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Getting To Know Water

How Water Supplies Become Contaminated: Water Purity and Pollution

Water purity and pollution are difficult to define because both terms are relative. Many people consider pollution and contamination to mean the same thing. If this is true, then all water on earth is polluted somewhat because there is no such thing as chemically pure water in nature. Water is a very good solvent and tends to take into solution some of almost everything that it contacts. And water contacts most things since it is constantly moving through the hydrologic cycle.

Water is most pure in nature when it evaporates from a water surface because it leaves many contaminants behind. However, it does not remain in this pure state very long. Even while forming water droplets in clouds and while falling back to the earth as precipitation, rainwater picks up small amounts of gases, dust, and particulate matter from the atmosphere. Oxygen, nitrogen, and carbon dioxide—the most common gases in the atmosphere—are always found in water. Natural rainfall is somewhat acidic (pH=5.6) because of the dissolved carbon dioxide from the air.

After rainfall reaches the ground and flows over or through the surface layers, it dissolves and carries with it some of almost everything it touches, including materials dumped by people. Naturally occurring impurities may give water a bad taste, color, odor, or cloudy appearance (turbidity) and may cause hardness, corrosiveness, staining, or frothing. Impurities may damage growing plants and transmit disease. Other than suspended solids and dissolved solids and gases, most natural water also contains living creatures, most of which are not harmful to healthy humans.

Water purity means different things to different people and is not an absolute term. Water that is ideal for one use may be poor quality for a second use.

Purity Of Surface Water And Groundwater

Surface water is affected by the surrounding soils and land features but not to the same extent as groundwater. Surface water usually contains more

suspended solids but less minerals and iron than groundwater. Thus, surface water is softer: groundwater is harder. Excessive iron and hardness are the most common natural problems for private users of groundwater in Alabama. Salty groundwater is a problem in only a few areas of Alabama.

Because of its accessibility and its exposure to air and rainfall, surface water is easy to contaminate and relatively easy to purify. We once thought that most groundwater was safe from surface pollution. We now know that this is not true: groundwater can be contaminated by surface activities. And cleaning up groundwater is difficult and time consuming.

Groundwater pollutants introduced by people include pathogens (bacteria and viruses), heavy metals, pesticides (mostly organic), and other organic chemicals from manufacturing, industry, and agriculture. Traces of solvents and fuels have also been found in Alabama groundwater.

Bacteria and nitrates are the greatest pollution threats to rural groundwater in Alabama. Septic tanks and animal wastes are the primary culprits.

In Alabama, eroded sediments and animal wastes are the major sources of agricultural pollution. Alabama is second in the nation in poultry production. Therefore, large poultry production units have huge amounts of on-farm waste, including litter and carcasses, that must be used or disposed of in an environmentally safe manner.

The most common sources of groundwater contamination in urban areas are chemicals leaking from tanks and pipelines, concentrated chemical spills, and leaching waters from landfills and buried wastes.

Scope Of Water Pollution

When the natural quality of water is degraded through the activity of people, we call this "pollution." Most pollution occurs when we exceed the natural capacity of water to purify itself to a certain stan-

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Table 1. Water Pollutants.

Classes	Examples
Oxygen-demanding wastes.....	Plant and animal material
Infectious agents.....	Bacteria and viruses from humans and animals
Plant nutrients.....	Nitrates and phosphates from fertilizers, detergents, plant wastes, and animal wastes
Organic chemicals.....	Pesticides, solvents, fuels, cleaners, detergents
Other minerals and chemicals.....	Road salts, mine drainage, industrial by-products
Sediment from land erosion.....	Clay and silt
Radioactive substances.....	Waste products from mining and processing radioactive materials
Heat.....	Cooling water used in steam or nuclear power generation

dard in reference to a particular pollutant and particular use.

While natural processes can contaminate water, human activity has caused the rapid, widespread degrading of water resources in the last few centuries. For example, the natural process of erosion, one of the most destructive processes in nature, has been accelerated by human activity. Humans have also engineered many chemicals that are direct environmental threats to water quality.

In general, water pollutants may be classified into eight broad categories. These classes, with some examples, are shown in Table 1.

Sources Of Pollutants

Water pollutants can also be categorized as to their source. Numerous classification systems have been devised but the most general approach is to classify all pollutants as coming from either a point or a nonpoint source discharge.

Point source pollutants enter the water from a specific point through a sewer pipe, a ditch, or a culvert. Common point sources of pollution are discharges from factories and municipal sewage treatment plants. This pollution is relatively easy to collect and treat.

Nonpoint source pollution, on the other hand, is really a new name for an old problem—runoff and sedimentation. Nonpoint source pollution (NPS) runs off or seeps from broad land areas as a direct result of the way the land is used. It actually comes from a variety of sources, such as farm fields, animal feedlots or pastures, residential developments, roadsides, and urban parking lots. Sediment, plant nutrients, toxic materials, and animal wastes are the major types of NPS pollutants. The diffuse source of these pollutants

makes them more difficult to quantify and control than point source pollutants.

A few examples of how human activity has influenced runoff by accelerating it or by loading it with undesirable substances may illustrate the scope of the nonpoint source pollution problem.

Urban stormwater runs off buildings, manufacturing and industrial sites, streets, and parking areas into storm sewers, where it flows untreated into water ways. It carries with it oil, grease, trash, salts, lead, and other pollutants.

Construction site runoff carries soil and debris into streams and lakes.

Agricultural runoff carrying barnyard effluent, fertilizers, pesticides, and topsoil can pollute surface waters.

Acid mine drainage deposits acid residue and metal tailings in water bodies.



Logging and timber cutting operations cause erosion in forests where the soil has been disturbed.

Leaching water from septic tanks, agricultural land, landfills, or underground waste disposal areas may pollute groundwater.

Leaking chemical storage tanks and pipelines may also contaminate water supplies in rural areas.

Conclusion

There was once a time when polluted water could be thought of in terms of dissolved minerals, natural silt, and contaminants associated with the natural wastes of animals and humans. As the use of water has increased, pollution has become more diversified.

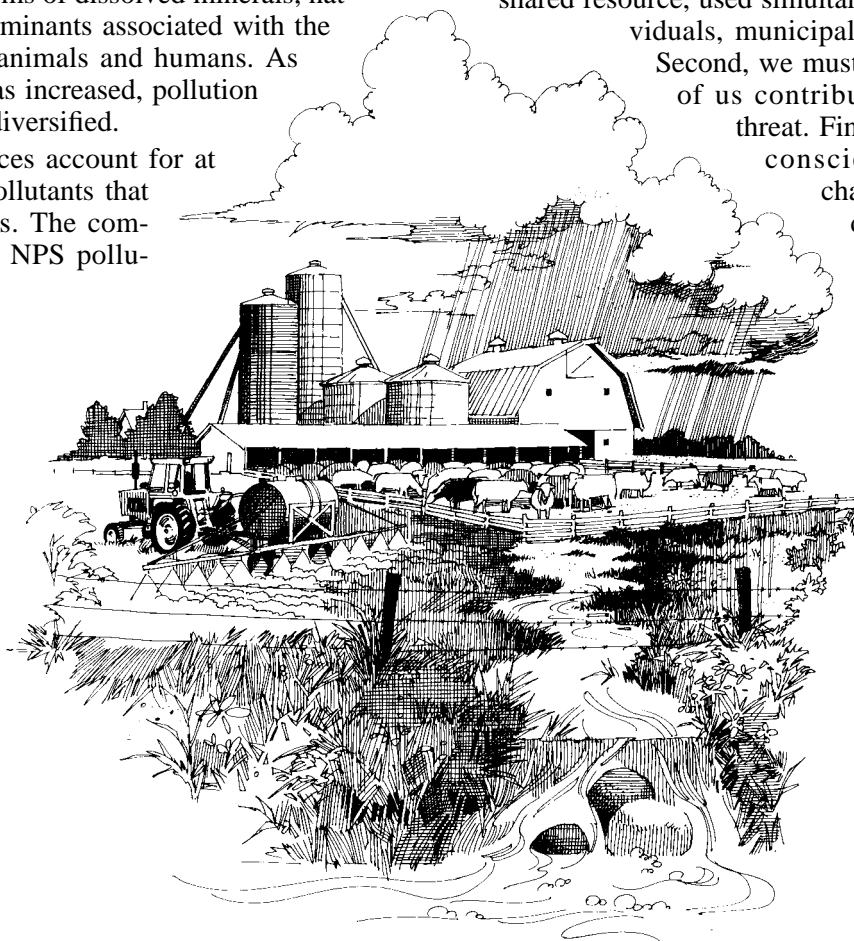
Nonpoint sources account for at least half of the pollutants that get into our waters. The complex nature of the NPS pollu-

tant means control programs will not produce crystal-clear water overnight.

The best protection against pollution is prevention—stopping contaminants from entering the system at the source. Federal and state agencies have expanded their efforts to prevent contamination of our water, but private citizens also have an active role to play.

There are many specific things that can be done to prevent surface water and groundwater contamination. First, we must realize that groundwater is a shared resource, used simultaneously by many individuals, municipalities, and businesses.

Second, we must understand that each of us contributes to the pollution threat. Finally, we must make a conscientious decision to change the way we conduct our daily activities.

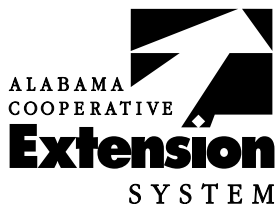


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