solids transport in the Perdido River basin and the fate of these materials in Perdido Bay. The study also includes analysis of sediments for metals and organic compounds. The following questions were addressed by the study: How do tide, wind, and runoff affect water movement in Perdido Bay and to what extent is circulation confined in the upper bay; what pollutants are entering the bay and from where; is Perdido Bay silting up due to man's activities in adjacent watersheds; how can we summarize the present condition of Perdido Bay; what is the rate of supply of nutrients to Perdido Bay and what is man's influence on this rate; how prevalent are hypoxic conditions in Perdido Bay and what are the causes; and does Perdido Bay trap nutrients.

Seitzinger, P. 1985. The importance of denitrification in Ochlockonee Bay, FL. Estuaries. 8(2B):123A.

Abstract. Denitrification rates in Ochlockonee Bay, an estuary with low anthropogenic nutrient inputs, ranged from 0 to 250 mu g-at N m^{-2} h^{-1} during April, June and November. The average denitrification rates in the estuary were 177, 74 and 103 mu g-at N m^{-2} h^{-1} during April, June and November, respectively. Denitrification is removing 50% or more of the nitrogen entering the estuary from riverine source on an annual basis. Rates of denitrification combined with benthic N and P nutrient flux measurements indicate that the N:P ratio of nutrients in the water entering the estuary could be reduced from 7:1 to < 1:1 in approximately 5 days.

Seitzinger, S.P. 1987. Nitrogen biogeochemistry in an unpolluted estuary: The importance of benthic denitrification. Mar. Ecol. 41(2):177-186.

Abstract. Denitrification rates (N_2 production), and benthic ammonium, nitrate and oxygen fluxes were measured along a salinity gradient in Ochlockonee Bay (Florida, USA) over an annual cycle. Denitrification rates ranged from 0 to 210 mu g-at N m^{-2} h^{-1}. Lowest rates of denitrification were measured in late winter and highest rates in late spring. Denitrification is a major removal mechanism for nitrogen in Ochlockonee Bay, and removes, on an annual basis, an amount of nitrogen equivalent to 54% of the river input of dissolved inorganic nitrogen. N_2O fluxes were small compared to N_2 fluxes; N_2O/N_2ratios in March were less than 0.01.

Serkiz, S.M. and E.M. Perdue. 1994. Isolation of dissolved organic matter from the Suwannee River using reverse osmosis. Water Research. 24(7):911-916.

Abstract. A portable reverse osmosis (RO) system was constructed and used to concentrate dissolved organic matter (DOM) from the Suwannee River in southeastern Georgia. Using this RO system, 150-180 l/h of river water could be processed with 90% recovery of DOM. After further action exchange and lyophilization of the concentrated river water samples,

large quantities of low-ash freeze-dried products were isolated. The authors highly recommend this RO method for concentration of DOM in fresh waters because (1) a very high percentage of DOM is recovered, which indicates minimal fractionation of the original sample, and (2) the process is quite rapid, which permits large quantities of DOM to be concentrated in a reasonable length of time.

Shaffer, R.N. 1993. Bibliography of Research on St. Andrew Bay, Its Tributaries, and the Nearby Coastal Waters of Bay County, Florida. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Memo. NOAA-TM-NMFS-SEFSC-320:67.

Abstract. The indexed bibliography is one of a three-part project, the goal of which is to collect and to make available the research that has been performed on St. Andrew Bay. Many of the publications are considered 'gray literature'--they have not appeared in professional, refereed journals. As a result, much of the literature is difficult to access by means of the traditional scientific indexes. It is hoped that the compendium will serve as a guide to what has been accomplished so far in understanding the biota and ecology of St. Andrew Bay, its tributaries, and the nearby coastal waters.

Shell, E.W. 1973. Factors Limiting the Survival and Growth of Early Life History Stages of the Striped Bass, `Morone Saxatilis'. (Project, AFG-4.) Auburn University, Department of Fisheries and Allied Aquacultures. Auburn, AL. 43 pp.

Abstract. Research was conducted on factors limiting the survival and growth of early life history stages of the striped bass. Specific areas of research were: survival and growth of striped bass fry in ponds, of fry in hatching jars and of fingerlings in ponds. Delayed stocking of fry and increasing the salinity of the water to approximately 150 ppm did not result in increased survival. Viability of fry from different females was a major factor affecting survival. Increasing the salinity to one or two ppt in are circulating water system resulted in increased survival of fry in hatching jars. Fry fed a combination of brine shrimp and dry feed could be changed to dry feed alone without difficulty. Survival and growth of fingerlings from two river systems was different when grown in ponds. Production of fingerlings was dependent to large extent on whether or not they learned to accept pelleted feed. In the three years, 14,856 marked fish were stocked in the lower Alabama River and Mobile Bay. Fourteen marked fish were recovered and reported during that period.

Sheridan, P.F. 1979. Trophic resource utilization by three species of sciaenid fishes in the northwest Florida estuary. Northeast Gulf Sci. 3(1):1-14.

Abstract. Food habits of Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), and sand seatrout (Cynoscion aranarius) were examined in 1976 collections from Apalachicola Bay, Florida. Ontogenetic, spatial, and temporal aspects of diet were considered. Polychaetes were the main food of croakers over all collections, followed in importance by detritus, fishes, insect larvae, mysids, and infaunal shrimp. Diet specialization occurred with growth of croakers, so that one or two food types dominated the diet. Polychaetes and harpacticoid copepods dominated the average spot diet, followed by detritus, bivalves and nematodes. Several distinctive patterns in

feeding were noted on ontogenetic and spatial bases, but not on a temporal basis. Intraspecific diet correlation indicated similar feeding patterns in all but the smallest (20-29 mm) and largest (100-109 mm) size classes examined.

Shoemyen, J.L. and J.R. Cameron. 1984. Local governments implement management plan for the Suwannee River. pp. 123-125. *In* Anon., ed. Regional and State Water Resources Planning and Management, Proceedings of a Symposium. American Water Resources Assoc, Bethesda, MD.

Abstract. The Suwannee River Basin in Florida is experiencing rapid development pressure, threatening a river of national significance. The Governor of the State appointed a Resource Planing and Management Committee in the Fall of 1980 to address the issues. Using Regional and State agency staff, a study was made of the problem and a management plan adopted by the committee. Key issues identified were: land use control in the floodplain, preservation of recreation and navigation, protection of water quantity, water quality, and the adoption of a non-structural approach to achieve management goals. Local governments were urged to pass a model floodplain development ordinance, developed by the committee. Ordinance implementation is achieved by using technical expertise provided by State and Regional agencies. Implementation and monitoring of the management plan is under the direction of a committee of elected officials representing all the local governments.

Souza Sierra, M.M.de, O.F.X. Donard and H. Chamley. 1991. Simulation of fluorescence variability in estuaries and DOM. pp. 275-284. *In* H. Chamley, ed. Proceedings of the International Symposium on Environment of EPI Continental Seas, Lille, 20-22 March 1990. Vol. V30N1. Gauthiers-Villars, Montrouge, FRANCE.

Abstract. Recent studies have revealed differences between the fluorescence spectra of coastal and open seawater. We investigate here the extent to which abiotic parameters such as pH, ionic strength and concentration of dissolved fluorescent matter could be related to this phenomenon. First, pH effect was addressed alone. Second, a 2^3 factorial experimental design was used to estimate the individual and/or combined contribution of the parameters mentioned above to the spectroscopic characteristics of dissolved organic matter represented here by the Suwannee River Fulvic Acid. High pH variations modify the spectroscopic characteristics of organic matter both qualitatively and quantitatively and those effects seem to be related to the dissociation of the major functional groups (e.g. carboxylic and phenolic). General results show that each of the above mentioned parameters affects dissolved fluorescent matter sufficiently to generate slight modifications in its spectral response.

Stone, D.A. and F.L. Wiseman. 1988. Proceedings of the Conference on the Environmental Chemistry of Hydrazine Fuels (3rd) Held in Panama City Beach, Florida on 15-17 September 1987. Sponsor: Air Force Engineering and Services Center, Tyndall AFB, FL. Engineering and Services Lab. Hazardous Materials Technical Center. Rockville, MD. 321 pp.

Abstract. The third conference on the environmental chemistry of hydrazine fuels consisted of the following five general sessions: gas-phase kinetics and models; soil, surface, and matrix isolation studies; hydrazine disposal studies; detection and monitoring; and toxicology. Researchers in these areas of hydrazine fuels chemistry gave short

lectures and afterwards entertained questions. The plenary lecture, entitled '100 Years of Hydrazine Chemistry', was given by Dr Eckart W. Schmidt. The first session dealt with gas-phase kinetics and models and included results from studies of the atmospheric reactions of hydrazine fuels with atmospheric pollutants, decay studies in Teflon chambers, and the interaction of hydrazine fuels with metals and metal oxides. Results show that hydrazine in the vapor state does not react with oxygen at atmospheric conditions, but does not react with commonly occurring pollutants, such as ozone, nitrogen oxides, and sulfur oxides. Hydrazine can be oxidized by certain metals and metal oxides, including aluminum and cupric oxide.

Stone, G.W. 1994. Sedimentation rates and heavy metal distribution in estuarine sediments: Northwest Florida coast, USA. pp. 1242-1259. *In* P.G. Wells and P.J. Ricketts, eds. Coastal zone Canada '94 Cooperation in the Coastal Zone. Conference proceedings. Vol. 3. Coastal zone Canada Assoc., Dartmough, NS, CANADA.

Abstract. There is a large body of international literature indicating a significant increase in the accumulation of heavy metals in estuarine sediments. Because of their persistence in estuarine environments, potential toxicity at high concentrations, and their bio-availability, heavy metals pose a significant problem for coastal managers. The magnitude of this problem has been investigated in two bayous interconnect with Pensacola Bay, located along the Northwest Florida coast. Thirty continuous sedimentary cores, up to 18 ft. in length, were extracted from Bayous Chico and Texar, analyzed lithologically and sampled for grain-size and heavy metal analyses. Over 100 bottom grab samples were extracted from the benthic layer for grain-size and metal determinations also. Sediments" enriched" with heavy metals were delineated in the subsurface where the thickness of contaminated sedimentary layers ranged between 3 and 6 ft. Cadmium, copper, lead and zinc levels in sediments are high when compared with concentrations for respective metals obtained from the National Standards and Trends program, conducted by the US National Oceanic and Atmospheric Administration. Although there is some correlation between point sources and high concentrations of certain metals in these sediments, the primary control on the spatial distribution of these toxins appears to be the presence, or absence of fine-grained material (i.e., fine silts and clays).

Strahle, W.J., M.A. Martini and R.E. Davis. 1994. Instrument packages to study long term sediment transport processes in a shallow bay. pp. 8-12. *In* Anon., ed. Challenges and Opportunities in the Marine Environment. Conference Proceedings. Atlantic Mar. Geol. Branch, USGS, Woods Hole, MA.

Abstract. Pressure and near-surface and near-bottom measurements of current, temperature, salinity and light transmission were required in Mobile Bay, a 3 m deep estuary on the Gulf of Mexico. This environment presented several obstacles to obtaining long term observations. Boat traffic, soft estuary bottom, heavy bio-fouling, rapid sample rates and large data storage were overcome by using instrumentation techniques that are applicable to other estuary systems. Nearly two years of continuous data was collected.

Stumpf, R.P., G. Gelfenbaum and J.R. Pennock. 1993. Wind and tidal forcing of a buoyant plume, Mobile Bay, Alabama. Cont. Shelf Res. 13(11):1281-1301.

Abstract. AVHRR satellite imagery and in situ observations were combined to study the motion of a buoyant plume at the mouth of Mobile Bay, Alabama. The plume extended up to 30 km from shore, with a thickness of about 1 m. The inner plume, which was 3-8 m thick, moved between the Bay and inner shelf in response to tidal forcing. The tidal prism could be identified through the movement of plume waters between satellite images. The plume responded rapidly to alongshore wind, with sections of the plume moving at speeds of more than 70 cm/s, about 11% of the wind speed. The plume moved predominantly in the direction of the wind with a weak Ekman drift. The enhanced speed of the plume relative to normal surface drift is probably due to the strong stratification in the plume, which limits the transfer of momentum into the underlying ambient waters.

Thorn, K.A. and M.A. Mikita. 1992. Ammonia fixation by humic substances - A N-15 and C-13 study. Science of the Total Environment. 113(1-2):67-87.

Abstract. The process of ammonia fixation has been studied in three well characterized and structurally diverse fulvic and humic acid samples. The Suwannee River fulvic acid, and the IHSS peat and leonardite humic acids, were reacted with N-15-labeled ammonium hydroxide, and analyzed by liquid phase N-15 NMR spectrometry. Elemental analyses and liquid phase C-13 NMR spectra also were recorded on the samples before and after reaction with ammonium hydroxide. The largest increase in percent nitrogen occurred with the Suwannee River fulvic acid, which had a nitrogen content of 0.88% before fixation and 3.17% after fixation. The N-15 NMR spectra revealed that ammonia reacted similarly with all three samples, indicating that the functional groups which react with ammonia exist in structural configurations common to all three samples. The majority of nitrogen incorporated into the samples appears to be in the form of indole and pyrrole nitrogen, followed by pyridine, pyrazine, amide and aminohydroquinone nitrogen. Chemical changes in the individual samples upon fixation could not be discerned from the C-13 NMR spectra.

True, W.R. 1994. New Mobile Bay complex exploits major sour gas reserve. Oil Gas J. 92(21):49-53.

Abstract. In March, 1994, Exxon Co. USA dedicated its natural-gas treating plant near Mobile, Ala. From start-up, the plant was handling its capacity of sour gas from leases in state and federal waters offshore in Mobile Bay. The company claims this is the world's largest sour-gas development, with reserves estimated at more than 1 tcf. Exxon further believes the wide swings in gas composition have led to a unique air-emissions permit from the state of Alabama. The complex, third in the area for handling the high-sulfur gas being produced in the bay, began taking the full 300 MMcfd of gas in October 1993 when the overall project started up.

Turner, R.E., W.J. Wiseman Jr. and W.W. Schroeder. 1985. Oxygen depletion zones in the North Central Gulf of Mexico: Physical, chemical and biological relationships. Estuaries. 8(2B):45A.

Abstract. Along the north central Gulf of Mexico oxygen depletion zones are commonly found in many of the coastal embayments (e.g. in the depressions and dredged channels of Mobile Bay, Alabama), offshore of

the barrier islands and over the continental shelves. Bottom waters are most often the site for this phenomenon but it is also observed in the water column. The effects of water column stratification are modified by surface and midwater sinking of metabolically active particles to the bottom layers. The hydrologic forcing is strongest just seaward of the estuaries of where channels encourage movement of high salinity water inshore. Biological factors are most influential in near shore regions.

Turner, R.E., W.W. Schroeder and W.J. Wiseman Jr. 1987. The role of stratification in the deoxygenation of Mobile Bay (Alabama) and adjacent shelf bottom waters. Estuaries. 10(1):13-19.

Abstract. Oxygen depletion in the shallow bottom waters of Mobile Bay, Alabama, and in adjacent near shore and continental shelf waters, is shown to be directly related to the intensity of water stratification. Low winds speeds are coincidental with the onset of water column stratification and the occurrence of hypoxic events. Hourly, daily, and seasonal changes in the relationship between percent oxygen saturation or oxygen concentration in the bottom waters and surface-bottom density differences indicate that the oxidized materials are recently formed, and not relic or over wintering carbon sources. The influence of density structure (water column stratification) in other oxygen-depleted coastal water masses is compared to Mobile Bay.

Valentine, R.L. and R.G. Zepp. 1993. Formation of carbon monoxide from the photo degradation of terrestrial dissolved organic carbon in natural waters. Environ. Sci. Tech. 27(2):409-412.

Abstract. In this study we investigated the photochemical formation of CO in water samples obtained from wetlands, lakes, and near-coastal/shelf areas and in aqueous solutions of soil organic matter. All of these samples contain dissolved organic matter (DOM) that is largely derived from terrestrial sources. Our studies show that, although the water samples had widely varying optical properties and CO photo production rates, the efficiencies for photochemical CO formation were remarkably similar in all waters examined. Model calculations further indicate that photo degradation of terrestrial DOM (e.g., in wetland and near-coastal environments) may be an important global source of carbon monoxide and a key process in the cycling of DOM in these environments. Natural water samples were obtained that were representative of wetlands and high-DOC lakes from the boreal forest/taiga regions of North America (Kinoshe Lake, Ontario, Canada; Houghton Marsh, Michigan, USA) and a southern wetland ecosystem (Okefenokee Swamp and Suwannee River, Georgia). Two coastal water samples also were studied, one from the Intra-coastal Waterway off the Atlantic coast of Florida, and the other obtained near Live Oak Island off the Gulf Coast of Florida.

Varani, A. 1987. A new application for a tired technology. Water Eng. & Mgmt. 134(2):27-29.

Abstract. Colorado's ground water is plagued with the highest concentration of dissolved uranium in the country. In 1983, the Marshdale Elementary School in the Jefferson County district discovered a uranium contamination level of 120 pci/l in a newly-drilled drinking water well. The school district funded a bench-scale ion-exchange pilot study, which proved successful. On June 1, 1986, the school finished construction of a full-scale ion-exchange facility at a cost of $11,600. Removal of U_{234},

U_{235} and U_{238} is in excess of 97%. Radioactive brine produced during regeneration of the ion-exchange columns is trucked to an existing school wastewater plant.

Versteeg, D.J. and S.J. Shorter. 1992. Effect of organic-carbon on the uptake and toxicity of quaternary ammonium-compounds to the fat head minnow, Pimephales-promelas. Environmental Toxicology and Chemistry. 11(4):571-580.

Abstract. The effect of dissolved organic carbon on the uptake and toxicity of quaternary ammonium compounds was investigated with the fat head minnow, Pimephales promelas. Aldrich humic acid (HA) reduced the toxicity of dioctadecyl dimethyl ammonium chloride (DODMAC) and mono-tallow trimethyl ammonium chloride (C16,18TMAC) but had no effect on the toxicity of tetradecyl trimethyl ammonium chloride (C14TMAC), dodecyl trimethyl ammonium chloride (C12TMAC), or octyl trimethyl ammonium chloride (C8TMAC). Aldrich HA also reduced the uptake rate constant of DODMAC and C16, 18TMAC. For DODMAC, the reduction in toxicity observed by Aldrich HA was similar to those observed with Suwannee River and Nordic Aquatic HAs and organic carbon from two river waters. For C16, 18TMAC, Suwannee River and Nordic Aquatic HAs and river water organic carbon caused a significant amelioration of toxicity. This amelioration of toxicity was quantitatively less than predicted, based on Aldrich HA.

Vetter, R.D. 1985. Elemental sulfur in the gills of three species of clams containing chemoautotrophic symbiotic bacteria: A possible inorganic energy storage compound. Mar. Biol. 88(1):33-42.

Abstract. Sulfur content and fine structure were studied for tissues of three species of clams, Lucinoma annulata, Calyptogena elongata and Lucina Floridana, which inhabit sulfide-rich environments and whose gills harbor symbiotic sulfur bacteria. When examined by freeze-etch microscopy, sulfur globules were found only within bacteria and not in the animal host cytoplasm. Sulfur globules were confined to the periplasmic space of the bacteria. C. elongata and Lucina Floridana resembled Lucinoma annulata in the physical form and distribution of elemental sulfur. The absence of elemental sulfur in the animal cytoplasm suggests that its formation from sulfide is not a detoxification scheme to protect animal tissue from sulfide toxicity. The sulfur deposits probably represent inorganic energy reserves that permit the symbiotic bacteria to function even during the temporary absence of external sulfide.

Wilson, A.J. and J. Forester. 1978. Persistence of Aroclor (Trade Name) 1254 in a contaminated estuary. Bull. Environ. Contam. Toxicol. 19(5):637-640.

Abstract. The brief report summarizes the concentrations of PCB's in oyster tissue (*Crassotrea virginica*) observed from April 1969 to June 1976 at three locations in the Escambia Bay estuary, following elimination of an accidental leak of Aroclor 1254 from an industrial site. Data showed that PCB's in oyster tissues decreased after the leak was eliminated, but a steady-state concentration was reached. No Aroclor 1254 was detectable in water at stations sampled, but was detectable in sediments. The study demonstrates the persistence of PCB's long after point-source discharges are eliminated.

Wilson, A.J., Jr. 1971. Polychlorinated biphenyl absorbed from sediments by fiddler crabs and pink shrimp. Nature. 231(5297):50-52.

Wilson, R.E. 1979. A model for the estimation of the concentrations and spatial extent of suspended sediment plumes. Estuarine and Coastal Marine Science. 9(1):65-78.

Abstract. A simple mathematical model is presented for the spatial structure of suspended sediment plumes produced by over-board pipeline disposal of dredge spoil in shallow waters. The model is based on a solution to the advection-diffusion equation for a continuous vertical line source. It provides information on the variation of both centerline concentration and the second moment of the lateral distribution with distance from the source. The structure of the plume is described by 2 parameters-one proportional to the settling velocity of the suspended material and the other equal to the ratio of a diffusion velocity to the advective velocity of the ambient flow. The model has been applied to represent the structure of observed suspended sediment plumes at 3 separate shallow waterbays - Atchafalaya Bay, Louisiana; Apalachicola Bay, Florida; and Corpus Christi Bay, Texas.

Winchester, B.H. 1985. Correlations of benthic macroinvertebrate diversity and salinity in northwestern Florida estuaries. Estuaries. 8(2B):87A.

Abstract. Data collected over a 10-year period as part of a statewide monitoring program are examined to quantify the relationship between salinity and benthic macroinvertebrate diversity. Nine Florida estuaries in the northeastern Gulf of Mexico were studied in an area bounded by Apalachee Bay on the east and Perdido Bay on the west. Regression analysis showed a correlation of 0.96 between average salinity and average macrobenthic diversity. The implications of using diversity indices as indicators of environmental health or as standards for regulating water quality are discussed.

Winchester, J.W. and Ji-M. Fu. 1992. Atmospheric deposition of nitrate and its transport to the Apalachicola Bay Estuary in Florida. Water, Air & Soil Pollution. 65(1-2):23-42.

Abstract. A comparison of fluxes of ten dissolved constituents of rain water and river water has been carried out for the watershed of the Apalachicola River in order to estimate the magnitude of nitrate contribution from the atmosphere to surface water that may flow to the Apalachicola Bay estuary. The comparison is based on statistical analysis of both atmospheric and river water monitoring data: weekly rain water chemical data from the National Acid Deposition Program (NADP) for five sites within the watershed area, from 1978-84 until late 1989, and less frequent river water chemical data from the U.S. Geological Survey for one site at Chattahoochee, Florida, from 1965 until late 1989. The means and standard errors of the fluxes from the atmosphere and in the river flow were determined.

Windom, H.L., S.J. Schropp, F.D. Calder, J.D. Ryan, R.G. Smith, L.C. Burney, F.G. Lewis and C.H. Rawlinson. 1989. Natural trace metal concentrations in estuarine and coastal marine sediments of the southeastern United States. Environ. Sci. Tech. 23(3):314-320.

Abstract. Over 450 sediment samples from estuarine and coastal marine areas of the southeastern United States remote from contaminant sources were

analyzed for trace metals. As, Co, Cr, Cu, Fe, Pb, Mn, Ni and Zn concentrations covery significantly with Al (aluminum), suggesting that natural aluminosilicate minerals are the dominant natural metal bearing phases. Cd and Hg do not covery with aluminum apparently due to the importance of the contribution of natural organic phases to their concentration in sediments. The covariance of metals with aluminum may provide a useful basis for identification and comparison of anthropogenic inputs to southeastern U.S. coastal/estuarine sediments. By use of this approach sediments from the Savannah River, Biscayne Bay, and Pensacola Bay are compared.

Winger, P.V., C. Sieckman, T.W. May and W.W. Johnson. 1984. Residues of organo-chlorine insecticides, polychlorinated biphenyls, and heavy metals in biota from Apalachicola River, Florida, 1978. J. Assoc. Off. Anal. Chem. 67(2):325-333.

Abstract. Residues of organo chlorine insecticides and PCB were determined in whole-body composites from seven river species (including fish, water snakes and herons) by the g.l.c. method of Schmitt et al. (Pestic. Monit. J., 1981, 14, 136). Metals, viz, Cd, Pb, As, Hg and Se, were determined by a.a.s. as described by May and McKinney (Ibid., 1981, 15, 14).

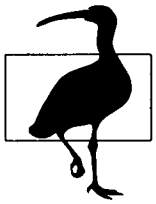
Wolfe, S.H. 1990. Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. U.S. Department of the Interior, Minerals Management Service. Biological Report 90(21):323.

Abstract. This report is one in a series that provides an ecological description of Florida's gulf coasts. The watersheds described herein, with their myriad communities, produce many benefits. The maintenance of this productivity through enlightened resource management is a major goal of this series. This report will be useful to the many people who have to make decisions regarding the use of the natural resources of the area. This region includes the drainage basins and nearshore waters of the west coast of Florida between, but not including, the Anclote River basin and the Suwannee River basin. This document is a summary of the available information on the Springs Coast area of Florida, for use by planners, developers, regulatory authorities, and other interested parties.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The National Biological Service Mission



As a bureau of the Department of the Interior (DOI), the National Biological Service's (NBS) primary mission is to provide the scientific understanding and technologies needed to support sound management and conservation of our Nation's biological resources. Independence from regulatory and management decision making greatly lessens the chance that scientific results will be viewed as less than objective science or subservient to the needs of policy makers. NBS provides credible, objective, and unbiased information needed by resources managers in the Department of the Interior in a form that allows them to assess, predict, and manage the biological consequences of various policies and management practices. Although the primary focus of the biological research is to meet DOI needs, the activities undertaken with natural resource research funding will also serve the science needs of a wide range of partners, including State governments, other Federal agencies, and private landowners.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.