Choctawhatchee River and Bay System
Surface Water Improvement and Management Plan

2002 Update

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Developed by the Northwest Florida Water Management District under the auspices of the Surface Water Improvement and Management (SWIM) Program and in cooperation with the Florida Department of Environmental Protection.

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Table of Contents

Acknowledgements iv
Table of Contents v
List of Figures v
List of Tables v
Introduction 1
Watershed Description 1
Implementation of the 1996 Choctawhatchee River and Bay SWIM Plan 2
Revised SWIM Project Plan 7
Related Resource Management Activities Since 1996 9
Watershed Conditions 22
Funding 33
References 35

List of Figures

Figure 1. Choctawhatchee River and Bay Watershed 3
Figure 2. 303(d) Listed Segments in the Choctawhatchee River Watershed 13
Figure 3. 303 (d) Listed Segments in the Choctawhatchee Bay Watershed 15
Figure 4. Regular Monitoring Sites Across the Choctawhatchee Watershed 19
Figure 5. General Land Use and Land Cover: Choctawhatchee River and Bay Watershed 23
Figure 6. Selected Spring Discharges Along Holmes Creek 31

List of Tables

Table 1. Choctawhatchee SWIM Projects and Interrelationships 2
Table 2. Project Schedule and Cost Estimates 8
Table 3. 303 (d) Listed Segments of the Choctawhatchee Watershed 17
Table 4. Generalized Land Use and Land Cover, Choctawhatchee River and Bay Watershed 25
Table 5. Population Growth by County 25
Table 6. Choctawhatchee Bay Nonpoint Source Inventory 27
Table 7. Surface Water Discharges in the Choctawhatchee River and Bay Watershed 28
Table 8. Choctawhatchee Bay Red Tide and Animal Mortality Events: 1999-2000 29

Introduction

The Choctawhatchee River and Bay Surface Water Improvement and Management (SWIM) Plan was developed in 1996 to provide a framework for the Northwest Florida Water Management District to work with local governments, state and federal agencies, and private initiatives to address major issues affecting the watershed. The plan was developed in cooperation with the Florida Department of Environmental Protection (DEP) and other participating agencies, local governments, and residents. It was reviewed pursuant to sections 373.455 and 373.456, Florida Statutes (F.S.), and approved in a public hearing on December 5, 1996. The plan provided a watershed description and resource summary, as well as a project plan and four-year funding schedule. Since the timeline described in the initial plan has passed, this update is required to document progress and identify future activities and funding requirements.

While the issues affecting the watershed are broad and potential projects are diverse, funding has been limited. Thus, implementation of the SWIM plan has focused on priority projects, particularly those for which other agencies and local governments have been able to contribute resources to achieve mutual objectives. Since the plan's approval, progress has been made on a number of projects, including restoration, public awareness, and land use and land cover assessment. Additional noteworthy activities have been initiated by the DEP, local governments, the Choctawhatchee Basin Alliance (CBA), and others. Also since the plan's approval, physical changes have affected the watershed, and new research has been conducted on the Choctawhatchee River and Bay system.

Despite changes that have occurred in the watershed since 1996, the primary management challenges remain essentially the same as they were when the plan was first approved. These include the need for improved treatment of stormwater runoff, prevention of nonpoint source (NPS) pollution, continued improvement in the management and treatment of domestic and industrial wastewater, and habitat protection and restoration. This plan update therefore supports a continued cooperative effort to protect and restore the natural resources of the watershed and the benefits they provide for the surrounding community. The update summarizes project activities, describes related programs, provides an estimate of SWIM funding needs over the next five years, and describes conditions and changes in the watershed.

Watershed Description

The watershed of the Choctawhatchee River and Bay system covers approximately 3,422,154 acres. About 42 percent of this is within Florida, and the remainder is in Alabama. Major tributaries of the river include the Pea and Little Choctawhatchee rivers in Alabama, as well as Holmes, Wrights, Bruce, and Pine Log creeks in Florida. Direct tributaries of the bay include Alaqua, Rocky, Black, and Turkey creeks. The watershed also includes a portion of the Sand Hill Lakes in Washington County, including a recharge area for Floridan Aquifer springs discharging into Holmes Creek. The bay has one direct opening to the Gulf of Mexico at East Pass, adjacent to the city of Destin, and joins with Santa Rosa Sound to the west and the Intracoastal Waterway to the east. The watershed and its resources are described further in the 1996 Choctawhatchee River and Bay Surface Water Improvement and Management (SWIM) plan.

The Choctawhatchee River and Bay watershed supports a wide array of aquatic and wetland resources and provides numerous benefits for the human community. Among the environmental resources are diverse aquatic and wetland habitats, vast forests, Floridan Aquifer springs, steephead streams, and many species of flora and fauna. Human benefits provided include commercial and recreational fisheries, marine transportation, military uses, outdoor recreation, tourism, aesthetic qualities, and economic benefits associated with all of these.

While the Choctawhatchee River and Bay watershed continues to support outstanding resources, it has also experienced many of the impacts that are common to Florida estuaries. These include

urban stormwater runoff and other nonpoint sources of pollution, widespread sedimentation, domestic and industrial wastewater discharges, and habitat loss and degradation. Cumulatively, these impacts have degraded the productivity of the river and bay system and diminished the benefits it provides. Effective watershed management and planning can help to preserve and restore the natural resources and human benefits provided by the Choctawhatchee River and Bay system and limit the need for more expensive and difficult solutions in the future.

Implementation of the 1996 Choctawhatchee River and Bay SWIM Plan

Project Implementation

The 1996 Choctawhatchee River and Bay SWIM plan identified four major issue areas affecting the watershed: water and sediment quality, biological resources, public awareness, and basinwide coordination. To address these issues, the plan described 18 projects incorporating a variety of assessment, public awareness, planning, and implementation activities. These projects and their interrelationships are listed in Table 1, adapted from Table A.3 of the 1996 plan.

Table 1. Choctawhatchee SWIM Projects and Interrelationships

#	Project	Water/Sed. Quality	Biological Resources	Public Awareness	Coordination
	Water and Sediment Quality				
Q1	Ecological Assessment	**x**	**x**	**i**	**i**
Q2	Shoreline Buffer Zones	**x**	**x**	**x**	
Q3	Land Use/Land Cover Assess.	**x**	**x**	**i**	**x**
Q4	NPS Pollution	**x**	**i**	**i**	**x**
Q5	Point Source Assessment	**x**	**i**		**x**
Q6	PLRGs	**x**	**i**		**x**
Q7	Urban Stormwater	**x**	**i**	**i**	**x**
Q8	Urban BMP Demonstration	**x**	**i**	**i**	**i**
Q9	Long-Term Monitoring Plan	**x**	**i**		**i**
	Biological Resources				
B1	Land Acquisition Assessment	**i**	**i**	**i**	**x**
B2	Ecological Restoration	**x**	**x**	**x**	**i**
B3	Seagrass Assessment	**i**	**x**	**i**	**i**
B4	Tidal Marsh Assessment	**i**	**x**	**i**	**i**
B5	Rec. Impacts Assessment	**i**	**i**	**x**	**x**
B6	Erosion Assessment	**i**	**i**	**i**	**x**
	Public Awareness				
P1	Public Awareness	**i**	**i**	**x**	**x**
	Coordination				
C1	Admin. and Planning	**i**	**i**	**i**	**x**
C2	Interstate Coordination	**i**	**i**	**i**	**x**

x=direct benefit; **i**=indirect benefit

Progress has been made on a number of projects since approval of the SWIM plan in December 1996. The major emphasis has been on the Ecological Restoration project, which is providing match for U.S. Environmental Protection Agency (EPA) funding of a series of demonstration projects on Choctawhatchee Bay. Other activities have included development and distribution of an educational video, evaluation of nonpoint source pollution loading across the watershed, planning a watershed symposium, and coordinating a watershed technical advisory committee. Activities carried out under the SWIM program have also helped support development of the District's Regional Mitigation Plan, implemented under the Florida Department of Transportation (FDOT) mitigation program.

Figure 1. Choctawhatchee River and Bay Watershed

As indicated by Table 1, most projects are interrelated, as are the underlying water resource issues. Thus, actions completed for a given project often help to achieve objectives of other projects as well. For example, the Ecological Restoration project has helped to accomplish tasks of the Shoreline Buffer Zone, Nonpoint Source (NPS) Pollution, Urban Best Management Practice (BMP) Demonstration, and other projects. Also, activities conducted as part of Planning and Administration have included land assessment activities that helped facilitate acquisition of property on Live Oak Point through the FDOT mitigation program. Thus, while SWIM project work has largely been focused on a few discrete projects, progress has been made toward accomplishing tasks of many of the listed projects. Project implementation is further described in the following project descriptions.

Q2 Shoreline Buffer Zones. District staff, working in cooperation with Florida Sea Grant, the Florida Department of Environmental Protection, and others, completed and distributed a document entitled *Waterfront Protection and Restoration: A Northwest Florida Homeowner's Guide*. Additionally, the SWIM program was used to match a U.S. Environmental Protection Agency Grant that funded the planting of wetland and transitional vegetation along waterfront areas in Valparaiso, Destin, and Okaloosa County. These and related activities are described in more detail under project B2, Ecological Restoration.

Q3 Land Use/Land Cover Assessment. Land use and land cover data have been obtained for the Choctawhatchee River and Bay watershed. Watershed land use has also been broken down by basin, and progress has been made toward developing a land use-based evaluation of nonpoint source pollution loading.

Q4 Basinwide NPS Pollution Abatement Planning and Implementation. Watershed land use has been broken down by basin, and alternative approaches to estimating sub-basin level NPS pollution loading have been evaluated. District staff surveyed conditions across the watershed and identified potential NPS pollution abatement project priorities in agricultural and urban sub-basins.

The distribution of unpaved road crossings was evaluated in the Wrights Creek basin, which is considered representative of much of the central and northern Choctawhatchee River watershed. Streams were characterized, road crossings were mapped, and selected site assessments were conducted. A total of 185 road crossings were identified, at an average of about 1.05 road crossings per mile of stream reach (including tributaries). Most of the stream crossings are unpaved. Within the Little Creek Sub-basin, for example, 22 of the 28 stream crossings were found to be unpaved.

Q7 Urban Stormwater Assessment and Technical Assistance. Preliminary activities have been conducted to evaluate stormwater treatment system needs for the Hogtown Bayou and Cinco Bayou basins. District staff also designed stormwater treatment systems for the city of Valparaiso, as described under project B2, Ecological Restoration.

Q8 Urban BMP Demonstration. District staff designed four NPS pollution treatment systems for the city of Valparaiso. Additionally, shoreline buffer zone proposals were developed for the city. These activities are described in more detail under project B2, Ecological Restoration.

B1 Land Acquisition Assessment. District staff developed land use and land cover GIS coverages, obtained property ownership data, and conducted field assessment of the Live Oak Point peninsula in south Walton County. Land acquisition and management recommendations were developed that culminated in the acquisition of 321.7 acres of wetlands bordering Hogtown Bayou using Florida DOT mitigation funds. The District also recently acquired approximately 1,115 acres along Holmes Creek. This acquisition will provide restoration opportunities and help prevent future NPS pollution of the creek and downstream habitats.

B2 Ecological Restoration. Working with the city of Valparaiso and DEP, the District initiated a multi-faceted restoration project focused primarily within Valparaiso. Project objectives include reduction of

NPS pollution, restoration of shoreline plant communities, and enhancement of shoreline stability. Wetland treatment systems have been designed for stormwater discharge channels that bisect three city parks, and a baffle box sediment trap has been designed for an additional stormwater outfall. An educational document describing shoreline BMPs was developed and distributed, and a public workshop was hosted.

Through this project, SWIM leveraged an additional $176,000 from the EPA's 319(h) nonpoint program. These funds will apply toward construction of the wetland treatment systems, planned for spring-summer 2002. The EPA funds also paid for the planting of over 11,700 wetland and upland plants by DEP staff along waterfronts in Valparaiso, Okaloosa County's Eldredge Park, and at Okaloosa-Walton Community College's Mattie Kelly Estate property.

Additional work within the Ecological Restoration project has included a preliminary analysis of restoration needs and opportunities on the Live Oak Peninsula in Walton County. Potential restoration activities would address wetland and associated upland and aquatic habitats on the peninsula, NPS pollution, shoreline erosion, and aquatic habitat quality within Hogtown Bayou.

P1 Public Awareness. District staff developed an educational video for the *WaterWays* program. This video describes water resource concepts and issues as they relate to the Choctawhatchee watershed and other systems in the region. It was distributed to 27 middle and high schools in Okaloosa, Walton, Holmes, Washington, and Bay counties. The District reprinted and distributed the popular *Historical Remembrances of the Choctawhatchee River*. The SWIM program also provided for development and distribution of *Waterfront Protection and Restoration: A Northwest Florida Homeowner's Guide*, which described shoreline BMPs for homeowners. Additionally, District staff participated in two "Choctawhatchee Bay Day" events, hosted by the CBA. For the first Bay Day, held May 31, 1997, the SWIM program paid for the use of 4-H Camp Timpoochee as the festival site. The District also contributed some of the funding for printing the *Choctawhatchee Bay Boater's Guide*, developed by the Northwest Florida Aquatic Preserves Office.

C1 Planning and Administration. In cooperation with Okaloosa-Walton Community College and the CBA, District staff helped coordinate a Choctawhatchee watershed symposium, held at Sandestin Resort on May 30, 1997. This symposium provided a forum for an interdisciplinary exchange of information between researchers, resource managers, and the interested public. District staff also chaired a watershed Technical Advisory Committee from 1996 through 1998 and coordinated a number of committee meetings. The District assisted the Northwest Florida Aquatic Preserves Office in coordination of a breakwater construction project at Camp Timpoochee on the north shore of Choctawhatchee Bay. District staff have also participated with other state and federal agencies in a variety of resource management activities. An example is participation in Okaloosa Darter recovery planning meetings hosted by the U.S. Fish and Wildlife Service in December 1999 and February 2001. District staff identified and developed projects for the District's Florida Forever program. Other activities conducted under the planning and administration project included SWIM plan development and revision, collection and analysis of land ownership data for south Walton County, development of proposals for potential future projects, and the development of GIS coverages.

C2 Interstate Planning and Coordination. On February 2, 1999, District staff met at Troy State University with staff representing Alabama state agencies and the Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority. A variety of approaches to interstate coordination of watershed management were discussed. The consensus of the meeting was to maintain informal interagency relationships and continue to work toward a whole-basin management perspective. Activities tentatively agreed to include information sharing, future informal meetings, occasional larger watershed workshops, and coordination of educational activities.

Progress Toward Meeting Plan Goals and Objectives

The overall goal of the Choctawhatchee River and Bay SWIM plan is to "facilitate a cooperative public-private effort to restore and protect the river and bay system and thus enhance human quality-

of-life" (NWFWMD 1996). This goal is ambitious and cannot be achieved in the absence of broad public and institutional interest and support. Progress has been made toward realizing the goal, however, since the original SWIM plan was approved in 1996. State and federal agencies and local governments have further recognized the importance of the river and bay system and have adopted watershed management principles. Among these are Florida's departments of Environmental Protection and Community Affairs and federal agencies such as the U.S. Fish and Wildlife Service, U.S. Geological Survey, and Eglin AFB. Local governments have also recognized the importance of water and related resources and reflected watershed management objectives within their plans. Walton County, for example, expressly addressed issues raised in the SWIM plan in its Comprehensive Plan Evaluation and Appraisal Report (EAR). Utilities are also taking measures to limit the use of septic systems near Choctawhatchee Bay, and a number of local governments are developing stormwater master plans.

Realization of such goals as widespread real world changes is more difficult, primarily due to the intractability of some of the primary issues and the high costs of addressing them. For example, nonpoint source pollution, generally thought to pose the greatest threat to the basin's water quality, is generated across the landscape—particularly from urban and agricultural areas. The cost of retrofitting the many untreated stormwater discharges exceeds the funding readily available to most local governments. Comprehensively addressing agricultural nonpoint source pollution would require concentrated efforts by numerous private landowners across extensive areas of land. The funding available to SWIM and state and federal grant programs can provide for design and implementation of pilot projects, but it is not nearly sufficient to provide for comprehensive watershed-wide implementation.

To help achieve the overall plan goal, the 1996 plan outlined a series of objectives, strategies, and projects designed to protect and improve water and sediment quality and biological resources, to promote public awareness of watershed resources, and to coordinate a basinwide watershed management effort. Progress has been achieved through the series of interrelated projects described above. In particular, demonstration projects have been conducted for NPS pollution abatement and habitat restoration, priorities for land acquisition and restoration have been identified, educational products have been developed and distributed, and the District helped coordinate basinwide watershed management efforts.

Revised SWIM Project Plan

Among the activities planned for fiscal year 2001-2002 and succeeding years are restoration planning and implementation, evaluation of urban stormwater impacts on the system, and development of stormwater treatment systems. The projects described below provide a basic strategy to guide the SWIM program toward achievement of the overall goal described above. Estimated project funding needs are provided in Table 2, although actual expenses will vary depending on funding available for implementation.

Table 2. Project Schedule and Cost Estimates

ID#	PROJECTS	Fiscal Year Expenditures*				
		01-02	02-03	03-04	04-05	05-06
	Water Quality					
Q1	Ecological Assessment					
Q2	Shoreline Buffer Zones		$20,000	$20,000		
Q3	Land Use/Land Cover Assessment					
Q4	NPS Pollution	$10,000	$200,000	$200,000	$200,000	$200,000
Q5	Point Source Assessment					
Q6	PLRGs					
Q7	Urban Stormwater	$250,000	$600,000	$500,000	$500,000	$500,000
Q8	Urban BMP Demonstration	$170,000				
Q9	Long-Term Monitoring Plan					
	Biological Resources					
B1	Land Acquisition Assessment		$15,000	$15,000	$15,000	$15,000
B2	Ecological Restoration	$250,000	$100,000	$100,000	$100,000	$100,000
B3	Seagrass Assessment		$20,000	$30,000		
B4	Tidal Marsh Assessment				$20,000	$20,000
B5	Recreational Impacts Assessment					
B6	Erosion Assessment					
	Public Awareness					
P1	Public Awareness	$35,000	$25,000	$25,000	$25,000	$25,000
	Coordination					
C1	Planning and Administration	$25,000	$10,000	$10,000	$10,000	$10,000
C2	Interstate Coordination	$10,000	$10,000	$10,000	$10,000	$10,000
	Total					
	Planned Expenditures, 2002-2006	$750,000	$1,000,000	$910,000	$880,000	$880,000

* Figures are preliminary estimates and subject to revision due to funding limitations and changes in project priorities.

Q2 Shoreline Buffer Zones. Evaluate the potential for establishment of shoreline buffer zones along bay and stream waterfronts throughout the watershed. Pursue implementation through voluntary action, acquisition, less-than-fee acquisition, overlay districts, public awareness activities, and other means. Recommend tasks to be implemented through the Ecological Restoration project. Completion of this project will facilitate continued implementation of shoreline restoration efforts initiated through the Ecological Restoration project, as well as by the CBA, DEP, and Northwest Florida Aquatic Preserves office.

Q4 Basinwide NPS Pollution Abatement Planning and Implementation. Complete NPS pollutant loading evaluations of the watershed based on GIS and field analysis. Where necessary, gather new data to further assess water quality constituents of concern, including chemical, physical, hydrologic, and biological parameters pertinent to the productivity and ecological health of the river and bay. In cooperation with other resource management agencies, identify sub-basin and site priorities and practices for NPS pollution control measures. Evaluate and map sedimentation and other NPS pollution sources, including road crossings and erosion sites. Develop specific restoration plans for priority sites. Implement priority projects using SWIM, Florida Forever, and grant sources. Work with DEP to develop NPS pollution reduction goals.

Q7 Urban Stormwater Assessment and Technical Assistance. Collect and develop storm and baseflow water quality and hydrologic data from priority basins, with emphasis on basins that are representative of land use types common to urbanized areas of the watershed. Use the data and evaluation to identify and define problems and prioritize future treatment and protection measures. Work with local governments to develop stormwater treatment designs for priority basins. Pursue implementation of major projects through Florida Forever and other programs. Implement pilot projects through the Urban BMP demonstration project.

Q8 Urban BMP Demonstration. Implement urban BMP demonstration projects in support of project Q7. Conduct appropriate monitoring to validate, compare, and demonstrate the applicability of BMPs implemented.

B1 Land Acquisition Assessment. Conduct a basinwide evaluation of land acquisition priorities and opportunities. Collect land use and ownership information, and develop a report with recommendations for resource protection. Specific measures to be incorporated may include habitat protection through fee simple and less-than-fee acquisition, as well as other management and restoration actions. Among the potential areas of emphasis are sensitive habitats on the bay and along the river and its tributaries, lands that may serve buffer and other public use and resource protection functions, lands within the recharge area for springs discharging into Holmes Creek and other waterbodies, steephead streams, and other areas of significant resource value. Pursue implementation through the Florida Forever and DOT Mitigation programs.

B2 Ecological Restoration. Continue to evaluate ecological conditions and restoration needs throughout the bay and watershed. Identify restoration priorities, collect data, and develop designs for restoration projects to be implemented through SWIM, Florida Forever, and DOT Mitigation. The focus of restoration may include critical wetland, aquatic, and upland habitats throughout the watershed. Project activities are expected to include planning and implementing habitat restoration and enhancement on the Live Oak Point peninsula, continuation of support for the U.S. EPA 319(h) grant for NPS pollution abatement and habitat restoration in Valparaiso, restoration of other priority wetland and riparian habitat sites, identification and correction of erosion and sedimentation sites, and other identified restoration needs.

B3 Seagrass Assessment. Evaluate the status of submerged aquatic vegetation communities in Choctawhatchee Bay. Compare data with earlier studies to identify trends and evaluate potential causes of any adverse effects identified. Relate to the NPS Pollution and Ecological Restoration projects to develop and pursue recommendations for protecting and restoring seagrass communities in the bay.

B4 Tidal Marsh Assessment. Evaluate conditions of tidal marshes and other wetlands in the vicinity of Choctawhatchee Bay with the objective of identifying site-specific restoration and protection needs. Apply results to the Ecological Restoration project and DOT Mitigation program.

P1 Public Awareness. Develop and distribute an educational satellite poster of the watershed with a companion brochure. Provide information to the public via a variety of media, support education events, and develop and distribute other public awareness and education products. Additionally, it is anticipated that one or more workshops and other outreach activities will be conducted to focus on protection of the recharge area and spring systems that discharge into Holmes Creek.

C1 Planning and Administration. Continue to administer the SWIM program. Develop concepts for future projects, and coordinate activities with local governments, state and federal agencies, and private initiatives. Develop grant applications to obtain additional funding. Continue to participate in inter-organizational initiatives, and assist in future public workshops, symposia, and other events.

C2 Interstate Coordination. Share information with federal and Alabama state agencies, coordinate actions where feasible, and participate in interstate workshops and other events.

Related Resource Management Activities Since 1996

Research

Investigations have been conducted into several topics relating to management of the Choctawhatchee River and Bay watershed. Schlenk et al. (2001) and Thompson (n.d.) both investigated aquatic biodiversity in Holmes Creek and described management challenges potentially

affecting the sustainability of this biodiversity. Hightower et al. (in press) monitored summer movements and populations of the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) from 1994 through 1997 and identified critical habitat for this threatened species in the Choctawhatchee River. Lenes et al. (2001) investigated relationships between atmospheric iron deposition, nitrogen fixing cyanobacteria, and harmful algal blooms affecting the Gulf coast.

Local Government Actions

Local governments throughout the watershed have taken a number of actions to help protect the quality of surface waters, wetlands, and other water related resources. Okaloosa County received funding from the Florida Department of Community Affairs (DCA) to complete a stormwater master plan for both incorporated and unincorporated areas countywide. The cities of Niceville and Destin have developed stormwater master plans, which will be coordinated with the county's plan. Walton County is also completing a stormwater master plan that will emphasize Choctawhatchee Bay and the coastal dune lakes. The county also established a coastal dune lakes task force to consider issues affecting the lakes and the sufficiency of measures in place to protect them.

Choctawhatchee Basin Alliance

Since 1996, the Choctawhatchee Basin Alliance (CBA) has been active in ecosystem management, public awareness, promotion of improved stormwater management, the interagency regional mitigation plan review process, and habitat restoration. The CBA has hosted "Bay Day" community festivals, as well as technical symposia and a variety of educational workshops. The CBA also organized stormwater management workshops for local government officials and the public. In 1998, the CBA, in cooperation with DEP, completed and distributed the ecosystem management plan *Breaking New Ground: Management of the Choctawhatchee River and Bay Watershed*. The CBA has also initiated a water quality monitoring program for Choctawhatchee Bay, tributaries, and coastal dune lakes. At the time of this writing, monitoring is ongoing at 50 sites in Choctawhatchee Bay and ten coastal dune lakes. Additionally, the CBA has conducted several shoreline habitat restoration projects around the bay to demonstrate the value and feasibility of establishing native shoreline vegetation. Over two hundred volunteers have participated in these projects.

The CBA recently received state funding to complete a Choctawhatchee Bay water quality assessment. The project will include evaluations of existing water quality and nutrient loading from the watershed, as well as a public outreach and awareness component.

Utilities

Regional Utilities and Destin Water Users are taking measures to reduce the use of septic systems in the vicinity of Choctawhatchee Bay. The initiatives include extending sewer lines to areas now served exclusively by septic systems and providing discounts and/or extended payment options to assist with tap fees for existing septic tank users.

Regional Mitigation for State Transportation Projects

Section 373.4137, Florida Statutes, was enacted by the Legislature in 1996 and amended in 1999. The section establishes a program for long-range planning and regional implementation of mitigation for wetland impacts caused by Florida Department of Transportation (FDOT) projects. Under this program, water management districts, in consultation with DEP, the U.S. Army Corps of Engineers (COE), other appropriate agencies and interested parties, plan and implement regional mitigation plans to meet state and federal permit requirements for FDOT construction projects. At the time of this writing, 21 FDOT work projects in the NWFWMD require wetland mitigation. Within the Choctawhatchee River and Bay watershed, these projects include:

- U.S. 98 road widening and improvement in Walton County from 0.6 miles west of Mack Bayou east to CR 30A West (21.8-acre impact);
- U.S. 98 road widening and improvement in Walton County from CR 30A east to US 331 (60.07-acre impact);
- U.S. 98 road widening and improvement in Walton County from US 331 to Peach Creek (42.9-acre impact);
- U.S. 98 road widening and improvement in Walton County Peach Creek east to the Bay County line (60-acre impact); and
- The U.S. 331 Freeport Bypass (10.69-acre impact).

Mitigation projects for the impacts in or near the Choctawhatchee watershed include acquisition and restoration at Live Oak Point and Devils Swamp and wetland enhancement on District lands in the Choctawhatchee River floodplain.

Florida Forever

Pursuant to Section 373.199, Florida Statutes and the NWFWMD Florida Forever 2001 Five Year Work Plan (NWFWMD 2001), a variety of projects may be implemented under the Florida Forever Program. Project funding under Florida Forever is described further in the *Funding* section.

NPDES Stormwater

The federal Clean Water Act (CWA) established permit requirements for certain municipal, industrial, and construction discharges. The Florida DEP implements the National Pollutant Discharge Elimination System (NPDES) stormwater program in Florida under delegation from the U.S. EPA.

Phase I of the program, administered previously by the U.S. EPA, provided for regulation of stormwater runoff from municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, construction activity disturbing five or more acres of land, and ten categories of industrial activity. An MS4 can include roads with drainage systems, gutters, and ditches, as well as underground drainage, operated by local jurisdictions, FDOT, universities, local sewer districts, hospitals, military bases, and prisons.

The Phase II program expands the program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites to implement programs and practices to control polluted stormwater runoff. Specifically, Phase II extends permitting coverage to two classes of stormwater dischargers:

(1) Operators of small MS4s that are located in “urbanized areas,” as delineated by the Bureau of the Census, or serve a population that is greater than 10,000 and more dense than 1,000 per square mile.

(2) Operators of small construction activities that disturb equal to or greater than one and less than five acres of land.

General permits for Phase II-designated small MS4s and small construction activities must be issued by December 2002. Operators of regulated small MS4s must fully implement their stormwater management programs by the end of the first permit term, typically a 5-year period.

Watershed Restoration Act of 1999 and Total Maximum Daily Loads

The Florida Legislature passed the Florida Watershed Restoration Act in 1999, creating Section 403.067, F.S. The section provides a process for restoring impaired waters through establishment of

total maximum daily loads (TMDLs) of pollutants, as required by the federal CWA. The DEP is lead agency for administering the program in coordination with local governments, water management districts, the Department of Agriculture and Consumer Services, soil and water conservation districts, environmental organizations, other state agencies, and affected pollution sources.

Pursuant to Section 303(d) of the federal Clean Water Act, Section 403.067, F.S., requires DEP to list surface waters for which TMDL assessments will be conducted. The Department has adopted by rule (Chapter 62-303, F.A.C., Identification of Impaired Surface Waters) a methodology for completing the assessments and identifying waters that fail to meet water quality standards. Based on the assessments, an updated list must be established identifying those waters for which TMDLs are to be calculated. Associated priority rankings and schedules must also be established.

The TMDL calculation shall establish the amount of a given pollutant that a waterbody or segment may receive from all sources without exceeding water quality standards, and it shall account for seasonal variations and include a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality (section 403.067(6)(a) 2, F.S.). The general TMDL formula can be described as a sum of point source wasteload allocations (WLAs), including water quality and technology based effluent limits (WQBELs and TBELs), nonpoint source load allocations (LAs), and the margin of safety. The TMDLs must include “reasonable and equitable” allocations of the TMDL among point and nonpoint sources that will, alone or in conjunction with other management and restoration activities, provide for the attainment of water quality standards and the restoration of impaired waters. The TMDL calculations and allocations for each waterbody or segment shall be adopted by rule.

Florida is implementing these TMDL requirements using a watershed management approach in which water resources are managed on the basis of natural boundaries such as river basins, rather than political or regulatory boundaries. This approach promotes the management of entire natural systems, addresses the cumulative effects of human activities, provides a framework for setting priorities, focuses resources, increases cooperation among participants, emphasizes public involvement, and encourages governmental accountability.

The watershed management approach is implemented using a cyclical management process in which the diverse stakeholders in each of the state's river basins work cooperatively to identify and solve water resource problems. The TMDLs will be developed and allocated as part of this watershed management cycle, which rotates through the state's 52 basins over five years. The cycle's five phases are as follows:

- Phase 1: Watershed Evaluation.
- Phase 2: Strategic Monitoring.
- Phase 3: Developing and Adopting TMDLs.
- Phase 4: Developing Watershed Management Plans.
- Phase 5: Implementing Watershed Management Plans.

In successive cycles, the effectiveness of management activities (TMDL implementation) will be monitored and evaluated to determine whether water quality objectives are being met and whether individual waters are no longer impaired. The Department also will track implementation of restoration activities to ensure continued progress toward meeting the TMDLs. The Department will begin Phase 1 activities in the Choctawhatchee Basin in 2002.

Fifteen segments of the Choctawhatchee River and Bay system are listed as impaired on Florida’s 1998 303(d) list, approved by the U.S. EPA in November 1998. These are displayed on Figures 2 and 3 and listed in Table 3.

Figure 2. 303(d) Listed Segments in the Choctawhatchee River Watershed

Figure 3. 303 (d) Listed Segments in the Choctawhatchee Bay Watershed

Table 3. 303 (d) Listed Segments of the Choctawhatchee Watershed

Water Segment	Parameters of Concern*	Projected Year of TMDL Development
Indian Bayou & Old Pass Lagoon	DO, Nutrients	2009
Choctawhatchee Bay (East)	DO, Nutrients	2004
Joes Bayou	Nutrients	2009
Choctawhatchee Bay (E-Central)	BOD, Coliforms, Nutrients, Turbidity, TSS, Mercury	2009
Choctawhatchee Bay (W-Central)	Coliforms	2004
Boggy Bayou	DO	2009
Lafayette Creek	Coliforms	2009
Choctawhatchee River	Coliforms, Turbidity, TSS	2004
Bruce Creek	Coliforms, Turbidity	2009
Choctawhatchee River	Coliforms, Turbidity, TSS, Mercury	2004
Camp Branch Creek	Coliforms, Nutrients, Turbidity	2009
Choctawhatchee River	Coliforms, Nutrients, Turbidity, TSS, Mercury	2009
Alligator Creek	Coliforms, BOD, DO, Nutrients, Turbidity	2009
Sikes Creek	Coliforms, DO, TSS, Turbidity	2009
Fish Branch	Coliforms, DO, TSS, Turbidity	2009

*****DO=Dissolved Oxygen, BOD=Biochemical Oxygen Demand, TSS=Total Suspended Solids

In September 2000, the U.S. EPA proposed fecal coliform TMDLs for Alligator, Bruce, Camp Branch, and Fish Branch creeks. The TMDLs were proposed to attain the water quality standards of a monthly average of 200 counts/100 ml, expressed as a geometric mean based on a minimum of ten samples taken over a 30-day period (Chapter 62-302, Florida Administrative Code). To provide a margin of safety, the TMDL water quality targets were set at a geometric mean of 190 counts/100 ml, five percent lower than the standard of 200 counts/100 ml. Fecal coliform load reductions proposed were 2.79%, 0.78%, 20.66%, and 0.00%, respectively, for Alligator, Camp Branch, Fish Branch, and Bruce creeks.

Environmental Resource Permitting

Within the NWFWMD, activities in wetlands and surface waters are regulated differently than in the rest of the state. Within most of Florida, activities involving the alteration of surface water flows are regulated under the Environmental Resource Permit (ERP) program as required by Part IV, Chapter 373, F.S. These include new activities in uplands that generate stormwater runoff from upland construction, as well as dredging and filling in wetlands and surface waters. Environmental Resource Permit applications are processed by either the area water management district or DEP in accordance with the division of responsibilities specified in operating agreements between DEP and the districts.

The ERP program, however, was never implemented in northwest Florida. Here, wetland dredge and fill activities are regulated by DEP according to the Henderson Wetlands Act of 1984. Isolated wetlands are not protected, and stormwater is not regulated under this program. A separate stormwater permitting program is run by DEP in northwest Florida. These stormwater permitting requirements (under rule 62-25, FAC) tend to be less stringent than those implemented through ERP elsewhere in the state. This was intended to be an interim situation, with the dredge and fill and stormwater programs being repealed when ERP was implemented in the Panhandle.

In 1999, the Florida Legislature directed the NWFWMD and DEP to develop a plan by which ERP is to be fully implemented in northwest Florida by July 1, 2003.

Panhandle Project

The DCA Florida Coastal Management Program has initiated a multi-year project to work with public and private interests in the Panhandle to design and implement conservation and development

strategies and tools that effectively address secondary and cumulative impacts. Objectives include facilitating dialogue and developing cooperative relationships between public and private interests to address conservation and development issues in the Panhandle. The project should also provide for an evaluation of the capability of management tools such as local comprehensive planning to enhance local government capacity to effectively plan for economic and conservation goals.

Resource Management Agency Reorganization

The Florida Fish and Wildlife Conservation Commission (FWCC) was established to replace the Florida Game and Fresh Water Fish Commission (FGFWFC) and the Marine Fisheries Commission (MFC). The FWCC has a nine-member appointed commission and has regulatory and management jurisdiction over game and non-game wildlife and marine and freshwater aquatic life. The FWCC is also responsible for research on freshwater and marine life, wild animals and their habitats, enforcement of fish and wildlife conservation laws, boating safety, and enforcement of environmental laws. The Commission reviews projects and permit applications that may affect fish and wildlife habitat. It monitors fish and wildlife populations and habitat quality, manages wildlife management areas, and coordinates non-game wildlife management and endangered species protection. The Division of Wildlife is also responsible for designating Critical Wildlife Management Areas to protect designated species. The Florida Marine Research Institute (FMRI) was transferred to the FWCC from DEP. The Institute conducts marine research, monitoring, and ecological modeling and maps marine resources and habitat. The Fort Walton Beach Field Laboratory of FMRI suspended Choctawhatchee Bay activities in 1997 and moved its operation to Apalachicola Bay.

Additionally, the Shellfish Environmental Assessment Section (SEAS) was transferred in 1999 from DEP to the Florida Department of Agriculture and Consumer Services, Division of Aquaculture.

Interstate Management of the Choctawhatchee-Pea Rivers Watershed

An array of agencies and organizations are working together to protect and restore watershed resources in the Alabama portion of the watershed. The state NPS Education program is facilitating efforts to form a Choctawhatchee Basin Clean Water Partnership and develop a Watershed Restoration Action Strategy. The Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority developed a recommended practices manual for maintenance and service of unpaved roads, and the Center for Environmental Research and Service at Troy State University has facilitated education and training for local government officials and others concerning control of sediment from unpaved roads and other sources. The Alabama Department of Environmental Management has conducted sub-watershed assessments in the Choctawhatchee-Pea rivers basin and is working on developing TMDLs for sub-basins considered impaired. Additional monitoring is being conducted by Alabama Water Watch and other volunteer organizations.

Monitoring

Several water quality monitoring programs are ongoing in the Choctawhatchee River and Bay watershed. These include the efforts of the Okaloosa County Aqualab, NWFWMD, the Florida Surface Water Temporal Variability Network, the CBA, Florida Lakewatch and Project Coast, the DEP, the DACS Shellfish Environmental Assessment Section, and county public health units. In Alabama, surface water monitoring is conducted by Alabama Water Watch, other volunteer monitoring programs, the Geological Survey of Alabama, and the Alabama Department of Environmental Management. Figure 4 displays regular monitoring sites of programs ongoing at the time of this writing.

Figure 4. Regular Monitoring Sites Across the Choctawhatchee Watershed

In considering Figure 4, it should be noted that the sites are monitored by programs that analyze for differing sets of parameters at different periodicities. The programs also differ in field and laboratory methods, differ as to whether water quality is related to flow measurements or other environmental conditions, and have different quality assurance standards. Additionally, positions of the various sites indicated were fixed with different levels of accuracy. Intermittent, short-term, and historical monitoring activities are not represented. The coverage will be revised and expanded as additional data become available.

The Aqualab program, sponsored by Okaloosa County and with technical and laboratory assistance provided by DEP, collects monthly samples from 22 sites in Choctawhatchee Bay. Parameters monitored include biochemical oxygen demand (BOD), chlorophyll a, color, nutrients, pH, fixed solids, precipitation, salinity, secchi depth, conductivity, temperature, turbidity, fecal coliform bacteria, and wind direction and velocity.

As part of Florida's Surface Water Temporal Variability (SWTV) network, the NWFWMD collects monthly samples from two sites on the Choctawhatchee River and one on Alaqua Creek. Parameters monitored include color, alkalinity, turbidity, suspended and dissolved solids, nutrients, total organic carbon, chlorides, sulfate, metals (calcium, potassium, sodium, magnesium), pH, conductivity, temperature, dissolved oxygen, total coliform bacteria, fecal coliform bacteria, enterococci bacteria and escherichia coli bacteria. These water quality stations are on gauged streams, which provide for calculated stream discharge. This permits water quality to be related to precipitation, runoff, and environmental conditions in the watersheds.

Working with the state's Project Coast, the CBA is monitoring 50 sites in Choctawhatchee Bay and ten coastal dune lakes. Parameters monitored at these sites include total nitrogen, total phosphorus, color, secchi depth, and chlorophyll a. Also monitored at the CBA sites are dissolved oxygen, temperature, salinity, turbidity, pH, and temperature. Florida Lakewatch provides for volunteer monitoring at several coastal dune lakes and six sites in Choctawhatchee Bay. Parameters monitored include total nitrogen, total phosphorus, color, secchi depth, and chlorophyll a.

The Shellfish Environmental Assessment Section (SEAS) of the Florida Department of Agriculture and Consumer Services monitors bottom and surface temperature, salinity, and dissolved oxygen and surface pH, turbidity, and fecal coliform bacteria, as well as water depth and wind direction and speed, at 58 sites in Choctawhatchee Bay. Additionally, county public health units conduct biweekly monitoring of enterococcus and fecal coliform bacteria at six estuary and 12 Gulf sites in Okaloosa and Walton counties.

The Alabama Water Watch helps support training and coordination of volunteer monitoring initiatives throughout Alabama. Basic parameters monitored include pH, temperature, total alkalinity, total hardness, dissolved oxygen, and turbidity. Additional monitoring of biological parameters is also conducted at some sites. Other monitoring activities in Alabama, including those conducted by the GSA and ADEM, measure a wide array of chemical, biological, and physical parameters, depending on specific program or project purposes.

The DEP Northwest District has collected considerable biological data and conducted biological evaluations of numerous stream and other aquatic habitat sites throughout the watershed. Some of this work has been conducted in partnership with Eglin AFB. Biological reconnaissance evaluations have been conducted at 44 stream sites. Of these, 14 were evaluated as healthy, eight were considered suspect, and 22 were found to be impaired based on the most recent data collected.

County health departments of the Florida Department of Health (DOH) collect bi-monthly water samples in recreational waters. These samples are analyzed for enterococci and fecal coliform bacteria. High concentrations of these bacteria may indicate the presence of microorganisms that could cause disease, infections, or rashes. County health departments issue health advisories or warnings when such conditions are confirmed.

Long et al. (1997) evaluated sediment toxicity in Florida Panhandle estuaries. Sediment samples were collected at 37 sites in Choctawhatchee Bay in 1994. Of these, all samples were evaluated based on multiple toxicity tests, and 21 samples were analyzed for chemistry. Concentrations of contaminants were generally higher in bayous than in the main bay. The highest polycyclic aromatic hydrocarbon (PAH) concentrations were found in Cinco Bayou. Concentrations of polychlorinated biphyenyls (PCBs) were found to be high at stations in Cinco and Boggy bayous, and lead and mercury concentrations were relatively high in Garnier, Cinco, Boggy, and Rocky bayous. Evidence of sediment toxicity was found at all stations. The highest levels of toxicity were found in Cinco, Garnier, Boggy, Tom's, Rocky, and LaGrange bayous and Destin Harbor. The toxicity tests performed included survival of marine amphipods, changes in bioluminescent activity, and sea urchin fertilization success and embryological development.

Water Supply Planning

The Northwest Florida Water Management District completed a District Water Supply Assessment in 1998. Through this assessment, it was determined that adequate future water supply sources have not been identified to sustainably meet projected future demands in Santa Rosa, Okaloosa, and Walton counties (designated as Region II of the NWFWMD). Thus, pursuant to section 373.0361, F.S., the District developed and is implementing a Water Supply Plan that examines a number of water supply options for the region and provides for water resource development.

Watershed Conditions

Land Use and Nonpoint Source Pollution

Figure 5 displays generalized land use and land cover in the Choctawhatchee River and Bay watershed across Florida and Alabama. The respective areas of the land use and cover categories are listed in Table 4. The Florida data were developed by DEP from interpretation of 1994-1995 National Aerial Photography Program (NAPP) color-infrared imagery. The Alabama data are derived primarily from spring Landsat Thematic Mapper (TM) imagery acquired in 1988, 1991, 1992, and 1993, processed and analyzed by the U.S. Geological Survey (USGS) in 1997 and 1998.

In considering the data, some caveats should be noted. Land use changes since 1995 (1993 for Alabama) have been significant in some areas and are not reflected. It was also considered that Alabama forested wetland area may have been underestimated due to difficulties in classifying wetlands based on the satellite data and limitations in the National Wetland Inventory (NWI) data available at the time of analysis (USGS 1998). Additionally, some difficulty was observed in discriminating between transitional barren and some silviculture lands. Within Florida, tree plantations, coniferous plantations, and forest regeneration areas are classified as silviculture. It should be noted, however, that nearly all forest land in the study area has been subject to silviculture.

Within Florida, most of the land cover consists of upland forest, with significant wetland systems along the river and its tributaries. Agricultural land use becomes more prominent in the northern portion of the watershed, particularly in Alabama. There are a number of concentrations of urban land uses, particularly in the vicinity of Choctawhatchee Bay.

Figure 5. General Land Use and Land Cover: Choctawhatchee River and Bay Watershed

Table 4. Generalized Land Use and Land Cover, Choctawhatchee River and Bay Watershed						
Land Cover Category	Florida		Alabama		Total Watershed	
	Acres	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Open Water	104,761.62	7.35%	11,306.13	0.57%	116,067.75	3.39%
Low Intensity Residential	22,161.27	1.55%	10,494.07	0.53%	32,655.34	0.95%
M-H Intensity Residential	26,568.92	1.86%	2,414.47	0.12%	28,983.39	0.85%
Commercial, Industrial, Transportation, Utilities	26,176.87	1.84%	8,176.37	0.41%	34,353.24	1.00%
Institutional	16,626.47	1.17%	*	*	16,626.47	0.49%
Bare Rock, Sand, or Clay	2,162.25	0.15%	60.46	0.00%	2,222.71	0.06%
Quarries/Strip Mines/ Gravel Pits	2576.8526	0.18%	288.12	0.01%	2,864.97	0.08%
Transitional	35,392.09	2.48%	68,278.61	3.42%	103,670.70	3.03%
Upland Coniferous Forest	247,087.58	17.33%	355,078.81	17.79%	602,166.39	17.60%
Deciduous and Mixed Upland Forest	177,034.43	12.42%	779,415.24	39.04%	956,449.67	27.95%
Silviculture	355,908.39	24.96%	**	**	355,908.39	10.40%
Agriculture	197,273.69	13.84%	627,257.81	31.42%	824,531.50	24.09%
Other Grasses (Urban)	3,789.56	0.27%	7,137.63	0.36%	10,927.19	0.32%
Woody Wetlands	201,291.16	14.12%	121,822.09	6.10%	323,113.25	9.44%
Emergent Herbaceous Wetlands	6,909.51	0.48%	4,703.42	0.24%	11,612.93	0.34%
Total	**1,425,720.66**	**100.00%**	**1,996,433.23**	**100.00%**	**3,422,153.89**	**100.00%**

Sources: Alabama - USGS; data collected 1988-1993. Florida – FDEP; data collected 1994-1995.
*Alabama portion included within the Commercial, Industrial, Transportation, Utilities category.
**Alabama silviculture encompassed within other forest categories.

Among the most prominent characteristics of the region is growth. The 2000 Census found the combined population of Okaloosa, Walton, Holmes, and Washington counties to be 250,636—a 23 percent increase over 1990 (Table 5). In Alabama, the watershed covers portions of ten counties: Bullock, Pike, Barbour, Henry, Dale, Coffee, Crenshaw, Covington, Geneva, and Houston. The 2000 population of these counties was measured at 345,258, a 6.4 percent increase over the 1990 population (324,392).

Table 5. Population Growth by County

County	1990	2000	% Change
Okaloosa	143,777	170,498	18.59%
Walton	27,759	40,601	46.26%
Holmes	15,778	18,564	17.66%
Washington	16,919	20,973	23.96%
Total	**204,233**	**250,636**	**22.72%**

Source: U.S. Census Bureau

Such a population increase comes with a transformation of land use. Particularly in the vicinity of the bay, a substantial area is in the process of changing from rural to urban or suburban in character. The potential for existing and new intensive land use to generate NPS pollution is among the greatest threats to future environmental quality in the Choctawhatchee River and Bay system. Thus, treatment of stormwater runoff from new development, investing in facilities to treat existing

stormwater discharges, and planning to avoid direct and secondary impacts on sensitive habitats are among the most important measures that can be taken to preserve and improve the health of the watershed and the benefits it provides.

Recent literature suggests a series of commonly understood and intuitive associations between land use and water quality. Basins with a predominance of upland forest, wetland cover, and low densities of impervious surface tend to be associated with good water and habitat quality. Those dominated by urban and agricultural land uses or characterized by substantial impervious surface area, however, are likely associated with substantial NPS pollutant loading and habitat disturbance (Harper 1994; NWFWMD 1998; Ferguson and Suckling 1990; Schueler 1994). Urban land uses, particularly medium-to-high density residential, commercial, and industrial, are generally found to cause the most severe environmental impacts associated with NPS pollution, including degraded water and sediment quality and physical degradation of benthic and littoral communities. Agricultural uses can lead to sedimentation, stream and habitat alteration, and the export of nutrients and chemicals into surface and ground waters. Silviculture activities can also cause sedimentation, habitat loss and alteration, and the export of chemical pollutants. Roads and stream crossings are also frequently constructed on silviculture lands, which can cause sedimentation and habitat fragmentation.

When properly implemented, BMPs have been shown to substantially reduce NPS pollution, sedimentation, and habitat loss. These include silviculture BMPs (FDACS 1993), agricultural BMPs, onsite and regional stormwater treatment systems, urban BMPs, and protection of wetlands and upland buffer zones (Desbonnet et al. 1995; Johnson et al. 1997). Effective land use planning may also reduce the potential for future impacts in the vicinity of environmentally sensitive areas.

Wiggins (1996) identified 317 direct stormwater discharges (138 of them major) within sub-basins draining into Choctawhatchee Bay (Table 6). Many of the stormwater structures identified were constructed prior to the enactment of modern stormwater treatment regulations and standards.

The current shellfish harvesting area survey (Couch et al. 2001) identified 61 marinas on the bay, up from the 56 reported in the 1996 survey. Such facilities have the potential to release pollutants, including vessel wastewater, oil and grease, heavy metals, and litter. Actual pollution from marinas can depend on the availability of pumpout facilities and the level and consistency of marina BMP implementation.

Table 6. Choctawhatchee Bay Nonpoint Source Inventory
Shellfish Environmental Assessment Section, 1995

Sub-Basin	Major* Drainage Discharges	Minor Drainage Discharges	Structures Served by Septic Systems	Marinas
Santa Rosa Sound	15	6	0	14
Cinco Bayou	6	19	0	1
Garnier Bayou	7	11	0	4
Eglin	15	4	6	2
Toms Bayou	2	13	0	1
Boggy Bayou	5	6	0	3
Rocky Bayou	3	14	319	1
Pippin Lake	4	0	360	0
Mullet Creek	2	0	0	0
Choctaw Beach	2	4	385	0
Eagle Creek	2	2	167	0
Trout Creek	2	3	81	0
Linton Springs	1	1	10	0
Basin Bayou	1	1	81	0
Alaqua Bayou	5	7	324	0
Bear Creek	2	1	55	0
LaGrange Bayou	7	17	589	0
Black Creek	3	5	554	0
Choctawhatchee Delta	5	22	674	0
Point Washington	9	13	300	0
Southern Shoreline	4	0	221	0
Hogtown Bayou	10	14	908	1
San Destin Basin	8	6	72	1
Indian Bayou	3	2	0	0
Joes Bayou	3	1	0	1
Destin Harbor	8	7	0	26
Destin Point	4	0	0	1
Total	138	179	5,106	56

*Major discharges are identified as those over 36” in diameter.
(Source: Wiggins 1996)

Wastewater Disposal

Couch et al. (2001) identified 20 permitted domestic wastewater facilities in the watershed, as well as four major industrial facilities in the vicinity of the bay. Four permitted domestic wastewater facilities discharge directly into surface waters, and a fifth discharges into percolation ponds that overflow into surface waters (Table 7). As indicated in the table, the facilities that directly impact surface waters are particularly concentrated in the Holmes Creek basin.

Table 7. Surface Water Discharges in the Choctawhatchee River and Bay Watershed		
Facility	**Permitted Capacity, Maximum Average Daily Flow (gpd)**	**Receiving Basin**
Chipley	1,200,000	Holmes Creek
Bonifay	1,400,000	Holmes Creek
Vernon*	126,000	Holmes Creek
Graceville	1,100,000	Holmes Creek
Noma	25,000	Wrights Creek
*Discharges to percolation ponds with emergency overflow to Holmes Creek. Sources: U.S. EPA 1999, DEP 2002.		

Several areas in the vicinity of the bay substantially rely on onsite sewage treatment and disposal systems (OSTDS)—septic systems—for treatment and disposal of domestic wastewater (Couch et al. 2001). These include the Rocky Bayou, La Grange Bayou, and Hogtown Bayou basins and their general vicinities. Couch et al. (2001) also identified 1,665 shoreline residences and businesses that are serviced by septic systems. Additionally, much of the upstream river watershed is dependent on OSTDS for wastewater disposal. Destin Water Users and Regional Utilities recently announced initiatives to extend sewer service into areas near the bay that now rely on OSTDS for wastewater treatment (Sherman 2001).

Properly sited and functioning OSTDS can effectively remove biochemical oxygen demand (BOD), fecal indicator bacteria, suspended solids, surfactants, phosphorus, and metals (Ayres Associates 1993). The treatment of nitrogen is typically less complete, however, and dissolved nitrogen is frequently exported from drainfields through the ground water. Additionally, when used in areas with a high water table, at high densities, close to surface waters, or in areas with inappropriate soils, OSTDS can export a wide range of pollutants, including microbial pathogens. Discharged pollutants can enter surface waters as seepage into drainage ditches, streams, lakes, and estuaries. Effluent may also enter stormwater runoff when the water table is at or near the ground surface or when failing drainfields otherwise discharge at the surface.

Eutrophication

Choctawhatchee Bay was cited by the National Oceanic and Atmospheric Administration (NOAA) as exhibiting strong symptoms of eutrophication (Bricker et al. 1999). In a comprehensive assessment, Bricker et al. (1999) considered a set of primary and secondary symptoms of the existence and severity of eutrophic conditions. Primary symptoms included algal abundance (using chlorophyll *a* as an indicator), epiphyte abundance, and macroalgae. Secondary symptoms considered indicative of eutrophication include loss of submerged vegetation, nuisance and toxic algal blooms, and low dissolved oxygen. Factors cited that place Choctawhatchee Bay at risk of eutrophication include relatively low flushing rates, warm water, long algal growing seasons, and significant and increasing nutrient loading. Symptoms of eutrophication identified in the bay include high epiphyte abundance, loss of seagrass beds, low dissolved oxygen, and algal blooms.

Eutrophication typically results from significant and sustained nutrient discharges into a waterbody from its surrounding watershed. The process is described in some detail in Bricker et al. (1999) and many other sources. The 1996 Choctawhatchee River and Bay SWIM plan described observations of eutrophication and low dissolved oxygen in Choctawhatchee Bay. Unabated, eutrophication can have profound implications, including nuisance algal blooms, depleted dissolved oxygen levels, reduced water clarity, seagrass losses, degradation of other habitats, diminished productivity, and diminished aesthetic and recreational value.

Harmful Algal Blooms and Aquatic Life Mortality Events

During 1999 and 2000, Choctawhatchee Bay was affected by a series of red tides and mass mortality events involving fish, dolphins, and other wildlife. Red tide is the term commonly applied to plankton blooms that discolor the water with pigments and make the water appear red, brown, green, or cloudy. Such blooms were observed in the bay generally from September 1999 through December 2000. From September 1999 through April 2000, approximately 144 bottlenose dolphins died in northwest Florida, generally coincident with the red tides (Table 8). Approximately 49 of these deaths were in Choctawhatchee Bay. Analysis performed by NOAA indicated the presence of red tide toxins in lung and stomach tissue in some of these animals (Jones 2001).

Table 8. Choctawhatchee Bay Red Tide and Animal Mortality Events: 1999-2000

Dates	Event	Location	Comments
1999			
September-December	Red tide	Choctawhatchee Bay	Widespread red tide. Shellfish beds in the central and eastern bay closed to harvesting.
September	Fish kill	Choctawhatchee Bay; Fort Walton Beach-Destin area	Primarily adult mullet; also a mix of small fish including white grunt, pinfish, sea catfish, croaker, and pigfish.
September-December	Dolphin mortality	Gulf of Mexico, Choctawhatchee Bay, adjoining bays	From September 1999 through April 2000, approximately 144 bottlenose dolphins died in the region; 49 in Choctawhatchee Bay or nearby Gulf waters.
2000			
January-April	Continued dolphin mortality	Gulf of Mexico, Choctawhatchee Bay, adjoining bays	Continued
January-February; September-December	Red tide	Choctawhatchee Bay	Widespread red tide. Shellfish beds in the central and eastern bay closed to harvesting.
January	Fish kill	Cinco Bayou, Hogtown Bayou, Choctawhatchee Bay, Santa Rosa Beach	Speckled trout, brim, sturgeon
March	Fish, waterfowl, wildlife kill	West, north, & south Choctawhatchee Bay and area bayous	Catfish, alewife, gar, jellyfish, catfish, blue crabs, baitfish, ducks, pelicans, otter
April	Fish kill, reports of low DO	Choctawhatchee Bay, Niceville, eastern Santa Rosa Sound	Gar, croaker, pinfish
Sources: FFWCC Florida Marine Research Institute, DACS Shellfish Environmental Assessment Section, and NOAA National Marine Fisheries Service (NMFS).			

Some species of plankton produce neurotoxins that can be transferred through the food web and affect aquatic life and potentially humans. Blooms of such species are generally referred to as harmful algal blooms (HABs). It should be noted that some blooming species do not produce toxins, and not all potentially toxic species bloom (Steidinger n.d.). The most prominent source of HABs in the Gulf of Mexico is *Karenia brevis* (formerly designated *Gymnodinium breve*). This is a dinoflagellate phytoplankton with two whip-like appendages that propel it through the water at speeds of up to one-meter per hour (Steidinger n.d.). The species can tolerate a high temperature range and generally prefers relatively high salinity. Blooms of *K. brevis* are thought to be typically initiated 40-80 miles offshore of the Gulf Coast, moving onshore with winds and currents. Water circulation patterns and winds influence bloom occurrence and distribution. Blooms that enter poorly flushed bays and bayous may be concentrated and persistent.

Fish kills are frequently associated with Gulf of Mexico red tides (Steidinger n.d.). A neurotoxin produced by *K. brevis* causes paralysis that impairs the ability of fish to breathe. Red tide toxins may also affect zooplankton, fish, sponges, marine mammals, and seabirds, either directly or through

consumption of contaminated prey (Woods Hole Oceanographic Institution n.d.). Marine mammals that have been affected include whales, dolphins, and manatees. In 1996, approximately 149 Florida manatee deaths were attributed to an unusually persistent bloom of *K. brevis* in southwest Florida (Steidinger n.d.).

Shellfish such as mussels, oysters, and clams become toxic when they filter high concentrations of *K. brevis* from the water. The toxins can reach humans through consumption of such contaminated shellfish. Symptoms of Neurotoxic Shellfish Poisoning (NSP) include tingling or numbness of the mouth and throat, muscular aches, dizziness and gastrointestinal distress. To protect consumers, the state closes shellfish beds affected by HABs to harvest. No human deaths have been associated with a Gulf of Mexico red tide (Steidinger n.d.). People can also be affected by what is referred to as the "red tide aerosol," whereby toxins become airborne in sea spray. When exposed, some experience throat, respiratory, and eye irritation.

A number of authors have suggested mechanisms by which human activities may have affected the intensity, distribution, prevalence, or recognition of HABs (Anderson et al. 1982; Anderson 1989; Smayda 1990; Gowen and Bradbury 1987; Hallegraeff and Bolch 1992; and Reide et al. 1990). These include: a) nutrient enrichment of coastal waters, leading to a selection for and proliferation of, harmful algae; b) aquaculture operations that enrich surrounding waters and stimulate algal growth; c) development of new fisheries that reveal the presence of indigenous harmful algae; d) dispersal of HAB species via ballast water or shellfish seeding; and e) increased scientific and regulatory scrutiny and improved analytical capability.

The degree to which nutrient enrichment from human and other sources affect the prevalence of HABs, however, is subject to debate. Harmful algal blooms and adverse effects on animals and humans have been documented in Florida since at least 1530 (Steidinger n.d.). In the northern Gulf of Mexico, it appears that most red tides initiate offshore in waters that normally have relatively low nutrient concentrations. Research has indicated that phytoplankton production is enhanced by fixation of atmospheric nitrogen by the cyanobacterium *Trichodesmium* spp. (Berman-Frank, et al. 2001). Observations by Lenes et al. (2001) further suggest that *Trichodesmium* activity and subsequent HABs in oligotrophic Gulf waters may tend to follow atmospheric deposition of iron in the form of dust originating in Saharan Africa.

Holmes Creek Watershed

With a watershed covering approximately 85,600 acres, Holmes Creek is the largest Florida tributary of the Choctawhatchee River and Bay system. In its upper reaches, the creek is generally slough like (Thompson n.d.). Beginning at its confluence with Hard Labor Creek, however, it receives discharges from a series of Floridan Aquifer springs (Figure 6) and takes on the characteristics of a karst stream (Pratt et al. 1989). Because it is relatively unique in certain characteristics and issues among the major tributaries, Holmes Creek merits particular management attention.

Being distinctive from the alluvial streams more common in the western Panhandle, Holmes Creek has significance for the region's biodiversity. Livingston et al. (1987) found the creek to have the most diverse fish habitats and highest species richness in the Choctawhatchee River basin. Hoehn (1998) identified Holmes Creek as supporting several species of rare or imperiled fish. Recent investigations (Thompson n.d. and Schlenk et al. 2001), indicate the significance of the stream for fish and snail diversity and the potential for human impacts. Spring areas in particular were identified as vital for the survival of endemic and rare species and subject to anthropogenic impacts. Recent research by Hightower et al. (in press) notes the importance of spring discharge and water quality in Holmes Creek for critical Gulf sturgeon habitat downstream of the confluence of the creek and the Choctawhatchee River.

Figure 6. Selected Spring Discharges Along Holmes Creek

East of the southern reach of Holmes Creek is a region of karst lakes and sinks. Much of this area provides recharge to the Floridan Aquifer. West of the Econfina Recharge Area (ERA), delineated by Richards (1997), lakes and basins recharge that portion of the aquifer that discharges via the springs in Holmes Creek. Maintaining this surface-groundwater system is important to the character of Holmes Creek and the Choctawhatchee River. Additionally, the region provides significant habitat and public use resources and supports distinctive littoral vegetation communities and a number of rare plants.

The NWFWMD has acquired a major portion of the ERA to protect groundwater recharge, surface waters, associated natural resources, and public uses. Continued public acquisition west of the ERA could provide similar protection for the recharge of springs discharging into Holmes Creek and would maintain an ecological connection between the Econfina Creek and Holmes Creek water management areas.

Although the Holmes Creek basin is less intensively developed than some areas of the Choctawhatchee River and Bay watershed, it does face significant management challenges. Past studies of the creek have suggested that water quality has been impacted by agricultural runoff and wastewater treatment plant discharges (Livingston et al. 1987; Hand et al. 1996). The work by Schlenk et al. (2001) indicates that heavy recreational use, particularly in the vicinity of springs, has adversely affected biodiversity. Additionally, residential and other development in the vicinity of the stream and in the recharge area has the potential to result in NPS pollution of the creek and adverse effects on groundwater recharge.

Three of the Choctawhatchee watershed's 303(d)-listed impaired waters—Camp Branch, Fish Branch, and Alligator Creek—are within the Holmes Creek basin. Additionally, of the five point sources that discharge directly to surface waters in the watershed, four are within the Holmes Creek basin. Thus, it would be appropriate to evaluate whether improved wastewater treatment, NPS pollution abatement, and improved management of recreational and other activities focused on the creek can be achieved. A preliminary evaluation of potential management options suggests consideration of the need and potential for the following:

a) move point source discharges to upland reuse and sprayfield disposal, and implement improved treatment technology and standards;

b) evaluate the need and potential for enhanced riparian buffer zones along the creek and its tributaries, and implement them where appropriate;

c) acquire additional public lands in the creek basin to protect habitat, groundwater recharge, water quality, and associated public benefits and uses;

d) ensure nutrient management, erosion control, and other BMPs are effectively implemented;

e) carefully manage springs and other recreational areas of the creek to ensure that use is compatible with protection of the stream and its biota; and

f) protect the contributing Floridan Aquifer recharge area from impacts to water quality and quantity.

Funding

Ecosystem Management and Restoration Trust Fund/Water Management Lands Trust Fund

The NWFWMD's SWIM program has primarily been funded through the Ecosystem Management and Restoration Trust Fund. In the past several years, funding for SWIM through this source has been limited. The 2001-2002 Florida Legislature, however, appropriated funds specifically for implementation of surface water improvement projects in Choctawhatchee Bay. Additionally, the District has the ability to draw on the Water Management Lands Trust fund for priority SWIM

activities. The Northwest Florida Water Management District annually receives up to ten percent of this fund, which is derived from a statewide documentary stamp tax on real estate sales. The ability of this fund to meet the needs identified in SWIM plans is limited, however, as there are six approved SWIM plans for the Northwest Florida Water Management District depending on it. Additionally, this fund is also used for acquisition and management of District lands, water supply planning, water resource development projects, and debt service on land acquisition bonds.

Florida Forever

The Florida Forever Act provides for annual funding over ten years for land acquisition and capital project expenditures that achieve a combination of conservation goals. The funding is split between water management districts, DEP, the FCT program, DEP Division of Parks and Recreation, DEP Greenways and Trails, DACS, and the FWCC. Water management district funds can be used for traditional Save Our Rivers projects, SWIM projects, stormwater projects, and water resource development projects that assist in meeting the goals of Florida Forever. At least 50 percent must be used for land acquisition.

Florida Forever provides a potential source of funds for implementing capital project priorities identified by the SWIM program. It cannot, however, be used to accomplish the initial background studies that are typically necessary for the development and prioritization of project plans. Accomplishment of these activities would depend on funding from SWIM, local governments, and state or federal grant sources.

Use of SWIM to Leverage other Funding Sources

As has been demonstrated by the Ecological Restoration project and many other District projects, the SWIM program provides an effective source of matching funds for federal grant programs. Project implementation also frequently results in complementary expenditures by local governments and state agencies, which further multiply SWIM funding. As a result, funds applied to the SWIM program consistently act to concentrate additional funding on northwest Florida priorities.

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