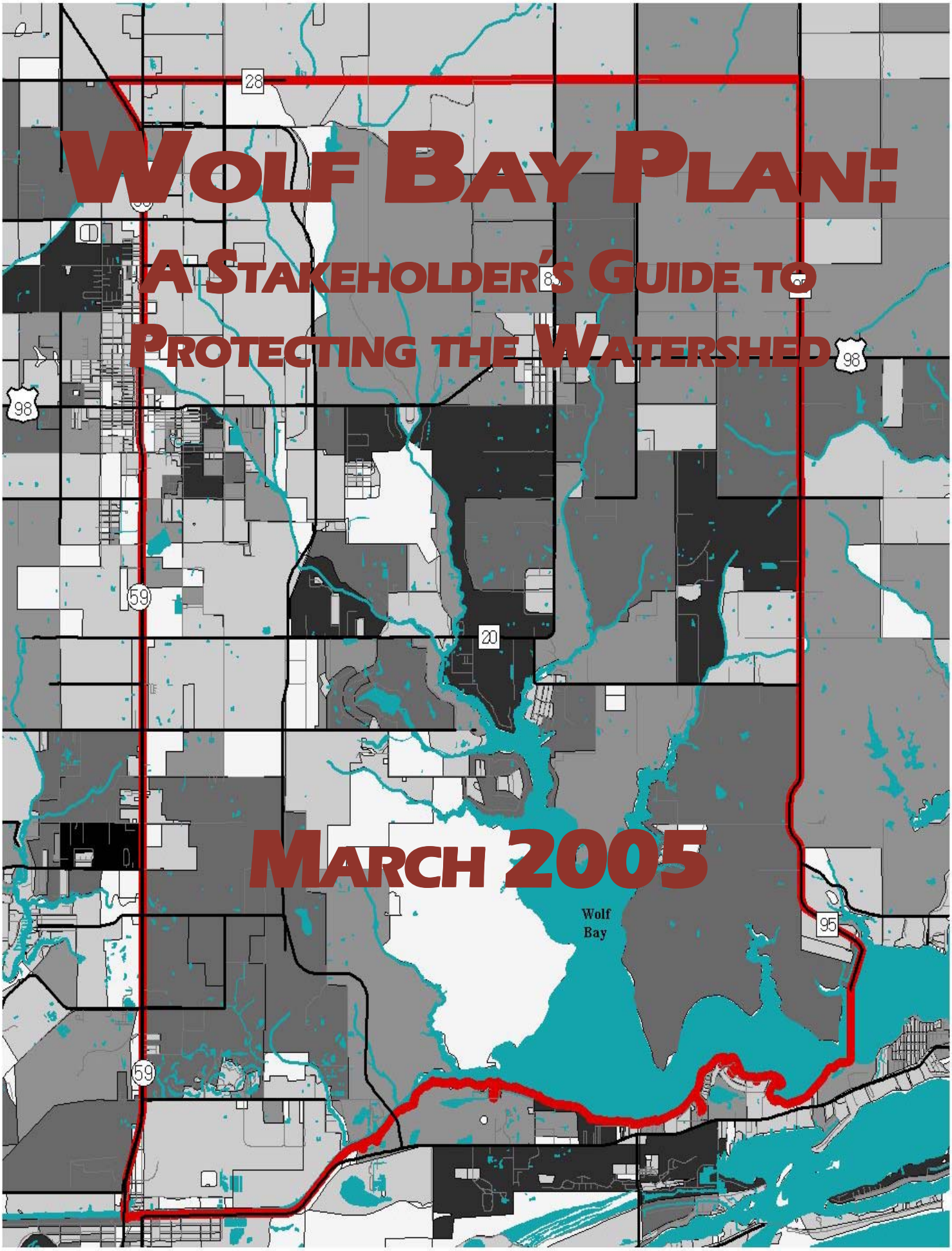
Wolf Bay Plan:

A Stakeholder's Guide to Protecting the Watershed



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Executive Summary

The Wolf Bay area has been fortunate to have a number of citizens concerned with the water quality of the watershed. In 1998, the Wolf Bay Watershed Watch (WBWW) formed "to promote the conservation, protection and improvement of the natural resources within the Wolf Bay Watershed." This group of individuals worked with the Alabama Department of Environmental Management (ADEM) and the Alabama Coastal Foundation (ACF) towards achieving their objectives. In November 2001, the Alabama Coastal Foundation *(with considerable support from WBWW)* received an Environmental Protection Agency (EPA) 319 grant award from ADEM, to produce a nonpoint source pollution management guide for the Wolf Bay watershed using broad based stakeholder input.

The Project hosted a community meeting kickoff in February 2002 at the Miflin Community Center to encourage citizen input and participation. Flyers were posted throughout the watershed, along with additional support from the local newspapers. The purpose of the meeting was to explain nonpoint source pollution, discuss the need for a watershed management plan, and discuss perceived problems and threats in the watershed. Fifty-eight professional and citizen participants came out to support the project and learn ways to involve themselves in the project.

The project continued over the next 36 months to host monthly citizen advisory committee meetings and periodic technical advisory committee meetings to refine the project document and fully develop the following vision, mission, objectives and action plans.

The watershed project is a dynamic process. This document has gone through technical and citizen review but continually remains "in draft form" due to the ever constant alterations to our land. The watershed project will update this plan as often as feasible to ensure the plan does not become outdated.

Vision

The Wolf Bay Watershed will be a clean vibrant ecological community with citizens dedicated to the preservation, protection, and restoration of its vital natural resources.

Mission

The purpose of the Wolf Bay Watershed Project is to develop and implement a plan to protect and improve the natural resources of the Wolf Bay Watershed.

The strategy for improving the watershed is based on the following objectives (based in order of importance within each category):

Cooperative Efforts Objectives

Cooperative efforts are essential to the success of the action strategies. These objectives are specific to action strategies which yield a pollutant reduction.

1. To reduce nonpoint source pollution from:
   a. Agricultural activities, including sod farms, golf courses and nurseries.
   b. Construction
   c. Land clearing and development activities, including the conversion of agricultural and silvicultural lands to residential and urban uses.
2. Decrease/reduce water pollution from stormwater, sewage and septic discharges from residential subdivisions and commercial areas.

Education Objectives

1. To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Monitoring Objectives

1. To identify all research conducted within the watershed that will assist decision makers in policy decisions.
2. To better understand the effects of nutrient runoff from golf courses, sod farms, and nurseries by developing a nutrient monitoring program.
3. To better understand and research fish tissue samples for metal contamination.
4. To better understand and research benthic, sediment and biotic samples to determine if contaminants such as pesticides are affecting aquatic or aquatic life dependent life.
5. To determine sources and levels of bacterial contamination.

Organizational Objectives

1. To keep the efforts of the watershed project ongoing, establish a watershed project coordinator.
2. To establish an organizational committee with representatives from each Hydrologic Unit Code (HUC) watershed or creek (Miflin, Wolf, Hammock, Sandy, Graham, Owens) in the project area.
3. Establish an educational center for the community to learn about the watershed resources.

Preservation and Protection Objectives

1. To classify Wolf Bay and its tributaries as an Outstanding Alabama Water (OAW).
2. To acquire land in the watershed, including areas designated as open space and riparian buffers.

3. To protect groundwater resources as well as address the regulations of well water protection in the watershed.
4. Ensure protection of fish and wildlife habitats as well as sensitive habitats such as wetlands, marshes, bogs, grady ponds, long leaf pine flatwoods, and white cedar stands.
5. To preserve family farms and the agricultural/rural heritage of the watershed while protecting water quality.

Program Partnerships Objectives

Program Partnership Objectives are similar to Cooperative Efforts but the success of these action strategies are dependent upon external partnerships.

1. Cooperate and develop relationships with local municipalities, government officials, governmental agencies, large landowners and businesses.
2. Develop better relationships with contractors, developers, utility companies, farmers, businesses and homeowners through the Clean Water Partnership, or any way possible.
3. Promote planning and zoning that will protect ecologically significant areas.
4. Work with Baldwin County to identify unpaved roads within the watershed and prioritize paving schedule.

The recommendations in this report are based on the best available data and factual information provided by the following agencies:

Alabama Cooperative Extension System (ACES);
Alabama Department of Conservation and Natural Resources, State Lands Division, Coastal Section (ADCNR);
Alabama Department of Conservation and Natural Resources, Marine Resources Division (MRD);
Alabama Department of Environmental Management (ADEM);
Alabama Department of Public Health (ADPH);
Baldwin County Commission/Planning and Zoning Department;
City of Foley;
City of Orange Beach, Community Development Department;
Dauphin Island Sea Lab (DISL);
Gulf Coast Convention and Visitors Bureau (CVB);
Natural Resources Conservation Service (NRCS);
South Alabama Regional Planning Commission (SARPC);
U.S. Fish and Wildlife Service (FWS);
United States Army Corps of Engineers (USACE);
Weeks Bay Watershed Project;
Wolf Bay Watershed Watch (WBWW).

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I. INTRODUCTION

The Wolf Bay area has been fortunate to have a number of citizens concerned with the water quality of the watershed. In 1998, the Wolf Bay Watershed Watch (WBWW) was formed "to promote the conservation, protection and improvement of the natural resources within the Wolf Bay watershed." This group of individuals formed when residents along the bay and its tributaries became increasingly concerned about the sedimentation, odor and discoloration of the water within the bay. Wolf Bay Watershed Watch worked with the Alabama Department of Environmental Management (ADEM) and the Alabama Coastal Foundation (ACF) towards achieving their objectives. In November 2001, ACF *(with considerable support from WBWW)* received an Environmental Protection Agency 319 grant award from ADEM for the Wolf Bay Watershed Project.

The Project hosted a community meeting kickoff in February 2002 at the Miflin Community Center to encourage citizen input and participation. Flyers were posted throughout the watershed, along with additional support from the local newspapers. The purpose of the meeting was to explain nonpoint source pollution, discuss the need for a management problem, and discuss perceived problems and threats in the watershed. Fifty-eight professional and citizen participants came out to support the project and learn ways to involve themselves in the project.

The Wolf Bay Stakeholder's Guide is based on the result of two and one-half years of community meetings and technical workgroups in the Wolf Bay watershed by the Wolf Bay Watershed Project. The Wolf Bay Watershed Project was initiated to develop a plan for improving and protecting Wolf Bay by addressing nonpoint source pollution. Interagency coordination has assured that the project is technically consistent with the Coastal Zone Management Act Reauthorization Amendments (CZARA) of 1990 and other Federal, State, and local regulations.

The Wolf Bay Watershed Project is a multi-agency project directed by the Citizens Advisory Committee (CAC) that is supported by a Technical Advisory Committee (TAC) *(Appendix 1)*.

A. Purpose of Plan

The mission of the Wolf Bay Watershed Project is to develop and implement a plan to protect and improve the natural resources of the Wolf Bay Watershed. This management plan describes the twenty objectives from which strategies were based. The strategies have been developed through a series of community meetings and regularly scheduled Citizens Advisory Committee (CAC) meetings to solicit public input. In addition, technical assistance was provided by local, state and federal agencies to ensure that the project meets their needs and objectives.

B. Overview of Report

This management plan was developed to serve as a planning and management tool for local decision makers. The community has worked to provide the necessary information needed by coastal decision makers to make environmentally sound judgments for the watershed. Section II of the management plan provides a description of the watershed that includes its location, environmental importance, climate, physical and geologic features, soils, land use and population growth, economic development and hydrology. Section III focuses on the issues that have been identified as environmental concerns by the watershed project. Issues include documented non-point source pollution problems as well as perceptions of local citizens. Section IV describes the current management methods (regulatory and non-regulatory) that are available to help protect water quality. Section V contains the Action Strategies for Protection, i.e., the specific action strategies that will need to be implemented to achieve the objectives of the Watershed Project. Section VI is Management Plan Implementation. Section VII& VIII are perhaps the most important components of the plan—the tables and figures that elected officials, agencies and watershed residents will utilize to address nonpoint source pollution and make sound decisions based on credible data.

C. Perceptions or Why Do We Need a Watershed Plan?

Whenever a grassroots organization or governmental agency initiate a project there is a perception that something bad has happened or that someone is in trouble. During the early stages of the community kickoff meetings there were a significant number of people that felt they knew what the problems were in the watershed. These concerns were noted and addressed in a non-judgmental and scientific approach. The following are those initial perceptions and how they were addressed.

Wastewater

Significant concerns were raised about the possible overflow of nutrients and bacteria from the wastewater treatment facility in Foley due to heavy odors after significant rainfall events. Presentations were made by Riviera Utilities representatives and data collected which did not substantiate this claim.

Additional concerns were raised regarding citizen understanding of septic tanks and the need for maintenance. The Baldwin County Health Department is working hard to address these citizen concerns and areas for improvement. In 2004, a new rule was passed which requires all new onsite sewage disposal systems to have an effluent filter installed in the septic tank. The filter improves the treatment of the sewage and prolongs the life of the system. All new septic tanks are recorded utilizing GPS, since 2004.

Lack of grease traps at businesses were also of concern because of the potential to cause sewage overflows. In 1994, as part of the Standard Plumbing Code, the City of Foley passed an ordinance requiring grease receptors.

There is also a lack of understanding regarding the land application of sewage sludge.

Erosion / Non-Point Source Pollution

Many individuals expressed a concern of increases in erosion and sedimentation. There was also a concern to the effects on wildlife, habitat and water quality. Through long term data collection and continued monitoring, the causes of erosion will be identified and plans developed to counteract the problems to the greatest extent possible.

Boat Wakes

Many residents expressed the belief that boat wakes and jet skis have created a loss of habitat for fisheries as well as eroded their property. Action items addressing these concerns were developed in the bulkheading and recreation sections.

II. DESCRIPTION OF THE WATERSHED

The Wolf Bay watershed encompasses a rich mosaic of upland and coastal habitats that support thousands of plant and animal species. The beauty of this area continues to attract large numbers of new residents who seek to make their homes along the shores as well as in woodlands and on farms in the watershed. Estuaries like Wolf Bay, where salt water and freshwater mix, are among the world's most important and productive ecosystems. The resources within the Wolf Bay watershed include fresh and saltwater fish, crabs, shrimp, dolphin, birds and waterfowl. This estuary serves as a nursery area for many types of fish, crab, shrimp, and other organisms. Parts of the watershed also contain the following federally listed species: Red Cockaded Woodpecker and the Bald Eagle. Imperiled habitats include Gulf Coast Pitcher Plant Bogs, Atlantic White Cedar Swamps and Long Leaf Pine Savannahs. There are also active Osprey nests within the watershed. Understanding, restoring, and preserving the watershed's important habitats are critical to protecting the long-term integrity of Wolf Bay *(Table 1, Species of Concern).*

A. Location

The Wolf Bay Watershed Project area includes about 60,160 acres located in Alabama's Baldwin County (*Figures 1,2&3*). Wolf Bay is a sub-estuary of Perdido Bay and has several tributaries, primarily Wolf, Sandy, Miflin and Hammock Creeks. Numerous municipalities exist within the watershed, including: Foley, Elberta, Gulf Shores and Orange Beach.

Watersheds do not follow geographical or jurisdictional boundaries. However, to take into account the political needs of this project, the watershed project area is bounded by County Road 28 (north), the Intracoastal Waterway (south), County Road 95 (east), and US 59 (west). It is important to note that this watershed incorporates portions of several Hydrologic Unit Codes (HUC): 03140107-020, 03140107-030, and 03140107-040 (*Figure 4*). During the course of this watershed project, the USGS has redefined the HUC codes for the watershed. These changes will alter previous studies and boundaries and must be addressed as the plan is updated in the future (*Figure 5*).

B. Environmental Importance

Worldwide, greater than 40 percent of the population lives within 100 km of the coast. The continental U.S. coastal zone represents 17 percent of the land area but contains greater than 50 percent of the population and it is estimated that the coastal population will increase by another 28 million people by 2015 (NOAA 1998). Increasing population and development threaten further impairment of estuarine and coastal ecosystems. It is also clear that ecosystem protection and restoration is inherent to cultivating and maintaining our coastal ecosystems' health in the future.

Oral histories taken of watershed residents indicate the Wolf Bay area has experienced a decline in its natural resources. These residents also profess coastal marshes and abundant shellfish, crustaceans, and finfish observed in the past have disappeared or are in rapid decline.

The Wolf Bay area is becoming increasingly residential and has a long history of agricultural usage. Land-use practices and population growth are primarily responsible for the perceived decline in this area's estuarine and coastal living resources.

Wolf Bay and its tributaries provide excellent sources of fishing, boating, sailing, canoeing, kayaking, skiing, bird watching, photography, swimming, and more. All of these recreational activities promote tourism — Baldwin County's biggest economic resource.

In March 2001, the Wolf Bay Watershed Watch requested ADEM upgrade portions of the watershed as an Outstanding Alabama Water (OAW). The OAW water use classification is defined "for high quality waters that constitute an outstanding Alabama resource, such as waters of state parks and wildlife refuges and waters of exceptional recreational or ecological significance." Currently, Wolf Bay holds three classifications: "Swimming and Whole Body Contact (S)," "Shellfish Harvesting (SH)" and "Fish and Wildlife (F&W)." An OAW classification is one of the first steps toward protecting the Wolf Bay watershed because the classification has higher standards of water quality and protection measures such as required best management practices *(Table 2, Current and requested use classification).*

C. Climate (Paraphrased from Schroeder 1996)

The Wolf Bay watershed lies in the humid subtropical climate region (Trewartha and Horn 1980), a climate that dominates the Gulf Coast states and Florida peninsula. Summers are characteristically warm while winters are relatively mild with occasional cold waves. In the contiguous United States, this region is second only to the Pacific Northwest in total annual rainfall (Baldwin 1973), receiving precipitation from a combination of winter storms, thunderstorms and tropical systems.

Summer Climate

High barometric pressure over the Atlantic Ocean is a dominant factor in the summer weather pattern. This semi-permanent weather system, called the subtropical anticyclone, provides a persistent southerly flow of humid air from the Gulf of Mexico. This air is normally unstable and thus, is easily lifted and condensed through convective heating or sea breeze convergences. As a result, thunderstorms are frequent and account for the major portion of summer rainfall. The

frequency of thunderstorms over coastal Alabama is surpassed in the United States only by the Florida peninsula.

The influx of moisture from the Gulf of Mexico, in combination with numerous thunderstorms, produces a small diurnal temperature range during the summer. Average maximum air temperatures during the summer months vary from the upper 80ºF to the low 90ºF range in the vicinity of the Wolf Bay watershed. Although temperatures may rise rapidly during the morning hours, the high frequency of thunderstorms usually limits the daily temperature peak at around 90 to 92ºF (Williams 1973). Because of the high absolute humidity during this period, temperatures of 100ºF or higher are occasionally observed in the bay area.

Winter Climate

During the winter months, the Atlantic subtropical anticyclone retreats southward allowing the polar front to make numerous incursions into the Gulf States region from September to May. The arrival of polar air is frequently marked by heavy rain and a strong wind shift from southerly to northwesterly. When extremely low temperatures occur for at least two successive nights, freezing of the bay surface may take place near shore and up creeks.

Winter Storms

Although summer thunderstorms are numerous and greatly contribute to high annual rainfall totals, winter storms also produce heavy downpours. Those winter storms with the greatest impact upon the estuarine system originate in west Texas or along the Texas coast and are usually formed by upper atmosphere troughs that track across the southwestern U.S. Surface cyclones developing beneath these troughs either move eastward from Texas across the Gulf States or along the coast. Storms of this type gain enormous energy from the contrast between warm Gulf waters and cold polar air positioned over the Gulf States. The high frequency of winter storms accounts for a secondary rainfall maximum in March for many Gulf coast regions. For areas around the Wolf Bay estuarine system, July slightly exceeds March as the wettest month with an average of more than 17.8 cm. (7 in.) of rain (Schroeder et al. 1990b).

Tropical Storms

The central Gulf Coast had one of the highest frequencies of hurricane landfall in the United States for the period 1871 - 1990. The average occurrence of tropical storms from 1871 was 2.2 storms making landfall along every 18.5 km (10 nautical miles) stretch of the Gulf Coast (Neumann et al. 1981). Tropical storms are capable of producing enormous rainfalls over the bay and surrounding areas. Rainfalls of 13 to 25 cm (5 to 10 in.) are not unusual. However, hurricane rainfall totals vary considerably from storm to storm. When totals are high, the combination of flood runoff, erosion and the destruction of trees and buildings along the shoreline results in the

transport of large amounts of sediment and debris into parts of Wolf Bay watershed and into Wolf Bay itself. This can have a profound post-storm impact on the ecosystem.

D. Physical and Geologic Features (paraphrased from Chermock 1974)

The Wolf Bay watershed lies within parts of the Southern Pine Hills and Coastal Lowlands subdivisions of the East Gulf Coast section of the Coastal Plain physiographic province. The Southern Pine Hills subdivision is a moderately dissected, southward sloping plain developed on sediments of Miocene to Pleistocene age (Boone 1974). In coastal Alabama, the Southern Pine Hills range to 100 feet in elevation with numerous shallow saucer-like depressions. These depressions are scattered over nearly level interfluves and hold water most of the year.

The Coastal Lowlands subdivision is an essentially flat to gently undulating plain extending along the coast adjacent to Mississippi Sound, along the margins of the bays and behind the coastal beaches. They merge inland with the alluvial-deltaic plains of the Mobile-Tensaw and Perdido fluvial systems and smaller streams of the area. The lowlands are inundated by many tidewater creeks and rivers and fringed by tidal marshes. Alluvial, deltaic, estuarine, and coastal deposits of Pleistocene and Holocene age underlie the Coastal Lowlands.

The Southern Pine Hills and Coastal Lowlands are separated by erosional escarpments with relief up to 100 feet. At their seaward margin they are curvilinear to the coast. They curve and extend inland forming subparallel facing escarpments that parallel the streams of the area. Carlston (1950) has interpreted the southern parts of these erosional escarpments as marine wave-cut scarps of Pamlico (Pleistocene) age. It is believed that the Wolf Bay embayment was formed during the Pleistocene (Smith 1986).

E. Soils

Soils are grouped according to common characteristics. Soils for the watershed are grouped into two major soil orders: ultisols and entisols.

Ultisols

The zonal soils consist of soils having well-developed profile characteristics that reflect the influence of the active factors of soil formation. The active factors are climate, vegetation, and animal life. The zonal soils have an alluviated A horizon that is underlain by a finer textured alluviated B horizon. The C horizon varies in texture, but is generally coarser textured than the B horizon. These soils are well drained and acid. Zonal soils are considered to be the more

productive agriculture soils. This group makes up 37% percent (22,259 acres) of the total watershed. The major soils are Norfolk-Klej-Goldsboro Association.

Characteristics of the Norfolk Series:

- Consists of deep, well drained soils that are strongly acidic
- Developed in sandy loam and sandy clay loam and found on uplands of coastal plains
- Mainly near Elberta
- Natural vegetation is Longleaf Pine and Short Leaf Pine

Characteristics of the Klej Series:

- Consists of deep, moderately well drained soils—strongly acid
- Developed in loamy sand and loamy fine sand on uplands
- Mainly near Elberta
- Natural vegetation is Longleaf Pine, Slash Pine, Scrub Oak, Gum and Sassafras

Characteristics of the Goldsboro Series:

- Consists of deep, moderately well drained soils—very strongly acid
- Developed in sandy loam and sandy clay loam on uplands of the Coastal Plains
- Mainly near Elberta and Foley
- Natural vegetation is Longleaf and Slash Pine

Entisols

The entisols consist of soils that lack distinct genetically related horizons, generally because of youth, resistant parent material, or steep topography. These soils are normally well drained to excessively well-drained and are sands and loamy sands. This group makes up 36% percent (21,657 acres) of the watershed area. The major soils are Lakeland-Plummer Association.

Characteristics of the Lakeland Series:

- Consisst of deep, excessively-drained soils that are strong acid to very strong acid
- Developed in a thick sand and loamy sand and are found in uplands
- Natural vegetation is Longleaf pine and Slash pine

Characteristics of the Plummer Series:

- Consists of deep, poorly-drained soils that are very strongly acid
- Developed on loamy sands and found in uplands
- Found along drainage ways
- Natural vegetation dominated by pitcher plant bogs and pine savannahs

Hydric Soils (found in both Entisols and Ultisols)

These poorly drained much to moderately fine textured soils occur in depressional areas and along upland drainage ways within coastal plains flatwoods. The remaining acreage is in water or the other 3 minor soil orders. Soil map to be added when made available by NRCS.

F. Land Use and Population Growth

The Wolf Bay Watershed Project area encompasses about 60,160 acres in Baldwin County in southwest Alabama. Numerous municipalities exist within the watershed including: Foley, Elberta, Gulf Shores, and Orange Beach. The table below represents NRCS 1998 data for acreage in the Miflin and Wolf Creek Subwatersheds. This is larger than the project boundary but provides a fairly accurate portrayal of the watershed land use.

Land Use	Total Acres	% Acreage
Agricultural	Cropland: 9,000 Pastureland: 1,600	13%
Forest Land	38,273	53%
Urban Land	15,000	21%
Other		13 %
Total Land In Watershed	71,733	

Note: the land use represented above is very different from the 1992 USGS land use map (Figure 6). It is important to understand the growth within the watershed during the period of time. Also, USGS and NRCS utilize different definitions of their land use classifications, thereby making the data difficult to compare. ***The Watershed Project Technical Advisory Committee strongly suggests the development of a new land use map based on the 2004 Hydrologic Unit Codes*** *(Figure 5). In the meantime, the Wolf Bay Watershed Project will continue to seek the best data for this plan and input as it becomes available.*

The watershed is primarily rural, but it is within commuting distance from the metropolitan areas of Mobile, Alabama and Pensacola, Florida. Baldwin County rallies with Shelby County for the honor as the fastest growing county in Alabama.

In 1998, the Natural Resources Conservation Service developed a Watershed Assessment and Characterization. The characterization broke the county up utilizing the 11 digit HUC codes. Assessments included notations on land use, streams, wildlife, endangered species, and cultural resources (*Figure 4*).

The Baldwin County Land Use Plan was designed as a general guide for long-range development in the county. The Baldwin County Land Use Plan indicates a likelihood of increased residential growth, especially along waterbodies, for the area of Baldwin County that includes the Wolf Bay watershed. Recently, rapid commercial growth has occurred in the area, especially along transportation arteries. The implications of this growth, both short-term and long-term, indicate that management of growth with regard to resource protection will be a challenge in the Wolf Bay watershed.

Relatively undisturbed wooded lands surround Wolf Bay and its tributaries. These include parcels that have a significant impact on the health and wellbeing of the natural resources (including clean water) of our watershed. The majority of land in the watershed is owned by a few entities. The purchase and protection of these parcels would provide long term habitat for resident and migratory wildlife, rare and protected species, and a substantial riparian buffer to protect water quality *(Figure 16).*

Other small landowners have key parcels that would provide public access to our bay for recreational and educational uses. These landowners are very interested in making sure the land is protected and preserved but are pressured to sell out by developers. Two significant land parcels are on Wolf Creek and at the mouth of Hammock Creek. One parcel presently has a boat ramp and wet slips and is for sale. This parcel would be a superb site to provide Foley with a park and public access to Wolf Bay. The other parcel landlocks 500 acres of the Brown Foundation between Hammock Creek and Baldwin Baptist Camp. The purchase or lease of both of these lands would allow the public a wonderful opportunity. These would be ideal for a natural recreational facility that would afford visitors the opportunity to canoe, sail, bird watch, hike, bike, etc. It would also provide substantial space for an educational and research facility while preserving one of the largest parcels of undisturbed land areas along the northern portion of Wolf Bay *(Figure 16).*

Population Data

Census results for Baldwin County in 2000 put population numbers for Baldwin County at 140,415, up 43% from the 1990 population of 98,280. It is important to note the US Census Bureau does not include migratory residents or tourists in its population figures but the Gulf Shores Convention and Visitor's Bureau estimated 26,045 transient winter residents. Listed below are population statistics from the US Census Bureau, 2003.

County/City	July-02	July-01	Census 2000
Baldwin	147,932	144,787	140,415
Elberta	563	558	552
Foley	8,791	8,336	7,590
Orange Beach	4203	4,076	3,784

(Figure 8, Population)

G. Economic Development

Current Economic Status

Good environmental quality in the Wolf Bay watershed is essential to the economic health of the region in many ways. Traditional land uses such as agriculture and silviculture continue to thrive in this portion of Baldwin County. Baldwin County leads all other counties in the state of Alabama in revenues from tourism, an industry fueled in large part by the abundance of beaches and water-related recreational opportunities and charming rural character.

Baldwin County's beaches, bays and rivers promote an ever-increasing tourism industry. According to the Alabama Bureau of Travel and Tourism (ABTT), tourism-related expenditures for 2001 in Baldwin County were $1.5 billion. Although nationally there has been a decline in tourism the past three years, Alabama experienced a 1% increase. Recreational activities enjoyed by tourists include visiting beaches, fishing, boating, waterskiing, golfing, shopping, hunting and bird-watching.

The Tanger Outlet in Foley, Alabama continues to draw visitors to the Wolf Bay watershed. The Center has exceeded $400 million in sales for each of the last three years. Retail expansion is expected to impact the watershed environmentally and economically.

"Snowbirds" is a term used by tourism agencies to define residents who live in cold climates and winter in temperate areas. Coastal Alabama has a significant population of these winter residents who contribute significantly to the economic status of the area. Also, many of these winter residents become very involved in the community during their stay. In 1999, estimates generated by the Gulf Coast Convention and Visitors Bureau indicate there were approximately 26,045 transient winter residents.

Baldwin County has established a reputation as a retirement community. Several magazines, including "Retirement Places Rated," tout the area as one of the top retirement areas in the country. Census data from 2000 reflects that the "over 65" age group has grown by 45.8% in Baldwin County. New residents are attracted by the relaxed rural character of the area as well as its proximity to the rivers and bays. As in many other communities, the real estate market is closely tied to aesthetic and environmental conditions such as land use and water quality.

In addition to tourism, the economy of the Wolf Bay watershed is heavily dependent upon agriculture. Row crops and sod production are the major farm enterprises *(Table 5, Sod Acreage).*

Listed below are the farming statistics for the Wolf Bay watershed.

Crops	Acres Harvested in Watershed
Corn	525
Soybeans	1,000
Small Grain	1,300
Peanuts	2,350
Cotton	3,550
Vegetable Crops	200

(Source: NRCS, 1998)

Future Economic Development

The 2001 opening of the Foley Beach Express has made land in the watershed more accessible for economic development. Since its opening a plastics plant has located within the watershed and discussions continue regarding malls, car dealerships, bridges, marinas, an Indian casino, and a water park at the Foley Beach Express and Intracoastal Waterway.

This management plan does not have any authority to abate development. However, it is our intention for this management plan to be utilized by area decision-makers when looking at growth opportunities. As the watershed continues to be converted from agricultural land to residential and commercial development and we increase the extent of impervious surface, it is imperative our cities utilize the principles and tools provided in this management plan to develop responsibly *(Figure 12, Impervious surface).*

The watershed project will continue to provide workshops to increase awareness and conservation opportunities for local stakeholders. Residents of the Wolf Bay watershed are also looking to utilize aerial photography to monitor local runoff *(Figure 9, 1996 aerial photography).*

H. Hydrology

Baldwin County is dependent upon groundwater for its water needs. Groundwater is water that sinks through the soil and is stored in underground reservoirs called aquifers. Aquifers are the layers of underground substrate (limerock and sand) that contain the water and are capable of producing water from a well.

The aquifer in the Wolf Bay watershed is the Miocene/Pliocene Aquifer, which is comprised of over 500 feet of inter-layered sands, gravels and clays. Aquifers are recharged or replenished naturally by precipitation, which percolates downward through soil and rock in what is called a recharge area. The recharge process is quite slow compared to the replenishment of surface water. Baldwin County is unique because the entire county serves as its recharge area.

Groundwater also discharges to surface water and provides a high percentage of the base flow to streams and creeks. Natural areas, like wetlands, are critical areas to protect for groundwater recharge.

Residents in the Wolf Bay watershed obtain their water from either public water supply wells or private residential wells. Based on the 2000 ADEM and GSA document "Hydrogeology and Vulnerability to Contamination of Major Aquifers in Alabama: Area 13" there are 11 public water supply wells located in the Wolf Bay watershed project area. One is owned by the Town of Elberta; three are owned by Riviera Utilities (Foley); four are owned by Gulf Shores, and three are owned by Orange Beach. However, efforts have been made by local utilities to build more wells. Foley and Riviera Utilities have bought 484 acres on Graham creek to construct additional drinking wells.

There are approximately 7,484 acres of designated Wellhead Protection Areas within the watershed project boundary. This represents 12% of the total watershed area.

Care for our groundwater must be addressed. Withdrawing large quantities of fresh water for drinking or irrigation uses can lead to groundwater depletion or the intrusion of salt water into our fresh groundwater supplies. Contamination of our groundwater supplies can lead to the contamination of our surface water through groundwater discharge. See chart below for area withdrawal rates. It is important to note individual and drinking water wells are not reflected in these withdrawal rates. Although we believe a map of the water supply wells would be useful information, the Office of Homeland Security has determined the location of these wells should not be published.

Municipality	Withdrawal rate Gallons per day (gpd)
Elberta	678,000 gpd
Foley	2,136,500 gpd
Orange Beach	2, 836,600 gpd

(Source: ADEM, Groundwater Unit, 2002)

III. ENVIRONMENTAL CONCERNS

The Wolf Bay watershed is fortunate to be without significant environmental problems. However, the area is not without pollution.

Point source pollution is an identifiable source that discharges pollutants into the environment. Examples include smokestacks and pipes. Point source discharges to area waterways are managed by ADEM through the National Pollutant Discharge Elimination System (NPDES) permitting process.

There are no permitted point source discharges directly into Wolf Bay; however, a local wastewater treatment plant discharges into Wolf Creek. In addition, there are two wastewater treatment plants (Gulf Shores and Orange Beach) that discharge into the Intercoastal Waterway.

Nonpoint source pollution is the #1 problem in Alabama's coastal area *(NEMO, 2002)*. Also known as polluted runoff, this is caused when water washes over the land and picks up pollutants, sediments and other contaminants. Addressing nonpoint source pollution is a major focus of the watershed project.

Nutrients, including nitrogen and phosphorus, are needed for plant growth but cause problems at elevated concentrations in surface waters. Sources include animal waste, fertilizers, detergents, and failing septic systems.

Pathogens include disease-causing bacteria and viruses associated with the presence of fecal matter. Sources include failing septic systems, wastewater treatment plant (WWTP) overflows, boat sewage and animal waste.

Sediment is eroded soil or sand that is transported to waterbodies via stormwater and can smother aquatic habitat. Sources include poorly managed agricultural practices, dirt roads and construction sites *(Figure 15, Dirt roads).*

Litter or debris is another problem that threatens aquatic life and is unsightly. Sources are directly connected to human activity including illegal dumping, boat waste or litter.

Thermal Stress is an elevation in water temperature that can harm native aquatic species and encourage nonnative species to spread. Sources include runoff from impervious surfaces such as roads, parking lots, and roofs and the removal of streamside vegetation space that provided shading *(NEMO, 2002).*

The majority of these water quality problems can be attributed to wastewater, human impacts, agriculture and construction. Agricultural and residential runoff contributes sediment, nutrients, pesticides and bacteria to surface water.

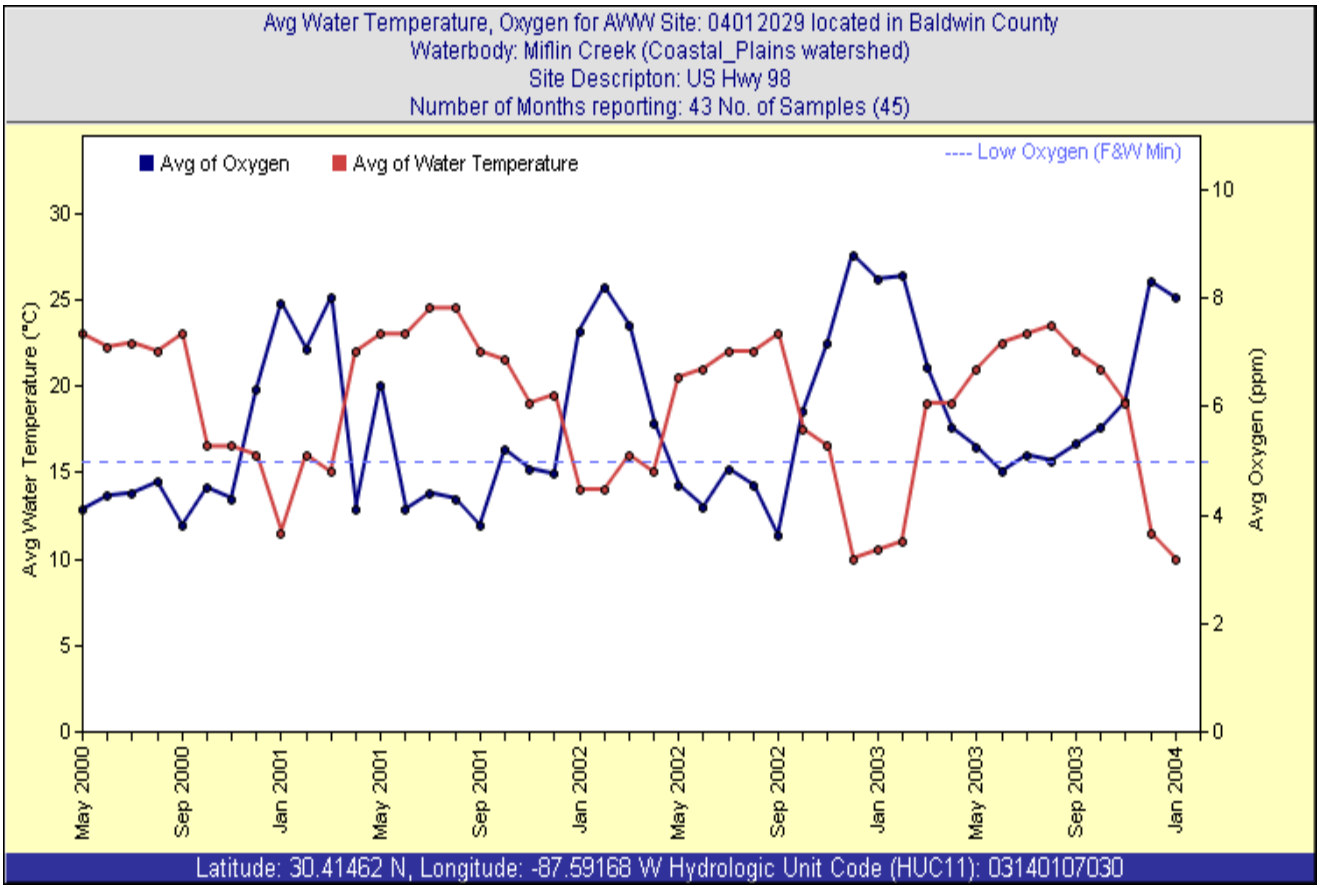
A. Current Environmental Monitoring

1. Residents believe there may be nutrient problems, however there is not sufficient data to determine these effects. A nutrient monitoring pilot project has been developed for the watershed by the ACF and is expected to commence in the Spring of 2005.

2. The ADEM Fish Tissue Monitoring Program was initiated in 1991 as a cooperative agreement with ADPH, ADCNR and the Tennessee Valley Authority (TVA) to monitor fish tissue throughout the state for bioaccumulative contaminants that can cause a risk to human health, e.g. mercury. Each year's sampling locations are determined based upon information available to the ADEM and input from the cooperative agencies.

In 2003, ADEM conducted fish tissue sampling at one location (north of Mulberry Point) in the Wolf Bay watershed. Three samples from two species of fish (speckled trout and ladyfish) were analyzed. None of the results recorded by ADEM exceeded FDA or EPA action levels. There are currently no advisories in place for Wolf Bay (ADEM Lab Report). There are, however, several advisories in place for mercury contamination within coastal Alabama *(Figure 14, ADEM Monitoring Sites).*

3. For the last six years, the WBWW has provided consistent, reliable data to Alabama Water Watch (AWW) at approximately 25 sites within the watershed. Although the number of sites vary annually, these citizen volunteers monitor a variety of parameters including pH, dissolved oxygen, turbidity, alkalinity, salinity, hardness, secchi depth, and air and water temperature. Currently, all sites are monitored for the presence of *E. coli*. All volunteers are certified according to the EPA approved *Alabama Water Watch Quality Assurance/Quality Control Plan.* This collection of data has helped provide insight into the environmental health of Wolf Bay and its tributaries. Their monitoring has shown an increase in alkalinity and pH from 1998-2000. Scientists from AWW believe this trend can be attributed to the drought cycle in south Alabama during this time. Since the drought period is over, the alkalinity and pH have since decreased. This monitoring has also shown the dissolved oxygen levels in Wolf Creek improve as it gets closer to the Bay *(Table 3, Wolf Bay Watershed Watch monitoring stations).*



4. *Enterococcus* monitoring – In June 1999, ADEM, in cooperation with the ADPH, initiated a program to routinely monitor bacteria levels at selected swimming beaches on the Gulf Coast. The effort was later expanded to include additional sites along the Gulf Coast and Mobile Bay. In October of 2000 the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act was signed into law. This act requires the monitoring and assessment of coastal recreational

waters and the prompt notification to the public when sufficient water quality standards are not being met. This program now involves the routine collection of water samples from 24 high use and/or potentially high risk public recreational sites from Perdido Bay to Dauphin Island. (ADEM website) Monitoring sites within the watershed include Orange Beach Waterfront Park on Wolf Bay. Results may be downloaded at www.adem.state.al.us.

5. ADEM has developed water quality criteria defined by each waterbody's use classification. Watershed residents want to maintain or improve current water use classifications. Water use classifications in the watershed include: Swimming and other Whole Body Water-Contact Sports, Shellfish Harvesting and Fish and Wildlife *(Table 4, ADEM Water use classifications).*

6. Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of impaired waters that are not meeting, or not expected to meet, water quality standards. Federal regulations require states to submit a new list at least every four years. The Intracoastal Waterway (ICW) is the only 303(d) listed waterbody within the watershed *(Figure 7, Water quality information*).

Intracoastal Waterway (5 Miles) Waterbody ID—AL/03140107-040-01
This impaired segment, with a designated use of Fish and Wildlife, includes two wastewater treatment facilities, two golf courses, fish hatchery facilities, restaurants and stormwater runoff from businesses and residents. The waterbody is on the 303(d) list for exceeding water quality standards for Dissolved Oxygen and Organic Enrichment. The ICW has been on the list since at least since 1996, and the TMDL is due 2003. Currently, there are efforts underway to delist this waterbody.

Dissolved oxygen (DO) is utilized as a water quality indicator because most aquatic plants and animals need oxygen to survive. These plants and animals obtain most of it from oxygen dissolved in the water. Simplistically, dissolved oxygen decreases with increasing depth, temperature and salinity. It also decreases in the presence of oxygen-demanding wastes, such as sewage. Organic enrichment (OE) occurs when organic matter exceeds the water's capacity to maintain adequate levels of dissolved oxygen (DO) for normal respiration and decomposition processes. Decay of organic matter in organically enriched waterbodies can create DO depletion resulting in fish kills.

B. Needed Environmental Monitoring

1. Additional fish tissue sampling is needed to see if there is a mercury problem in the fish that inhabit Wolf Bay and its tributaries.

2. Further bacteriological monitoring is needed in areas of high contact (swimming holes and popular swimming creeks) to determine if the waters are safe for swimming and fishing.

3. Benthic studies
   a. Fish
   b. Macro
   c. Sediment samples need to be analyzed and routinely monitored for metal and pesticides contamination, phosphorus and bacteria contamination. All of these can remain in the sediment until disturbed.

4. Total suspended solids (TSS) analysis is also needed.

5. Nutrient/pesticide monitoring is needed to determine whether their sources and levels.

Note: This list of monitoring needs is not based on any order of preference.

IV. CURRENT MANAGEMENT METHODS

The Wolf Bay Watershed Project has developed this Stakeholder's Guide for the citizens of Wolf Bay to act as guidance in future project implementation to protect water quality. The success of this project rests solely on the participation of local governments and area residents.

The strategies for protection are non-regulatory. The project is dependent upon the responsible parties' commitment to clean water to accomplish the objectives set forth. The plan also serves as a planning tool and resource guide for local experts and agencies.

The two most successful management tools are citizen involvement and private stewardship. No regulation can substitute a landowner's willingness to employ Best Management Practices (BMPs) on his land. Citizens working together are also an undeniable force in promoting environmental awareness. Incentive programs, which provide money on a cost share or grant basis, will also help accomplish the management plan objectives. It is also important to understand existing regulatory programs which affect development in the watershed.

A. Non-Regulatory

1. Incentive Programs

Many landowners do not have funds to initiate a restoration or preservation project without the support of incentive programs. These programs provide a match to encourage participation.

a. Conservation Reserve Program (CRP)

This program, administered by the Consolidated Farm Service Agency, was established as a conservation provision of the Farm Bill to encourage and assist farm producers willing to set aside highly erodible, riparian, and other environmentally sensitive land from crop production for a 10 or 15 year period. Producers may enroll in the program according to USDA rules. The program is a 50-50 cost share.

b. Wetlands Reserve Program (WRP)

Another voluntary program is administered by NRCS with technical support from FWS. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved. NRCS and FWS assist private landowners with site selection and development of restoration plans for the site. Up to 100% of the cost of restoring the wetland can be provided for a permanent easement by USDA.

c. Grassland Reserve Program (GRP)

GRP is another voluntary program offered by NRCS. This program offers landowners the opportunity to protect, restore and enhance grasslands on their property.

d. Environmental Quality Incentives Program (EQIP)

EQIP is another voluntary program administered by NRCS. EQIP works in locally identified conservation priority areas where there are significant problems with natural resources. High priority is given to areas where state or local governments offer financial, technical, or educational assistance, and to areas where agricultural improvements will help meet water quality objectives. Landowners apply to the program for assistance in solving problems related to animal waste management, erosion, and other environmental problems. EQIP will provide up to 60% cost-share for restoration.

e. Forest Land Enhancement Program (FLEP)

The Forest Land Enhancement Program (FLEP) was part of Title VIII of the 2002 Farm Bill. FLEP replaces the Stewardship Incentives Program (SIP) and the Forestry Incentives Program (FIP). FLEP is optional in each State and is a voluntary program for non-industrial private forest (NIPF) landowners. It provides for technical, educational, and cost-share assistance to promote sustainability of the NIPF forests.

State Forestry Agencies in coordination with their State Forest Stewardship Coordinating Committees will develop a State Priority Plan for FLEP. This Plan will provide the details for

how the FLEP funds will be utilized, including minimum acres, maximum acres, aggregate payment, use for technical, educational and cost-share assistance, and all other factors for the program. Landowners will have to have a forest management plan to be eligible for cost-share. The practices to be cost-shared and the cost-share rate will be described in the State Priority Plan.

f. Wildlife Habitat Incentives Program (WHIP)

Administered by NRCS, WHIP is a voluntary program for landowners who want to develop and improve wildlife habitat on private lands. Participants work with NRCS to prepare a wildlife habitat development plan. USDA provides technical assistance and cost-share payments up to 50 % of the cost of installing the wildlife habitat practices.

g. Partners for Fish and Wildlife

Administered by FWS, this program restores, improves and protects fish and wildlife habitat on private lands. Funds can not exceed $25,000 per project and the landowners must secure a minimum 10-year habitat development agreement. Landowners can receive up to 100% funding for project expenses, however, the overall goals of partners is a 50-50 cost share.

h. Farm and Ranch Land Protection Program (FRPP)

The Farm and Ranch Lands Protection Program (FRPP) is a voluntary program that helps farmers and ranchers keep their land in agriculture. The program provides matching funds to State, Tribal, or local governments and non-governmental organizations with existing farm and ranch land protection programs to purchase conservation easements. FRPP was reauthorized in the Farm Security and Rural Investment Act of 2002. USDA and NRCS manage the program.

USDA works through State, Tribal, and local governments and non governmental organizations to conduct FRPP. These entities acquire conservation easements from landowners. Participating landowners agree not to convert their land to non-agricultural uses and to develop and implement a conservation plan for any highly erodible land. All lands enrolled must have a conservation plan developed based on the standards in the NRCS Field Office Technical Guide and approved by the local conservation district. Landowners retain all rights to use the property for agriculture.

2. Alabama Nonpoint Source Management Program

In 1987, Congress passed Section 319 of the Clean Water Act which established a national program to address the problems of nonpoint source pollution. Although each state enacts the program differently, the program was developed to highlight watershed approaches to nonpoint source pollution impacts. ADEM administers this program in Alabama.

In 1990, the Coastal Zone Act and Reauthorization Amendments (CZARA) section 6217 was promulgated to establish the Alabama Coastal Nonpoint Source Pollution Program, also administered by ADEM.

3. Private Stewardship

Wolf Bay Watershed Landowners, particularly farmers, are interested in incorporating conservation practices into management of their property. NRCS educates the landowners of the incentive programs and works with them to incorporate nonpoint source pollution control methods. Education and public participation are also an important part of private stewardship.

The Private Stewardship Program, through NRCS, provides grants and other assistance on a competitive basis to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species. Diverse panels of representatives from state and federal government, conservation organizations, agriculture and development interests, and the science community assess applications and make recommendations to the Secretary of the Interior, who awards the grants. The Private Stewardship Program was initiated during Fiscal Year 2002, with grants first awarded during FY 2003.

For Fiscal Year 2004, NRCS will award more than $7 million in Federal funding under the Private Stewardship Program. A ten percent (10%) match of cash or through in-kind contributions is required. The program is available to private landowners and their partners.

4. Tax Incentives

a. Conservation Easements

A conservation easement is a legal agreement between a landowner and a land trust (or government agency) that protects open space by limiting the amount and type of development that can take place, but leaves the land in private ownership. Each easement restriction is tailored to the individual landowner's need. When a landowner donates or sells a conservation easement to a land trust, he can continue to live on or work the land - in accordance with the easement's provisions - and can sell the land or pass it on to heirs. Donating the easement can result in reduced income and estate taxes.

b. Gift of Remainder Interest

A gift of a remainder interest in a personal residence or farm provides one with an income tax charitable deduction for the present value of the remainder interest and permits one to escape any potential capital gain tax on the built-in appreciation. The property owner can continue to occupy the residence or operate the farm without disruption. Such a gift provides a deduction

that frees up tax dollars into spendable income without causing any disruption in lifestyle. Taxes, insurance, and normal maintenance remain ones responsibility.

c. Gift by Will

A charitable contribution of a conservation easement or gift of property can be made by will. The full value of the gift is deductible from estate taxes.

There is a current move, primarily on behalf of media and civic groups, to promote constitutional reform. A large portion of this movement is to do away with the current property tax assessment which is based on current use and set tax rate based on potential use. Such a change could leave many farmers unable to pay taxes and would increase the potential for conversion to urban development. The rules already require rollback taxes for the previous three years. Estate tax problems also exist because many heirs are left farmland and sell because they can't pay the taxes.

5. Citizen Involvement

The Wolf Bay Watershed Project (WBWW) has developed a variety of education and public participation programs to encourage stakeholders to take the steps necessary to protect their watershed. WBWW hosts an active volunteer water quality monitoring program. Programs, such as the Clean Water Guardian Program and Backyard Wildlife Habitat, are also recommended to include a variety of audiences, namely agricultural interests, builders and contractors, educators, students, homeowners and elected officials.

6. Baldwin County Wetland Conservation Plan (BCWCP)

Baldwin County estimates 470 square miles of wetlands exist in Baldwin County. In 1995, Baldwin County began mapping and assessing wetlands as part of EPA's Advance Identification (ADID) of wetlands program. The ADID project mapped portions of south Baldwin County based on its "suitability for fill." In 1999, the Baldwin County Commission developed the Baldwin County Wetland Conservation Program to:

1. Further develop a Wetlands Protection Overlay District (WPOD) and incorporate into the Baldwin County Planning and Zoning Regulations.
2. Develop a Geographic Information System (GIS) wetlands data layer containing information on wetland locations, types, and functional capacity for wetlands in Baldwin County.
3. Research, design, and implement wetland restoration/construction projects at selected sites throughout the County.
4. Develop a wetlands education/outreach program for area stakeholders.

7. ADEM Source Water Assessment and Protection Plan

The Source Water Assessment and Protection Program was mandated by Congress in the 1996 Amendment to the Safe Drinking Water Act. The Source Water Assessment Program is a mandatory program in Alabama and requires that all public water supply utilities complete a 3-part assessment for all of their supply wells. The assessment must delineate the boundaries of the area that contribute groundwater and potential contaminants to the community water systems. The assessment must include a contamination source inventory and a susceptibility determination to identify how prone the public water supply is to contamination. Lastly, the assessment must include a public awareness program that informs the public about information gathered by the assessment. All public water supplies within the Wolf Bay watershed have completed the Source Water Assessment Program.

Once the assessment is completed, local authorities are encouraged to use the assessment information to protect their water supplies and to develop a Source Water Protection Plan. Source water protection efforts may involve corrective activities to remove contamination threats or preventative actions through land use planning and education. Gulf Shores is the only community with an approved and active protection program in South Baldwin County.

B. Regulatory Programs

1. National Pollutant Discharge Elimination System (NPDES) Program

Under the Clean Water Act, most point source discharges of pollution require a permit. The NPDES program is administered by ADEM. Point sources are direct discharges from factories, sewage treatment plants, mining and concentrated animal feedlot operations. Permittees are required to submit discharge monitoring reports (DMR) to ADEM. The DMR contains data for all parameters and monitoring frequency required by the NPDES permit.

On Jan. 23, 2003 ADEM approved Administrative Code Chapter 335-6-12 which regulates stormwater discharges from construction and mining activities. All construction sites greater than 1 acre and all mining activities greater than 5 acres are required to register under the regulations. The regulations require the implementation and maintenance of effective BMPs to control pollutants in stormwater discharges. ADEM enforces the regulations through site inspections and sampling.

Note: The act specifically excludes "return flows from irrigated agriculture or agricultural storm water runoff. This exempts many, but not all, agricultural activities from the NPDES program.

2. Army Corps of Engineers Regulatory Programs

The Corps of Engineers has been involved in regulating activities by others in navigable waterways through the granting of permits since the passage of the Rivers and Harbors Act of 1899. At first, this program was meant to prevent obstructions to navigation, although an early 20th century law gave regulatory authority over the dumping of trash and sewage. Passage of the Clean Water Act in 1972 greatly broadened this role by giving the Corps authority over dredging and filling in the "waters of the United States," including many wetlands.

A major aspect of the Regulatory program is determining which areas qualify for protection as wetlands. In reaching these decisions, the Corps uses its 1987 Wetland Delineation Manual. In making decisions on whether to grant, deny or set conditions on permits, District commanders are required to consider "all factors in the public interest," including economic development and environmental protection.

Numerous relatively minor activities in wetlands are covered by regional or nationwide general permits, allowing the regulatory staff to concentrate on more complex cases. Of the approximately 1,100 people who carry out this mission, about 70% have academic backgrounds in biology and environmental sciences.

The navigation program includes all of the nation's deep draft harbors which are a vital link to seaborne commerce and handle much of the nation's international trade each year, as well as hundreds of smaller harbors that serve a variety of recreational and commercial purposes. The Corps has also built an intracoastal and inland network of commercial navigation channels, and locks and dams for navigation.

<u>Section 404 of the Clean Water Act</u>

The United States Army Corps of Engineers administers Section 404 of the Clean Water Act. Section 404 requires permits for dredging or filling a "water of the United States." This permit requires public input on the questions of need, alternatives and impacts. In theory, the law requires the permit applicant to prove the destruction of wetlands is necessary. If the proposed activity does not have to be conducted near the water, the permitting agency is to assume practical alternatives exist.

<u>Section 10 of the Rivers and Harbors Act</u>

The United States Army Corps of Engineers also administers Section 10 of the 1899 Rivers and Harbors Act. This act was enacted to protect and promote water navigation for commercial activity. This act prohibits the unauthorized obstruction or alteration of any "navigable water of

the United States" except by a Corps of Engineers permit. Regulated activities include dredging, placement of dredged or fill material, and construction in or over navigable waters.

3. Baldwin County Health Department Septic Tank Permits

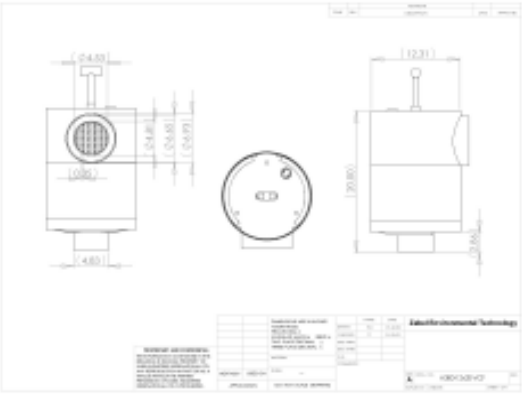
The Baldwin County Health Department requires a permit for the installation of onsite sewage disposal systems (OSDSs). The most common conventional OSDS is the septic tank, which is used to treat household and business waste. The septic tank receives liquid household wastes (soapy water from the laundry and bath, discarded food scraps and all body wastes) from the house plumbing. The solids settle to the bottom of the tank and the liquid passes into the seepage field. The solids in the tank are subjected to decomposition by bacterial and natural processes. The tank is large enough to accumulate substantial amounts of solids at the bottom while bacteria work to decompose the solid matter. Baffles are provided in the tank to prevent floating solids or scum from entering the seepage field.

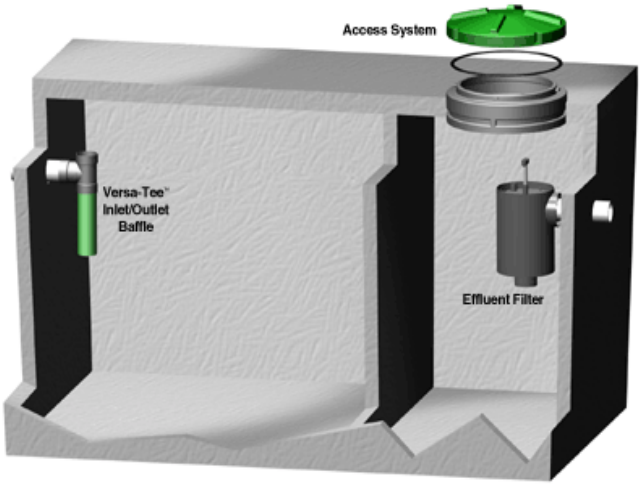
Permit receipt is dependent upon a soil percolation test which is performed by a licensed engineer, surveyor, or soil classifier. A site evaluation performed by a certified site evaluator from the health department can be used in lieu of a percolation test. These tests are used to determine the suitability of a site for an onsite sewage disposal system. A percolation test or site evaluation determines the soil's permeability and checks for any limiting factors, such as a seasonal high water table. The percolation test procedures are designed to simulate conditions of the onsite sewage disposal system and the site evaluation uses soil texture to determine site suitability.

As mentioned earlier in this document, all new onsite sewage disposal systems require the installation of an effluent filter in the septic tank. The filter is installed in the outlet tee and helps prevent suspended solids from going out into the disposal field. Keeping the solids out of the disposal field prevents the soil pores from becoming clogged, therefore prolonging the life of the system.

Another advancement in the field of onsite sewage disposal was the passing of a legislative bill in 1999, creating the Alabama Onsite Wastewater Board. The Board established rules that govern the onsite wastewater industry. All installers, pumpers, and manufactures, must obtain a license before they can perform any work in the State of Alabama. They are required to attend a training course and pass an exam before they can become licensed. Continuing education hours are required each year in order to renew a license. The establishment of the Board and its rules has helped to improve the onsite sewage disposal industry. The homeowner and the environment can only benefit from this improvement. The diagram on page 33 shows an effluent filter installed in a septic tank.

Zabel Environmental Technology





The number of septic tank permits issued for Baldwin County increased from 1994 to 1999, then decreased in 2000. In 1994, for every 2.8 new persons in the County, one new septic tank permit was issued. In 2000, the ratio was 3.45 new persons for each new permit issued. In 2000, septic tank permits declined in Baldwin County. Some communities in the county offer incentives for sewer hook-ups in lieu of septic tanks.

Source: Envision Mobile Baldwin

4. Baldwin County Commission

The Baldwin County Planning and Zoning Department was established by the Baldwin County Commission in 1996 to oversee the County's growth management activities. This includes administration of the County's land development regulations and management and implementation of various environmental, community development and economic development policies and programs. These departmental responsibilities include the enforcement of subdivision and zoning regulations. Subdivision regulations are also enforced in areas that do not fall within the jurisdiction of a municipality. Zoning regulations are only applied to those districts where the residents have elected to come under the authority of the County Commission.

Zoning is a tool used by communities to guide growth and development to protect public health, safety, and general welfare by encouraging the use of lands and natural resources in accordance with their character and adaptability. Zoning works by dividing an area into agricultural, residential, commercial, and industrial zones. Zoning regulates the use of buildings, structures and land to be used for trade, industry, residence or other purposes by specifying which uses are permitted in each zone. Zoning regulations also establish standards for the size and placement of buildings on the land *(Figures 10 & 11, Building development and County zoning).*

Subdivision Regulations

In 1996, subdivision regulations were adopted countywide which apply to "the division of a lot, tract, or parcel of land in two or more lots, plats, sites, or other division of land for the purpose, whether immediate or future, of sale or of building development."

Building Permits

Any construction activity in the county also requires a building permit. Land use certificates are also required in zoned areas prior to issuance of building permits.

Both the Planning and Zoning Department and the Building Department require that any permit or letters of release deem necessary be received before approval is granted. In each case, the county utilized GIS layers such as wetland and flood zone areas to insure that the appropriate measures are met. Lastly, county enforcement officers are required to notify the proper authority of any perceived impact during the inspection process.

5. Municipal Separate Storm Sewer System (MS^4)

A municipal separate storm sewer system (MS^4) is a conveyance or system of conveyances that is owned by a state, city, town, or other public entity that discharges to U.S. waters. Even though the systems are designed and used for collecting storm water, they are not part of a Publicly Owned Treatment Works (POTW).

Phase 1 covers "large and medium sized cities" (as defined by the Bureau of the Census). These are cities which generally serve populations of 100,000 or greater. Phase II automatically covers on a nationwide basis all small MS^4s located in "urbanized areas" (as defined by the Bureau of the Census), and on a case-by-case basis those small MS^4s located outside of urbanized areas that the NPDES permitting authority designates. Phase II requires operators of small MS^4s to design their programs to reduce the discharge pollutants to the "maximum extent practicable," protect water quality, and to satisfy appropriate water quality standards set forth by the Clean Water Act. However, one can petition ADEM to include a town under Phase II if it is causing water quality problems.

The Phase II rule defines a small MS^4 management program with six elements that, when implemented, are expected to result in reduction of pollutants discharged into waterbodies. The six elements include: public education and outreach, public participation, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping. *Sources: EPA, Office of Water, Fact Sheet 2.0-2.1, 2000*

While there are no phase I or II municipalities in the Wolf Bay watershed, there will come a time in the future when a phase III will be implemented. Foley, Gulf Shores and Orange Beach will most likely come under that phase and have similar requirements to meet the regulatory program. By coordinating and encouraging stormwater protection in this management plan, those cities will be meeting requirements ahead of time.

6. Coastal Zone Regulations

In 1972, Congress passed the Coastal Zone Management Act (CZMA) in order to improve the management of our nation's coastal resources. The Act created the Coastal Zone Management Program (CZM), which is administered by NOAA. The CZM provides coastal states the opportunity and financial support to develop coastal zone management programs to protect coastal resources. Alabama joined the CZM program in 1979.

Within Alabama's designated Coastal Area (generally defined as the 10' contour elevation of Mobile and Baldwin Counties seaward to the outer limit of the United States territorial sea) ADEM has certain regulatory, permitting, and enforcement functions that are established under the Alabama Coastal Area Management Program (ACAMP). The specific regulatory requirements and procedures can be found in ADEM Administrative Code R 335-8xx. In general terms, ADEM regulates certain activities in the coastal area, including beach and dune construction, commercial and residential developments greater than 1 acre, groundwater extraction of a certain capacity, siting, construction and operation of energy facilities, marina development, and wetland impacts, to name a few. Approximately the southern third of the Wolf Bay project area is in the coastal zone. Since many of these activities are also federally regulated, ADEM has developed procedures for joint review in order to avoid overlap. For more information on coastal zone permitting, visit www.adem.state.al.us/FieldOps/Permitting/Coastal/coastal.htm.

7. Coastal Consistency

One power granted to states by the CZMA gives states with federally approved coastal zone management programs the authority to require federal agencies to carry out their activities within the coastal zone in ways that are consistent with the state's coastal program's policies. As such, activities occurring within the designated coastal area that require a federal permit must certify that the proposed activity is consistent with the policies and regulations of the ACAMP. In review of coastal consistency, ADEM is granted the authority to deny or conditionally approve a project that is determined to be inconsistent with ADEM Division 8 Coastal Program Regulations. Federal activities subject to coastal consistency determination include: US Army Corps of Engineers Section 10 (Navigation and Navigable waters) and Section 404 (wetland dredge and fill) permits; Federal Energy Regulatory Commission permits, and Environmental Protection Agency permits for air quality, water quality and solid waste disposal.

8. Section 401 Water Quality Certification

Under Section 401 of the Clean Water Act, the state water quality agency (ADEM) must certify that adequate measures for water quality protection are to be implemented before a Federal agency can issue a permit that allows pollutant discharges into state waters. Like the coastal consistency review, the water quality certification process allows the state to condition federal permits in order to comply with state regulations and enforceable policies. Alabama water quality certifications issued by ADEM under section 401 are typically conditioned to require the implementation of management measures, the avoidance of specific activities, and strict standards for certain types of discharges. Certification for wetland and riparian impact typically includes conditions for avoidance, minimization, and mitigation of impacts. Certification for dams and other impoundments typically includes conditions for maintaining minimum instream base flows and minimizing impacts downstream. Certification for dredge impacts typically includes conditions for minimizing dredge quantity, protecting instream water quality and maximizing beneficial use of dredge disposal. Certification for structural shoreline stabilization calls for demonstration that nonstructural methods are not feasible and dissuades use of vertical bulkheads.

9. Wetland Conservation Provisions (Swampbuster)

Swampbuster has reduced the loss of wetlands due to agricultural activities to the lowest levels on record. Swampbuster helps preserve the environmental functions and values of wetlands, including flood control, sediment control, groundwater recharge, water quality, wildlife habitat, recreation, and aesthetics.

The 1996 Farm Bill changed Swampbuster to give USDA participants greater flexibility to comply with wetland conservation requirements and to make wetlands more valuable and functional. The new Farm Bill changed the following Swampbuster provisions:

Upon request, NRCS will determine if a producer's land has areas subject to Swampbuster. The agency maintains a list of the plants and combinations of soils and plants found in wetlands and uses these technical tools, along with the hydrology of the area, to conduct determinations. These determinations stay in effect as long as the land is used for agricultural purposes (unless a violation occurs) or until the producer requests a review due to natural events. NRCS certifies previous wetland determinations upon request.

V. ACTION STRATEGIES FOR PROTECTION

The goal of the Wolf Bay Watershed Project is "to develop and implement a plan to protect and improve the natural resources of the Wolf Bay Watershed." Twenty objectives have been defined to assist the Watershed Project in addressing nonpoint source pollution impact.

The Citizens Advisory Committee believed it was important to highlight the objectives of the plan. Therefore, rather than prioritize all goals, the committee decided to prioritize goals within each objective.

A. Objectives

Cooperative Efforts Objectives

1. To reduce nonpoint source pollution from:
   a. Agricultural activities, including sod farms, golf courses and nurseries.
   b. Construction
   c. Land clearing and development activities, including the conversion of agricultural and silvicultural lands to residential and urban uses.
2. Decrease/reduce water pollution from stormwater, sewage and septic discharges from residential subdivisions and commercial areas.

Education Objectives

1. To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Monitoring Objectives

1. To identify all research conducted within the watershed that will assist decision makers in policy decisions.
2. To better understand the effects of nutrient runoff from golf courses, sod farms, and nurseries by developing a nutrient monitoring program.
3. To better understand and research fish tissue samples for metal contamination.
4. To better understand and research benthic, sediment and biotic samples to determine if contaminants such as pesticides are affecting aquatic or aquatic dependent life.
5. To determine sources and levels of bacterial contamination.

Organizational Objectives

1. To keep the efforts of the watershed project ongoing, establish a watershed project coordinator.

2. To establish an organizational committee with representatives from each Hydrologic Unit Code (HUC) watershed or creek (Miflin, Wolf, Hammock, Sandy, Graham and Owens Creek) in the project area.
3. Establish an educational center for the community to learn about the watershed resources.

Preservation and Protection Objectives

1. To classify Wolf Bay and its tributaries as an Outstanding Alabama Water (OAW).
2. To acquire land in the watershed, including areas designated as open space and riparian buffers.
3. To protect groundwater resources as well as address the regulations of well water protection in the watershed.
4. Ensure protection of fish and wildlife habitats and sensitive habitats such as wetlands, marshes, bogs, grady ponds, long leaf pine flatwoods and white cedar stands.
5. To preserve family farms and the agricultural/rural heritage of the watershed while protecting water quality.

Program Partnerships Objectives

1. Cooperate and develop relationships with local municipalities, government officials, governmental agencies, large land owners and businesses.
2. Develop better relationships with contractors, developers, utility companies, farmers, businesses and homeowners through the Clean Water Partnership, or any way possible.
3. Promote planning and zoning that will protect ecologically significant areas.
4. Work with Baldwin County to identify unpaved roads within the watershed and prioritize paving schedule.

Each section that follows includes specific and measurable action strategies, a discussion of each action strategy, responsible parties and partners, potential funding sources, and a timeline. The strategies for each objective are listed in sequential order and should be viewed as a series of steps needed to accomplish the overall objective. Responsible parties are those agencies with regulatory or legal authority or a vested interest in the strategy. Partners are those who could assist the responsible parties through shared resources and/or technical input. Potential funding sources are grant programs where funds may be pursued, however, the list is not comprehensive and does not guarantee that funds have been committed by those agencies. The timeline identifies the quarter of the year the activity will be initiated. The action strategies, responsible parties, partners, funding sources and timelines are recommendations only and are dependent on available funding resources and local support. As stated, the overall purpose of the following management objectives and action strategies is to coordinate and better utilize existing federal, state and local resources to improve and maintain water quality in Wolf Bay.

B. Evaluative Criteria

It is important to track the progress of the management plan and its effect to the improvement of water quality. Stakeholders and decision-makers need to know what makes this management plan successful. Therefore, each one of these action strategies have an evaluation mechanism to accurately assess each strategy. We will continually evaluate this mechanism based on the evolution of the plan and funding needs. Listed below are the evaluative criteria that will be utilized for the action strategies. In cases where these criteria are not applicable, the evaluation criteria will be listed within that action strategy. Also, it is important to note that these action strategies will also develop an implementation strategy and develop criteria based on the evaluation mechanism. These are only suggested methods that can be applied when developing a program.

Evaluation Method	Strategy Evaluated	Evaluation Mechanism
1.	Workshops, Conferences, Handouts Informal presentations	Pre and post tests # of attendees
2.	Surveys	Evaluations Act or vote on recommendations
3.	Adoption or Implementation	# of attendees
4.	Maps, Documents and Final Reports	# documents returned vs. # of documents distributed
5.	Property acquired	# of municipalities vs. # of policies adopted # of acres
6.	Pollution reduction	# of permits applied # of permits issued

Reminder: The funding sources listed in the action strategies below are only potential and do not guarantee those agencies will allocate the funds.

1. Wastewater and polluted runoff

Wastewater is used water and includes substances such as human waste, food scraps, oils, soaps and chemicals. In homes, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers. Businesses and industries also contribute their share of used water that must be cleaned.

Wastewater also includes storm runoff from heavy rains. Although some people assume that the rain that runs down the street during a storm is fairly clean, it isn't. Harmful substances that wash off roads, parking lots, and rooftops can harm our rivers and lakes.

Source: USGS, Water Science for Schools

Cooperative Effort Objective #2: Decrease/ reduce water pollution from stormwater, sewage and septic discharges from residential subdivisions and commercial areas.

Education Objective #1: To make landowners/ homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Program Partnership Objective#1: Cooperate and develop relationships with local municipalities, government officials, governmental agencies,large landowners and businesses.

Issue: The public does not understand the basics of septic tank and sewer system care and maintenance or the potential impacts of improperly maintained septic systems.

Action Strategy 1: Develop or adopt educational programs to educate septic tank owners and sewer system users. This program will highlight the need for tank inspection and periodic pump out. The program will also work to explain the reasons sewage systems fail, including our input of grease.
Responsible Parties: BCHD, City of Foley, ADEM OEO
Partners: Sewer utilities, MEE, ACES
Funding Sources: Sewer Utilities, 319 Grants, other Grants, Septic Tank Companies, 306, 6217
Timeline: 2nd Quarter, 2004
Evaluation method 2

Action Strategy 2: Target all homeowner associations in the area and provide them with educational presentations about septic systems.
Responsible Parties: BCHD
Partners: Homeowners/Homeowners Associations, Realtors, Mortgage Companies, MEE, WBWP, WBWW, ACF
Funding Sources: no funding needs anticipated
Timeline: 3rd Quarter, 2004
Evaluation method 1

Action Strategy 3: Develop a survey to determine how many houses within the watershed utilize septic tanks. Work with Baldwin County Health Department to have all existing septic tanks GPS'd. (This information is required by ADPH to classify waters, i.e. shellfish harvesting)
Responsible Parties: BCHD, ADCNR
Partners: WBWW, WBWP
Funding Sources: NOAA (309/6217/306)
Timeline: 3rd Quarter, 2004
Evaluation method 2

Issue: Homeowners, decision-makers, installers and many developers are not aware of advanced treatment systems for wastewater (residential or commercial).

Action Strategy: Conduct workshops that compare advanced and decentralized wastewater treatment systems.
Responsible Parties: BCHD, Baldwin County Commission, ADEM, USA
Partners: WBWP, local citizens, ADEM
Funding Sources: BCHD, ADEM 319
Timeline: 3rd Quarter, 2004
Evaluation method 1

Issue: Owners of waterfront properties do not always follow Best Management Practices and need to be better educated on nonpoint source pollution.

Action Strategy: Develop or adopt educational programs (e.g. Weeks Bay's Greener by the Yard, NEMO, Clean Water Guardians) to educate waterfront residents about preventing polluted runoff from their property.
Responsible Parties: BCMG, WBWW, NEMO
Partners: WBWP, ADEM, CACWP, AUMERC
Funding Sources: Legacy, Inc., ADEM, ACES, CACWP
Timeline: commence 2004
Evaluation method 1

Issue: Additional treatment of stormwater runoff is necessary to protect area waterways.

Action Strategy 1: Encourage municipalities to develop and implement stormwater management policies to control both the quantity and quality of stormwater runoff.
Action Strategy 2: Determine impervious cover limits and its effect on water quality.
Action Strategy 3: Work with Auburn University Marine Extension and Research Center to implement a storm drain stenciling program throughout the watershed.
Responsible Parties: Towns of Elberta & Summerdale, Cities of Foley and Orange Beach, Baldwin County
Partners: ADEM, ADCNR, AUMERC, Neighborhood Associations
Funding Sources: OEO, NOAA, 6217
Timeline: commence 2004
Evaluation method 3 & number of storm drains stenciled

Issue: Stormwater runoff is not monitored so the quality or quantity is not known.

Action Strategy 1: Monitor stormwater in strategic locations to determine types and quantities of contaminants and quantity of runoff.
Responsible Parties: Towns of Elberta & Summerdale, Cities of Foley and Orange Beach, Baldwin County, WBWW
Partners: ACF, ADEM, ADCNR, AUMERC, AWW, Neighborhood Associations,
Funding Sources: OEO, NOAA, 6217
Timeline: commence 2004
Evaluation method 6

2. Bulkheading

Some watershed residents do not understand the impacts of bulkheads to the coastal community. Bulkheads are a popular erosion solution in Alabama's coastal area. Although a well-built bulkhead will protect the upland areas from wave erosion, it does not address the erosional dynamics that was causing the problem in the first place. In addition, bulkheading causes more erosion on adjacent properties.

In addition to the increased sediment load during seawall construction, many residents believe the bulkheads have decreased the population of breeding shrimp.

The Alabama Department of Conservation and Natural Resources, State Lands Division Regulation 220-4-.09 Placement and Configuration of Piers and other Improvements on State Submerged Lands, approved in September of 2003, states in section (b) Resources Management, (6) "To the maximum extent possible, shoreline stabilization should be accomplished by the establishment of appropriate native vegetation. Rip-rap materials, pervious interlocking brick systems, filter mats, and other similar stabilization methods should be utilized in lieu of vertical seawalls where ever feasible." Also, bulkheads are not allowed to be placed below mean high tide and requirements can address adjacent property impacts.

Education Objective #1: To make landowners/ homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Monitoring Objective #1: To identify all research conducted within the watershed that will assist decision makers in policy decisions.

Preservation and Protection Objective # 4: Ensure protection of fish and wildlife habitats and sensitive habitats such as wetlands, marshes, bogs, grady ponds, long leaf pine flatwoods and white cedar stands.

Issue: Shoreline erosion; loss of habitat due to bulkhead construction.

Action Strategy 1: Develop a mailing list of watershed waterfront property owners and target an educational pamphlet on bulkheading alternatives.
Responsible Parties: WBWP, WBWW, ACF
Partners: ADCNR Coastal, MRD; USACE; ADEM
Funding Sources: In Kind
Timeline: 3rd Quarter, 2004
Evaluation method: length of list and pamphlet

Action Strategy 2: Develop or adopt a workshop on alternatives to bulkheading for citizens, elected officials, Corps of Engineers, and contractors.
Responsible Parties: ADCNR Coastal, USACE
Partners: ADEM, USA, WBWW, WBWP, CACWP
Funding Sources: ADCNR
Timeline: 1st Quarter, 2005
Evaluation method 1

Action Strategy 3: Develop an incentive program to help homeowners plan and build alternative structures to vertical seawalls.
Responsible Parties: WBWP, WBWW
Partners: ADCNR, USFWS,
Funding Sources: WHIP
Timeline: 2nd Quarter, 2006
Evaluation method 4

Action Strategy 4: Investigate effects of wake on shoreline erosion to determine the need for wake free zones.
Responsible Parties: ADCNR Coastal, USA, MRD, AMP, DISL
Partners: WBWW
Funding Sources: 306, 6217
Timeline: 1st Quarter, 2005
Evaluation method 4

Action Strategy 5: Map all existing hardened shoreline in the watershed.
Responsible Parties: ADCNR
Partners: WBWP, WBWW
Funding Sources: NOAA, 306, 6217
Timeline: 4th Quarter, 2004
Evaluation method 4

3. Recreation

The Wolf Bay watershed is rich in recreational opportunities. Residents and visitors fish, boat, sail, canoe, kayak, watch birds, swim, and much more in Wolf Bay and its tributaries. Significant concern regarding the lack of wake control was voiced during public meetings. In addition to safety issues, the public is concerned about the erosional effects of wakes. Residents also highlighted they would like to see recreational opportunities expanded.

Education Objective #1: To make landowners / homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Organizational Objective #3: Establish an educational center for the community to learn about the watershed resources.

Preservation and Protection Objective #2: To acquire land in the watershed, including areas designated as open space and riparian buffers.

Issue: There is a lack of public understanding on the impact of wakes and speed within the watershed.

Action Strategy: Investigate effects of wake on shoreline for public safety and habitat loss.
Responsible Parties: ADCNR, Coastal; MRD
Partners: WBWP, DISL
Funding Sources: NOAA
Timeline: 4th Quarter, 2004
Evaluation method 4

Issue: There is a need for public recreational and education facilities within the watershed.

Action Strategy: Identify areas for possible acquisitions or partnerships to be used for a variety of uses including habitat protection and restoration, as well as recreation.
Responsible Parties: WBWP
Partners: County, Municipalities, TNC, Private Landowners, WBWW, ADCNR, ACF, NEP, FWS, ADCNR, Coastal
Funding Sources: ADCNR, Brown Foundation, National Coastal Wetland Conservation Grants Program, CELCP, Forest Legacy, FWS
Timeline: Ongoing
Evaluation method 5

Issue: There is a need for vessel pumpout facilities and boater awareness programs.

Action Strategy 1: Develop public education and outreach tools about pump out locations
Action Strategy 2: Work with local marinas to acquire grants for pump out stations, recycled oil facilities and fishing line collection facilities.
Action Strategy 3: Promote the Clean Marinas Program.
Responsible Parties: GCRCD, ADCNR
Partners: AUMERC, Marina ROSE, WBWW, WBWP, ADEM, MASGC, Marinas
Funding Sources: ADEM (Clean Vessel Act Program)
Timeline: 2nd Quarter, 2005
Evaluation 1 & # of pumpouts, recycled oil and fishing line collection facilities.

4. Agriculture and Forestry

Cooperative Efforts Objective #1: To reduce nonpoint source pollution from:
- **Agricultural activities including sod farms, golf courses, nurseries**
- **Land clearing and development activities, including the conversion of agricultural and silvicultural lands to residential and urban areas.**

Monitoring Objective #1: To identify all research conducted within the watershed that will assist decision makers in policy decisions.

Monitoring Objective #2: To better understand the effects of nutrient runoff from golf courses and sod farms by developing a nutrient monitoring program.

Monitoring Objective #4: To better understand and research benthic, sediment and biotic samples.

Monitoring Objective #5: To determine sources and levels of bacterial contamination.

Program Partnerships Objective #2: Develop better relationships with contractors, developers, utility companies, farmers, businesses and homeowners through the Clean Water Partnership, or any way possible.

Preservation Objective #2: To acquire land in the watershed, including areas designated as open space and riparian buffers.

Education Objective #1: To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts including sewage, petroleum products and litter.

Issue: There is a lack of stakeholder understanding regarding effects of agriculture interactions in the watershed.

Action Strategy 1: Determine the number and types of farms, proximity to waterways and effects on land and water.
Responsible Parties: NRCS
Partners: Farmers, Elberta Co-Op, ADEM, WBWP
Funding Sources: no funding anticipated
Timeline: 1st Quarter, 2005
Evaluation method 4

Action Strategy 2: Develop a bacteria, nutrient and pesticide monitoring program to determine effects from agricultural and forestry sources including golf courses and sod farms.
Responsible Parties: ACF, AWW, ADEM, WBWW
Partners: Golf Courses, Sod Farms, Elberta Co-Op, GCRCD, CACWP
Funding Sources: GCRCD, NEP, ADEM, CACWP
Timeline: 1st Quarter, 2005
Evaluation method 4 & 6

Action Strategy 3: Develop or adopt an education campaign about nutrient effects with turf management specialists.
Responsible Parties: ACF, WBWP, ACES
Partners: Golf Courses, Sod Farms, Elberta Co-Op, WBWW, AUMERC, Auburn University
Funding Sources: CACWP, GCRCD
Timeline: 2nd Quarter, 2005
Evaluation method 1

Action Strategy 4: Develop Green Golf Initiative or Clean Water Guardian Program for water quality protection, e.g. an award program highlighting BMPs based on % pollutant reduction.
Responsible Parties: WBWP
Partners: Craft Farms, CACWP, ACF, AUMERC, Glen Lakes
Funding Sources: AUMERC
Timeline: 1st Quarter, 2005
Evaluation method 6

Action Strategy 5: Identify and encourage BMP demonstration projects on local farms within the watershed.
Responsible Parties: NRCS, SWCD
Partners: Elberta Co-Op, FWS, Landowners, WBWP
Funding Sources: Farm Bill Conservation Programs, 319 Program, Partners for Fish and Wildlife, FWS
Timeline: 1st Quarter, 2005
Evaluation method 6

Issue: There is limited information on monitoring runoff from agricultural activities.

Action Strategy 1: Develop sediment and water column monitoring program, particularly total suspended solids.
Responsible Parties: WBWW, ACF, AWW
Partners: ADEM, GCRCD, NEP, NRCS
Funding Sources: GCRCD, ADEM, NEP
Timeline: 2nd Quarter, 2005
Evaluation method 6

Action Strategy 2: Develop an aerial photography nonpoint source pollution monitoring program.
Responsible Parties: WBWW, ACF
Partners: CACWP
Funding Sources:
Timeline: 2nd Quarter, 2005
Evaluation method 2 & 4

Issue: Nonpoint source runoff from silviculture operations

Action Strategy 1: Determine % of watershed in timber, amount of $ raised, get list of timbering operations.
Action Strategy 2: Work with Forestry Commission to encourage and install BMPs
Action Strategy 3: Encourage participation in Sustainable Forestry Initiative and ISO certifications.
Responsible Parties: ADEM, Alabama Pulp and Paper Council, AFC
Partners: WBWP, ACES, NRCS, SWCD, Landowners
Funding Sources: Farm Bill Conservation Programs, 319 Program
Timeline: 2nd Quarter, 2005
Evaluation method 4

Issue: Conversion of agricultural and silvicultural land to residential land

Action Strategy 1: Develop or adopt a workshop for estate attorneys, landowners, municipalities, etc. on incentives to preserve land.
Responsible Parties: ACF, WBWP
Partners: Hand Arendall, NRCS, farmers, Elberta Co-Op, attorneys, municipalities, CPAs
Funding Sources: In Kind
Timeline: 2nd Quarter, 2005
Evaluation method 1

Action Strategy 2: Work to develop an incentive based program to conserve land, i.e. riparian buffers, conservation easements, land trusts, etc.
Responsible Parties: Unknown
Partners: ACF, WBWP, Hand Arendall, NRCS, farmers, Elberta Co-op, Forever Wild, Coastal Land Trust
Funding Sources: In Kind
Timeline: 1st Quarter, 2005
Evaluation method 1

Action Strategy 3: Provide education and outreach to the general public on estate taxes, property tax assessments and conservation easements and its connection to land use.
Responsible Parties: ACF, WBWP
Partners: Hand Arendall, NRCS, farmers, Elberta Co-op
Funding Sources: In Kind
Timeline: 3rd Quarter, 2005
Evaluation method 1

Action Strategy 4: Work with community to develop and provide incentives to preserve family farms.
Responsible Parties: ACF, WBWP
Partners: NRCS, farmers, Elberta Co-op
Funding Sources: In Kind
Timeline: 1st Quarter, 2006
Evaluation method 1

5. Construction

A survey of dirt roads was conducted by the volunteers of the Wolf Bay Watershed Watch and Figure 16 illustrates the location and extent of unpaved roads in the Wolf Bay Watershed Project Area. Of the 250 miles of roads, 49 miles are dirt or gravel and are maintained by the City of Gulf Shores, City of Foley, Town of Elberta, Baldwin County Commission and private citizens. Unpaved roads can be significant contributors of water quality degradation if not properly designed and maintained. Discharges of sediment laden waters into our waterways and wetland habitats diminishes channel capacity, causing more frequent and severe flooding; destroys aquatic and riparian habitat; and has other adverse effects on water quality and water-related activities. Erosion of unpaved roads occurs when soil particles are loosened and carried away from the roadway base, ditch, or road bank by water, wind, or traffic. After being dislodged, eroded soil particles are carried into the roadway drainage system. These systems should be designed to allow eroded particles to settle out before discharging into our waterways. Sediment control is usually accomplished through gradients of slope and vegetative buffers. Over time, the particles that settle out build up and reduce the carrying capacity of the drainage system and can cause increased flooding, erosion, and discharges of sediment. Therefore, proper maintenance reduces both environmental impacts and maintenance costs.

The Baldwin County Commission has implemented several programs and documents to combat these environmental and monetary costs. In 1998 the Baldwin County Environmental Advisory Board (BCEAB) was charged by the County Commission to identify unpaved roads that caused the largest impacts. Using data collected as part of the County Road Maintenance Cost Records and site visits, *The 25 Most Environmentally Damaging Dirt Roads in Baldwin County* was developed to provide priority and recommendations for county-maintained roads. From this list, Crawford Road was the only road listed for the Wolf Bay Watershed Area. As a result of this study and the availability of adequate right-of-way, it was paved and stormwater management was addressed. Also, dirt roads are graded on a routine cycle and after prolonged rainy periods. Ongoing since 2001, the implementation of the Erosion and Sediment Control Initiative of the *Coastal Impact Assistance Plan* (CIAP) has provided funding to accomplish three primary goals at the county level: 1) Best Management Training (BMP) training and certification of staff, 2) acquisition of alternative BMP technologies such as hydroseeders and hay bale shredders, and 3) paving of portions of dirt roads which cross sensitive habitats (Hill-top to Hill-top Program). In 2003 the Baldwin County Commission developed a BMP Policy document for construction and maintenance of county-maintained roads. The result of these programs and documents has lead to a marked improvement in both water quality and transportation. As unpleasant and damaging as unpaved roads are, they provide a necessary function for the residents and commerce of Baldwin County. Therefore, adaptation and expansion of managing techniques by stakeholders will prove to be the most efficient way of tackling impacts and costs from unpaved roads.

5. Construction

Cooperative Efforts Objective #1: To reduce nonpoint source pollution from construction.

Program Partnership Objective #1: Cooperate and develop relationships with local municipalities, government officials, government agencies, large landowners and businesses.

Program Partnership Objective #2: Develop better relationships with contractors, developers, utility companies, farmers, businesses and homeowners through the Clean Water Partnership, or any way possible.

Program Partnership Objective #3: Promote planning and zoning that will protect ecologically significant areas.

Program Partnership Objective #4: Work with Baldwin County to identify unpaved roads within the watershed and prioritize paving schedule.

Monitoring Objective #1: To identify all research conducted within the watershed that will assist decision makers in policy decisions.

Monitoring Objective #4: To better understand and research benthic, sediment and biotic samples to determine if contaminants such as pesticides are affecting aquatic or aquatic dependent life.

Issue: Nonpoint source runoff from dirt roads, farms and commercial and residential development.

Action Strategy 1: Develop workshops to explain impacts of NPS pollution and the benefit of better site design for homeowners, design engineers, architects, municipalities and developers.
Responsible Parties: WBEC
Partners: ADEM, ACF, WBWP, AGCA, HBBA, homeowner, engineers, architects, municipalities
Funding Sources: No funding anticipated
Timeline: Ongoing
Evaluation method 1

Action Strategy 2: Work with roadbuilders on implementation of BMPs.
Responsible Parties: Baldwin County
Partners: ADEM, ACF, WBWP, Roadbuilders Association
Funding Sources: No funding anticipated
Timeline: Ongoing
Evaluation method 6

Action Strategy 3: Work with Baldwin County Commission to prioritize paving of dirt roads within the watershed. Acquire list of dirt roads as well as cost to maintain these roads.
Responsible Parties: Baldwin County
Partners: WBWW, WBWP
Funding Sources: No funding anticipated
Timeline: Ongoing
Evaluation method 4 & 6

Action Strategy 4: Encourage municipalities, county, and roadbuilders to hold interdepartmental and inter-municipal pre-proposal conferences so all affected parties understand construction as well as request a county-wide transportation master plan.
Responsible Parties: WBWP, SWCS
Partners: Municipalities, County, Roadbuilders, ADEM, SARPC, HBBA
Funding Sources: Unknown
Timeline: 1st Quarter, 2005
Evaluation method 3

Action Strategy 5: Recognize contractors that are taking steps to protect the watershed by developing a builder rating system.
Responsible Parties: ACF
Partners: WBWW, WBWP, AGCA, HBBA
Funding Sources: In Kind
Timeline: 3rd Quarter, 2004
Evaluation method: length of list

Action Strategy 6: Support efforts to ensure that permits are obtained for one acre or larger disturbances and BMPs are installed correctly.
Responsible Parties: ADEM
Partners: WBWP, AGCA, HBBA
Funding Sources: No funding anticipated
Timeline: Ongoing
Evaluation method 3

Action Strategy 7: Work with utility companies to continue installing and maintaining effective BMPs.
Responsible Parties: WBWP
Partners: Utility Companies, WBWW
Funding Sources: In Kind
Timeline: 3rd Quarter, 2004
Evaluation method 6

6. Development and Enforcement of Regulations

Watershed residents are confused about the roles varying agencies play for watershed protection. There is a fear that when jurisdictional lines are crossed, regulatory effectiveness is decreased. There is also the desire to work for increased state and municipal budgets to provide the necessary people power to enforce existing regulations.

Issue: Varying levels of NPS enforcement make it difficult for residents and municipalities to understand and enforce codes.

Program Partnership Objective #1: Cooperate and develop relationships with local municipalities, government officials, government agencies, large landowners and businesses.

Program Partnership Objective #2: Develop better relationships with contractors, developers, utility companies, farmers, businesses and homeowners through the Clean Water Partnership, or any way possible.

Program Partnership Objective #3: Promote planning and zoning that will protect ecologically significant areas.

Education Objective #1:.To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Action Strategy 1: Develop ordinances and NPS guidelines that may be used countywide that will identify similarities in each municipality and promote the adoption of watershed planning.
Responsible Parties: Baldwin County Planning and Zoning Department, City of Foley, Town of Elberta and Town of Summerdale, City of Orange Beach, County Engineer, ADEM, Contractors, Engineers
Partners: Eastern Shore Chamber of Commerce, Environmental Committee, ADCNR Coastal
Funding Sources: ADCNR, Coastal
Timeline: 1st Quarter, 2005
Evaluation method 3

Action Strategy 2: Develop, distribute and publicize a responsibility matrix for residents to know what to do when a problem arises, who to call, etc.
Responsible Parties: Baldwin County Planning and Zoning Department, ADCNR, Coastal
Partners: WBWW, WBWP, ACF, City of Foley, Town of Elberta, Town of Summerdale, City of Orange Beach, ADEM, ADPH, COE
Funding Sources: NOAA, ADCNR
Timeline: 2nd Quarter, 2005
Evaluation method 4

7. Fisheries:

Fish and shellfish populations serve as easily understood measures of how well watershed management efforts are working. Good water quality and adequate habitat result in sustainable fisheries when adequate fisheries management measures are in place.

Monitoring Objective #3: To better understand and research fish tissue samples for metal contamination.

Monitoring Objective #4: To better understand and research benthic, sediment and biotic samples.

Issue: Limited information exists on metal contamination in aquatic organisms.

Action Strategy: Research available data and encourage applicable agencies to monitor mercury levels and sources within the watershed.
Responsible Parties: USFWS, EPA, ADPH, MRD
Partners: MBW, MASGC, The Forum
Funding Sources: Unknown
Timeline: Ongoing
Evaluation method 6

Note: ADEM's fish tissue monitoring program samples at one location within the watershed.

8. Human Health Issues:

With the continued increase in population, watershed residents are concerned about a variety of human health issues including the presence of pathogenic bacteria in area waterways, the rate of groundwater withdrawal, sediment contamination, and hazardous waste.

Preservation and Protection Objective #3: To protect groundwater resources as well as address the regulations of well water protection in the watershed.

Education Objective #1: To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts particularly sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Program Partnership Objective #1: Cooperate and develop relationships with local municipalities, government officials, governmental agencies, large landowners and businesses.

Monitoring Objective #1: To identify all research conducted within the watershed that will assist decision makers in policy decisions.

Issue: Limited information regarding groundwater withdrawal and recharge.

Action Strategy 1: Assess groundwater withdrawal zones and rates within the watershed.
Responsible Parties: Local municipalities
Partners: GSA, USGS, OWR, ADEM
Funding Sources: No funding anticipated
Timeline: 1st Quarter, 2005
Evaluation method 4

Action Strategy 2: Encourage local municipalities to develop source water protection zones.
Responsible Parties: Local Municipalities
Partners: ACF, ADEM, WBWW, WBWP
Funding Sources: Unknown
Timeline: 2nd Quarter, 2005
Evaluation method 4

Action Strategy 3: Partner with AWW to develop a volunteer ground water monitoring program.
Responsible Parties: AWW, WBWW, WBWP
Partners: CACWP, ADEM, AUMERC, ACF, municipalities
Funding Sources: ADEM, EPA
Timeline: 3rd Quarter, 2005
Evaluation method 6

Action Strategy 4: Encourage a countywide licensing requirement for all wells including well driller licensing.
Responsible Parties: BCC, ADEM
Partners: BCEAB, OWR, Municipalities, Residents
Funding Sources: No funding anticipated
Timeline: commence 2004
Evaluation method 3
Note: In October, 2003, the Baldwin County exemption was lifted by court order. Now, Baldwin County Well Drillers are required to be licensed.

Action Strategy 5: Provide citizen education on prevention of groundwater pollution and saltwater intrusion.
Responsible Parties: ADEM, ACES
Partners: ACF, WBWP, NEP
Funding Sources: NEP
Timeline: Ongoing
Evaluation method 1

Action Strategy 6: Develop a Groundwater Festival for watershed fourth graders.
Responsible Parties: ADEM
Partners: MEE, WBWP, ACF, OWR, municipalities, Board of Education, Weeks Bay Watershed Project
Funding Sources: ADEM, municipalities, In Kind
Timeline: Annually, beginning April 2004.
Evaluation methods 1 & 2

Action Strategy 7: Develop incentive programs to encourage recycling of greywater and the use of shallow water aquifers for irrigation.
Responsible Parties: ADEM
Partners: WBWP, ACF, OWR, ACES, municipalities
Funding Sources: Unknown
Timeline: 2nd Quarter, 2006
Evaluation methods 3 & 4

Issue: Inadequate disposal facilities for hazardous waste

Action Strategy 1: Work with county and municipalities to sponsor HHW collection day.
Action Strategy 2: Work to acquire funds for permanent HHW collection facility.
Responsible Parties: Baldwin County Solid Waste Department
Partners: ACF, WBWP, ADCNR, Coastal; ADAI
Funding Sources: ADCNR, NOAA (CIAP), BCC
Timeline: Ongoing
Evaluation method: pounds of waste collected and number of people participating

Issue: Homeowners are concerned about how to properly address nutrient and sediment runoff.

Action Strategy 1: Develop a workshop for Wolf Bay Homeowners on stormwater runoff and BMPs.
Responsible Parties: WBEC
Partners: Homeowners Associations, ACES
Funding Sources: Unknown
Timeline: 3rd Quarter, 2004

Issue: Bacteria levels may be unsafe after rain events.

Action Strategy 1: Develop an enterococcus monitoring program.
Responsible Parties: WBWW, WBWP, local citizens
Partners: ACF
Funding Sources: Unknown
Timeline: Upon funding

Action Strategy 2: Develop a bacteria source tracking program.
Responsible Parties: WBWW, WBWP, local citizens
Partners: ACF
Funding Sources: Unknown
Timeline: Upon funding

9. Wetlands

Wetlands are a semi-aquatic lands that are either inundated or saturated by water for varying periods of time. The three defining characteristics of wetlands include hydrology, hydrophytic vegetation and hydric soils. Wetlands serve as a transitional zone between upland and aquatic systems and are typically very productive nursery areas. Wetlands serve additional functions including: pollution control, sediment filtering, groundwater recharge, flood protection, and shoreline buffering. Wetlands also provide recreational opportunities including boating and birding.

The federal regulations implementing Section 404 of the Clean Water Act define wetlands as: "*Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas* (40 CFR 232.2(r))."

Education Objective #1: To make landowners/homeowners aware of their impacts on the watershed, including their recreational impacts including sewage, petroleum products, nutrients, pesticides, boat wakes and litter.

Preservation and Protection Objective #1: To classify Wolf Bay and its tributaries as an Outstanding Alabama Water.

Preservation and Protection Objective #2: To acquire land in the watershed, including areas designated as open space and riparian buffers.

Preservation and Protection Objective #3: To protect groundwater resources as well as address the regulations of well water protection in the watershed.

Preservation and Protection Objective #4: Ensure protection of fish and wildlife habitats.

Program Partnerships Objective #1: Cooperate and develop relationships with local municipalities, government officials, governmental agencies, large landowners and businesses.

Program Partnerships Objective #3: Promote planning and zoning that will protect ecologically significant areas.

Issue: Current wetland regulations do not protect ecologically sensitive areas like isolated wetlands (e.g. grady ponds).

Action Strategy 1: Develop and implement a non-regulatory protection program similar to the ADID process.
Action Strategy 2: Identify isolated wetlands and have them mapped.
Action Strategy 3: Restore isolated wetlands.
Responsible Parties: Baldwin County Planning and Zoning Department, City of Foley, Town of Elberta and Town of Summerdale.
Partners: USACE, ADEM, ADCNR Coastal, BCC, WBWP
Funding Sources: Baldwin County
Timeline: Underway
Evaluation method 4

Issue: There is a need for the general public to understand the benefits of wetlands.

Action Strategy 1: Provide educational programs for the general public on the economic, social and environmental benefits of wetlands.
Action Strategy 2: Provide information to the general public on tax incentives and other benefits that can be achieved through the use of conservation easements for land protection.
Action Strategy 3: Partner with the Coastal Training Institute for Wetlands.
Action Strategy 4: Develop an Adopt a Wetlands Program
Responsible Parties: USACE, ADEM, ADCNR Coastal
Partners: USACE, ADEM, ADCNR Coastal, BCC, WBWP, Hand Arendall, FWS
Funding Sources: Baldwin County
Timeline: Ongoing
Evaluation method 1

Action Strategy 5: Utilize existing and pursue new programs to provide landowners with economically viable solutions for wetland habitat protection and restoration activities.
Responsible Parties: USACE, ADEM, DCNR coastal
Partners: BCC, WBWP, ACF
Funding Sources: Baldwin County, City of Foley, City of Orange Beach
Timeline: 1st Quarter, 2005
Evaluation method 4

Issue: Need for coordinated plan to protect sensitive habitats including habitat acquisition and protection.

Action Strategy 1: Identify and map sensitive habitats and work with existing ranking systems to prioritize the acquisitions or other forms of protection.
Responsible Parties: ACF, TNC
Partners: FWS, NEP, ADCNR, USACE, Land Trusts, BCC, Wetland Resources, ACF, Baldwin County Planning Department, WBWP, Forever Wild, CLT, Forest Legacy
Funding Sources: CELCP, ADCNR, FWS, Forest Legacy, Forever Wild
Timeline: Underway
Evaluation method 4

Action Strategy 2: Encourage local authority for overlay districts of riparian buffer zones for planning and zoning documents, countywide master plans, and subdivision regulations.
Responsible Parties: Baldwin County, local legislators, municipalities
Partners: ACF, WBWP
Funding Sources: No funding anticipated
Timeline: Unknown
Evaluation method 3

VI. MANAGEMENT PLAN IMPLEMENTATION

Upon completion of the management plan, funding for project implementation has yet to be secured. Although ACF and WBWW will do as much as possible to keep this stakeholder's guide in front of the community, it is inherent to have personnel dedicated to keep the momentum going during this community process.

A variety of organizational and monitoring objectives as well as action strategies have been identified to outline the steps necessary to keep the plan afloat. The WBWP Citizens Advisory and Technical Advisory Committees believe this process should address evaluative monitoring. This project was developed to decrease nonpoint source pollution. Therefore, background monitoring will be needed to highlight the success of this plan. A Quality Assurance Protection Plan (QAPP) will be developed to address specific monitoring needs that have not been addressed through action strategies included in this stakeholders guide.

Issue: Ensure support of all agencies and affected parties of watershed management plan

Organizational Objective #1: To keep the efforts of the watershed project ongoing, establish a watershed project coordinator.

Organizational Objective #2: To establish an organizational committee with representatives from each Hydrologic Unit Codes (HUC) watershed or creek (Miflin, Wolf, Hammock, Sandy, Graham, Ownes) in the project area.

Organizational Objective #3: Establish an educational center for the community to learn about the watershed resources.

Action Strategy 1: Encourage agencies to sign memoranda of understanding supporting management strategies.
Responsible Parties: ACF, WBWP
Partners: WBWW, ADEM, EPA
Funding Sources: No funding anticipated
Timeline: Ongoing

Action Strategy 2: Host annual updates on management plan implementation to community and local officials and agencies.
Responsible Parties: WBWP
Partners: ACF, WBWW, ADEM
Funding Sources: No funding anticipated
Timeline: Annually, commence 2004

Action Strategy 3: Review watershed management plan and update as necessary.
Responsible Parties: WBWP
Partners: ADEM, ACF, EPA
Funding Sources: Unknown
Timeline: As necessary

Action Strategy 4: Take local officials on tours of the watershed to discuss needs and problems.
Responsible Parties: WBWW, WBWP
Partners: Local municipalities, ACF
Funding Sources: None anticipated
Timeline: As necessary

Issue: Watershed residents need support committee and coordinator to implement management plan and continue education activities throughout the watershed.

Action Strategy 1: Develop a committee based on the creeks and geography.
Action Strategy 2: Solicit funding for full-time watershed project coordinator.
Responsible Parties: ACF, WBWP
Partners: ADCNR, Coastal, ADEM, WBWW, municipalities, residents of area, ADEM, Baldwin EMC, Volkert, Riviera Utilities
Funding Sources: Unknown
Timeline: As soon as possible

Action Strategy 3: Provide workshops and community events to keep watershed residents engaged.
Responsible Parties: WBWP
Partners: ACF, WBWW
Funding Sources: Unknown
Timeline: As necessary

Action Strategy 4: Publish semi-annual Watershed Project newsletter.
Responsible Parties: WBWP
Partners: municipalities, residents of area, ADEM, EMC, Volkert, Riviera
Funding Sources: Unknown
Timeline: semi-annually, commence 2004

Monitoring Objective #1: To identify all research conducted within the watershed that will assist decision makers in policy decisions.

Issue: Limited information on water quality within Wolf Bay Watershed.

Action Strategy 1: Continue to research and catalog water quality sampling conducted by agencies and environmental groups.
Responsible Parties: WBWP
Partners: WBWW, ADEM, MRD, ADPH, DISL, USA, GSA, USGS, FWS, ACF, ADCNR
Funding Sources: Unknown
Timeline: Ongoing

Action Strategy 2: Establish volunteer water quality monitoring and encourage agency monitoring, in areas where little or no sampling has been conducted.
Responsible Parties: WBWW, WBWP
Partners: AWW, ACF, ADEM
Funding Sources: AWW, ADCNR, Baldwin County, ADEM
Timeline: Ongoing

Action Strategy 3: Submit data as part of statewide water quality database.
Responsible Parties: WBWW, AWW
Partners: ACF, WBWP, ADEM
Funding Sources: No funding necessary
Timeline: Ongoing

Table 1

Species of Concern in Wolf Bay

Species	Notes
Alabama Red Bellied Turtle	Endangered
American Eel	Protected as an anadromous species by NOAA
Bald Eagle	Federally listed threatened species One active nest site in watershed One inactive nest
Brown Pelican	Federally listed in MS but not AL
Dolphins and Whales	Migratory
Estuaries	Ecologically significant habitat
Gopher Tortoise	Federally listed threatened species west of the Mobile River State listed in Florida Closed season in Baldwin County, AL
Gulf Sturgeon	Federally listed threatened species
Manatee	Endangered
Neotropical Migratory Birds	Federally protected by the Migratory Bird Treaty Act
Pitcher Plants	State listed in Florida Found in ecologically significant habitat
Red Cockaded Woodpecker	Endangered
Sea Turtles	Endangered
Wood Stork	Endangered

Source: USFWS,2004

TABLE 2
OAW CURRENT AND REQUESTED USE CLASSIFICATION FROM WBWW

Waterbody Recommended	Current Classification	Classification Upgrade	Area Location
Wolf Bay, connecting coves and bayous	S/F&W/SH	OAW	Wolf Bay, connecting coves and bayous
Bay La Launch, connecting coves and bayous	S/F&W/SH	OAW	Bay La Launch, connecting coves and bayous
Arnica Bay, connecting coves and bayous	S/F&W/SH	OAW	Arnica Bay, connecting coves and bayous
Miflin Creek	S/F&W	OAW	Wolf Bay to limit of tidal effects
Miflin Creek	F&W	S/OAW	Limit of tidal effects to its source
Hammock Creek	S/F&W	OAW	Wolf Bay to limit of tidal effects
Hammock Creek	F&W	S/OAW	Limit of tidal effects to its source
Wolf Creek	F&W	S/OAW	Wolf Bay to its source
Sandy Creek	S/F&W	OAW	Wolf Bay to its source
Gum Branch	F&W	S/OAW	Miflin Creek to its source
Graham Creek	F&W	S/OAW	Graham Bayou to its source
Owens Creek	F&W	S/OAW	Owens Bayou to its source
Intracoastal Waterway	F&W	S/OAW	Hwy. 59 to Wolf Bay
Ingram Creek	F&W	S/OAW	Ingram Bayou to its source
Soldier Creek	S/F&W	OAW	Perdido Bay to its source
LEGEND S = Swimming & Whole Body Contact; F&W = Fish & Wildlife; SH = Shellfish Harvesting		OAW = Outstanding Alabama Waters	

Table 3

Wolf Bay Watershed Watch Monitoring Stations

AWW Site Code	Waterbody	Site Location	Latitude	Longitude
4012001 Currently Inactive	Wolf/Sandy Creek	Clay docks	30.3575	-87.61139
4012002	Miflin Creek	Miflin Moorings, CR 20 bridge (was 04011001)	30.36417	-87.60263
4012003	Owens Bayou	Bay Forest launch ramp	30.3525	-87.61083
4012004 Currently Inactive	Hammock Creek	Braswell's dock	30.345	-87.57889
4012005 Currently Inactive	Graham Bayou	McArthur's dock	30.36056	-87.615
4012006	Wolf Bay	west shore @ Griggs' dock	30.3425	-87.60361
4012007 Currently Inactive	Wolf Bay	Danley point	30.34333	-87.6000
4012008 Currently Inactive	Wolf Bay	mouth of Portage Creek	30.30043	-87.60683
4012009	Sandy Creek	N of confluence with Wolf Creek	30.36784	-87.62098
4012010	Wolf Creek	above confluence with Sandy Creek	30.36791	-87.62195
4012011	Hammock Creek	Benton Branch	30.35432	-87.57428
4012012	Miflin Creek	at Gum Branch	30.36952	-87.59136

Table 3

Wolf Bay Watershed Watch Monitoring Stations

AWW Site Code	Waterbody	Site Location	Latitude	Longitude
4012013	Roberts Bayou	at Pirates Cove Marina	30.32	-87.53333
4012014	Portage Creek	Orange Beach WWTP discharge pipe	30.29619	-87.63089
4012015	Wolf Bay	at McCamish's dock	30.33469	-87.57809
4012016 Currently Inactive	Wolf Creek	Poplar Street, Foley	30.40962	-87.67665
4012017 Currently Inactive	Wolf Bay	Aspray's dock	30.347941	-87.598574
4012018	Soldiers Creek	Knaebel's dock	30.365409	-87.500495
4012019 Currently Inactive	Spring Branch	Paletti dock	30.34167	-87.5195
4012020	Wolf Creek	Cummings Dock	30.355684	-87.609635
4012021 Currently Inactive	Bay La Launch	Boyce's Dock	30.29745	-87.57062
4012022	Hammock Creek	CR 20	30.36353	-87.56797
4012023	Graham Bayou	Bay View Dr boat ramp	30.34078	-87.61269
4012024 Currently Inactive	Old River	Currier Dock (28808 Ono Blvd.)	30.28177	-87.53367

Table 3
Wolf Bay Watershed Watch Monitoring Stations

AWW Site Code	Waterbody	Site Location	Latitude	Longitude
4012025	Wolf Creek	upstream from US98 bridge	30.40667	-87.66833
4012026 Currently Inactive	Roberts Bayou	Douglas' dock	30.32833	-87.53833
4012027 Currently Inactive	Wolf Creek	Doc McDuffie Road	30.38855	-87.65323
4012028	Sandy Creek	upstream of US Hwy 98 bridge	30.40667	-87.63
4012029	Miflin Creek	US Hwy 98	30.41462	-87.59168
4012030	Wolf Creek	Foley Beach Expressway bridge	30.38167	-87.65167
4012031	Wolf Creek	Swift Church Rd.	30.373171	-87.632692
4012032	Stone Quarry Bayou	285 Josephine Harbor	30.31333	-87.53889
4012033 Currently Inactive	Soldiers Creek	end of Baldwin St.-Perdido Bch.	30.35	-87.49833
4012034 Currently Inactive	Palmetto Creek	end of Baldwin St.,Perdido Beech.	30.35	-87.50889
4012035	Perdido River	Duck Place Rd, Barrineau Bridge	30.68833	-87.44028
4012036	Styx River	SR 87 - downstream	30.60542	-87.54711
4012037 Currently Inactive	Lake Shelby	Gulf State Park Picnic River	30.25333	-87.66111
4012038 Currently Inactive	Intracoastal Waterway	Waterway Inn	30.27917	-87.68306
4012039	Perdido Bay	Lillian Bridge	30.401677	-87.426204
4012040	Wolf Bay	Dukes Dock	30.350	-87.598

Table 4 - ADEM Water Use Classification

Rank	Classification	Sewage, Industrial Waste or Other Waste	pH (s.u.)	Temperature (F)	Dissolved Oxygen (mg/L)	Bacteria (colonies/100-mL)	Turbidity (NTU)	Toxicity, Taste, Odor and Color
*i	Outstanding National Resource Water (ONRW)	No new or expanded point source discharges shall be allowed.	The water quality criteria are contingent upon the use classification of the specific Waterbody that has been assigned the ONRW designation. For example, Little River has been designated as an ONRW waterbody, however it has been classified by ADEM as a PWS, S, & F&W, therefore the applicable water quality criteria associated with the PWS,S, & F&W classification apply.					
1	Outstanding Alabama Water (OAW	No new or expanded point source discharges shall be allowed, unless no other feasible alternative can be demonstrated to the satisfaction of the Department.	6.0-8.5	Shall not exceed 90 F; (86 F)*ii Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F) *iii	Shall not be less than 5.5	Fecal coliform group shall not exceed a geometric mean of 100 (coastal waters) and 200 (all other waters)	Shall not exceed 50 NTUs above background	Must meet all toxicity requirements, not affect propagation or palatability of fish/shellfish, or affect aesthetic values
2	Public Water Supply (PWS)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; (86 F) Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F)	Shall not be less than 5.0	1000 geometric mean 2000 max. single sample (year-round) [100(coastal waters) and 200 (all other waters) June-Sep] *iv	Shall not exceed 50 NTUs above background	Shall not render waters unsafe or unsuitable for drinking supply or food processing; must meet all toxicity requirements, & not affect fish palatability
3	Swimming and Other Whole Body Water Contact Sports (S)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; (86 F) Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F)	Shall not be less than 5.0	Fecal coliform group shall not exceed a geometric mean of 100 (coastal waters) and 200 (all other waters)	Shall not exceed 50 NTUs above background	Shall not render the water unsafe for water-contact; not exhibit acute or chronic toxicity; not impair fish palatability, or affect the aesthetic value
4	Shellfish Harvesting (SH)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; (86 F) Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F)	Shall not be less than 5.0	Fecal coliform group shall not exceed a geometric mean of 100 (coastal waters) and 200 (all other waters) Not to exceed FDA limits *v	Shall not exceed 50 NTUs above background	Shall not exhibit acute or chronic toxicity; not affect marketability or palatability of fish and shellfish, or affect the aesthetic value

Table 4 - ADEM Water Use Classification

Rank	Classification	Sewage, Industrial Waste or Other Waste	pH (s.u.)	Temperature (F)	Dissolved Oxygen (mg/L)	Bacteria (colonies/100mL)	Turbidity (NTU)	Toxicity, Taste, Odor and Color
5	Fish and Wildlife (F&W)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; (86 F) Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F)	Shall not be less than 5.0	1000 geometric mean 2000 maximum any sample (year-round) [100 (coastal waters) and 200 (all other waters) Jun-Sep]	Shall not exceed 50 NTUs above background	Shall not exhibit acute or chronic toxicity; not affect marketability or palatability of fish and shellfish, or affect the aesthetic value
6	Limited Warmwater Fishery (LWF)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; (86 F) Maximum instream rise above ambient conditions shall not exceed 5 F; (4.0/1.5 F)	Shall not be less than 5.0 (Dec-Apr) Shall not be less than 3.0 (May-Nov)	Fecal coliform group shall not exceed a geometric mean on 1000; nor exceed a maximum of 2000 for any single sample	Shall not exceed 50 NTUs above background	Shall not exhibit acute or chronic toxicity; Shall not render waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply, fish survival, or interfere with downstream water uses
7	Agricultural and Industrial Water Supply (A&I)	Must be treated or controlled in accordance with ADEM Rule 335-6-10-.08	6.0-8.5	Shall not exceed 90 F; Max rise above ambient conditions shall not exceed 5 F)	Shall not be less than 3.0	Fecal coliform group shall not exceed a geometric mean on 2000; nor exceed a maximum of 4000 for any single sample	Shall not exceed 50 NTUs above background	Shall not render waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply, fish survival, or interfere with downstream water uses

**i* ONRW is a special designation and is not defined as a separate use classification. Specific water quality criteria are dependent upon the particular waterbody and its associated use classification.

**ii* For streams, lakes and reservoirs in the Tennessee and Cahaba River Basins, and for specific segment of the Tallapossa River Basin, that has been designated by the Alabama Department of Conservation and Natural Resources as supporting smallmouth bass, saugher, or walleye, the instream temperature shall not exceed 86 F.

**iii* The maximum instream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 4 F in coastal estuarine waters during the period October through May, nor shall the rise exceed 1.5 F during the period June through September.

**iv* For incidental water contact and recreation during June through September, the bacterial quality of the water is acceptable when sanitary survey by the controlling health authority reveals no source of dangerous pollution and when the geometric mean fecal coliform organism density does not exceed 100 col/100 ml (coastal waters) and 200 col/100 ml (other waters).

**v* Not to exceed the limits specified in the latest edition of the National Shellfish Sanitation Program Manual of Operations, Sanitation of Shellfish Growing Areas (1965), published by the Food and Drug Administration, U.S. Department of Health and Human Services.

Table 5

Sod Acreage in Baldwin County

Year	Growers	Acres
1978	2	250
1988	4	4,200
2001	14	9,033

Source: John Adrian, Auburn University, Department of Agriculture and Economy, 2003

TABLE 6

SOIL EROSION RATES FOR MIFLIN AND WOLF CREEK SUB-WATERSHEDS

Source of Erosion and Sediment	Acres in Watershed	Estimated Erosion (Ton/Acre)	Total Erosion (Tons)	Delivery Ratio	Sediment (Tons)
Cropland	8,000	14	56,000	.6	16,800
Sand and Gravel Pits	110	1,000	55,000	1.4	38,500
Developing Urban Land	4,450	300	667,500	.8	267,000
Critical Areas	450	300	63,750	1.0	33,750
Gullies	105	1,200	63,000	1.4	44,100
Streambank	46	20	460	2.0	460
Dirtroads and Roadbanks	170	500	42,500	1.2	25,500
Woodland	38,273	2.0	38,273	.6	11,481

Note: In doing this assessment, NRCS considered "critical areas" to be special areas in the watersheds that would need particular attention other than gullies and streambanks. The column on critical areas includes calculations on tonnage for "our critical areas and our woodlands." Pastures were not included since it was calculated separately.

SOURCE: NRCS, 1998

FIGURE 1

Wolf Bay Watershed Project

Watershed Project Locator Map

Watershed Project Boundary
County Boundaries

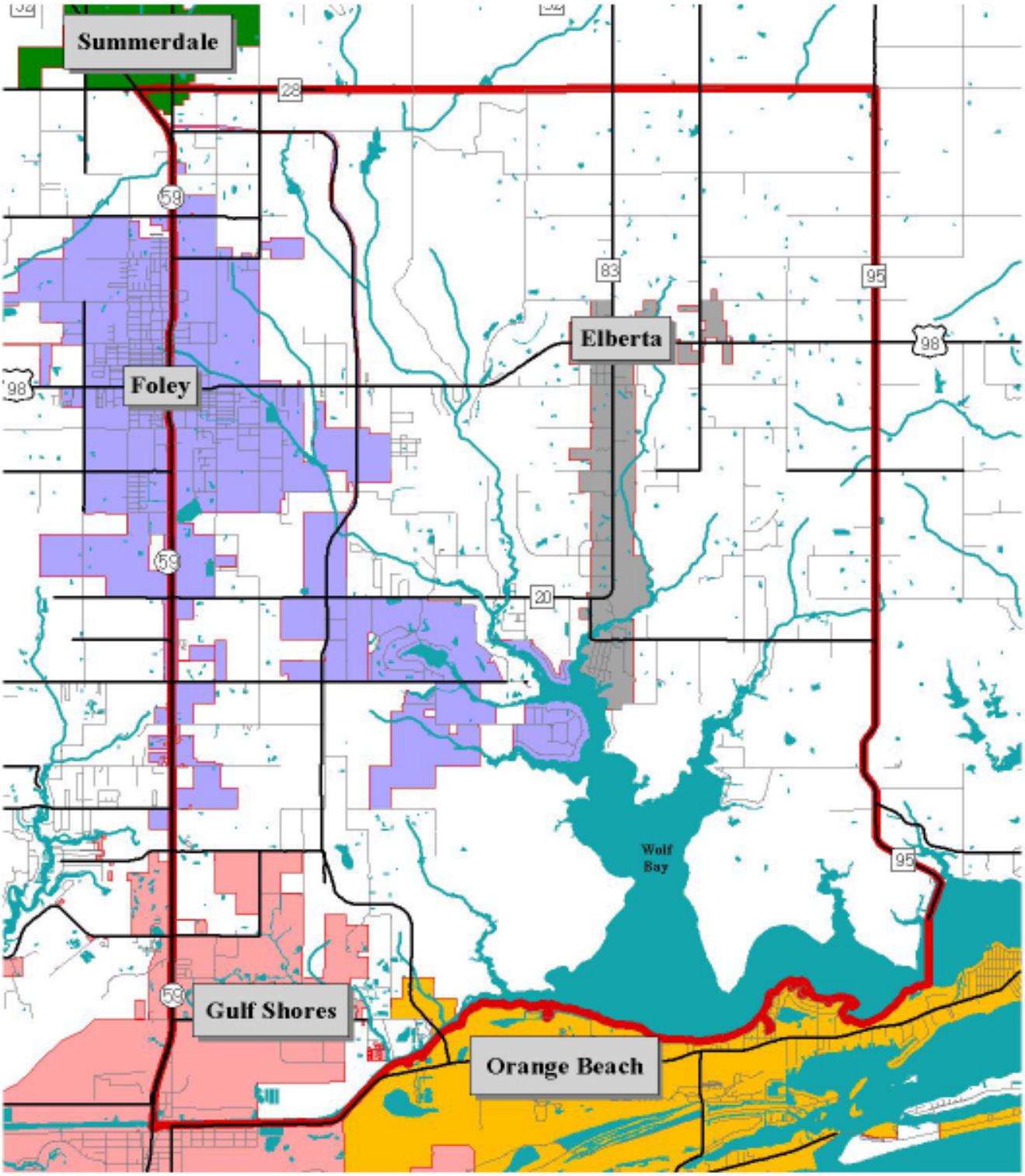
Some geographic data provided by the Baldwin County Commission

20 0 20 40 Miles

FIGURE 2

Wolf Bay Watershed Project

Watershed Project Boundary



Major Roads
Roads
Watershed Project Boundary (approximately 94 square miles)
Waterways

Some geographic data provided by the Baldwin County Commission

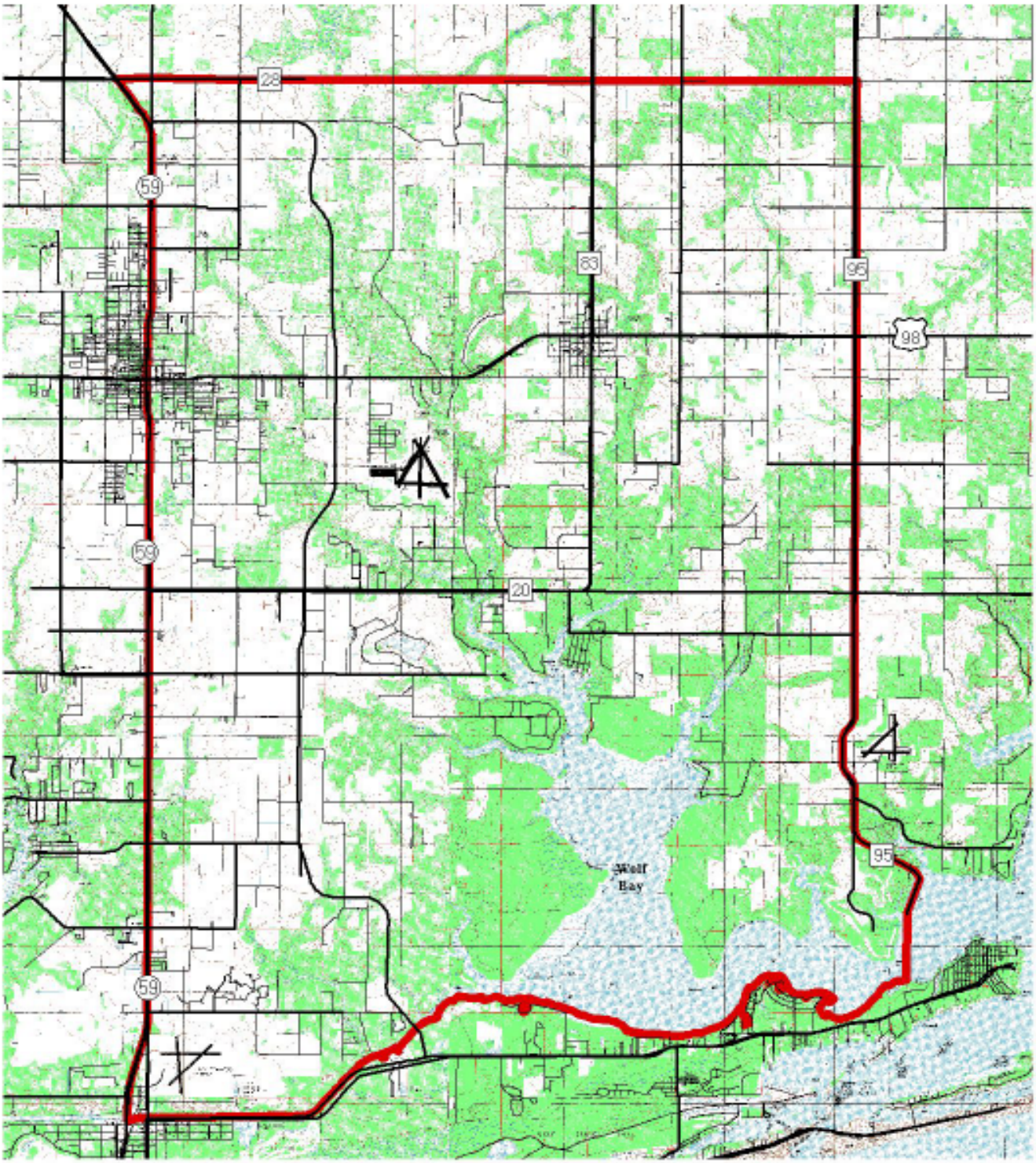
1 0 1 Miles

FIGURE 3

Wolf Bay Watershed Project

USGS Topographic Data

Source: US Geological Survey



Major Roads
Roads
Watershed Project Boundary

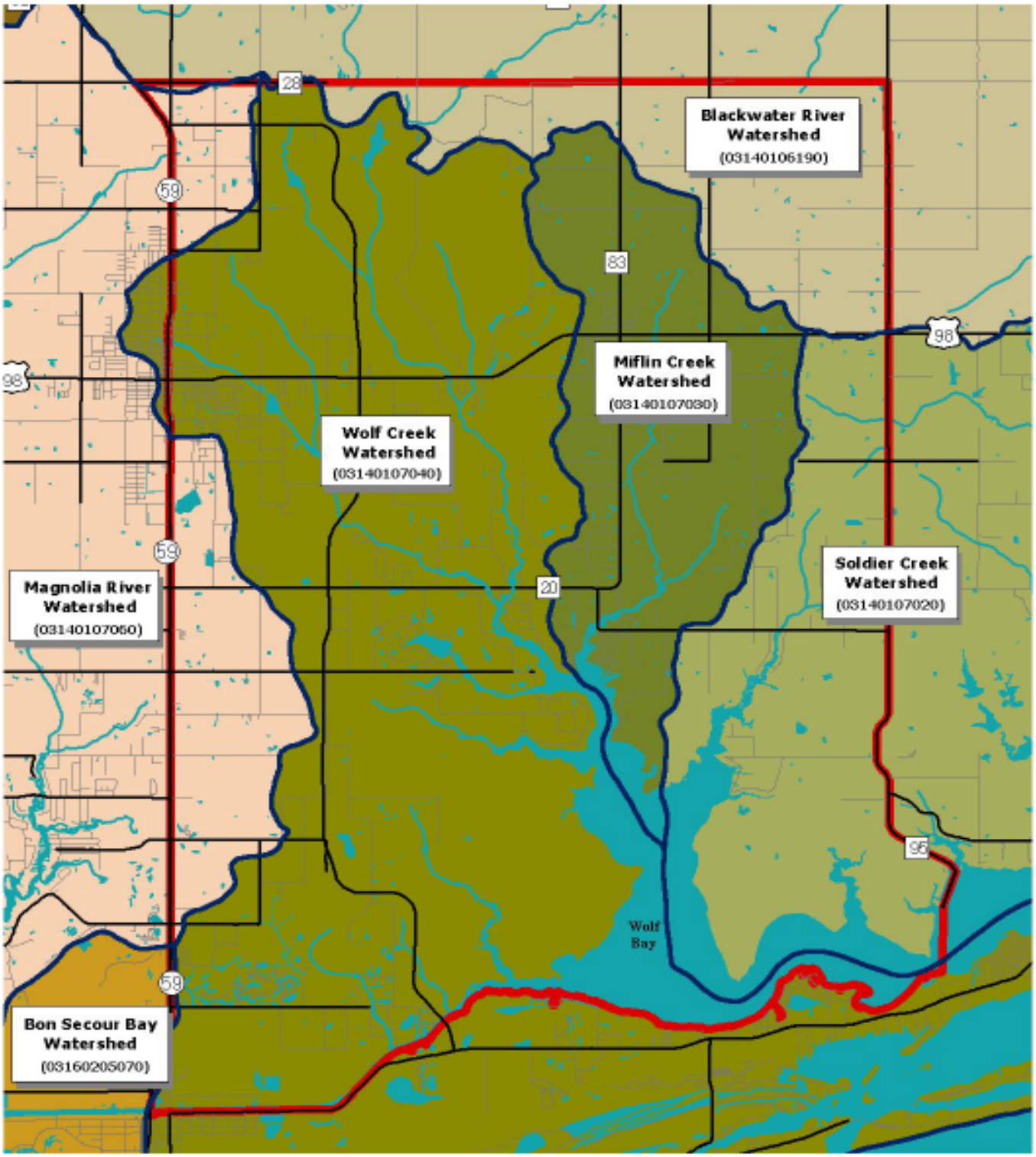
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 4

Wolf Bay Watershed Project

USGS 11-Digit Hydrologic Units



Major Roads
Roads
Watershed Project Boundary
USGS HUC (Watershed) Boundaries
Waterways

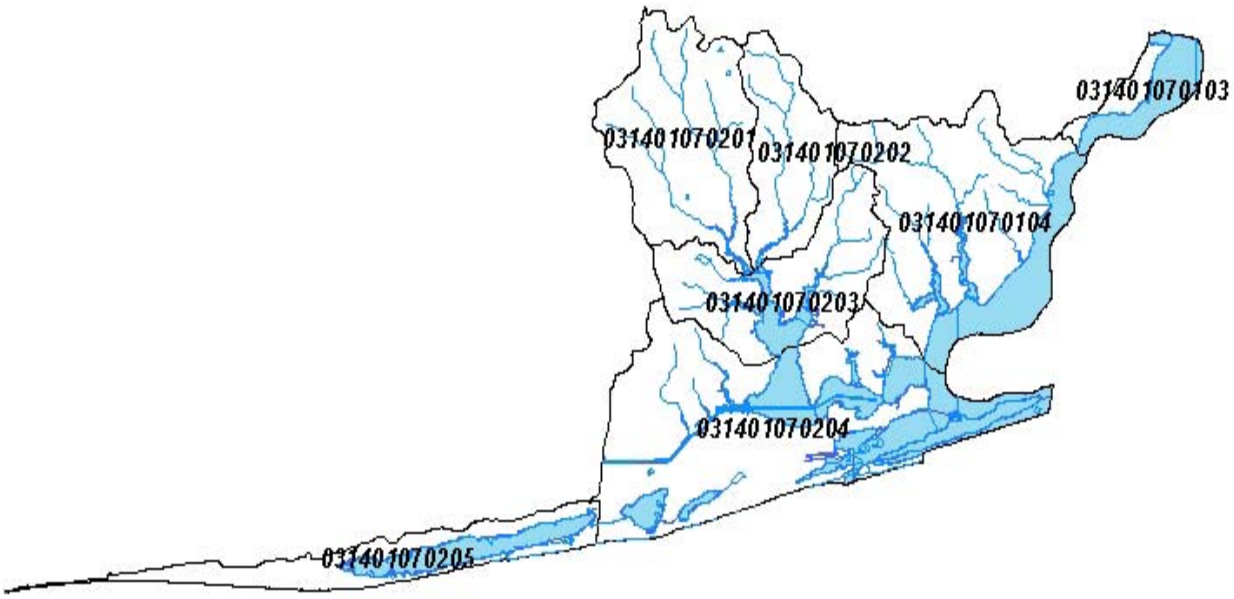
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 5

Wolf Bay Watershed Project

Proposed Hydrologic Unit Codes



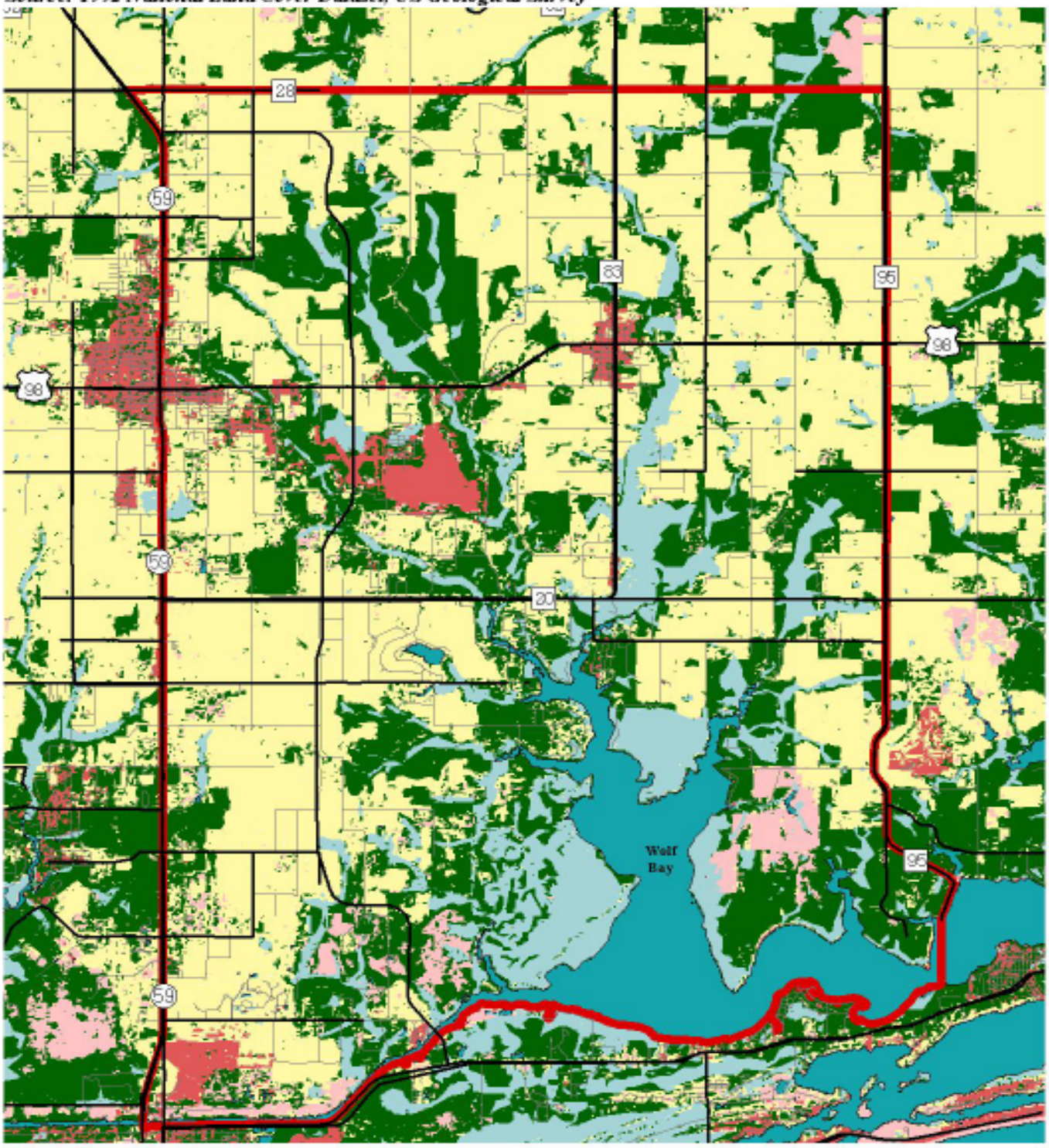
Source: USGS, 2004

FIGURE 6

Wolf Bay Watershed Project

Existing Land Use

Source: 1992 National Land Cover Dataset, US Geological Survey



Major Roads
Roads
Watershed Project Boundary
Waterways

Land Use Classification
Urbanized (3%)
Barren/Transitional (3%)
Forested (27%)
Agricultural (48%)
Wetlands (12%)

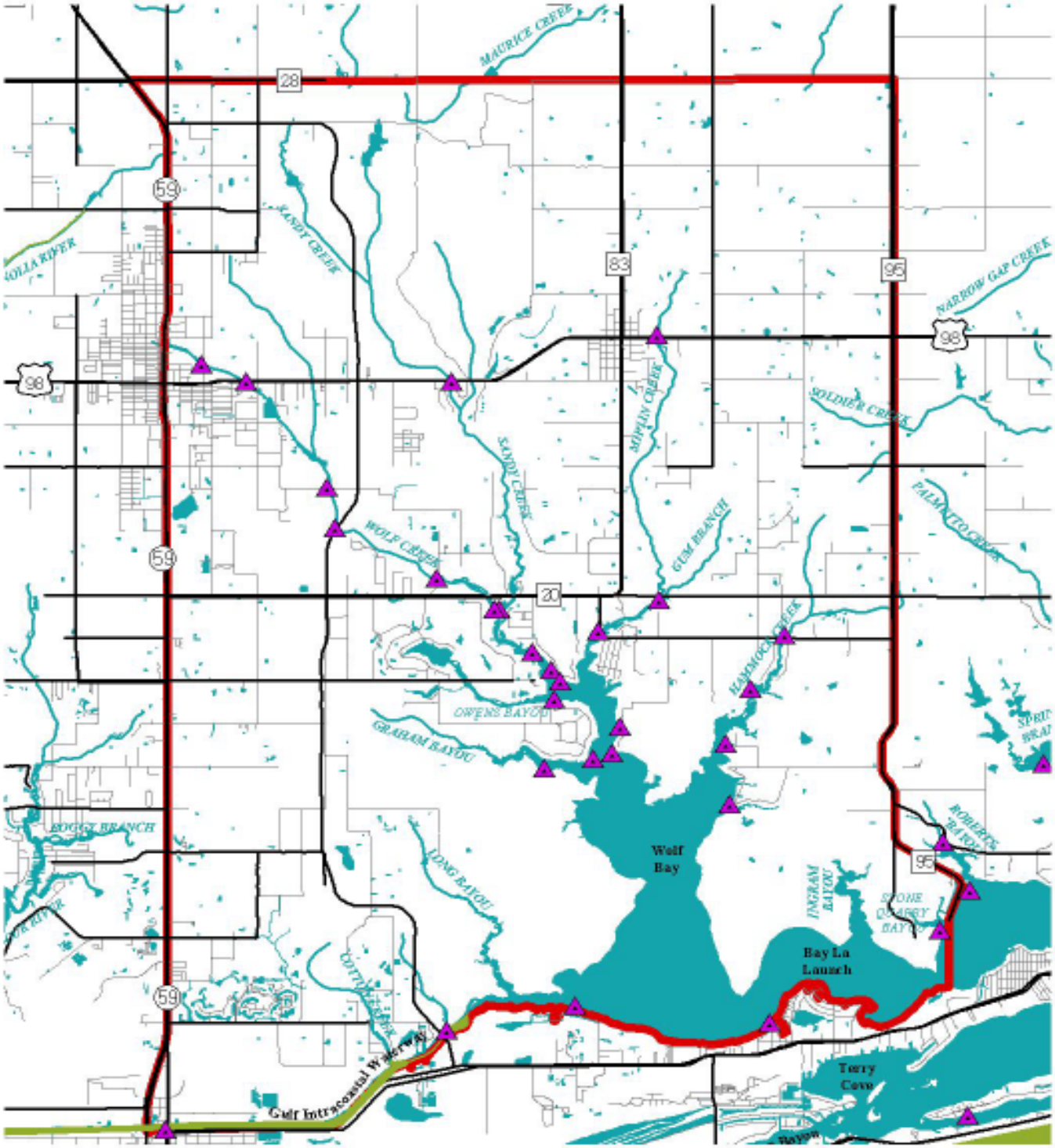
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 7

Wolf Bay Watershed Project

Water Quality Information



Major Roads
Roads
Watershed Project Boundary
Waterways

WBWW Monitoring Sites
303(d) Impaired Waters

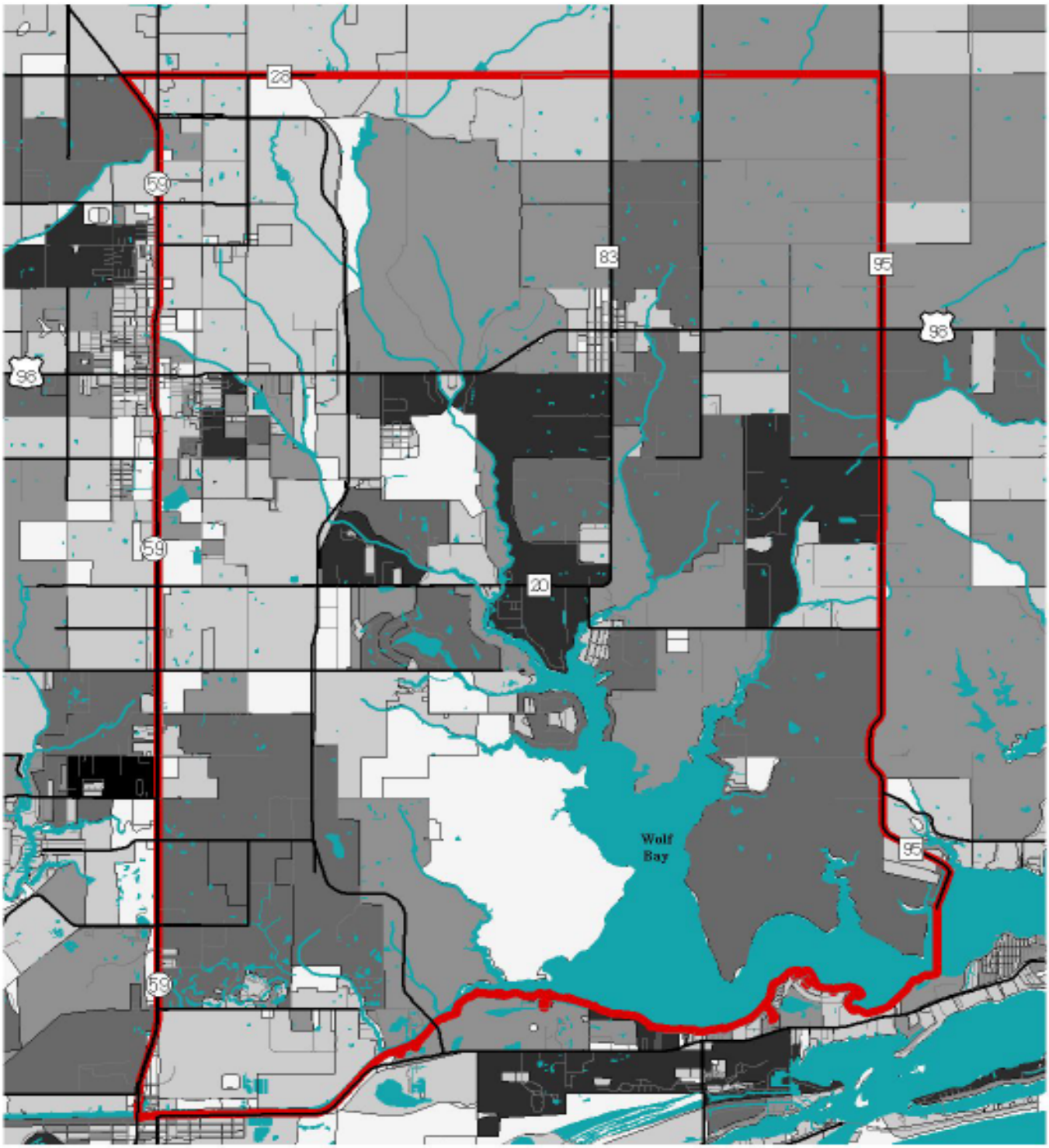
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 8

Wolf Bay Watershed Project

Population (Census 2000)



Major Roads
Roads
Watershed Project Boundary
Waterways

Census 2000 population
0
1 - 50
51 - 100
101 - 250
251 - 500
>500

Project Area
Total Population:
10,846

Some geographic data provided by the Baldwin County Commission

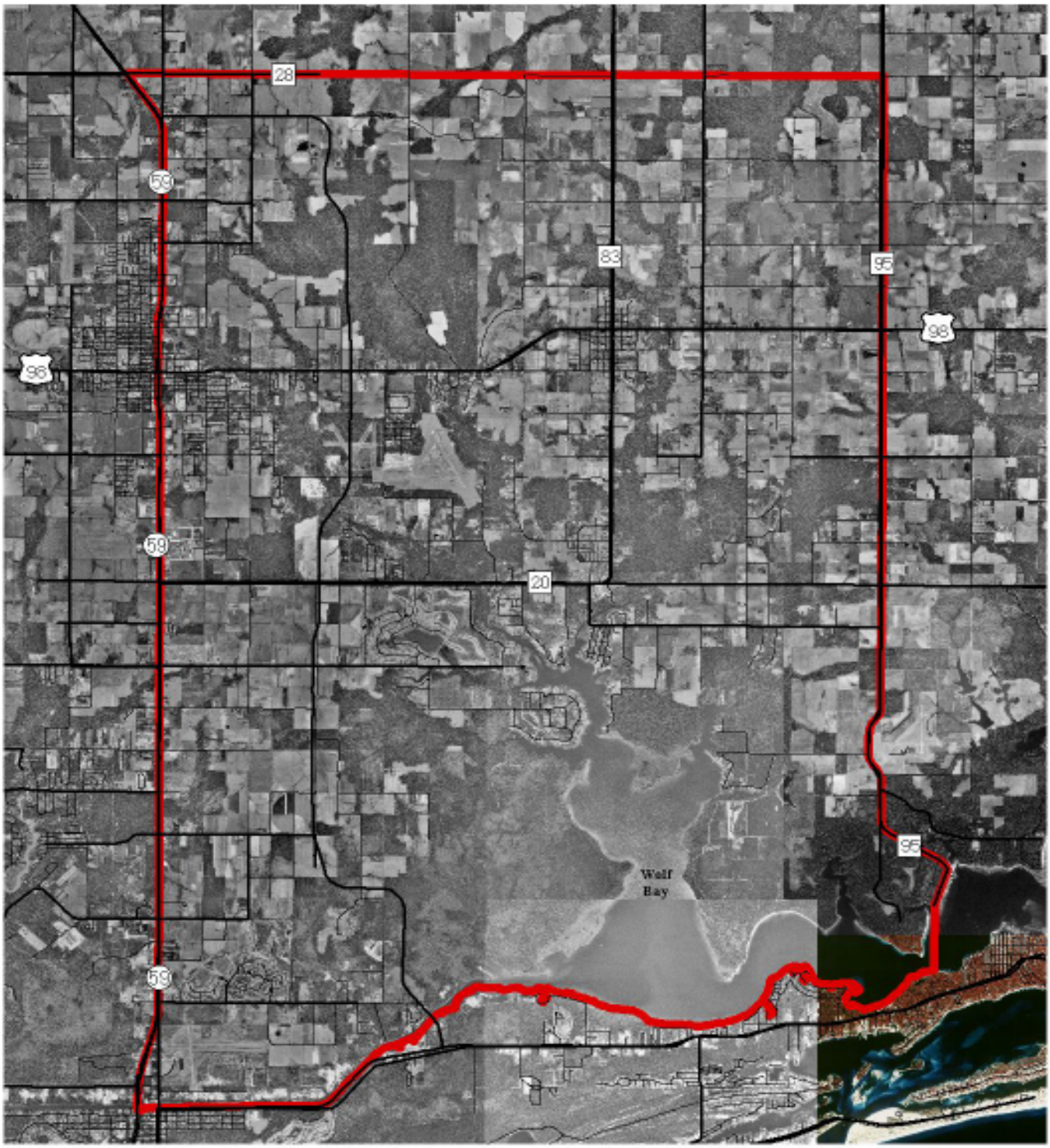
1 0 1 Miles

FIGURE 9

Wolf Bay Watershed Project

1996 Aerial Photography

Source: US Geological Survey



Major Roads
Roads
Watershed Project Boundary

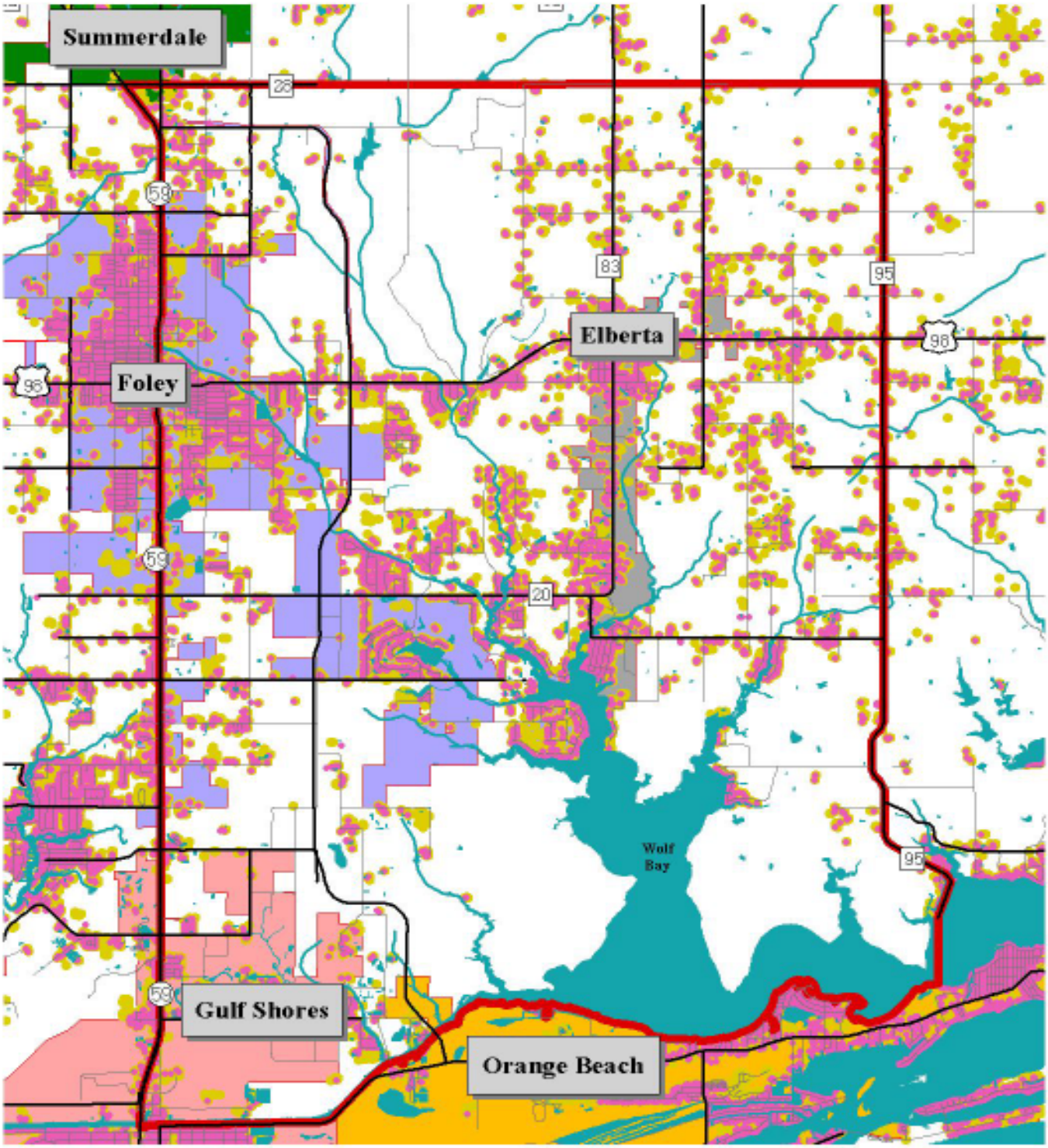
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 10

Wolf Bay Watershed Project

Building Development



Major Roads
Roads
Watershed Project Boundary
Waterways
1996 Buildings (6,201 in project area)
2001 Buildings (9,840 in project area)

Some geographic data provided by the Baldwin County Commission

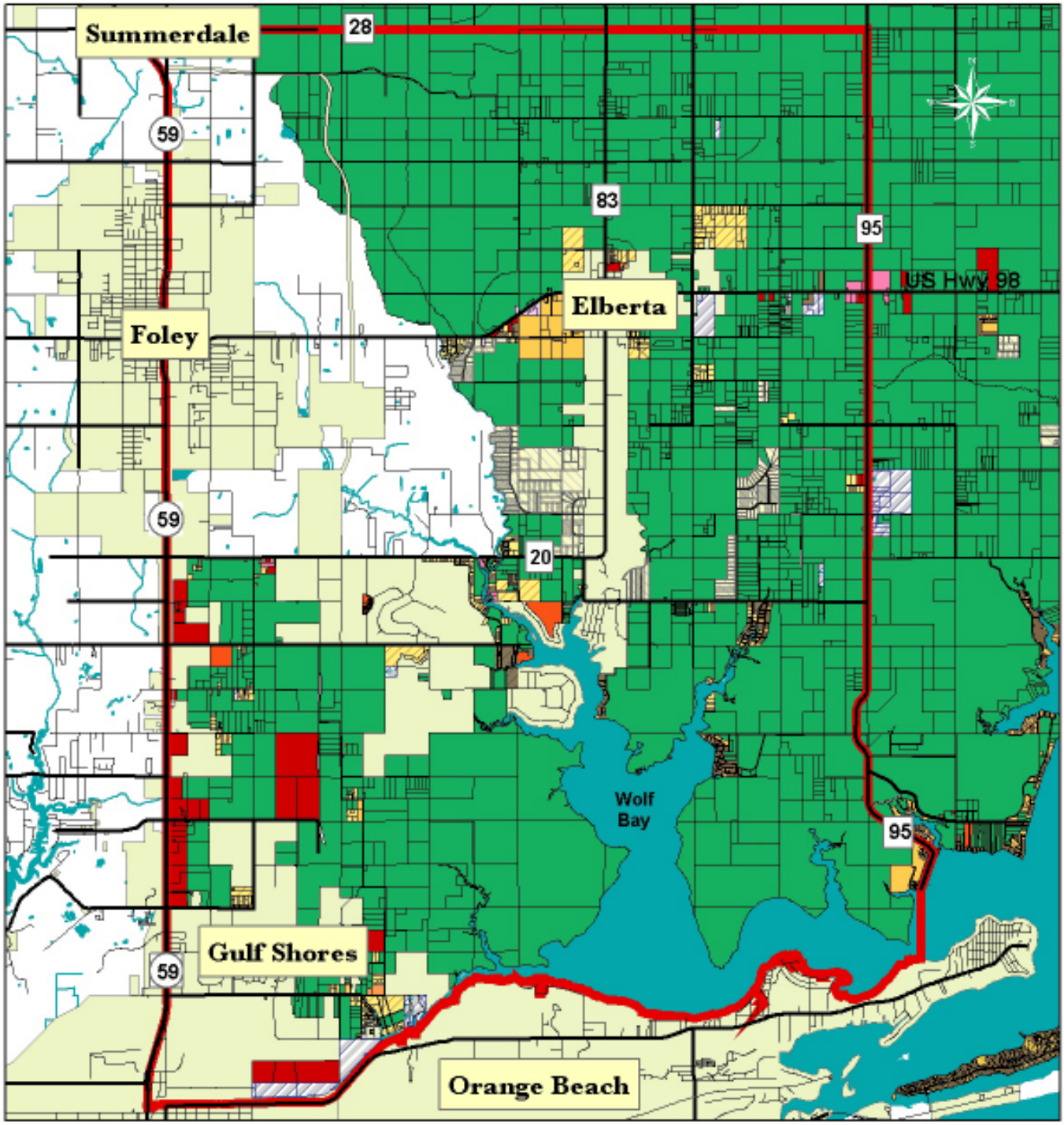
1 0 1 Miles

FIGURE 11

Wolf Bay Watershed Project

County Zoning

Geographic data provided by the Baldwin County Commission



Major Roads
Roads
Project Boundary
City Limits

0 0.5 1 2 Miles

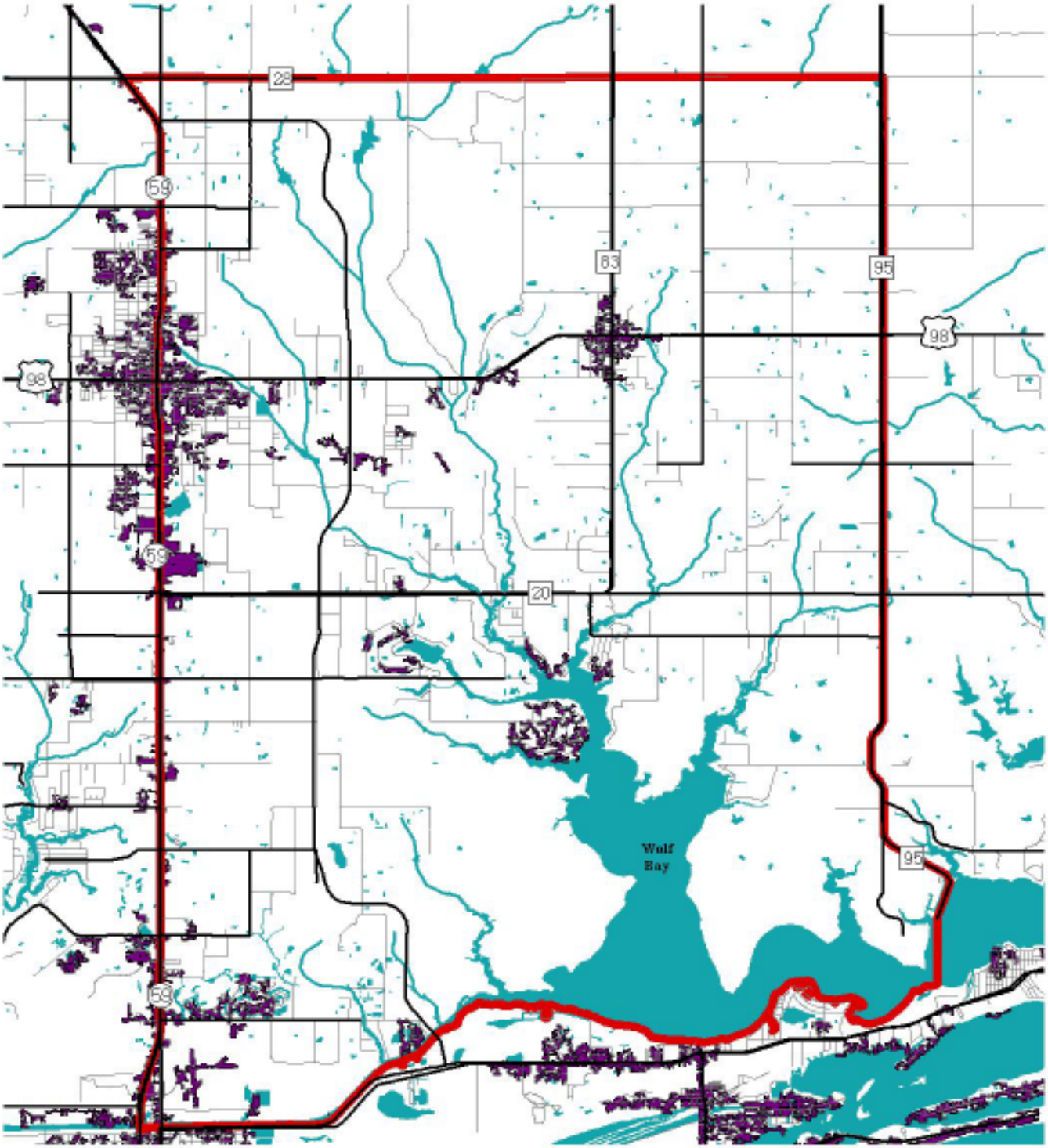
Rural District (RR)
Rural Agricultural District (RA)
Single Family Estate District (ER)
Single Family District (R1A)
Single Family District (R1B)
Single Family District (R2A)
Single Family District (R2B)
Single Family District (R3)
Two Family District (R4)
Multiple Family District (R6)
Manufactured Housing Park District (MHP)
Professional Business District (B1)
Local Business District (B2)
General Business District (B3)
Marine Recreation District (MR)
Outdoor Recreation (OR)
Tourist Recreation District (TR)
Light Industrial District (M1)
General Industrial District (M2)

FIGURE 12

Wolf Bay Watershed Project

Impervious Surface

Source: Geological Survey of Alabama, Based on LandSat Imagery from 2000



Major Roads
Roads
Watershed Project Boundary
Waterways

Impervious Surface (2.4% of Project Area)

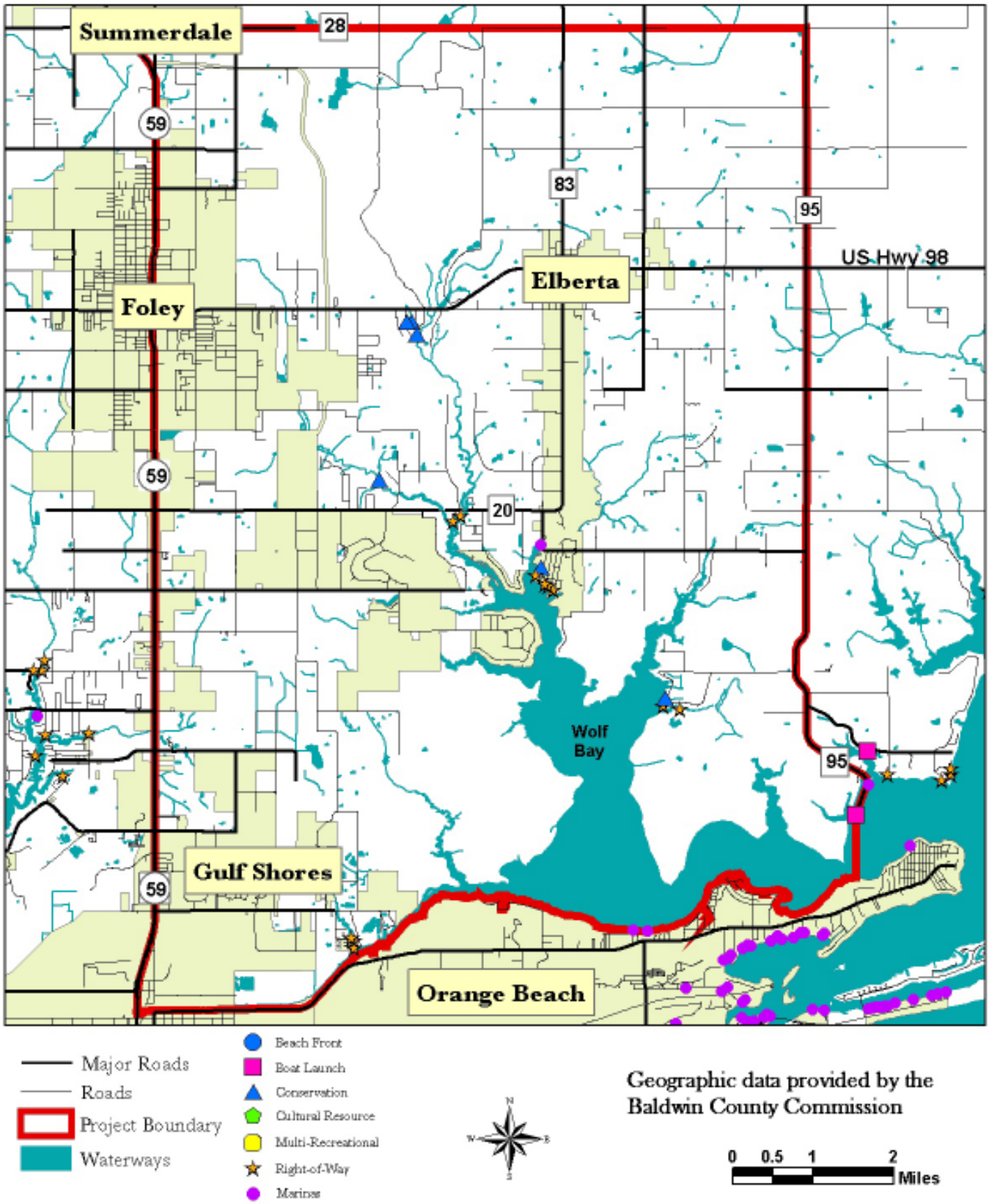
Some geographic data provided by the Baldwin County Commission

1 0 1 Miles

FIGURE 13

Wolf Bay Watershed Project

Marinas



Geographic data provided by the Baldwin County Commission

FIGURE 14

Wolf Bay Watershed Project

ADEM Monitoring Sites

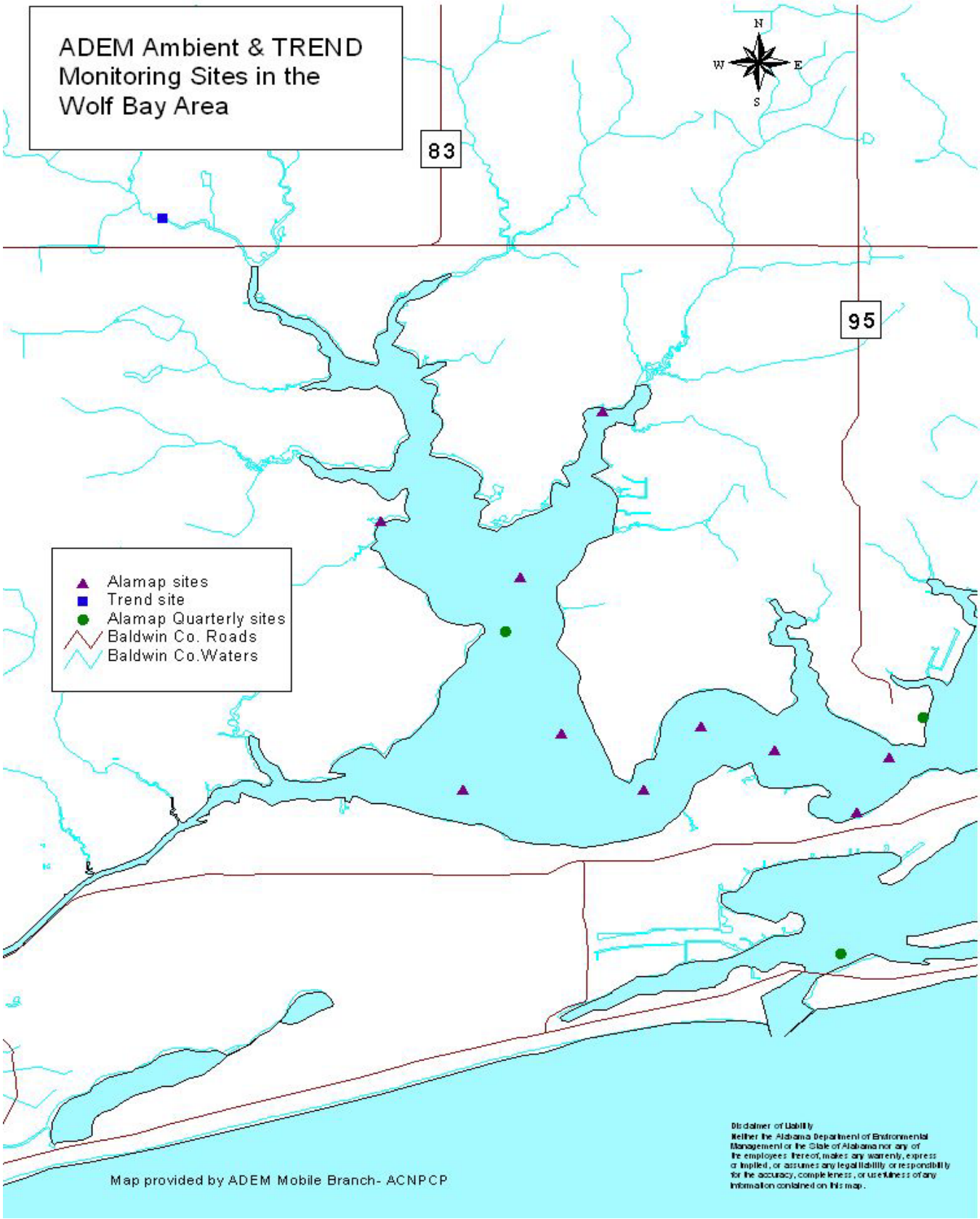
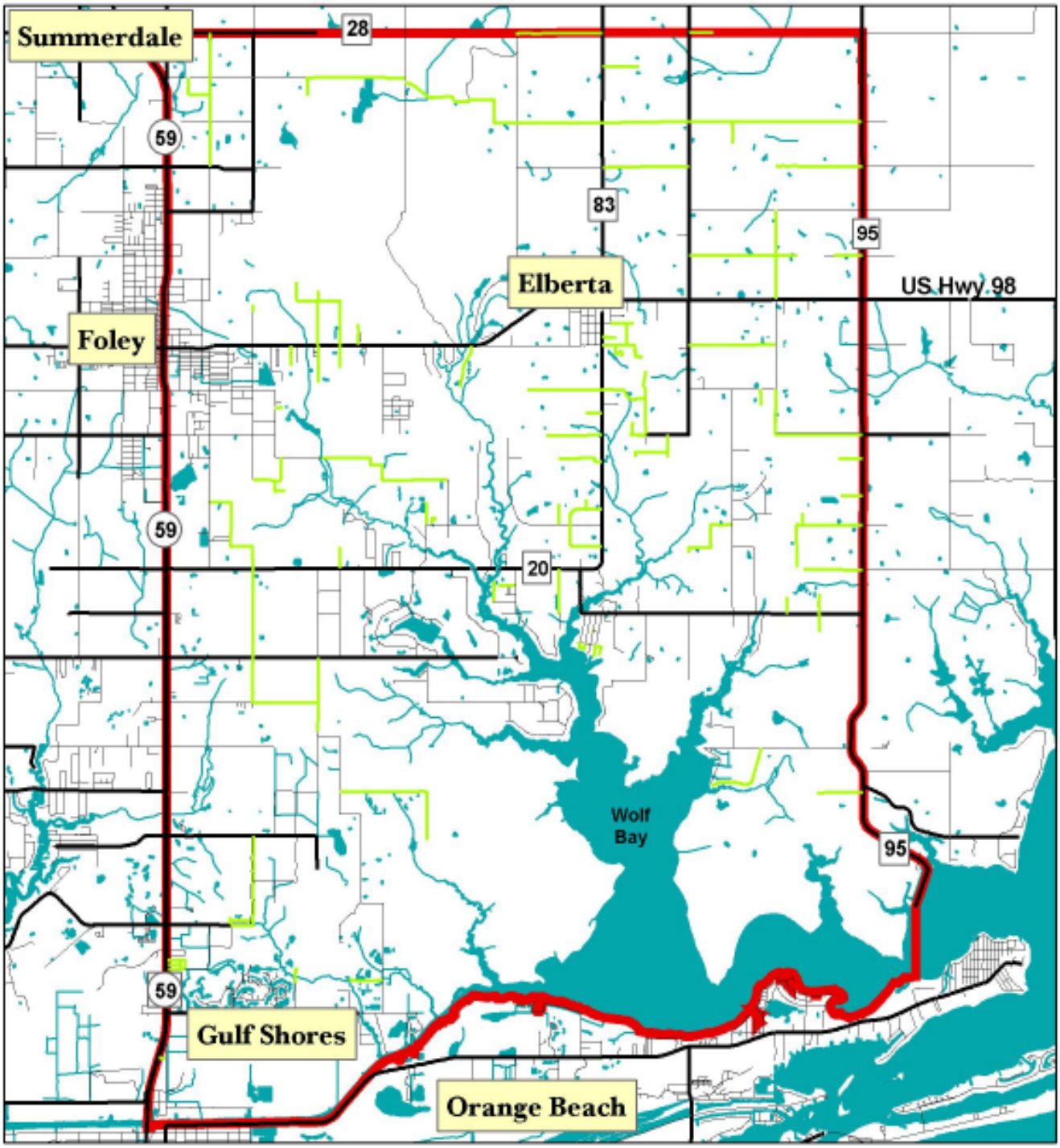


FIGURE 15

Wolf Bay Watershed Project

Dirt Roads In Project Area (Approximately 49 miles)



Major Roads
Roads
Dirt Roads
Waterways
Watershed Project Boundary

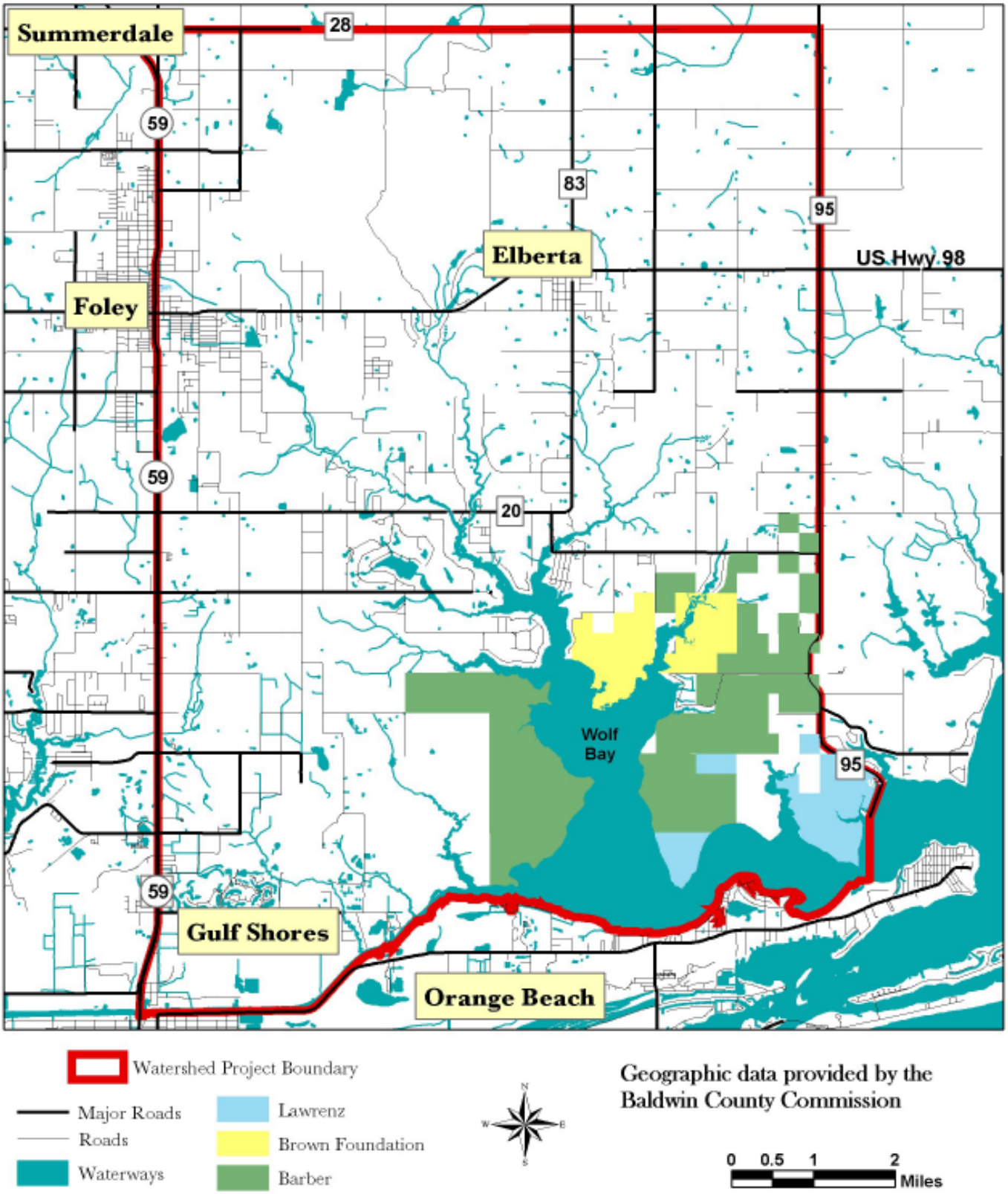
Geographic data provided by the Wolf Bay Watershed Watch

0 0.5 1 2 Miles

FIGURE 16

Wolf Bay Watershed Project

Large Land Owners



Appendix 1—Steering Committee Members

Citizens Advisory Committee	
Keeton Barnes	Liz Langston
David Bitto	Raymond Langley
Curtis Cassebaum	David Lawrenz
Ann Crawford	Karl Mueller
Henry Cummings	Don & Sandra Nevels
Gerry & Jeanne Douglas	Rod Platt
Tom & Nancy Dukes	Greg & Jane Prine
John & Trixie Foley	Leo & Wanda Ramos
Chief Gene Griffith	David Saur
John Griggs	Paul Salzman
David Horton	Mike & Pat Siano
Tom Hutchings	Bob & Polly Simpson
Ed Jackson	James Wallace
George P. Kaiser	John Woodham
Butch Lambard	
Technical Advisory Committee	
Stan Arbaczauskas, Baldwin County	Larry Morris, NRCS
Miriam Boutwell, City of Foley	Richard Petersen, Riviera Utilities
Hank Burch, ADCNR State Lands Div.	Enid Probst, ADEM
Clark Cathey, Elberta	Randy Roach, USFWS
Tom Harrell, Elberta Co-Op	Jody Scanlan, AUMERC
Steve Heath, ADCNR, MRD	Mike Shelton, Weeks Bay WP
Patti Hurley, ADEM	Cara Stallman, Baldwin County
Teddy King, BCHD	Gena Todia, Wetland Resources
Leslie Lassiter, ADEM	Phillip West, City of Orange Beach
David Lawrenz, WBWP	

Appendix 2—List of Abbreviations and Acronyms

A&I	Agriculture and Industry (water use classification)
ABTT	Alabama Bureau of Tourism and Travel
ACES	Alabama Cooperative Extension System
ACF	Alabama Coastal Foundation
ADAI	Alabama Department of Agriculture and Industries
ADCNR	Alabama Department of Conservation and Natural Resources
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
ADID	Baldwin County Wetland Advance Identification
ADPH	Alabama Department of Public Health
AFC	Alabama Forestry Commission
AGCA	Associated General Contractors of Alabama
AMP	Alabama Marine Police
ARA	Alabama Rivers Alliance
AUMERC	Auburn University Marine Extension and Research Center
AWW	Alabama Water Watch
BCC	Baldwin County Commission
BCEAB	Baldwin County Environmental Advisory Board
BCEDA	Baldwin County Economic Development Alliance
BCHD	Baldwin County Health Department
BCMG	Baldwin County Master Gardeners
BMP	Best Management Practice
CAC	Citizens Advisory Committee
CACWP	Coastal Alabama Clean Water Partnership
CELCP	Coastal and Estuarine Land Conservation Program
CIAP	Coastal Impact Assistance Program
CLT	Coastal Land Trust
CRP	Conservation Reserve Program
CVA	Clean Vessel Act
CZMA	Coastal Zone Management Act
CZARA	Coastal Zone Act Reauthorization Amendments
DISL	Dauphin Island Sea Lab
DMR	Discharge Monitoring Reports
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
F&W	Fish and Wildlife (water use classification)
FDA	U.S. Food and Drug Administration
FLEP	Forestland Enhancement Program
FRPP	Farmland and Ranchland Protection Program
FWS	U.S. Fish and Wildlife Service
GBTY	"Baldwin County Greener by the Yard"
GCRCD	Gulf Coast Resource, Conservation and Development
GIS	Geographic Information System
GPS	Global Positioning System
GRP	Grassland Reserve Program
GSA	Geological Survey of Alabama
HBAA	Homebuilders Association of Alabama
HHW	Household Hazardous Waste

MASGC	Mississippi Alabama Sea Grant Consortium
MBW	Mobile Bay Watch
MEE	Master Environmental Educators
MOA	Memorandum of Agreement
MRD	Marine Resources Division
MS4	Municipal Seperate Storm Sewer Systems
NEMO	Nonpoint Education for Municipal Officials
NEP	Mobile Bay National Estuary Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
OAW	Outstanding Alabama Water (water use classification)
OE	Organic Enrichment
OEO	Office of Education and Outreach (ADEM)
ONRW	Outstanding National Resource Water (water use classification)
OSDS	Onsite Sewage Disposal System
OWR	Office of Water Resources
POTW	Public/Private Owned Treatment Works
PWS	Public Water Supply (water use classification)
QA/QC	Quality Assurance / Quality Control
S	Swimming and Other Whole Body Contact (water use classification)
SARPC	South Alabama Regional Planning Commission
SAV	Submerged Aquatic Vegetation
SH	Shellfish Harvesting (water use classification)
SWCD	Soil and Water Conservation District
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
TVA	Tennessee Valley Authority
USA	University of South Alabama
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WBEC	Wolf Bay Education Committee
WBWP	Wolf Bay Watershed Project
WBWW	Wolf Bay Watershed Watch
WHIP	Wildlife Habitat Incentives Program
WRP	Wetlands Reserve Program
WWTP	Wastewater Treatment Plant

Appendix 3—Glossary

Alluvial - Depsoits of soil made by flowing water washed away from one area and deposited in another.
Aquatic— Associated with water; living or growing in or near water.
Aquifer— Aquifers are the layers of underground sediment that contain water and are capable of producing water from a well.
Best Management Practice (BMP)— A conservation practice or technique which is implemented to address a potential pollutant source or problem.
Constructed Wetlands— Managed wetlands that are intentionally created on upland sites for the primary purpose of treating wastewater or runoff.
Cost share— Federal and/or state funds provided to a landowner for installation of a best management practice.
Curvilinear - Formed, bounded, or characterized by curved lines.
Discharge—The amount of water flowing past a given point per unit time.
Erosion—Movement of soil from one place to another by wind or water. This process can be accelerated by human activities that remove vegetation from the soil.
Escarpment - A steep slope or long cliff that results from erosion or faulting and separates two relatively level areas of differing elevations.
Estuary— Zone along the coastline where fresh water mixes with seawater.
Eutrophication— Physical, chemical and biological changes that take place after a water body receives input of plant nutrients—mostly nitrates and phosphates.
Fertilizer— Substance that adds inorganic or organic plant nutrient to soil and improves its ability to grow crops, trees, or other vegetation.
Floodplain— Area along a waterbody that is periodically flooded when the waterbody overflows its banks.
Groundwater— Water that sinks into the soil and is stored in aquifers.
Habitat— Place or type of place when an organism or community of organisms lives and thrives.
Herbicides— Chemicals used to kill selected vegetation.
Impervious surface— A hard surface that either prevents or impedes natural infiltration of water into the soil or causes water to runoff the surface in greater quantities or at an increased rate of flow than under natural conditions. Examples include rooftops, walkways, driveways, parking lots, gravel roads and sod farms.
Interfluve - The region of higher land between two rivers that are in the same drainage system.
Land-use planning— Process for determining appropriate uses of land in an area, based on factors such as infrastructure, population and environmnetal susceptibility.
Leaching— Process in which various chemicals in upper layers of soil are dissolved and carried to lower layers of soil, and in some cases to groundwater.
Nonbiodegradable— Substance that cannot be broken down in the environment by natural processes.
Nonpoint source pollution— Polluted runoff that occurs when soil particles, plant nutrients, bacteria or chemicals are washed off of land into area waterways. Examples include runoff from parking lots, agricultural fields and homes.
NPDES permit—National Pollutant Discharge Elimination System permit is required for all point source pollutant discharges to waters of the U.S.
Onsite septage disposal or treatment system— A system designed to treat wastewater at a particular site such as single family dwellings or small businesses not connected to municipal sewage treatment systems.
Organism— Any form of life.
Pathogens— Organism that produces disease.

pH— Numeric value that indicates the relative acidity or alkalinity of a substance on a scale of 0 to 14, with the neutral point at 7. Acid solutions have pH values lower than 7, and basic solutions have pH values greater than 7.
Physiographic - Of or pertaining to the study of physical features of the earth's surface.
Point source pollution— Pollution coming from an identifiable source such as the discharge from a wastewater treatment facility.
Pollution— A change in the physical, chemical, or biological characteristics of the air, water, or soil that can affect the health, survival, or activities of humans in an unwanted way.
Recharge Area— Area in which an aquifer is replenished with water by the downward percolation through soil and rock.
Resource—Anything obtained from the environment to meet human needs and wants.
Runoff— Water from precipitation or other sources that flows off an impermeable or saturated surface. The water that flows off the surface of the land without infiltrating the soil is called surface runoff.
Section 303 (d) list— A list of lakes or stream segments that do not meet one or more of their designated uses. Such waterbodies are required under Section 303(d) of the federal Clean Water Act to be included on a list to be submitted to EPA by states every 2 years.
Section 305 (b) Report— A biennial report required under Section 305(b) of the federal Clean Water Act used by EPA, Congress, and the public to identify the status and recent trends of the quality of the state's waters and to assess the effectiveness of statewide pollution control efforts.
Sediment— Insoluble particles of soil, silt and other solid inorganic and organic materials that become suspended in water and eventually fall to the bottom of a body of water.
Silivculture - The care and cultivation of forest trees.
Topography— The surface configuration of the landscape.
Turbidity— A cloudy condition in water due to suspended silt or organic matter.
Water quality standard— Standards for surface water quality that define goals for specific waterbodies consisting of three components: designated uses, criteria and antidegradation.
Waters of the State— All waters of any river, stream, watercourse, pond, lake, coastal, ground or surface water, wholly or partially within the state, natural or artificial. This does not include waters which are entirely confined and retained completely upon the property of a single individual, partnership or corporation unless such waters are used in interstate commerce.
Watershed— Land area that delivers runoff water, sediment and dissolved substances to a major river and its tributaries, often referred to as a drainage basin.
Wetland— Land that stays flooded all or part of the year with fresh or salt water and has hydric soils and hydrophytic vegetation.

Appendix 4 - Action Strategies

	Action Strategy	Timeline	Progress
Wastewater/ Stormwater	Develop or adopt approved educational programs to educate septic tank owners and sewer system users.	2nd Quarter, 2004	Ongoing
	Target all homeowner associations in the area and provide them with educational presentations about septic systems.	3rd Quarter, 2004	
	Develop a survey to determine how many house within the watershed utilize septic tanks and work with Baldwin County Health Dept. to have all existing septic tanks GPS'd.	3rd Quarter, 2004	
	Conduct workshops that compare advanced and decentralized waste water treatment systems.	3rd Quarter, 2004	
	Develop or adopt an educational program (e.g. Weeks Bay Greener by the Yard, NEMO, Clean Water Guardians) to educate waterfront residents about preventing polluted runoff from their property.	commence 2004	
	Encourage municipalities to develop and implement stormwater management policies to control both the quantity and quality of stormwater runoff.	commence 2004	
	Determine impervious cover limits and its effect on water quality.	commence 2004	
	Work with Auburn Marine Center to implement a storm drain stenciling program throughout the watershed.	commence 2004	
	Monitor stormwater runoff in strategic locations to determine types and quantities of contaminants and quantity of runoff.	commence 2004	
Bulkheading	Develop a mailing list of watershed waterfront owners and target an educational pamphlet on bulkheading alternatives.	3rd Quarter, 2004	
	Develop or adopt a workshop on alternatives to bulheading for citizens, elected officials, corps, and contractors.	1st Quarter, 2005	
	Develop an incentive program to help homeowners plan and build alternative structures to vertical seawalls.	2nd Quarter, 2006	

	Action Strategy	Timeline	Progress
Bulkheading (cont.)	Investigate effects of wake on shoreline erosion to determine the need for wake free zones.	1st Quarter, 2005	
	Map all existing hardened shoreline in the watershed.	2nd Quarter, 2004	
Recreation	Investigate effects of wake on shoreline for public safety and habitat loss.	4th Quarter, 2004	
	Identify areas for possible acquisitions or partnerships to be used for a variety of uses including habitat protection and restoration, as well as recreation.	Ongoing	
	Develop public education and outreach toolsabout pump out locations.	2nd Quarter, 2004	
	Work with local marinas to acquire grants for pump out stations, recycled oil facilities and fishing line collection facilities.	2nd Quarter, 2005	
	Promote the Clean Marinas Program.	2nd Quarter, 2004	
Agriculture/ Forestry	Determine the number and types of farms, proximity to waterways and effects on land and water.	1st Quarter, 2005	
	Develop a bacteria, nutrien and pesticide monitoring program to determine effects from agricultural and forestry sources including golf courses and sod farms.	1st Quarter, 2005	
	Develop or adopt an educational campaign about nutrient effects with turf management specialists.	2nd Quarter, 2005	
	Develop Green Golf Initiative or Clean Water Guardian Program for golf courses, i.e. an award program highlighting BMP's based on % pollutant reduction.	1st Quarter, 2005	
	Identify and encourage BMP demonstration projects on local farms within the watershed.	1st Quarter, 2005	
	Develop sediment and water column monitoring program, particularly total suspended solids.	2nd Quarter, 2005	
	Develop an aerial photography nonpoint source pollution monitoring program.	2nd Quarter, 2005	
	Determine % of watershed in timber, amount of $ raised, get a list of timbering operations.	2nd Quarter, 2005	

	Action Strategy	Timeline	Progress
Agriculture/ Forestry	Work with the Forestry Commission to encourage and install BMPs	2nd Quarter, 2005	
	Encourage participation in Sustainable Forestry Initiative and ISO certifications.	2nd Quarter, 2005	
	Develop or adopt a workshop for estate attorneys, landowners, municipalities, etc. on incentives to preserve land.	2nd Quarter, 2005	
	Work to develop an incentive based program to conserve land, i.e. riparian buffers, conservation easement, land trusts, etc.	1st Quarter, 2005	
	Provide education and outreachto general public on estate taxes, property tax assessments and conservation easements and its connection to land use.	3rd Quarter, 2005	
	Work with community to develop and provide incentives to preserve family farms.	1st Quarter, 2006	
Construction	Develop workshops to explain impacts of NPS pollution and the benefit of better site design for homeowners, design engineers, architects, municipalities, and developers.	Ongoing	
	Work with roadbuilders on implementation of BMP's.	Ongoing	
	Work with Baldwin County Commission to prioritize paving of dirt roads within the watershed. Acquire list of dirt roads as well as cost to maintain these roads.	Ongoing	
	Encourage municipalities, county,and roadbuilders to hold interdepartmental and inter-municipal preproposal conferences so all affected areas understand construction, as well as request a county-wide transportation master plan.	1st Quarter, 2005	
	Recognize contractors that are taking steps to protect the watershed by developing a builder rating system.	3rd Quarter, 2004	
	Support efforts to ensure that permits are applied for one acre or larger disturbances and BMPs are installed correctly.	Ongoing	
	Work with utility companies to continue installing and maintaining effective BMPs.	3rd Quarter, 2004	

	Action Strategy	Timeline	Progress
Development & Enforcement of Regulations	Develop ordinances and NPS guidelines that may be used countywide that will identify similarities in each municipality and promote the adoption of watershed planning.	1st Quarter 2005	
	Develop, distribute and publicize a responsibility matrix for residents to know what to do when a problem arises, who to call, etc.	2nd Quarter, 2005	
Fisheries	Research available data and encourage applicable agencies to monitor mercury levels and sources within the watershed.	Ongoing	
Human Health	Assess groundwater withdrawal zones and rates within the watershed.	1st Quarter, 2005	
	Encourage local municipalities to develop source water protection zones.	2nd Quarter, 2005	
	Partner with AWW to develop a groundwater monitoring program.	3rd Quarter, 2005	
	Encourage a countywide licensing requirement for all wells including well driller licensing.	2004	completed
	Provide citizen education onprevention of groundwater pollution and saltwater intrusion.	Ongoing	
	Develop a Groundwater Festival for watershed fourth graders.	Annually, beginning April 2004	
	Develop incentive programs to encourage recycling of greywater and the use of shallow water aquifers for irrigation.	2nd Quarter, 2006	
	Work with county and municipalities to sponsor HHW collection day.	Ongoing	
	Work to acquire funds for permanent HHW collection facility.	2nd Quarter, 2006	
	Develop a workshop for Wolf Bay Homeowners on stormwater runoff and BMPs.	3rd Quarter, 2004	
	Develop and Enterococus monitoring program.	Upon Funding	
	Develop a bacteria source tracking program.	Upon Funding	

	Action Strategy	Timeline	Progress
Wetlands	Develop a non-regulatory protection program similar to ADID process.	Underway	
	Identify isolated wetlands and have them mapped.	Underway	
	Restore isolated wetlands.	Upon Funding	
	Provide educational programs for the general public on the economic, social and environmental benefits of wetlands.	Ongoing	
	Provide information to the general public on tax incentives and other benefits that can be achieved through the use of conservation easements for land protection.	Ongoing	
	Partner with the Coastal Training Institute for Wetlands.	Ongoing	
	Develop an Adopt a Wetlands Program	Ongoing	
	Utilize existing and pursue new programs to provide landowners with economically viable solutions for habitat protection and restoration activities.	1st Quarter, 2005	
	Identify and map sensitive habitats and work with existing ranking systems to prioritize the acquistions or other forms of protection.	Underway	
	Encourage local authority for overlay districts of riparian buffer zones for planning and zoning documents, countywide master plans, and subdivision regulations.	Unknown	

Appendix 4 - Action Strategies (cont.)

	Action Strategy	Timeline	Progress
Management Plan Implementation	Encourage agencies to sign memoranda or understanding supporting management strategies.	Ongoing	
	Host annual updates on management plan implementation to community and local officials and agencies.	Annually, commence 2004	
	Review watershed management plan as necessary.	As necessary	
	Take officials on tours of the watershed to discuss needs and problems.	As necessary	
	Develop a committee based on geography.	ASAP	
	Solicit funding for full-time watershed project coordinator.	ASAP	
	Provide workshops and community events to keep watershed residents engaged.	As necessary	
	Publish a semi-annual Watershed Project newsletter.	semi-annually, commence 2004	
	Research and catalog water quality sampling conducted by agencies and environmental groups.	Ongoing	
	Establish volunteer water quality monitoring, and encourage agency monitoring, in areas where little or no sampling has been conducted.	Ongoing	
	Submit data as part of statewide water quality database.	Ongoing	

Appendix 5 - Acknowledgements

This project was funded or partially funded by the Alabama Department of Environmental Management through a Clean Water Act Section 319(h) nonpoint source grant provided by the U.S. Environmental Protection Agency-Region IV.

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About the Alabama Coastal Foundation (ACF)

Founded in the Spring of 1993, the Alabama Coastal Foundation has provided Alabama's coastal area with more than 12 years of innovative outreach programs with participation across the spectrum of socio-economic groups. The ACF distinguishes itself among environmental protection advocates because of its goal to seek common ground among government, business/industry and citizens through the acknowledged need to maintain a balance between the conservation of our natural resources and the need for economic growth. The organization's activities provide for citizen participation through issue resolution forums, volunteer water quality monitoring programs, public education seminars, household hazardous waste collection days, habitat restoration projects and through direct participation in governmental planning. The Alabama Coastal Foundation is committed to factually addressing priority environmental issues throughout the region. These issues include habitat degradation, waste disposal, sedimentation, sustainable growth, water quality and public health.