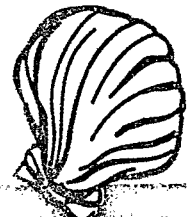
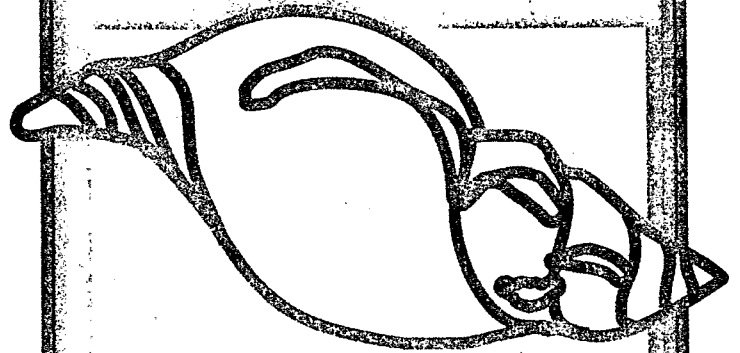


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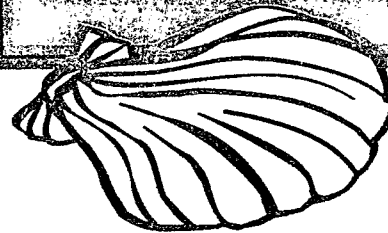


GULF OF MEXICO PROGRAM

Citizens' Pollution Prevention



HANDBOOK



COOPERATIVE EXTENSION SERVICE • MISSISSIPPI STATE UNIVERSITY

Acknowledgment

Many individuals contributed to the development of this handbook. We would like to thank all Gulf of Mexico partners who gave of their time, energy, and expertise in creating this handbook.

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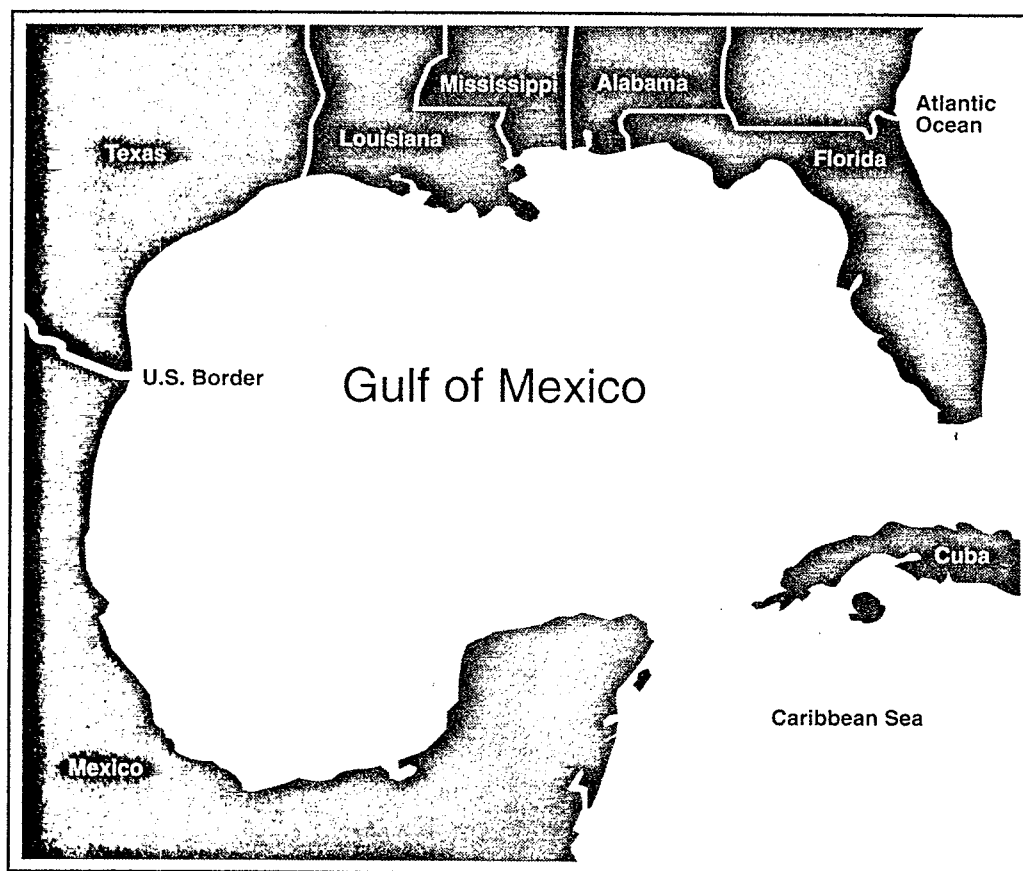
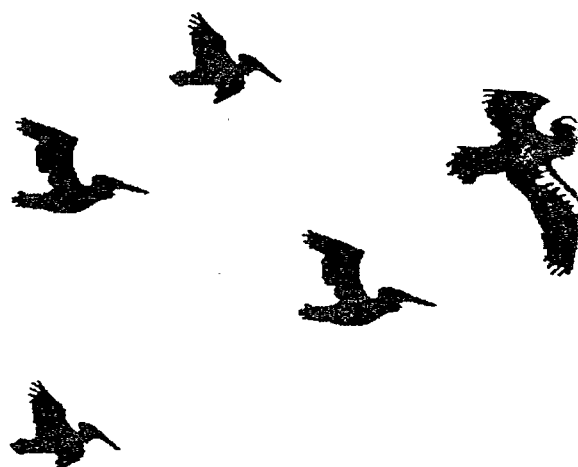
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Introduction

The Gulf of Mexico Program Citizens' Pollution Prevention Handbook is a quick and easy-to-read reference guide to help you learn ways in which you can make a difference in protecting the environment of the Gulf.

People who live, work, and play in the Gulf area -- beachgoers, boaters, students, sport and commercial fishermen, landowners, farmers, business owners, and coastal residents -- will find facts and figures that give a clear picture of the current environmental status of the Gulf. The handbook will create a deeper understanding of the impacts of personal and professional behavior on the Gulf environment and suggest ways in which you can take action toward eliminating pollution problems that threaten the Gulf of Mexico.

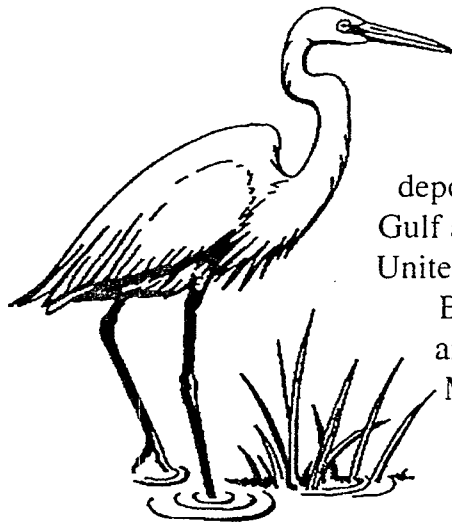
We hope the information contained in this handbook is useful in preventing pollution in your home and at work. You can make a difference no matter who you are, or where you live.

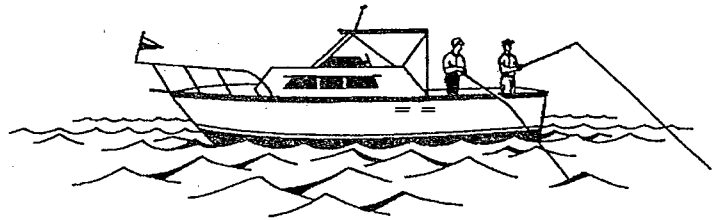
The Gulf of Mexico — “America’s Sea”

The Gulf of Mexico is truly a national treasure. Because it is a semienclosed body of water and the source of many of America’s renewable and nonrenewable resources, the Gulf is sometimes called “America’s Sea.” Spanning the southern part of the United States, the 600,000-square-mile Gulf is bordered by five states: Florida, Alabama, Mississippi, Louisiana, and Texas. One thousand six hundred miles of primary coastline also include part of the shoreline of Mexico and Cuba. The Gulf is relatively shallow, averaging 5,000 feet deep, when compared to the Pacific, Indian, and Atlantic Oceans, each of which averages about 13,000 feet. The

bottom topography includes broad continental shelves, submarine canyons, abyssal plains, and ancient reefs. In some places, bottom sediments are 10 miles thick due to deposits made by rivers that flow into the Gulf and drain two-thirds of the continental United States.

Between 1956 and 1990, offshore oil and gas development in the Gulf of Mexico generated more than \$82 billion in federal revenues, one of the largest sources of funds to the nation’s treasury. Oil and gas from the Gulf





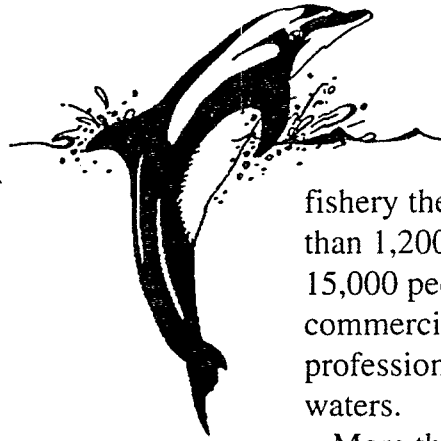
account for 90 percent of America's offshore production. Texas, Louisiana, Mississippi, and Alabama have about 40 percent of the total U.S. petroleum refining capacity. Gulf Coast facilities refine about 275 million gallons of crude oil each day.



Nearly half of all U.S. import/export shipping tonnage passes through Gulf waters. Four of the nation's 10 busiest ports are located on the Gulf Coast, with the Port of New Orleans at the top of the list, handling some 170 million tons of freight annually. Houston, Texas, ranks third with more than 110 million tons handled each year.

The Gulf of Mexico and its coastal areas are rich fishing grounds.

Commercial fisheries are among the most important of the Gulf's renewable resources with more than 1.7 billion pounds landed annually, valued at more than \$640 million. Five of the top 10 U.S. fishing ports are located in the Gulf states. The Gulf provides more than 50 percent of the U.S. landings of fish, shrimp, and shellfish and yields more seafood annually than the south Atlantic, mid-Atlantic, and Chesapeake areas combined. Two-thirds of the shrimp landed in this country come from the Gulf, making the Gulf shrimp



fishery the second most valuable U.S. fishery. More than 1,200 seafood processors and wholesalers employ 15,000 people in the Gulf region. More than 22,000 commercial fishing boats, manned by over 40,000 professional fishermen, harvest seafood from Gulf waters.

More than 100 million fish are caught each year by recreational fishermen in the Gulf. Three million sports fishermen make more than 17 million fishing trips into Gulf waters annually. This accounts for more than one-third of all marine recreational fishing in the United States.

Habitats and ecosystems along the Gulf Coast include such diverse areas as freshwater swamps, mangrove forests, seagrass beds, and salt marshes. About half of the coastal wetlands in the conterminous United States are located along the Gulf. These habitats and breeding grounds shelter and feed thousands of species of coastal and marine wildlife. The coastal wetlands of the Gulf provide habitat for four to seven million migratory waterfowl every winter. Many rare and endangered species of wildlife, including sea turtles and manatees, are found in the Gulf.

Tourism is another important business that pumps an estimated \$20 billion per year into the economies of the Gulf states. People come to the Gulf to catch some of the nearly 50 species of finfish or shellfish, play along beautiful beaches, view the exotic array of wildlife, or to escape colder climates.

Issues of Environmental Concern in the Gulf

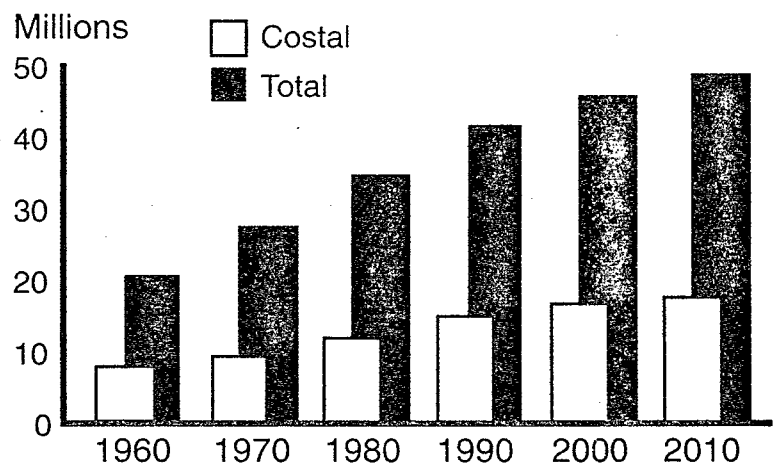
In spite of its importance to our quality of life, or perhaps because of it, the Gulf of Mexico is in serious trouble. Both natural and man-made causes are contributing to a rapid decline in the environmental quality of the Gulf. Formerly pristine habitats and many species of marine and coastal life have been adversely affected by an increase in human activities. Today, one-sixth of the U.S. population lives in the five states bordering the Gulf. Of these 42 million people, 15 million live in coastal counties. By the year 2010, coastal population densities in the Gulf are projected to increase to an average of 227 people per square mile (over 1,000 per shoreline mile). These new coastal residents will further strain Gulf resources as they demand housing, jobs, fresh water, and the conveniences of modern life.

Numerous local and state agencies working with the U.S. Environmental Protection Agency, through its Gulf of Mexico Program, have identified several major areas of environmental concern.

Gulf of Mexico Population

1960-2010

Five Gulf States (Florida West Coast Only)



Marine Debris

Garbage from merchant ships, commercial and recreational fishing vessels, cruise ships, and drilling platforms, plus debris from inland municipal sewage and waste disposal facilities that washes into the Gulf, is a major problem. Because circulation within the Gulf is limited, solid waste and other pollutants float along with the currents until, eventually, they wash up on shore. Indestructible plastic waste tossed into the marine environment kills thousands of seabirds and marine mammals each year by entanglement or being mistaken for food. Many sea turtles die each year from eating plastic that looks like jellyfish, one of their favorite foods.

Within 3 hours on a single day in September 1991, volunteers picked up 18 tons of garbage on Alabama beaches, of which 57 percent was plastics. On both coasts of Florida, there were 180 tons of garbage, 60 percent plastics; in Louisiana, 133 tons, 68 percent plastics; Mississippi, 23 tons, 53 percent plastics; and in Texas, 199 tons, 72 percent plastics. This debris came only from those beaches chosen as cleanup sites. However, more than a ton of trash per mile can be found on some Gulf beaches. In fact, three Gulf states exceeded the national average in terms of plastics as a percentage of marine debris collected.

Nutrient Enrichment

Water from two-thirds of the United States drains into the Gulf of Mexico, and one-half of the runoff from all this land actually makes its way into the Gulf. Excessive levels of nitrogen, phosphorus, and other nutrients come from city sewage treatment plants, industrial operations, septic tanks, lawns, gardens, and agricultural activities. An overdose of nitrogen and phosphorus can lead to algal blooms that deplete the water's dissolved oxygen, making it unsuitable for other forms of life. A 3,600-square-mile oxygen-deficient "dead zone," located off the coasts of Texas and Louisiana, contributes to a dramatic reduction in species diversity and abundance in the region. This area is in the heart of one of the nation's richest and most extensive fishing grounds.

Habitat Degradation

Coastal habitats, such as marshes and estuaries, are disappearing at an astounding rate. Louisiana alone is losing 35 to 40 square miles of valuable wetlands every year. These nursery grounds and refuge areas for fish and wildlife also act as antipollution devices by filtering sewage and contaminants before they enter open water. An estimated 95 percent of the Gulf's commercial fish and shellfish rely on wetlands for critical habitat during their life cycles. More than 75,000 acres of wetlands have been affected by dredge and fill operations in Texas, Louisiana, and Florida. Urban and residential expansion in Florida has destroyed 22,000 acres of mangrove swamps. Alabama has lost 25,000 acres of wetlands and bay bottoms in the Mobile-Tensaw Delta.

Freshwater diversion has decreased inflow into Gulf estuaries, increasing salinity and causing the loss of more habitat. In Mississippi, water is so contaminated in four of the state's major estuaries that oyster harvesting is prohibited. Nearly 3.5 million acres where shellfish grow in the Gulf are permanently or conditionally closed due to pollution.

Toxics and Pesticides

Recent toxic release inventory data showed that the Gulf states of Alabama, Mississippi, Louisiana, and Texas were 4 of the top 10 states in the country in total surface water discharge of toxic chemicals. A total of 460 municipalities and large industries pipe discharges directly into the Gulf. Farmers spread more than 21 million pounds of chemical fertilizers and pesticides on croplands in the Mississippi River region each year. Industries in the same area annually release 2.3 billion pounds of toxins into the marine environment. Offshore oil and gas operations have released an estimated 14 million gallons of oil into the Gulf as a result of well blowouts and explosions on drilling platforms. Tankers and barges moving petrochemicals, petroleum, and other hazardous waste contribute to the problem.

Public Health

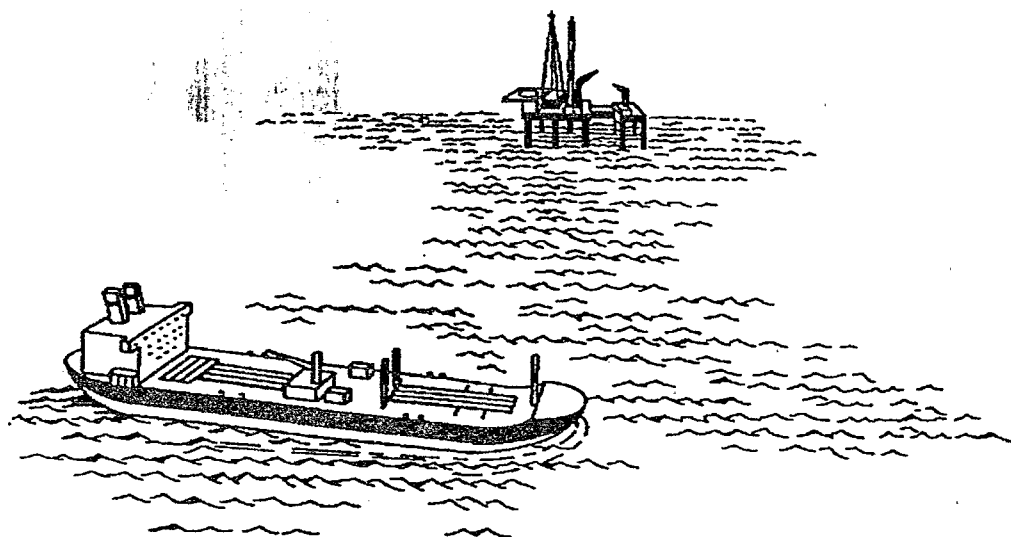
Many environmental factors have a direct impact on public health in the Gulf of Mexico. More people get sick from eating raw oysters, clams, and mussels than any other seafood. Many of these illnesses are directly linked to poor water quality due to pollution in oyster-growing areas. Water pollution can also cause human illness by direct contact through activities such as swimming and boating. Other marine biotoxin events, such as red tides, which can be associated with nutrient overenrichment, can cause severe health problems in humans through direct contact or consumption of contaminated seafood.

Freshwater Inflow

Rivers from as far away as Montana and New York, including all of the states between the Rocky Mountains and the Appalachians, drain into the Gulf. The greatest amount of freshwater inflow comes from the Mississippi River, which sends more than 3.3 million gallons of water into the Gulf every second. By comparison, the Rio Grande in southern Texas has a discharge rate of about 15,000 gallons per second, because the river is used extensively for irrigation and only a small percentage reaches the Gulf. Dams and levees built for hydroelectric power generation and flood control further alter the natural flow of freshwater reaching the Gulf. Many plants and animals require a balanced mixture of fresh- and saltwater in order to grow and survive. Alteration of natural flow patterns allows saltwater to intrude into estuaries that directly affect species diversity and abundance. Freshwater inflow is also essential for flushing pollutants out of the estuaries.

Coastal and Shoreline Erosion

Coastal wetlands in the Gulf area are rapidly disappearing due to severe erosion. Since the mid-1950's, 800 square miles between Vermillion Bay and the Mississippi state line have washed away. If the present rate of loss persists, several coastal parishes will disappear within 50 years. Loss of vegetative cover on barrier



islands due to human activities increases the effect of wind and wave erosion and reduces the storm protection provided by these fragile land areas.

Living Aquatic Resources

The bountiful fisheries in the Gulf are being fished beyond their limits as more people compete for the resources. Several Gulf fisheries are now closed during certain seasons to allow the stocks time to rebuild. Others are under strict regulation from federal and state agencies. Many other species of wildlife are also being diminished due to overharvesting, pollution, and habitat loss. The Gulf of Mexico is home to many rare and endangered species of wildlife, including five species of sea turtles, the West Indian manatee, sperm whales, whooping cranes, bottlenosed dolphins, and the American bald eagle.

Save the Gulf?

Who, Me?

The Gulf of Mexico is America's Sea, but it's your backyard! Every day millions of people affect the quality of the Gulf without even knowing it. Do you know...

- Where your storm sewers drain?
- Where your garbage goes once it leaves your curb?
- Where your septic field drains?
- Where pesticides and fertilizers go once they leave your lawn?
- Where the used oil from your car is disposed?

Knowing the answers to these questions and many more like them can help you to improve **your** backyard. There are many things in your daily life that affect the health of the Gulf that you may be unaware of.

Nonpoint-source pollution is increasingly recognized as a significant factor in coastal water degradation. Nonpoint-source pollution includes lawn and garden pesticides and fertilizers, street or parking lot runoff, and septic tank drainage. In urban areas, storm water and combined sewer overflow are linked to major coastal problems, and in rural areas, runoff from agricultural activities adds to coastal pollution. *These sources are attributable to people conducting their everyday activities and are examples of just a couple of ways that **your** actions can have a large impact on the quality and future of the Gulf.* The first step is to recognize the connection between your way of life and the health of the Gulf. Everyone is responsible for the future of the Gulf, so get involved and start making a difference. Here are some pollution sources affecting the Gulf of Mexico and things you can do to help "Take Pride Gulfwide."

Erosion and Surface Runoff

Erosion and surface runoff cause sediments and contaminants to enter Gulf waters directly by washing into tributaries and indirectly by being carried through storm drains and water treatment facilities. Erosion also causes the loss of valuable wildlife habitat, and in some cases, may actually threaten building structures located on shorelines. There are simple steps you can take to reduce erosion and surface runoff from your property.

- Minimize hard surfaces, such as paved areas, and maximize the absorption capacity of your ground. Protect soil by planting ground covers, grasses, shrubs, and trees and by adding mulch. This will allow water to sink into the soil where it can be naturally filtered to remove sediments and contaminants.
- Plant and maintain trees, shrubs, perennial grasses, or legumes along steep slopes, drainage channels, or ditches, and around bodies of water. These are called "buffer strips" and help trap surface water and sediments. Native plants generally survive best. The proper width of buffer strips of vegetation between the land being used and the water body depends on the type of soil, the degree of slope, and the type of vegetative cover. Consult a landscape architect or your local Extension agent. Forested areas are more effective than grasslands. A one-acre buffer of trees, 50 feet wide, protects almost 900 feet of a waterway by reducing soil erosion caused by rainfall impact and allowing more water to filter through the soil.
- Use terraces to reduce water runoff velocity on long or steep slopes. Grade your land with a series of gentle swales (or low areas) and berms (elevated areas) to drain water away from the house, yet allow water to sink into the soil. This system will allow particles to settle or filter out as the water percolates into the soil.
- Keep heavy equipment off exposed soil during the rainy season to reduce erosion and allow for vegetative growth. Use gravel cover for unpaved parking areas.

- Direct sprinkler heads away from paved surfaces, especially if drainage is directly into the street or drainage ditch.
- Irrigate or water lawns in the evening or early morning, but never on windy days or when it has rained recently. This reduces the amount of water lost to evaporation and runoff. Plants don't need water for several days after a heavy rain.
- Irrigate only when necessary instead of on a schedule. This minimizes water consumption and reduces the potential for contaminant-laden surface runoff. Apply no more than three-fourths of an inch of water at a time for grass. Lawns need watering when they have a bluish cast or when you can see your footprints after walking across them.
- For areas that need more frequent watering, use efficient watering devices such as pop-up sprays, bubblers, drips, microsprays, and soaker hoses.
- Reduce watering requirements by using landscape plants that are drought-tolerant. Check with your local Cooperative Extension Service for a listing of drought-tolerant species suitable for your area.
- Drip lines under roof eaves and downspouts are particularly susceptible to sediment erosion. Place gravel or plant hardy vegetation under roof eaves. Add downspout attachments to slow and spread out the draining water. This reduces erosion and runoff.

Lawn and Garden Chemicals

Lawn and garden chemicals are beneficial when correctly used. But when nutrients, such as fertilizers, enter waterways, they can cause algal blooms that lead to oxygen depletion and have a negative impact on other forms of life. Many fish kills can be traced to oxygen depletion caused by an overabundance of nutrients in the water. Many herbicides and pesticides

can kill nontargeted species directly if they enter surface waters. You should always strive to reduce the amount of these toxic substances released into the environment.

- Choose a fertilizer that has at least one-fourth of the nitrogen in a slow-release, water-**insoluble** form. Fertilize in the dry months, usually October to May.
- Use the minimal amount of fertilizer necessary, and apply it in small, frequent applications. An application of 2 pounds of fertilizer five times per year, is better than 5 pounds of fertilizer twice a year. **Always read and follow label directions.** Many suburban homeowners use 5 to 10 pounds of pesticide per acre. That's about **ten times** more chemicals per acre than farmers use!
- Pull weeds instead of using herbicides. Use mulch to discourage weeds from growing in the first place.
- Choose plants that are pest-resistant and don't require much fertilization. Your local Cooperative Extension Service office can provide you with a list of suitable plants. Do not apply fertilizer within 50 feet of a water body.
- Avoid applying fertilizer to paved surfaces. If any fertilizer is inadvertently spread on sidewalks or driveways, sweep it off before watering.
- Apply fertilizer when the soil is moist, and then water lightly. The fertilizer will sink into the root zone where it is available to the plants, rather than stay on top of the soil where it can be blown or washed away.
- Mow your lawn frequently, and leave the grass clippings to decompose on the lawn. Annually, this will provide nutrients equivalent to one or two fertilizer applications. Remove grass clippings within 50 feet of waterways. Never dump grass clippings or other organic material into a waterway.

- Weakened plants are susceptible to pests. Make sure the blades on your mower are sharp and adjusted to a high setting to reduce the temporary stress caused by mowing.
- Always consider natural alternatives to lawn and garden chemicals. Pesticides kill beneficial as well as harmful insects. Biological controls, such as natural predators and companion planting plus a well-planned pest management program, can prevent pollution and save money. Some bugs can be dislodged merely by forcefully spraying them with a stream of water. Safe bacteria used to control caterpillars are sold in garden supply stores. Consider using natural alternatives for chemical pesticides, such as nondetergent insecticidal soaps, garlic, and hot pepper sprays.
- Always keep lawn and garden chemicals away from surface water. Never spray when it may rain in the same day, and do not water heavily after application. Do not spray on windy days. Be particularly careful in spring or early summer because many species of wildlife are much more sensitive to toxics during their juvenile stages.
- Never dump poisonous chemicals into sewers, drains, toilets, or any other connections to wastewater treatment systems. Triple-rinse containers, and apply the water to the treated area.
- Farmers and others who use a lot of lawn and garden chemicals should dispose of the containers in special incinerators or at landfills with programs for handling toxic waste. Call the EPA's RCRA Superfund Hotline at 1-800-424-9346 for the phone numbers of state agencies who can help you dispose of hazardous wastes.
- Wrap single containers in several layers of newspaper, tie securely, and place in a covered trash can. Do not burn containers: smoke and fumes may be

hazardous. The **best** way to dispose of lawn and garden chemicals is through proper use.

Septic Systems

Nutrients and pathogens from malfunctioning septic systems cause health problems and add to the pollutant load on coastal waters. Excess nutrients lead to algal blooms and oxygen-poor waters. Pathogens from human sewage can cause diseases like cholera and hepatitis. Fecal coliform bacteria associated with human and animal wastes are used as an indicator of water quality. Pathogens from malfunctioning septic systems are involved in the closure of shellfish harvest areas and, in some cases, the closure of swimming areas.

- Know the location and components of your septic system. Use the access manhole to inspect the septic tank annually for accumulation of sludge and surface scum. If the bottom of surface scum is within 3 inches of the tank's outlet pipe, have the septic tank pumped and properly cleaned. Generally, have the sludge pumped every 3 to 5 years.
- Kitchen garbage disposals unnecessarily burden septic systems. Put kitchen organic material in compost piles or in curbside trash cans for landfill disposal. If you do use a garbage disposal, have the septic tank cleaned every 2 years.
- Keep surface water out of septic tank or absorption areas. These areas already receive all the water they need.
- Use water-reducing devices, such as flow-restricting shower heads and toilet tank inserts, to minimize water flow to the septic tank. Balance water use throughout the week to avoid overloading the system at any one time.
- Keep heavy vehicles away from the septic system because their weight can crush drain fields and keep

them from functioning properly. Don't plant trees or shrubs near drain lines; roots can clog them.

- Don't flush into the system material that will not easily decompose, such as hair, cigarette filters, sanitary napkins or tampons, condoms, etc. They will reduce your system's capacity and clog the drain field.
- Do not wash or flush strong chemicals into the system. They could kill the bacteria needed to decompose the wastes.
- Do not cover the surface of the drain field with any impermeable material such as plastic or cement. This reduces the soil's ability to "breathe," preventing proper function of the drain field.
- Keep accurate records, including diagrams of design, location, and size of the entire septic system. They should include dates that the system is inspected and when the tank has been pumped out.
- Be on the lookout for signs of septic system failure, e.g., patterns of bright lush growth in your lawn, toilets that flush slowly, or drains that back up. Foul-smelling water or water that rises to the surface during heavy rains or when your water use is high (as when doing laundry) are other signs of septic system failure.

Hazardous Wastes

Look around your house and notice what hazardous substances you might have stored. Paint, solvents, or rat poison in the shed? Heavy cleansers (ammonia, bleach, and spot removers) in the kitchen, bath, or laundry? A shelf of automotive oils, lubricants, and antifreeze in the garage? These toxic materials present a serious environmental concern. It is everyone's responsibility to handle and dispose of these hazardous materials in a safe manner.

- Be sure all containers are clearly marked, and **always follow the manufacturer's instructions for use.** Warning labels will advise you if the product becomes more hazardous when mixed with another substance.
- Use only enough of the product to get the job done. Buy only as much as you need.
- Store hazardous products in an area that will never be flooded.
- **Sweep** your driveway. Accumulations of toxics and heavy metals will wash into surface water if you hose it. Automotive wastes are major sources of contamination. When washing vehicles, use soap sparingly and rinse on gravel, lawn, or other absorbent ground to filter the detergents and oils before the runoff reaches water courses.
- Avoid using hazardous chemicals on impermeable surfaces during rainy periods.
- Never dump hazardous products down drains, the toilet, or near flowing water, ponds, or lakes. Do not dump them on the ground!
- Wrap empty containers securely in several layers of newspaper and place them in covered trash receptacles. Periodically dispose of excess containers at hazardous waste collection sites. Don't let wastes accumulate.
- Allow the moisture in small quantities of latex paint to evaporate and dispose of the remaining waste properly. Larger amounts can be recycled through your local center. For information on local recycling centers, contact your city or county solid waste disposal organization.
- Paint thinner can be stored in covered containers and reused once the paint has settled out.

- Always try to use nontoxic products instead of hazardous chemicals for cleaning. There are many new environmentally safe products on the market, but you may already have products in your home that will do a good job and may save you money. Here are some alternatives:

- **Air freshener** - A small dish of vinegar or lemon juice set out in a warm area
- **Bleach** - Borax
- **Chlorine scouring powder** - Baking soda
- **Detergent** - Simple soap (or phosphate-free detergent)
- **Disinfectant** - Ammonia
- **Drain cleaner** - Plunger, followed by a handful of baking soda and a half cup of vinegar. Cover and allow to set for 15 minutes. Pour in two quarts of boiling water, and the clog should disappear.
- **Glass cleaner** - Two tablespoons of vinegar to one quart of water
- **Grease remover** - Baking soda paste
- **Mildew stain remover** - Vinegar solution
- **Mothballs** - Cedar chips
- **Oven cleaner** - Pour salt on fresh oven spills, and scrape the residue off when the oven cools. Ammonia can be applied to tough stains.
- **Stain remover** - Cornstarch paste
- **Tile cleaner** - Baking soda and toothbrush
- **Toilet bowl cleaner** - Baking soda

Pets and Livestock

Pets and livestock contribute to pollution because their untreated wastes are often deposited directly on the ground where surface runoff can carry them into water bodies or storm drains. Grazing animals can remove so much vegetative cover from an area that it becomes highly susceptible to erosion. Larger animals can also destroy vegetation through trampling.

Never allow pet feces to remain on streets, sidewalks, driveways, or other impervious surfaces where it will be washed directly into storm drains.

- Locate barnyards, stockyards, and feeding and watering areas well away from surface waters. Maintain pasture fencing to keep animals away from surface waters and swampy areas. Keep as much distance as possible between fencing and surface waters. Vegetated buffer strips provide filtration and absorption of pollutants.
- Determine the number of animals you pasture on the basis of the productivity of your land. Restrict grazing when plants are dormant and when soils are wet. Wet soil is easily compacted, and traffic in muddy areas will break the root systems of ground cover. Place salt licks and supplemental feeding stations away from water supplies to encourage even grazing. Rest periods are critical to proper pasture growth. A grazing rotation that allows foliage 21 to 28 days of regrowth between grazing periods is recommended. Divide pasture area into separate units if possible.
- Where practical, such as in concentrated feedlots or dairy barns, collect manure regularly for proper storage. Select a storage site where water runoff cannot mix with manure and seepage from the manure cannot mix with surface water. Optimal storage is on a concrete slab with walls or curbs and a fixed roof. Cover stored manure to keep rainwater from seeping through it. Consider constructing an animal waste lagoon.
- Apply manure evenly to pastures, fields, and gardens where nutrients will aid plant growth. Apply only as much as your crop or pasture can use. Excess manure will wash off into surface waters or filter into ground-water systems. Till manure into soil evenly whenever possible. Leave an adequate buffer strip between manure application sites and surface waters.

Swimming Pools

Pools require large doses of chlorine and other chemicals that should not be dumped directly into a water body.

- Drain your pool only when necessary and never during water restriction periods.
- Do not chlorinate the pool water for several days before draining it. Drain the pool slowly onto a large expanse of lawn to allow the water to slowly filter through the soil. Never drain directly into a waterway or the street.

Automobiles

Your car carries motor oil, battery acid, gasoline, anti-freeze, and transmission and brake fluids. Degreasers, rust preventives, radiator flushers, and cleaning and waxing compounds are rubbed, buffed, flushed, or applied sometime during the life of most cars. These automotive products contain toxic chemicals that should not find their ways into waterways. Moreover, recycling used motor oil can save resources. The amount of used, nonrecycled oil that is improperly dumped in the United States each year is 10 to 20 times the amount that leaked from the *Exxon Valdez* oil tanker during the 1989 Alaska oil spill.

- Maintain your car. Note any fluid leaks. Repair oil, transmission fluid, and brake fluid leaks immediately. This not only prevents pollution but ensures your safety as well.
- Never dump oil or antifreeze into storm drains, ditches, or onto the soil. One quart of oil, when completely dispersed, can contaminate as much as 2 million gallons of drinking water. Take used fluids to service stations or recycling centers. Use a mild, biodegradable, phosphate-free soap to wash your car. Use a bucket of water or a hose with a shutoff nozzle, rather than a constant stream of water.
- Buy only the minimum amount of automotive products you need to maintain your car. Store and dispose of empty containers properly.

- Do your part to save energy and cut down on air pollution. Walk, bicycle, carpool, or use public transportation whenever you can. Buy a fuel efficient car. Check your tire pressure often; low tires waste gas.

Boats

The manner in which boaters use and care for their craft has a large impact on the health of the Gulf. Boat fuels and other chemicals are often spilled into waterways. Boat wakes can increase shoreline erosion. Propellers can damage seagrass beds and other valuable wildlife habitats. Trash thrown overboard contributes to the marine debris problem. Improper use of marine sanitation devices adds pollution to our waterways.

- When fueling your boat, take extra care not to spill fuel or overfill the tank. When filled sufficiently, tighten the fill cap and wipe away any dripped fuel.
- Discard all trash properly. Never toss any litter overboard, especially plastics. Monofilament fishing line and six-pack rings are particularly harmful to aquatic and bird life.
- Maintain your boat engine to avoid any oil leaks. When changing the engine oil, bring the used oil to a marina that recycles oil or to another recycling drop-off point. If oil spills into your bilge, use sorbent pads to soak up the spilled oil. Never discharge oily bilge water into waterways.
- Rinse and scrub your boat with a brush rather than with soap. When soap is necessary, use phosphate-free soap.
- When removing the paint from boat hulls, catch the scrapings in a drop cloth or sweep and throw them into the trash. Bottom paints contain copper or tin that is extremely harmful to aquatic life.

- Avoid cutting through seagrass beds with boat propellers. Seagrass meadows, one of the Gulf's most important habitats, are severely scarred by boat propellers and may take up to 15 years to recover. Leave at least 12 inches of clearance between your boat propeller and the bottom. Churned up sediments cloud the water and damage bottom-dwelling plants and animals. Observe "no wake" zones.
- Use onshore sanitary facilities whenever possible. If you are navigating within 3 miles of shore, the U.S. Coast Guard requires sanitizing gear or an onboard holding tank. Empty the holding tank at a designated pump-out station.

Household and Office Waste Management

The average person in the United States generates more than 4 pounds of trash each day—twice as much as people in most other industrialized countries.

About 80 percent of what we throw away is recyclable, yet we recycle less than 10 percent. Recycling one ton of paper saves about 17 trees, 3 cubic yards of landfill space, 2 barrels of oil, 7,000 gallons of water, and 4,100 kilowatt hours of electricity — enough energy to power the average American home for 5 months. It also prevents 60 pounds of stack emissions from being released into the air. Recycling aluminum cans uses only 5 percent of the energy required to make new ones. Twenty-eight million tons of grass clippings, leaves, and other yard waste are dumped in landfills each year. This adds up to almost 20 percent of all landfill trash.

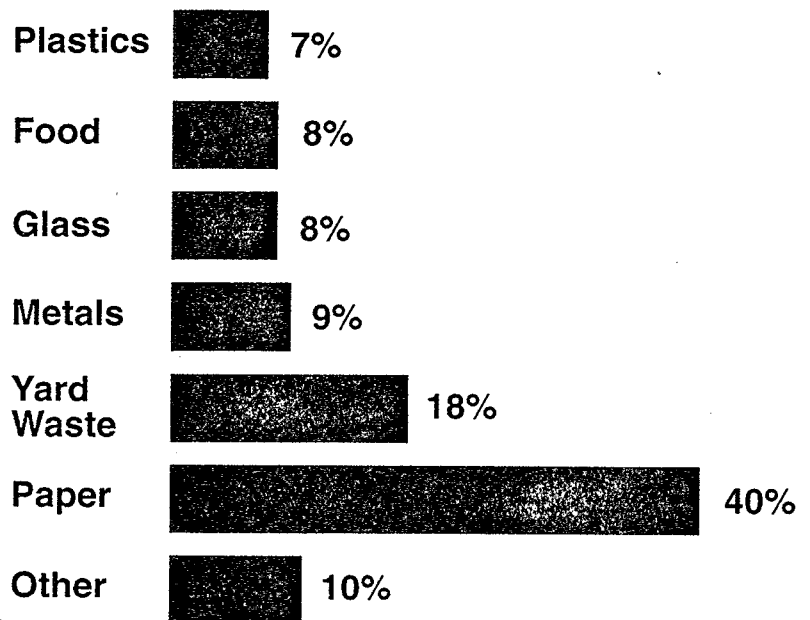
- Recycle your paper, metal, plastic, and glass. Check with your local department of solid waste for the location of recycling centers in your area.
- Buy recycled and recyclable products. Encourage schools, businesses, and employers to buy recycled paper products. One of the greatest barriers to recycling is that there is not enough demand for recycled products.

- Write letters to state and national governments encouraging them to use recycled paper products; the U.S. government is one of the biggest paper users in the world. Encourage your local newspaper to use recycled newsprint. Look into the use of electronic mail as a means to reduce paper use.
- Don't buy goods overpackaged with paper, plastic, plastic foam, or other materials. Write letters to retailers and manufacturers explaining why you refuse to buy their overpackaged products.
- Laid end-to-end, the 18 billion disposable diapers thrown away in the United States each year could reach to and from the moon seven times. Make the switch from disposable diapers to cloth. Disposable diapers waste resources, contaminate landfills with human waste, and take up valuable landfill space. Besides, cloth diapers are cheaper!
- Buy soft drinks in recyclable or refundable containers and return or recycle them. Use your own sturdy canvas bags whenever you shop. If you don't have a canvas bag, reuse paper and plastic bags. Encourage your grocer to use bags made of sturdy, recycled paper.
- Choose reusable tableware instead of disposable plates, cups, and utensils. Take a mug to work so you don't throw away a coffee cup every day.
- Avoid one-use consumer items such as disposable razors, cigarette lighters, flashlights, cameras, and nonrechargeable batteries, all of which are sources of waste.
- Make a compost pile instead of throwing grass clippings, leaves, and food waste in the trash. After the leaves, food, and grass decompose, you can use the compost as fertilizer for your garden. Your county Extension agent can provide you with information on composting.

- Buy nonperishable products in large quantities or in bulk. Products sold in small, individual units use far more packaging material and are usually more expensive.
- Be careful about buying plastic products labeled "degradable." Many break down only in sunlight and some break down into toxic materials.

What We Throw Away

(Percent of All "Trash")



Water Conservation

A lot of the water we use comes from lakes, rivers, streams, and other surface sources. But much of it comes from underground supplies, which in some areas are getting dangerously low. Some of these water supplies are becoming polluted. And to make matters worse, we're disrupting natural water systems by channeling rivers, building dams, and draining wetlands. In the Gulf of Mexico region, this disruption has created water shortage concerns and destroyed valuable wildlife habitat.

- Install a low-flow shower head with a maximum flow rate of 2.5 gallons per minute or less. You'll cut your bathroom water use by 30 to 50 percent, and you'll conserve the energy required to heat the "extra" water.
- Add low-flow aerators to threaded faucets in kitchen and bathroom sinks. These inexpensive devices reduce flow rates while maintaining enough force for washing and other uses.
- If you have a dripping faucet, you may be wasting hundreds of gallons of water a week. Replace worn out washers to stop faucet leaks.
- If your toilet "runs" between flushes, you are wasting a **lot** of water. In fact, you usually can't hear a leaky toilet valve until you're losing more than 250 gallons per day. To test your toilet, place food coloring or dye tablets in the toilet tank, and then check the bowl for traces of color after 15 minutes. Buy an inexpensive repair kit to repair any leaks.
- When you replace a toilet, install a low-consumption model, or a water saver. Standard toilets use 5 to 7 gallons per flush; "water-savers" use 3 to 4 gallons per flush; and new low-consumption models use 1.6 gallons, or less, per flush. Until you replace your toilet, put a plastic bottle filled with water in the tank to cut down on water needed for a flush. (Don't use bricks. They can disintegrate and cause plumbing problems.) Bathrooms use more than 65 percent of home indoor water.

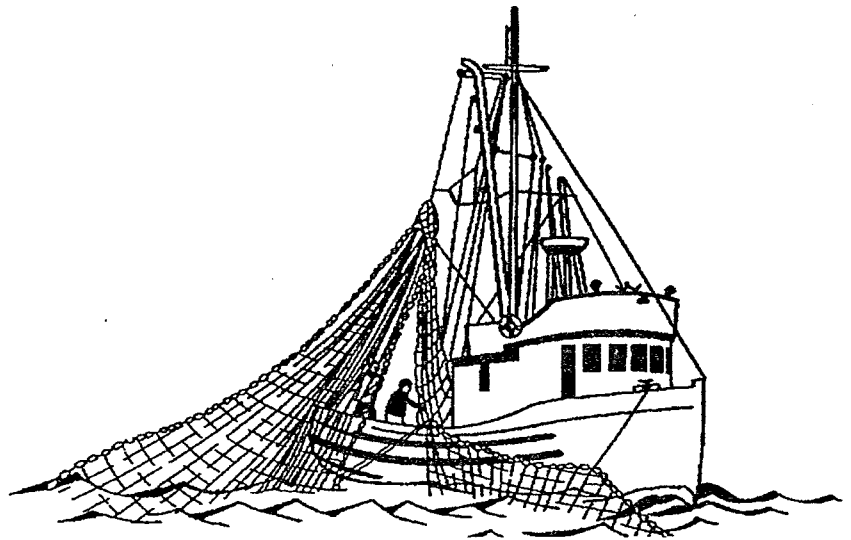
- To conserve water and energy, wait until you have a full load before running your dishwasher or washing machine. Use the water-saving cycle whenever you can.
- Use phosphate-free detergent. When phosphates end up in lakes, estuaries, and streams, they can kill aquatic organisms by promoting algae growth that depletes oxygen supplies in the water.

Energy Conservation

Our continued and increasing use of fossil fuels is causing many serious environmental problems. Digging coal mines, drilling oil wells, and transporting fossil fuels can damage wildlife habitat. Burning fossil fuels to generate electricity contributes to air pollution and, possibly, to global warming. Fossil fuels provide more than 80 percent of the world's energy. Each year, the amount of energy that leaks through windows in American homes equals the energy produced by the oil that flows through the Alaskan pipeline. The United States has 5 percent of the world's population, but consumes nearly 25 percent of the world's energy.

- Set home heating temperatures no higher than 68 degrees Fahrenheit. Each degree below 68 °F lowers heating costs an additional 2 to 3 percent.
- Use fans instead of air-conditioners to cool your home on hot days. If you use an air-conditioner, set the temperature no lower than 78 °F. Each degree above 78 °F lowers cooling costs by an additional 5 percent.
- Change or clean furnace and air-conditioner filters once a month to keep heating and cooling systems running efficiently.
- Install a clock thermostat to save heating and cooling energy at night and when no one is home. A clock thermostat can be set to turn on heating and cooling systems only when needed and to turn them off at other times, such as at night or when no one is home.

- Set your water heater to a lower setting (about 120 °F). If you have a dishwasher, check to see if the manufacturer recommends a certain water temperature. Insulate your water heater.
- Wash clothes in cold water. Hang them out to dry or buy a clothes dryer with a moisture-sensor control so the dryer will stop automatically when clothes are dry.
- Replace incandescent light bulbs with lower watt or fluorescent bulbs. Although fluorescent bulbs often cost more, they save money in the long run because they last much longer than standard incandescent bulbs and use one-fourth the electricity. If you install outdoor security lights, use high-pressure sodium lamps and turn them off during the day.
- If you leave lights and a radio on in the house while you're away, use timers to turn them on and off.
- Save energy by eliminating drafts in your home. Repair broken windows and warped doors, caulk and weatherstrip around windows and doors, put up storm windows and doors in the winter, and use insulated curtains. Install solar heating devices whenever possible. Roof-mounted collection grids for hot water heaters and solariums are two types of solar devices suitable for the Gulf region.
- When shopping for any major appliance, compare the energy consumption figures on the black and yellow "energy guide" labels, and buy the most energy efficient appliance.
- Call your utility company to arrange for an energy audit of your home to give you specific ideas about how to save energy and money.
- Plant trees or bushes in your yard. They will save you money on heating and cooling by providing shade and serving as windbreaks. They also replenish the earth's oxygen supply and provide habitat for wildlife.



Participation in Permit Actions

Activities that occur in waters, including wetlands, generally require federal and/or state permits. The public has the right to get involved in these permitting decisions. The permitting agencies can issue a permit, deny a permit, or issue a permit with special conditions that mitigate environmental impacts. You can help by providing input into the decision-making process on the permit action. You can also help by reporting violation such as activities being performed without a permit or where special conditions to a permit (such as constructing new wetlands to mitigate for those that were lost due to the action) have not been adhered to.

If you follow the simple steps in this handbook, your actions will help improve the environmental quality of the Gulf of Mexico and the earth. Now you know why it is important for every one of us to share in maintaining this valuable resource. It is easy and will take a couple of minutes each day. Carry the message to others. Encourage everyone you meet to **Take Pride Gulfwide!**

Agencies and Organizations To Contact for Further Information

National

America's Clean Water Foundation

750 First Street, NE

Suite 911

Washington, DC 20002

202-898-0902

(Helps citizens understand the Clean Water Act and encourages their involvement at the local level)

Center for Marine Conservation

1725 DeSales St. NW

Washington, DC 20036

202-429-5609

(Promotes conservation of threatened marine wildlife and critical habitats)

Clean Ocean Action

P.O. Box 505

Sandy Hook, NJ 07732

908-872-0111

(Crusades against pollution and ocean dumping)

Coast Alliance

235 Pennsylvania Ave. SE

Washington, DC 20003

202-546-9554

(Promotes conservation of coastal wildlife and habitats)

Coastal Society

P.O. Box 2081

Gloucester, MA 01930-2081

508-281-9209

(Promotes wise use and management of the coastal zone)

Environmental Action Foundation

1525 New Hampshire Ave. NW

Washington, DC 20036

202-745-4870

(Helps communities protect people's health and clean up pollution)

Environmental Defense Fund

257 Park Ave. S

New York, NY 10010

800-225-5333

(Free recycling brochure; champions clean air and water)

Gulf of Mexico Program

Bldg. 1103, Room 202

Stennis Space Center, MS 39529

601-688-3726

Electronic Bulletin Board - 800-235-4662

(Multiagency effort to protect and restore Gulf of Mexico and its resources)

Environmental Protection Agency

Office of Solid Waste

401 M St. SW

Washington, DC 20460

800-424-9346

(Information about your state's recycling coordinator and how to plan a hazardous waste collection in your community)

Greenpeace USA

1436 U St. SW

Washington, DC 20009

202-467-1177

(Protects wildlife, habitat, and natural resources)

National Audubon Society

700 Broadway

New York, NY 10003

212-979-3000

(Sanctuary management, research, and education to protect wildlife and habitat)

National Wildlife Federation
1400 16th Street NW
Washington, DC 20036-2266
202-797-6829

(Fights for endangered species and safe drinking water;
exposes toxic polluters; saves wetlands and forests)

Nature Conservancy
1815 North Lynn St.
Arlington, VA 22209
703-841-5300

(Buys and maintains land to protect the environment and
save the world's rare animals and plants)

Seventh Generation
49 Hercules Drive
Colchester, VT 05446-1672
802-862-2999

(Free catalog of recycled products)

Sierra Club
730 Polk St.
San Francisco, CA 94109
415-776-2211

(Promotes protection of land, wildlife, and people;
crusades against pollution)

The Windstar Foundation
2317 Snowmass Creek Road
Snowmass, CO 81654
303-923-2145

(Publications about alternative products and other
environmental topics)

Texas

Galveston Bay Foundation
17324-A Highway 3
Webster, TX 77598
713-334-3665
(Promotes wise management of Galveston Bay)

Gulf Coast Conservation Association
4801 Woodway Ste. 220W
Houston, TX 77056
713-626-4222
800-626-4222 (Texas only)
(Concerned with marine fisheries issues)

Marine Education Services
University of Texas, Austin
P.O. Box 1267
Port Aransas, TX 78373
512-749-6764
(Field trips and classroom education for educators and students)

Nature Conservancy, Texas Field Office
P.O. Box 1440
San Antonio, TX 78295-1440
512-224-8774

Texas Adopt-a-Beach Program
Texas General Land Office
1700 N. Congress, Room 730
Austin, TX 78701-1495
512-463-5108
800-85-BEACH (Texas only)
(Supports reduction of coastal and marine debris)

Texas Coastal Cleanup
Center for Environmental Education
1201 W. 24th St.
Austin, TX 78705
512-477-6424
(Organizes beach cleanups; documents sources of marine debris)

Texas Parks and Wildlife Department
Resource Protection Division
Environmental Quality Branch
4200 Smith School Rd.
Austin, TX 78740
512-389-4636
(Coastal and marine resource management)

Texas Sea Grant College Program
Texas A&M University
P.O. Box 1675
Galveston, TX 77553-1675
409-762-9800
(Research, education, and advisory services concerning
coastal and marine resources)

Texas State Aquarium
Education Department
P.O. Box 331307
Corpus Christi, TX 78463
512-886-6018
(Educational activities for teachers and students)

Texas Water Commission Environmental
and Recycling Information Center
512-908-2944
(Used oil recycling information)

Texas Soil Conservation Service State Office
W.R. Poage Federal Building
101 South Main
Temple, TX 76501-7682
817-774-1214
(Provides information and technical assistance for
wetlands restoration and construction of terraces,
waterways, waste lagoons, and other soil and water
conservation practices)

Louisiana

Aquarium of the Americas
Education Department
111 Iberville St., Suite 500
New Orleans, LA 70130
504-565-3800
(Educational programming for schools)

Lake Pontchartrain Basin Foundation
P.O. Box 6965
Metairie, LA 70009-6965
504-836-2215
(Research and education to improve environmental
quality of Lake Pontchartrain Basin)

Louisiana Department of Environmental Quality
P.O. Box 44066
Baton Rouge, LA 70804
504-342-6390
(Pollution control; permitting)

Louisiana Department of Wildlife & Fisheries
2000 Quail Drive
Baton Rouge, LA 70898
504-765-2800
(Coastal and marine resource management)

Louisiana Office of Litter Reduction and Public Action
P.O. Box 94291
Baton Rouge, LA 70804-9291
504-342-8148
(Promotes reduction of marine and coastal debris)

Louisiana Sea Grant College Program
Louisiana State University
Wetlands Resources Bldg.
Baton Rouge, LA 70803-7507
504-388-6148
(Research, education, and advisory services concerning
coastal and marine resources)

Nature Conservancy
Louisiana Field Office
P.O. Box 4125
Baton Rouge, LA 70821
504-338-1040

Louisiana Department of Environmental Quality
Solid Waste Division Recycling Section
504-765-0249
(Used oil recycling information)

Louisiana Soil Conservation Service State Office
3737 Government Street
Alexandria, LA 71302
318-473-7751
(Provides information and technical assistance for
wetlands restoration and construction of terraces,
waterways, waste lagoons, and other soil and water
conservation practices)

Mississippi

Mississippi State University Coastal Research
and Extension Center
2710 Beach Blvd., Suite 1-E
Biloxi, MS 39531
601-388-4710
(Research, education, and advisory services concerning
coastal and marine resources)

J.L. Scott Marine Education Center & Aquarium
115 Beach Blvd.
Biloxi, MS 39530
601-374-5550
(Educational activities for students and teachers)

Mississippi Bureau of Marine Resources
2620 Beach Blvd.
Biloxi, MS 39531
601-385-5860
(Coastal and marine resource management)

Mississippi-Alabama Sea Grant Consortium
Gulf Coast Research Laboratory
Caylor Building
P.O. Box 7000
Ocean Springs, MS 39564
601-875-9341
(Research, education, and advisory services concerning
coastal and marine resources)

Mississippi Bureau of Pollution Control
P.O. Box 10385
Jackson, MS 39289-0385
601-961-5171
(Pollution abatement; permitting)

Mississippi Wildlife Federation
520 North President Street
P.O. Box 1814
Jackson, MS 39215-1814
601-353-6922
(Promotes conservation of wildlife and habitat)

Nature Conservancy
Mississippi Field Office
P.O. Box 1028
Jackson, MS 39215-1028
601-355-5357

Mississippi Bureau of Pollution Control
Larry Estes
601-961-5171
(Used oil recycling information)

Mississippi Soil Conservation Service State Office
Dr. A. H. McCoy Federal Building
Suite 1321

100 West Capitol Street
Jackson, MS 39269-1399
601-965-4330

(Provides information and technical assistance for
wetlands restoration and construction of terraces,
waterways, waste lagoons, and other soil and water
conservation practices)

Alabama

Alabama Coastal Cleanup
Alabama Department of Environmental Management
2204 Perimeter Rd.
Mobile, AL 36615-1131
205-450-3400
(Marine debris information and beach cleanups)

Alabama Department of Environmental Management
Water Division
1751 W. L. Dickinson
Montgomery, AL 36130
205-271-7700
(Pollution control; permitting)

Auburn University Extension and Research Center
4170 Commanders Drive
Mobile, AL 36615
205-438-5690
(Research, education, and advisory services concerning
coastal and marine resources)

Nature Conservancy
Alabama Field Office
2821-C 2nd Ave. S
Birmingham, AL 35233
205-251-1155

Marine Environmental Sciences Consortium
Dauphin Island Sea Lab
P.O. Box 369
Dauphin Island, AL 36528
205-861-2141
(Research and educational activities)

Project Rose
205-348-4878
800-392-8098
(Used oil recycling information)

Alabama Department of Economic
and Community Affairs
10936-B, U.S. Highway 98
Fairhope, AL 36532
205-928-3625
(Information on Boater's Pledge and Adopt-A-Beach
programs)

Alabama Soil Conservation Service State Office
P.O. Box 311
Auburn, AL 36380
205-887-4535
(Provides information and technical assistance for
wetlands restoration and construction of terraces,
waterways, waste lagoons, and other soil and water
conservation practices)

Florida

Florida Department of Environmental Regulation
Twin Towers
2600 Blair Stone Rd.
Tallahassee, FL 32399-2400
904-488-0784
(Pollution control; permitting)
(Used oil recycling information - 800-741-4337)

Florida Sea Grant Program
University of Florida
Box 110409
Gainesville, FL 32611
904-392-2801

(Research, education, and advisory services concerning
coastal and marine resources)

Keep Florida Beautiful
402 W. College Ave.
Tallahassee, FL 32301
904-561-0700
(Coastal and marine debris awareness)

Mote Marine Laboratory
1600 Thompson Pkwy.
Sarasota, FL 34236
813-388-1385
(Environmental education and research)

Nature Conservancy
Florida Chapter
2699 Lee Road, Suite 500
Winter Park, FL 32789
407-628-5887

Florida Soil Conservation Service State Office
Federal Building, Room 248
401 Southeast First Avenue
Gainesville, FL 32601-6849
904-377-1098
(Provides information and technical assistance for
wetlands restoration and construction of terraces,
waterways, waste lagoons, and other soil and water
conservation practices)

To report an oil or chemical spill:

National Response Center
U.S. Coast Guard
(24-Hour Hotline)
800-424-8802

U.S. Environmental Protection Agency
(24-Hour Hotline)
214-655-2222

Bibliography

Braus, J. (ed) 1990. *Your Choices Count - National Wildlife Federation Citizen Action Guide*. National Wildlife Federation, Washington, DC. 25 p.

Casteel, P. 1992. "America's Sea" *Texas Shores*, Texas A&M Sea Grant College Program, Galveston, Texas, Vol. 25, No. 2. pp. 5-24.

Clean Ocean Action. 1989. *Clean Ocean Action, 1989 Annual Guide*. New York, New York. 52 p.

Cornell Cooperative Extension, et al. 1991. *Sound Gardening - Gardening With an Eye on Water Quality*. Cornell University, Ithaca, New York. 23 p.

Cottingham, D. 1988. *Persistent Marine Debris: Challenge and Response - the Federal Perspective*. National Oceanic and Atmospheric Administration. Washington, DC. 41 p.

Culliton, Thomas J., et al. 1989. *50 Years of Population Change Along the Nation's Coasts - 1960 - 2010*. U.S. Department of Commerce. NOAA/NOS, Rockville, Maryland. 41 p.

Daniel, J. 1992. "Give Drinking Water a Helping Hand." *GEM Notes*. Institute of Water Research, Michigan State University, East Lansing, Michigan. Vol. 4, No. 1. pp. 1 - 2.

Folit, R. 1989. *Bay Repair Kit - What Each of Us Can Do to Keep Our Bays Clean*. Sarasota County Natural Resources Department, Sarasota, Florida. 18 p.

Freeman, H. et al. 1992. *Industrial Pollution Prevention: A Critical Review*. USEPA Pollution Prevention Research Branch, Cincinnati, Ohio. 40 p.

Holm - Shuett, A., Sly, C., and Greg Shuett. 1990. *Earth Day 1990 - Lesson Plan and Home Survey - Energy, Solid Waste/Recycling, Toxics, Transportation and Water With Fact Sheets and Action Guide*. Stanford University, California. 42 p.

Lee, V., and E. Ely. 1990. *National Directory of Citizen Volunteer Environmental Monitoring Programs*. U.S. Environmental Protection Agency. Washington, DC. 43 p.

National Wildlife Federation, 1989. *Conservation Directory, 34th Edition*. National Wildlife Federation, Washington, DC. 333 p.

National Oceanic and Atmospheric Administration. 1992. *Fisheries of the United States 1991, Current Fishery Statistics No. 309100*. U.S. Department of Commerce, Washington, DC. 113 p.

O'Hara, K.J., S. Iudicello, and R. Bierce, (eds.) 1988. *A Citizen's Guide to Plastics in the Ocean: More Than a Litter Problem*. Center for Environmental Education, Washington, DC. 131 p.

Tibbetts, J. 1992. "Forest Buffers Help Clean Rivers," *Coastal Heritage*. South Carolina Sea Grant Consortium, Charleston, South Carolina, Vol. 7, No. 1. p. 9.

U.S. Environmental Protection Agency. 1990. *Meeting the Environmental Challenge - EPA's Review of Progress and New Directions In Environmental Protection*. USEPA, Washington, DC. 27 p.

_____. 1990. *Let's Reduce and Recycle: Curriculum for Solid Waste Awareness*. USEPA, Washington, DC. 144 p.

_____. 1990. *Educators Earth Dry Sourcebook*. USEPA, Washington, DC. 5 p.

Washington State Department of Ecology. 1991. *Water Quality Guide - Recommended Pollution Control Practices For Homeowners and Small Farm Operators*. Olympia, Washington. 31 p.

Yepsen, R. B., Jr., and James Jarrett (eds.) 1987. *Organic Plant Protection*. Mississippi State University, Starkville, Mississippi. 24 p.

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