UNIVERSITY OF GEORGIA EXTENSION

Protecting Georgia's Surface Water Resources

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Water is an odorless, colorless, and tasteless compound that is also considered to be a renewable resource. It is a renewable resource since it has been continually recycled through the ***water cycle*** (also known as the hydrologic cycle) for millions of years (Figure 1). Water is recycled through the processes of ***evaporation*** and ***precipitation***. Even though water is constantly being recycled, only a small amount is available for use by humans.

Since only a small amount of water is available for human use, this publication was written to provide a broad-based discussion of how to protect our surface water resources.

The Water Cycle!

Since water is constantly being recycled, let's begin with evaporation. Evaporation is the process of converting water into water vapor through the application of heat. The main source of heat when discussing surface water is the sun. The water vapor then becomes part of the atmosphere. Precipitation occurs when atmospheric water vapor combines to form water droplets. When the droplets are large enough, they fall from the clouds. Depending on the weather conditions, the forms of precipitation can be rain, snow, hail, sleet, dew or frost. In Georgia we get all forms of precipitation and all follow a similar pathway, but for purposes of discussion we will use rain.

When rainfall occurs, it can be intercepted, flow along the ground and be stored on the surface, or infiltrate into the ground. In an average year, Georgia receives 50 inches of precipitation with 35 inches reentering the water cycle through evaporation (i.e., atmospheric water vapor) and ***transpiration***.

Six (6) of the 50 inches infiltrate into the ground and can refill the soil volume of water that is used by plants. If water infiltrates into the ground and exceeds the holding capacity of the soil, it can continue to flow downward by gravity and become ***deep percolation water***, or it can move downslope. Deep percolation is the primary water source to raise the water table (saturated soil). The water that moves

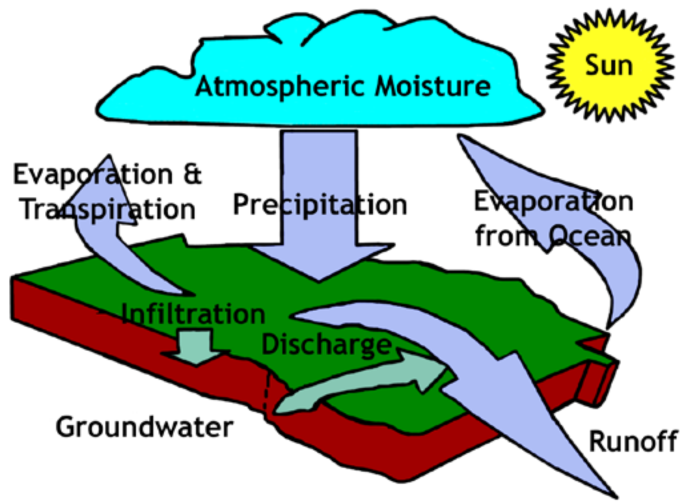

Figure 1. The water cycle (hydrologic cycle) is a process through which water has been recycled for millions of years. (Drawing from Georgia Environmental Protection Division).

downslope usually exits to the surface via seepage in the form of ***springs***. This water then has the potential to begin the cycle over through evaporation.

The remaining 9 inches of the 50 inches of precipitation is surface ***runoff***. Runoff is that portion of water that exceeds the ***infiltration rate*** of the soil where the water falls. This runoff becomes part of surface water bodies such as creeks, streams, rivers, lakes and reservoirs. Impervious areas (e.g., sidewalks, paved areas, rooftops, compacted soil surfaces) promote water movement across the surface without infiltration. The interaction between infiltration and runoff is delicate. As the amount of impervious area increases, the amount of runoff increases and less water infiltrates into the ground.

Runoff can become a more severe problem in the case where rainfall rates (how fast rain falls) are very high or rainfall amounts (volume of rainfall) are large enough to exceed the ***storage capacity*** of the soil. Water that cannot be held by the soil becomes runoff. When runoff exceeds the capacity of water bodies to transport or hold water, ***floods*** can occur.

*Words highlighted in ***bold italics*** type are defined in the Glossary.

Under average conditions, Georgia annually receives 50 inches of rainfall. This rainfall is needed for infiltration and runoff to replenish soil water (i.e., water in pores used by plants and animals and aquifers) and refill surface water bodies through runoff. However, if precipitation is less than the amount needed for infiltration and runoff for an extended period of time, ***drought*** conditions occur. ***Agricultural drought*** is where drought conditions extend for short periods of time (depends on area geography) and plants are affected. If drought conditions extend for long periods of time (years), water resources can be severely impacted, which causes a ***hydrologic drought***. Under an agricultural drought, if rainfall returns to average levels the drought can be stopped. Under a hydrologic drought, ground and surface water resources may be depleted and small amounts of rainfall may be insufficient to return water levels to safe conditions.

Of all the water on the surface of the earth, 97 percent is located in the oceans and the remaining 3 percent is freshwater (Figure 2). This 3 percent of freshwater is further divided, with about 70 percent stored as ice (i.e., glaciers and the polar ice caps), 29 percent stored as ground water, and the remaining 1 percent stored as surface water.

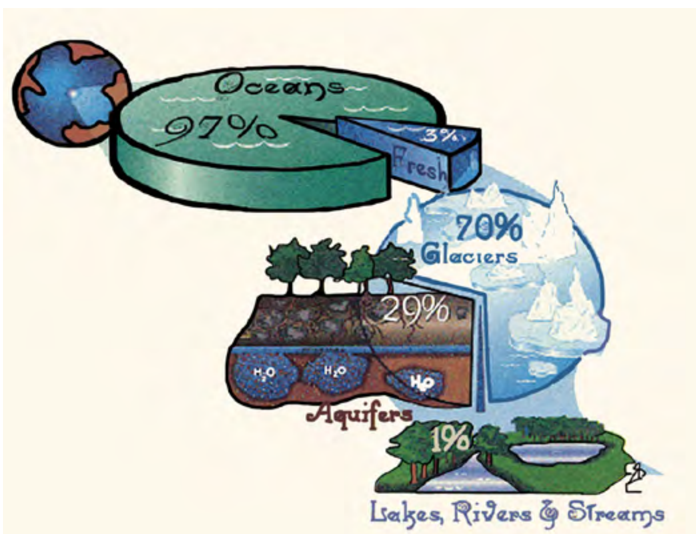

Figure 2. There is only 1 percent of the freshwater on earth available as surface water. Drawing from US-EPA.

What Is Ground Water and Surface Water?

Ground water is that 29 percent of freshwater that lies beneath the earth's surface. Ground water is contained in the pores between soil particles and gravel or in cracks in fractured rocks under the soil surface. When all of the pores are filled with water, or ***saturated***, they are referred to as ***aquifers*** (Figure 3). The water stored in aquifers is available for uses such as drinking, watering animals, manufacturing, and irrigation to name a few. Unfortunately, all ground water is not easy to obtain for those uses. Ground water is

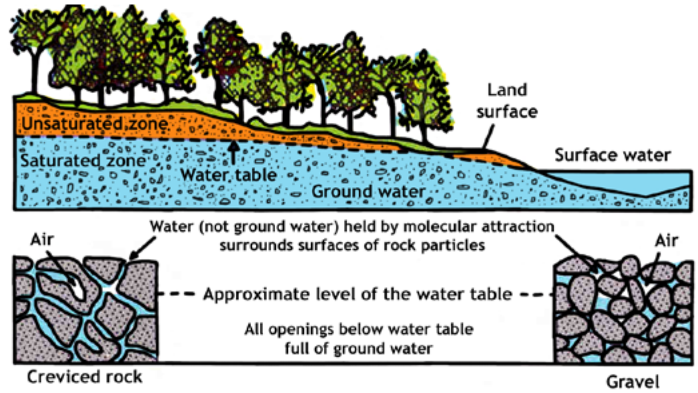

Figure 3. Ground water is located in soil and gravel pores or in cracks in fractured rocks. Ground water is also interconnected to surface water supplies. From: Waller, 1988.

used daily by 37 percent (104 million people) of the U.S. population for drinking purposes alone. In Georgia, 24 percent of the public water supply and 92 percent of rural drinking water sources come from ground water.

Surface water is that 1 percent of useable freshwater located in creeks, rivers, ponds, lakes, reservoirs and freshwater wetlands. Georgia has more than 70,000 miles of rivers; more than 425,000 acres of ponds, lakes and reservoirs; and 4,500,000 acres of freshwater wetlands. Like ground water, surface water is used for things such as drinking, watering animals, recreation, manufacturing and irrigation to name a few. In addition to human use, surface water is home to many different aquatic plant and animal species that require clean water for survival. Surface water is used daily by 63 percent (180 million people) of the U.S. population for drinking purposes alone. In Georgia, surface water is used for drinking purposes by over half the population.

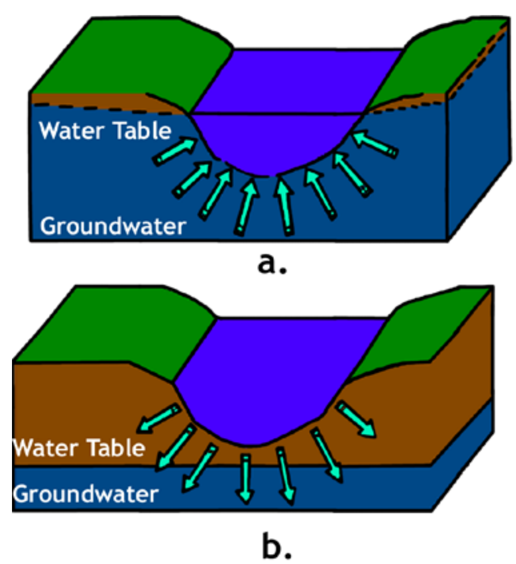

Figure 4. Interaction between surface water (stream) and ground water (aquifer). a) Gaining stream; b) Losing stream. Modified from Georgia Adopt-A-Stream Manual.

Surface water (streams) and ground water (aquifers) are interconnected in that one water source is used to recharge the other. During times of the year when the shallow ***water table*** is high (mainly during rainy parts of the year), the ground water flows into the streams. This flow helps the streams maintain a basic water level. This basic level of water is called ***baseflow*** (Figure 4a) and the stream is referred to as a ***gaining stream***. During times of the year when the water table is low, the water in the stream flows into the ground water (Figure 4b). This type of stream is referred to as a ***losing stream***.

To assist scientists in accounting for the water resources in Georgia as well as in the United States, the United States Geological Survey has divided the United States into 21 different regions. These 21 regions are further broken down into smaller and smaller regions. These large and small regions are known as ***watersheds***. Georgia has been divided into 14 sub-regional watersheds and 52 major watersheds (Figure 5).

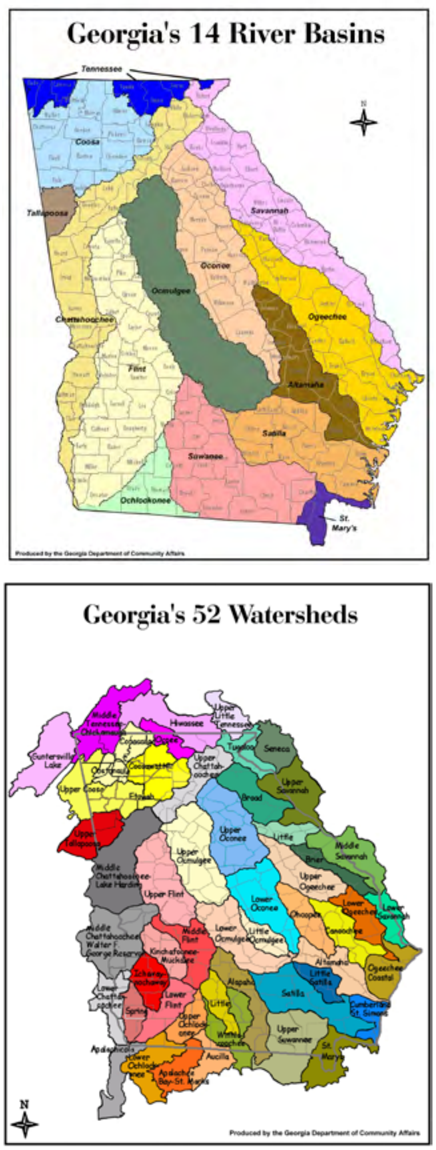

Figure 5. Watersheds of Georgia. Top: The 14 sub-regional watersheds; bottom: the 52 major watersheds of Georgia. As the map shows, watersheds can cross state, county and city boundaries. Maps from Georgia Department of Community Affairs.

Watersheds

Technically, a ***watershed*** is defined as:

A system of land area from which water, sediment, and dissolved materials drain to a common point along a stream, wetland, lake or river. Each watershed has a drainage system that conveys rainfall to an outlet. The high points of land surrounding a ***water body*** define the boundaries of a watershed.

A broader definition is: A watershed is more than the physical landscape that is defined by ridges with one outlet for water to flow. Watersheds support a variety of resources, uses, activities, and values where everything is linked in such a way that eventually all things are affected by everything else. Most importantly, it contains the history of all that went before us and the spirit of all to come.

- George Wingate, Bureau of Land Management
  Georgia Department of Natural Resources

Maybe a better way to think of a watershed is to think of it as a maple leaf (Figure 6). The leaf edge forms the boundary of the watershed. The veins are the tributaries feeding the stream or river (the stalk). The bottom of the stalk is the mouth of the stream or river. This water can then flow into a larger stream or river. In the case of large rivers like the Mississippi River, the river water flows into larger water bodies such as the Gulf of Mexico or the Atlantic or Pacific Ocean.

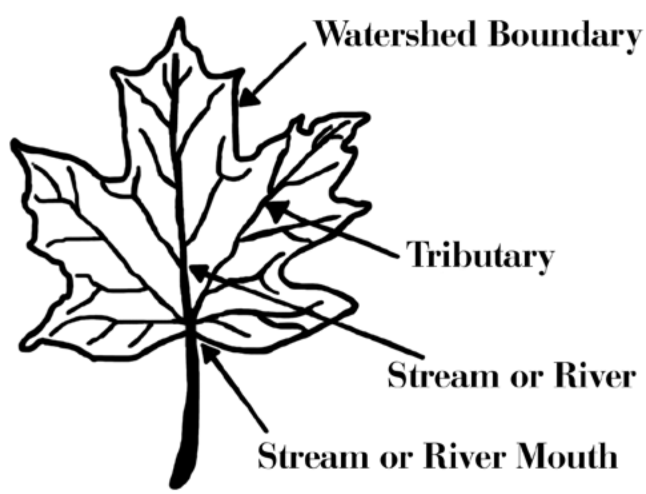

Figure 6. A maple leaf can be used to represent a watershed.

A Watershed's Water Quality

The quality of water within a watershed, both surface and ground water, is affected by two major sources of pollution: point and non-point sources. ***Point sources*** are defined as discharges from a given point such as a pipe or ditch. ***Non-point sources*** are defined as discharges from non-specific points such as leaking septic tanks and urban, forest and agricultural runoff (Figure 7).

Both sources of pollution add compounds or chemicals to the water that degrades the water quality within the watershed. This degradation is termed ***pollution***.

Many point sources are monitored and some are allowed (or permitted) to discharge specific amounts of pollutants to creeks, streams, rivers, lakes or reservoirs. These allowances (or permits) are issued under the National Pollution Discharge Elimination System (NPDES). NPDES is a program that originated in the Clean Water Act and is administered by Environmental Protection Departments (Department of Natural Resources in Georgia) in individual states. The purpose of the permit is to control the amount of compounds being discharged into water bodies from point sources such as industries, waste-water treatment plants, large construction sites, and large animal facilities.

Non-point sources that discharge compounds into water bodies are not currently regulated and may affect a watershed's water quality more than point sources. Non-point sources can be divided into three main areas: urban, forest or wildlife, and agricultural.

Urban non-point source pollution (NPS) (Figure 7) results from leaking septic systems, runoff from impervious surfaces (asphalt, rooftops and concrete), run-off from construction sites and lawn runoff. These different sources of pollutants enter the water bodies through runoff from rain and landscape irrigation. Typical pollutants are:

- ***Bacteria (fecal coliform)*** - from domestic animals and humans,
- ***Sediment*** - from yards, streets, construction sites, and parking lots,
- ***Organic matter*** - from yard clippings and leaves,
- ***Nutrients and pesticides*** - from lawns, driveways and streets, and
- ***Oils and greases*** - from leaking vehicles and materials poured onto streets.

Forest NPS pollution results from water falling as precipitation and flowing through forested areas. This water can carry bacteria, sediment, nutrients, organic matter and pesticides into water bodies. Additional sources of pollution may result from recreational use of forests by humans or vehicles crossing streams.

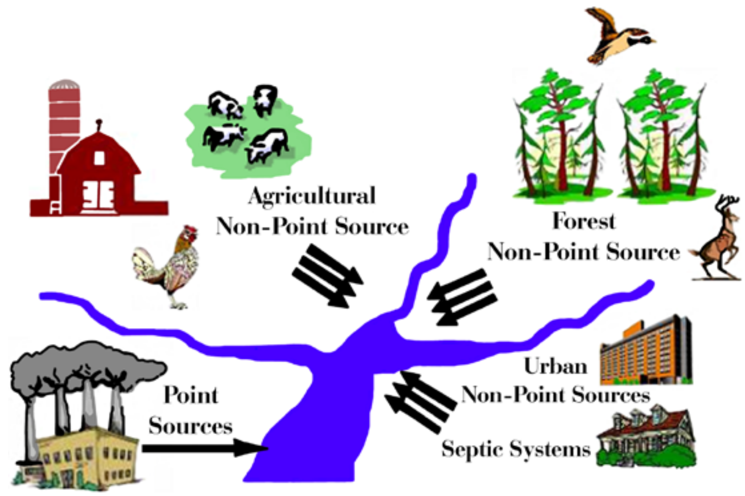

Figure 7. Source representation of where point and non-point source pollution originates. Modified from drawing by Georgia Environmental Protection.

Agricultural NPS pollution results mainly from row cropping and animal agriculture. Row cropping introduces pollution to water bodies in the form of nutrients (Nitrogen, N; Phosphorus, P and Potassium, K), sediment, and pesticides. Nutrients come from runoff of fertilizers and waste applications (animal and industrial). Bacteria from applications of waste products are also discharged to water bodies through runoff. Organic matter from decomposed plant materials or waste products can be easily moved during rain events or irrigation. Pesticides (either adsorbed to sediment or in water soluble forms) can also be transported in runoff.

Why Is Sediment Bad for Water Quality?

Sediment is bad for water quality because it is the result of a larger problem -- ***Erosion***. Erosion is the process by which water or wind detaches soil particles from their current location and moves them to other locations (Figure 8). Erosion is constantly occurring even in areas with protection such as vegetative cover. This is called ***natural erosion***. The erosion we are mainly concerned with is that erosion caused by rainfall or runoff that contacts unprotected soil. This unprotected soil (usually due to and accelerated by man's activities) is easily dislodged from its current location through ***splash erosion*** (Figure 9).

This dislodged soil is then easily ***suspended*** in the runoff and carried to new locations. When there is enough runoff to move large amounts of soil we term this ***sediment transport***. When there are sufficient soil particles in a runoff stream and the flow slows down (at the bottom of a hill) the soil starts to "drop out" of the runoff. This process is called ***sedimentation***.

Figure 8. Water (top) and wind (bottom) can dislodge and move soil from its original location. This dislocated soil is the source of sediment that causes pollution of water bodies. Photos from USDA-NRCS.

Figure 9. Splash erosion results when bits of soil are thrown in all directions from a single raindrop hitting bare soil. Photo from USDA-NRCS.

Sand bars in rivers are examples of this "dropping out" of sediment as the runoff streams slow down to a point where the moving water cannot continue to suspend the particles.

The soil and sand that makes the sand bars in the Coastal Plain (lower part of the state) may have come from as far away as the mountains of Georgia. For example, as rainfall collects in the mountains and starts to run off into the small streams, it carries soil particles. As the water joins other small streams, the one stream becomes larger and the soil particles help to dislodge other particles in the stream and along the stream banks. In the Mountain and Piedmont regions of the state, the water mainly stays in defined channels "carved" in the underlying bedrock. Once the stream or river enters the Coastal Plain (i.e., crosses the "***fall line***"), the land is flatter and the speed of the flowing water slows down enough for the soil particles to start dropping out of the water. These particles are what forms sand bars. Another unique feature of the Coastal Plain is that there are no underlying rocks to keep the river channels defined, so the flowing water erodes the banks and deposits this removed soil downstream. This removal and depositing of soil causes the streams and rivers in the Coastal Plain to have the typical ***meandering*** shape. Meandering is a natural process by which streams and rivers protect themselves from further erosion. In addition to meandering, ***streambank stabilization*** is another process that helps reduce erosion.

In addition to erosion moving soil from areas where it is useful, it also carries soil particles with attached pesticides, nutrients and bacteria. These pesticides, nutrients and bacteria can cause problems with water quality.

Effects of Pollution

Whether the pollution is a point or non-point source, the effects are relatively the same. Bacteria from either source can cause illness, rashes or -- in worst cases -- death. Nutrients carried by sediment or in runoff water can lead to ***eutrophication*** of a water body. The addition of nutrients stimulates the growth of aquatic plants. This stimulated growth reduces light penetration to bottom growing plants, thereby killing the plants. These dead plants along with leaves, organic matter and sediment flowing into the water body provides an organic "food" source for bacteria to "eat" and grow. As the bacteria decompose the organic matter, ***dissolved oxygen*** in the water is depleted below the level required by most aquatic animals (5 milligrams of oxygen per liter of water).

Pesticides are used to control weeds, insects and animals on land. Likewise, the same pesticides, mostly from non-point sources, can lead to death of plants or animals in the water body. The death of these living organisms adds to the organic matter in the water body and provides additional "food" for the bacteria. This additional "food" further aids in the depletion of dissolved oxygen in the water.

Measures to Protect Surface Waters

There is no way to keep surface water perfectly clean. Water flows over the ground surface as well as under the ground surface to recharge streams and rivers. As the water moves across or under the surface, it picks up pollutants such as nutrients, pesticides, bacteria and sediment and carries them to the water bodies. We cannot keep all of this pollution out of our water bodies, but there are ways to lower the amount of pollutants entering these water bodies.

Point Source Pollution

Sources of point source pollution such as industries, wastewater treatment plants, and some confined animal operations are regulated and monitored by the Georgia Environmental Protection Division (EPD). Fines are assessed if the allowable limits of a pollutant are exceeded in the discharged water. These allowable limits are based on having sufficient flow and volume in the receiving water body. The allowable limits are set so the amount of pollutants discharged into the water bodies is well below the drinking water standards.

There are also point sources of pollution that are not regulated by EPD. These sources include such things as fuel storage tanks and some animal waste storage lagoons. However, if these sources contribute to degraded water quality through spills or containment breaks, EPD does have regulations that will allow the owner to be fined and force the owner to clean up any damage caused by the leak or containment break.

Non-Point Source Pollution

Non-point source pollution is different in that it is not currently regulated or monitored except in specific research situations. This can cause problems because there is no record of how much pollutant is being discharged to the water body or the source of the pollutant. Even though there is no written record of discharge, evidence can be seen in water body degradation. As the nutrient concentration increases, the aquatic plants start to grow faster. If too much sediment is discharged into the water body, the bottom dwelling plants and animals start to die or disappear. If too much organic matter enters the water body, the dissolved oxygen starts to decrease and the aquatic animals start to die and disappear.

So even though we do not monitor non-point source pollution, we can see the effects of such pollution. As homeowners and farmers, the responsibility lies with you to use and implement voluntary practices that prevent the movement of pollutants to the water bodies.

One such method is to use a home or farm self-assessments to determine if there are activities that may be leading to pollution. The self-assessments are titled Home*A*Syst and Farm*A*Syst and are available at your local County Extension Office. Both are voluntary and allow the homeowner or farmer to complete an assessment of the activities occurring at home or on the farm. The results provide a general idea about the potential for that home or farm to pollute the nearby water body, and it also provides information about people who may be contacted for further information or help.

Urban Settings

In urban settings, there are a few things that can be done to protect water quality. These include proper oil disposal, proper application and timing of fertilizers and pesticides, and proper placement or reuse of organic matter.

Used Oil Disposal:

Small amounts of used oil, grease, antifreeze or any other such compounds can cause large problems when they enter water bodies. For example, some general facts about the pollution potential of oil are:

- Used oil contains toxic substances such as zinc, benzene and lead,
- Oil from one oil change (1 gallon) can ruin the taste of a million gallons of water (1 part per million), enough to supply 50 people with water for one year,
- One pint of oil when put in water can spread over a surface of one acre,
- Oil dumped on land will reduce productivity of that land, and
- Sewage treatment processes can be severely hindered if concentrations of used oil are as low as 50 to 100 parts per million (50 gallons in 1 million gallons).

Usually oil-changing facilities will accept used oil for recycling. If there is no place to take used oil, then mix the oil with an adsorbent such as kitty litter. Make sure there is enough litter available so there is no free liquid after the oil and litter is completely mixed. Once mixed, dispose of the oil and kitty litter in a proper garbage receptacle.

Proper Application of Pesticides:

Pesticides are major sources of pollution from the urban settings. Prior to applying pesticides, think of IPM (integrated pest management). IPM involves four parts that can help reduce the need for pesticides.

1. **Combine compatible plants** - add a couple of plants that either attracts beneficial insects or prevents growth

of weeds in the flower garden,
2. **Learn your bugs** - some bugs are actually beneficial and help control the pest insects,
3. **Use biological controls** - use non-toxic sprays instead of toxic sprays, and
4. **Chemicals** - use toxic chemicals only as a last resort and only on those areas as needed. Pesticides should also be used according to label instructions.

These four guidelines will help reduce the amount of chemicals entering the water bodies.

Proper Application of Fertilizers:
Fertilizers, like pesticides, can be sources of pollution of water bodies. Prior to applying fertilizers to a yard:

- Know the requirements of the plant(s) being grown,
- Have a soil test run on the yard or flowerbed, and
- Only apply the needed amount of fertilizer.

Your local University of Georgia Extension Office will be happy to provide you with information for better applications of fertilizers.

Disposal of Organic Waste:
Organic waste, when it enters a water body, can cause a depletion of dissolved oxygen. In order to keep this material out of the water bodies:

- Mow only of the grass height,
- Mow when grass is dry and use a sharp mower blade,
- Leave clippings in yard to provide nutrients and mulch to yard, and/or
- Compost yard clippings and leaves.

These simple ideas will lower the potential of organic matter entering the water body.

Forest Settings
Pollution from forests is usually attributed to organic matter in the runoff, bacteria from waste produced by wildlife, sediment from logging operations, and recreational activities. When forest areas are of concern, the Georgia Forestry Commission has produced a Best Management Practices booklet that explains different programs and management practices that can be used to reduce the amount of pollutants entering the water bodies.

Agricultural Settings
Agricultural settings have the potential for producing large quantities of non-point source pollution due to the scale of most operations. Therefore, the agricultural communities should be aware of the potential for non-point pollution and know effective methods of controlling pollution (nutrients, pesticides, bacteria, organic matter) movement. Since non-point source pollution is not regulated, it is not mandatory that the farmer control pollution movement; but as good stewards of the land, farmers should be aware of measures that can be taken to reduce the movement of pollutants.

The measures that can be taken are referred to as ***Best Management Practices (BMPs)***. BMPs are individual measures that can be used on a farm to reduce or prevent pollution movement. Best management practices can be separated into four categories:

1. ***Source control (SC)*** - The restriction or removal of a pesticide or nutrient sources. This is the easiest method to regulate and implement.
2. ***Structural control (STC)*** - Structural methods of controlling water and sediment movement; includes grassed waterways. filter strips, drip irrigation. This method may require initial capital outlay.
3. ***Cultural practice (CP)*** - Cropping and tillage practices that minimize pest problems and the use of pesticides, or maximize nutrient use efficiency or natural pest control, and
4. ***Management practice (MP)*** - Site specific management strategies or tools that minimize pollutant movement into surface or ground water. The higher management allows the producer to consider both environmental and economic impacts of the management practice.

Since Georgia has various regions, soil types and agricultural practices, no one BMP listed here will completely control the movement of pollution. A combination of practices can be employed to reduce the movement of pollutants.

Some BMPs that can be used, individually or in combination, are (category in parentheses):

- Conservation Tillage (CP),
- Contour Farming and Terracing (STC),
- Riparian Buffers/Vegetative Filters (STC),
- Stripcropping (CP),
- Cover crops (CP),
- Nutrient Management (SC or CP or MP),
- Integrated Pest Management (MP),
- Irrigation Scheduling (MP), and
- Composting (MP).

1. Conservation tillage
Conservation tillage is defined as a process that leaves at least 30 percent of the previous year's residue on the soil surface (Figure 10).

Figure 10. Cotton directly planted into a cover crop of wheat.

Some of the environmental impacts of conservation tillage are:

- **Improved soil quality** - this goes hand-in-hand with water quality,
- **Increased organic matter** - this helps in the retention of soil moisture,
- **Increased wildlife** - the cover provided by conservation tillage provides cover and food for wildlife,
- **Reduced soil erosion** - soil retention is important in the productivity of the land, and
- **Reduces the number of trips required by tractors in the fields** - this reduces air pollution and reduces the fuel consumption.

2. Contour Farming and Terracing

Contour farming uses the natural "lay of the land" instead of plowing up and down the slope. This type of BMP uses terraces to stop water from flowing down a slope. The terrace also slows the water velocity and re-directs the water to flow toward structures designed to allow water to move down slope without causing erosion. By controlling the velocity of flowing water, soil erosion is reduced and water infiltrates better. By reducing the amount of water that discharges to water bodies, the amount of nutrients, pesticides and sediment is reduced. Nutrient and pesticide management should also be a part of this practice for better results.

3. Riparian Buffers/Vegetative Filters

Riparian buffers are wooded or grassed strips adjacent to water bodies. These strips are usually 50 to 100 feet wide. Riparian buffers and vegetative filter strips help reduce non-point pollution by providing a strip to lower the velocity of the flowing water. This slow-flowing water allows sediments to fall out of the water. When this sediment falls out, the attached nutrients and pesticides also are removed from the water. Forested and vegetated areas increase infiltration, which provides additional filtering as water moves through the soil. The strips remove nutrients through tree, grass and bush growth and provide a good environment for beneficial bacteria to survive. These bacteria convert nitrogen sources into nitrogen gas through the processes of ***nitrification*** and ***denitrification***.

4. Stripcropping

Stripcropping is a BMP that uses different plants in strips to reduce wind and soil erosion. The different strips can also be designed to provide host plants for beneficial bugs. The increased population of beneficial insects aids to reduce the use of pesticides (Figure 11).

5. Cover Crops

The use of cover crops not only provides a cash crop for times when the land is normally fallow, but also provides cover for the soil. The cover crop provides benefits such as:

Figure 11. Contour stripcropping, alternating bands of corn and alfalfa on the Iowa-Minnesota border. Photo by T. McCabe, USDA-NRCS.

- Increased soil organic matter,
- Increased water holding capacity,
- Improves soil quality,
- Improves water quality from reduced pollution movement,
- Reduces soil erosion,
- Reduces need for pesticides,
- Reduces need for nutrient input,
- Natural weed control, and
- Additional cash crop.

6. Nutrient Management
Nutrient management provides the correct amount of nutrients to the plants at a time needed by the plants. If nutrients are applied as needed by the plants, the potential for movement to water bodies through erosion and in run-off is reduced. This reduction provides better water quality.

Figure 12. Bin composting of chicken litter and yard waste. The final product is a less bulky material that, when added to the soil, improves the soil quality.

7. Integrated Pest Management
Integrated pest management (IPM) is a method of controlling pest populations through socially acceptable, environmentally responsible and economically practical methods. IPM incorporates a variety of cultural, biological and chemical methods to efficiently manage pest populations while lowering dependence on chemical means of control. Since IPM uses various methods of scouting for pests, incorporates beneficial bugs and plants, and incorporates crop rotation; there are reductions in: 1) the potential for pesticide resistance, 2) the cost of chemicals, 3) the exposure of workers to chemicals and 4) environmental impacts.

8. Irrigation Scheduling
Irrigation scheduling is a BMP that incorporates:

- Information about the crop water requirements,
- Soil water balance,
- Irrigation system efficiency and uniformity, and
- Rainfall.

These four things working together assists the farmer in applying irrigation only when needed to provide the sufficient water needed by the crop. By applying water only when needed by the crop, the potential for runoff and water body pollution is reduced. Also, by maintaining a healthy crop, plants are less susceptible to disease and insect pressures or problems.

9. Composting
Composting is a natural process where bacteria, fungi, and insects break organic matter down into a more stable organic form — humus. Composting helps reduce the potential of water pollution by:

- Breaking down organic residues,
- Breaking down toxic chemicals,
- Stabilizing nutrients,
- Killing weed seeds,
- Killing pathogens, and
- Eliminating odors.

The final product (Figure 12) is a less bulky material that, when added to the soil, improves the soil quality. This improved soil quality improves the water holding capacity, reduces runoff, provides a slow release of nutrients and adsorbs pesticides that can then be broken down by soil microorganisms. By adding compost to agricultural land, the soil quality is improved which in turn improves the water quality of the associated water body.

Surface Water Quality Summary

There is no way to totally prevent water pollution, but we can reduce the potential for water pollution. The best way is to reduce the amount of pollutants being discharged into the water bodies through non-point source pollution. The suggestions listed above can help in reducing the amount of pollutants entering the water bodies and local and state watersheds. If, after reading this, you want to find out more about the suggestions listed, contact your local County Extension Office or local organizations that have formed to specifically deal with the watershed of interest.

Glossary

Agricultural drought - A drought that extends only a short period of time and has noticeable effects on plants.

Aquifers - A rock or soil formation capable of storing and transmitting usable ground water to the surface of the land.

Bacteria (fecal coliform) - a type of coliform bacteria found in the intestines of humans and warm blooded animals that aids in the digestion process and is used as an indicator of fecal contamination and/or possible presence of pathogens.

Baseflow - The basic level of water in a stream or river.

Best Management Practices (BMPs) - Individual methods, practices, or structures designed to reduce or prevent possible water pollution while maintaining economic returns.

Deep percolation - Water that moves below the root zone of plants.

Denitrification - The bacterial process of converting nitrate into atmospheric nitrogen.

Dissolved oxygen (DO) - Oxygen gas (O2) dissolved in water.

Drought - A long period of abnormally low rainfall.

Erosion - the wearing away of the earth's surface by running water, wind, ice, or other geological agents; processes including weathering, dissolution, abrasion, corrosion, and transportation by which material is removed from the earth's surface.

Eutrophication - The artificial or natural enrichment of a water body by the influx of nutrients. These nutrients promote plant growth over that of animal life.

Evaporation - the act or process of converting or changing water into water vapor by applying heat.

Fall line - The imaginary line that separates the Pied-mont and Coastal Plain portions of the state.

Floods - Overflowing of water, especially over land not usually submerged.

Gaining stream - A stream that is recharged by ground water.

Ground water - All water below the land surface. Ground water usually refers to subsurface water in a zone of saturation that can be pumped from a well or that flows from a spring or seep.

Hydrologic drought - A drought that extends over a long period of time and severely impacts water resources.

Infiltration rate - A measurement of how fast water moves into the soil.

Losing stream - A stream that loses water through percolation to ground water.

Meander(ing) - To follow a winding course, such as a brook meandering through the fields.

Natural erosion - Wearing away of the earth's surface by water, ice or other natural agents under natural environmental conditions such as climate and vegetation, undisturbed by man.

Nitrification - A biological process through which nitrifying bacteria convert toxic ammonia to less harmful nitrate.

Non-point source (pollution) - Contamination that enters water from a broad area such as a field, yard, or road.

Organic matter - materials derived from living organisms.

Point source (pollution) - Contamination that enters water from a stationary source such as a pipe or ditch.

Pollution - (a) Any natural or manmade material that contaminates the soil, air or water. (b) The inability of soil, air or water to naturally cleanse itself.

Precipitation - Water droplets or ice particles condensed from atmospheric water vapor and sufficiently massive to fall to the earth's surface, such as rain or snow.

Runoff - Water that flows over the land because the ground surface is impermeable or unable to adsorb water from precipitation or irrigation.

Saturated - All voids and cavities are filled with water.

Sediment - Insoluble material suspended in water that consists mainly of particles derived from rocks, soil and organic materials; a major non-point source pollutant to which other pollutants may attach.

Sediment transport - The movement of sediment in flowing water.

Sedimentation - The act of removing sediment from flowing water; usually occurs as the water slows down.

Splash erosion - The spattering of small soil particles caused by the impact of raindrops on very wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

Springs - Location where ground water exits at the surface.

Storage capacity - The maximum amount of water that can be held in the soil or the maximum amount of material such as sediment that can be suspended in a water stream.

Streambank stabilization - The natural process of protecting streambanks from eroding.

Surface water - All water above the land surface. This water is contained in streams, rivers, lakes, reservoirs and oceans.

Suspended - Temporarily dispersed through a fluid but not dissolved in it.

Transpiration - Process in which water absorbed by the root systems of plants moves up through the plants, passes through pores (stomata) in their leaves or other parts, and then evaporates into the atmosphere as water vapor; the passage of water vapor from a living body through a membrane or pores.

Water - A substance that in its purest form is odorless, colorless and tasteless and is needed for survival by every living being.

Water body - A depression that contains water. Usually a water body refers to a stream, river, lake, reservoir and ocean.

Water Cycle (hydrologic cycle) - The continuous movement of water from the Earth's surface to the atmosphere and then back to Earth. Some of the processes involved are:

1) Evaporation
2) Precipitation
3) Transpiration
4) Runoff
5) Infiltration
6) Percolation

Water table - The upper surface of ground water, or the level below it, in which the soil is saturated by water.

Watersheds - The land area from which water drains to a given point.

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