What do You Think?

1. Why is it important to keep our drinking water clean?
2. What happens to rainfall when it reaches the ground?
3. What are some things that rain fall may pick up as it makes its way through the watershed?
4. How does construction affect water quality?
   - New Homes
   - Retail Development
   - Roads
5. How can builders minimize the impacts of soil erosion?
6. What does impermeable mean?
7. What effects can occur if soil and plants are replaced with impermeable cover?
8. What types of things do you typically see in a parking lot? Where do these things go when it rains?
9. Where do storm drains lead?
10. What is the sheen you see in runoff from parking lots when it rains?
11. What can happen if someone uses lawn products/agricultural products such as fertilizers and pesticides improperly?
12. What can happen or be released when wastewater treatment plants are overloaded with stormwater?
13. What types of industry can be found in the Houston-Galveston area?
14. What can happen if industries fail to meet their required discharge permit standards?
15. What types of activities are found in the Houston Ship Channel and IntraCoastal Waterway?
16. How could these activities potentially pollute the bay?
17. How can maintenance of these waterways affect water quality?
18. Although urban land use comprises a major part of our region, agriculture and animal husbandry is also prevalent here. What are some examples of these land use activities and how can they affect water quality?
19. How can improperly maintained septic systems in rural areas impact water quality?
20. What is one way people can reduce the volume of solid waste?
21. How does this positively affect water quality?
22. What are the pros and cons of shoreline development?
23. What are some examples of household hazardous wastes that may be harmful to the environment if not disposed of properly?
24. What happens to the oil you see leaking from cars in driveways and parking lots?
25. Where does litter go when it rains?
26. Where is the best place to dispose of used oil? Why?
27. What pollutants could be included in runoff when you wash your car?
28. What pollutants could be included in runoff generated from overwatering your lawn or garden?
29. Why is it a good idea to pick up pet waste?
30. How do flooding events affect water quality?

To find out What Watershed You Live In
Or For More Information On Watersheds And Water Quality
Call Toll Free 1-866-77WATER
Or Go To http://www.hgac.cog.tx.us/waterdata

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What Watershed Do You Live In?

A Publication of HOUSTON-GALVESTON AREA COUNCIL & THE TEXAS CLEAN RIVERS PROGRAM

WHAT IS A WATERSHED?

A watershed is the hydrologic or geographic boundary of a river system. Watersheds can be delineated for any waterbody, whether it is the creek flowing through your neighborhood or the Mississippi River!

Watersheds are defined by a point along a stream or river and traced backward from there according to the main stem's tributaries, if any, and the topography of the terrain. All waters falling within the watershed boundary eventually will flow to the original point designated to define the watershed.

Much of what occurs within a watershed can directly or indirectly affect the water quality in the river system. This booklet summarizes the various factors and activities that can affect water quality in our region's lakes, bayous, rivers, bays, estuaries, and the Gulf of Mexico.

WHAT CAN YOU DO?

First, find out what watershed YOU live in.

Think about what is in YOUR watershed?

Agriculture?

Industry?

Urban Development?

Learn what activities affect the quality of water and the entire ecosystem in your watershed. The following pages describe the many factors and activities that impact our region's watersheds.

More questions to consider are featured on the back page!

FACTOR

RAINFALL

Rainfall either soaks into the ground to recharge groundwater supplies or it runs into area streams.Whether water supplies are obtained from wells or from surface sources (lakes, reservoirs, etc.) it is important that rainfall runoff does not become contaminated. Contaminated runoff can have a negative impact on humans. Proper management of our activities helps ensure drinking water is safe and that aquatic life is protected.

ACTIVITY

FLOOD CONTROL

Over the years drainage control ditches and canals have been built to help control flooding. This has not only altered existing habitats, but it has created new habitats with both positive and negative effects, depending on the type of flood control measures employed.

For example, when a channel is lined with concrete, natural aquatic habitats are disturbed or destroyed. Pollutants can more easily enter a waterway due to the lack of vegetation to control and filter runoff.

Control Measures

- ✔ Alternative flood control measures have proved effective. Some of these include constructed wetlands and detention ponds. In these cases, habitat is not destroyed, but created, and pollutants are kept from entering waterways.

ACTIVITY

LAWN & GARDEN

Most people like nice gardens and lush, green lawns. Individuals use a lot of materials to control weeds, to fertilize lawns and other plants and to prevent animals from damaging gardens. Modern fertilizers, herbicides and pesticides are designed to have a minimal impact on our environment. However, when overused or used improperly, these materials can be carried by rainfall into our waterways. Many of these materials can have unwanted effects on our water supplies and on aquatic life.

Watering a lawn or garden after application of fertilizers and pesticides has the same effect as rainfall. Over-watering of lawns produces runoff (potentially polluted) into streets, storm drains, and area waterbodies.

Control Measures

- ✔ Only use the minimum amount of fertilizer, herbicide, or insecticide required as necessary.
- ✔ Try other measures such as natural soil amendments to slowly release nutrients over a long period of time. Some of these include fish meal, bone meal, rock phosphate, kelp meal, and compost.
- ✔ Do not over-water lawns; watch for runoff from lawns into streets.

ACTIVITY

INDUSTRY

Petrochemical and other industries use water as part of the manufacturing process. This water usually becomes contaminated and requires treatment before it can be discharged to receiving streams.

Control Measures

- ✔ To discharge treated water, each facility must obtain a permit. These permits strictly define the quality of water that must be produced by these treatment processes in order to discharge to a receiving body of water. Failure to meet these requirements can result in fines or imprisonment.

ACTIVITY

ROAD CONSTRUCTION & DEVELOPMENT

Constructing roads, houses, buildings, and parking lots initially removes soil and vegetation which has been soaking up rainfall and replaces them with a structure, or an impermeable surface such as asphalt or concrete. An impermeable surface prohibits infiltration of rainwater. These surfaces also collect materials like litter and vehicle fluids.

When impermeable surfaces are washed by rainfall, collected materials are carried into ditches and storm sewers. Where do these outlets go? They lead straight to area lakes, bayous, rivers, Galveston Bay/other local bays, estuaries, or the Gulf of Mexico.

In addition, when vegetation is removed from a site, before a new surface is in place, the soil has a greater ability to wash into area waterbodies. This creates a number of problems for aquatic life as well as issues concerning aesthetics. If pollutants are attached to soil particles that are washed into waterbodies, there is the potential for additional, potentially toxic, pollution.

Control Measures

- ✔ Builders are usually required to use best management practices such as silt fences or hay bales to control the amount of soil erosion washed into our waterways.
- ✔ Another example is the diversion of runoff to a temporary detention basin where sediment can settle out, and water can either infiltrate the soil or again be diverted to another area.

ACTIVITY

AGRICULTURE

This activity is simply a larger-scaled version of lawn and garden concerns. Over-application of fertilizers, herbicides,and pesticides as well as poor soil management practices pose serious threats to water quality.

Control Measures

- ✔ Erosion control through proper soil management techniques (proper tilling, use of soil stabilizers) and good management of agricultural chemicals has been promoted by soil conservation services and County Agricultural Extension Agents for many years.
- ✔ Some best management practices for agriculture include crop rotation, postemergence application, early preplant, and split application with low rates ($^1/_2$-$^2/_3$ applied at early preplant and $^1/_2$ to $^1/_3$ applied at planting)
- ✔ Other effective practices involve reducing water and sediment runoff in general. These measures include building terraces without outlets, constructing water and sediment control basins, contour farming, incorporating grass filter strips or buffer zones, and reducing tillage. Another consideration is to involve the site characteristics (soil, slope) and weather conditions (wind, temperature, and rain can cause off target drift) into the irrigation or application plans.

ACTIVITY

LIVESTOCK

Animal husbandry is an important industry in this region. Horses, range cattle, feedlots, dairy farms and other livestock are plentiful. Of course, where there are animals, there are animal wastes which must be managed properly. If not controlled, these elements can be washed into waterways with each rainstorm. Nutrients such as nitrogen and phosphorous compounds and bacteria contained in these wastes have the potential to pollute waterways and impair aquatic life.

Control Measures

- ✔ Construction of water and sediment control basins, buffer zones between feedlots and streams, and terraces are useful best management practices for control of pollution from animal waste.

ACTIVITY

Municipal Sewage Treatment Plants & Septic Systems

Under ideal conditions, stormwater would not flow to wastewater treatment plants. Most cities and utility districts work diligently to try to keep rainwater from getting into treatment plants, but in older collection systems, rainwater can leak into cracked pipes which carry sewage from homes and businesses to treatment plants. If the collection system receives more water (for example, from a heavy rainfall) than it can handle, untreated waste can leak out of the system and into our streams.

Most communities have centralized treatment plants for treatment of wastewater from homes, offices and plants. State and federal government issue permits for various levels of treatment required to ensure water quality standards are met. Violating these permit requirements may result in heavy fines or imprisonment.

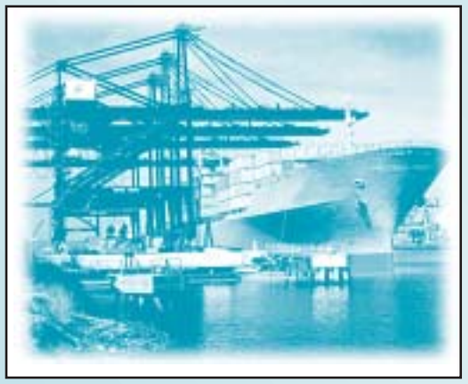
Where buildings are remote or located away from centralized waste treatment facilities, septic systems are generally used. If properly designed and maintained, septic systems should have a minimal impact on the environment. Improperly designed and maintained systems may introduce contaminated water or wastes into groundwater supplies and surface waters.

Control Measures

- ✔ Municipal treatment plants are governed by strict permits just like industries.
- ✔ Regularly inspect septic systems to ensure functionality. Report any sewage problems to the appropriate authority immediately.

ACTIVITY

Shipping & Transportation



Major users of the Houston Ship Channel include ships and barges carrying raw materials and finished products. The Ship Channel and the Intracoastal Waterway both cross Galveston Bay. In addition, the bay is home to hundreds of commercial fisherman. One of the greatest concerns for the bay are accidents that result in oil or chemical spills from these watercraft.

Other forms of transportation such as pipelines, trucks and trains are also vulnerable to accidental releases.

Maintenance of shipping channels involves periodic dredging. Disturbing the channel bottom increases the potential for pollutants that have settled in the stream, bay, etc. to be disrupted and carried back into the water system and possibly to other waterbodies.

Another concern is emissions from vehicles. The processes of how water and air pollutants interact is poorly understood, but efforts to research this potential issue are underway.

Control Measures

- ✔ Much effort goes into planning timely responses to spills and the prevention of accidental spills. Care must be taken in responding to accidents involving land vehicles so that oil or chemicals do not find their way into the storm drain system.

ACTIVITY

Household Waste

Household hazardous wastes include common cleaners, paint thinners and other solvents, pesticides, and herbicides. If handled improperly, they can pose a threat to water quality. Always read and follow label instructions for safe handling. Some household chemicals can go down the drain and pose problems in a septic system or even pass through a treatment plant without treatment.

Used oil from vehicles and lawn mowers can be very detrimental if poured down a storm drain. Used oil contains hydrocarbons, very fine metal shavings and other harmful materials that can remain in an ecosystem for many years.

ACTIVITY

Urban Runoff

A variety of pollutants can be carried from parking lots, streets, construction sites, or driveways into nearby streams during rain events. Some of the pollutants deposited on impervious areas include dust and dirt, animal fecal waste, atmospheric fallout, dead vegetation, pesticides, heavy metals, and traffic pollutants such as oil and lead.

Control Measures

- ✔ There are a number of commonly used best management practices implemented in order to control the amount of pollutants entering waterbodies.
- ✔ Wet and dry detention ponds collect stormwater and allow pollutants to settle before being discharged or diverted to another area. Wet detention ponds can serve as a community resource as well as a wildlife habitat area.
- ✔ Sand filters accomplish the same goal by allowing water to run through one or more types of media. Larger particles and materials settle out first in a "pretreatment" phase, and the water is then diverted to the filter. Pollutants attach to the soil particles, while the water drains to another basin and flows to the specified receiving waters.
- ✔ Constructed wetlands are extremely useful in allowing solids to settle out as well as in utilizing excessive nutrients, and in filtering oil and grease and metals. Another benefit to this strategy is the creation of habitat for wildlife.
- ✔ Vegetative buffers and riparian zones are another measure commonly used to protect waterbodies. These options slow down the rate of flow and allow solids to settle out as well as allow vegetation to filter other types of pollutants.

ACTIVITY

Solid Waste

Each one of us creates trash, and its volume increases with the growth of the number of homes and businesses. Solid waste landfills must be operated within strict regulatory guidelines. If not carefully controlled, contaminated materials and organics can leach into groundwater and potentially travel to surface water.

Control Measures

- ✔ Recycling is one way to decrease the amount of wastes entering landfills. Recycling efforts have expanded to include more types of wastes including hazardous materials such as oil and toxic containers. Proper disposal/recycling of these materials reduces the chance of hazardous materials leaching into water supplies.
- ✔ Under federal regulation, landfills in the Houston-Galveston Area are required to place a clay liner and then a plastic liner at the bottom of the landfill. Each day, waste is covered with dirt, and when the landfill is full, another liner is required on the top, essentially "entombing" the landfill.

Control Measures

- ✔ Always capture used oil and dispose of it at an oil recycling facility. Make sure hazardous containers are properly sealed.
- ✔ Take all empty hazardous waste containers to a recycling facility.
- ✔ Try non-toxic alternatives to household cleaners and disinfectants.