III. WATER AND LAND: A BACKGROUND

Abundant clean water is one of New York State's greatest resources. Every citizen of New York benefits from clean water and every citizen has a responsibility to protect this resource. Protecting water quality involves many types of actions from many organizations and individuals. Local governments can play a key role in watershed protection, having day-to-day contact with residents, businesses, and visitors, and a clear view of the progression of activities on the ground. Local governments recognize that efforts such as public education, municipal road de-icing techniques, stormwater management improvements, sediment and erosion control regulations, and enforcement of existing local development controls can all contribute to the protection of water resources.

A. WATER POLLUTION

Water is one of the most important of all natural resources. Biological processes necessary for all living organisms require water. Although we have recognized the importance of water to both the environment and society, we have often disregarded its value by polluting rivers, lakes, oceans, and groundwater. By our actions, we have altered natural processes to the point where many organisms can no longer exist, once-reliable sources of drinking water can no longer be used, and our ability to use water for recreational purposes has been impaired. To combat pollution, we must understand the nature of the problem and select and implement practices that reduce our impact upon this natural resource.

Thankfully, our understanding of the problem has grown over the past several hundred years. From the construction of the first public water systems in the early 1800s that brought pure water to cities such as New York and Philadelphia, to early 20th century sewer and waste disposal systems, to landmark federal legislation, such as the Clean Water Act of 1972, our understanding of the necessity and desirability of clean water has increased.

As direct (or "point source") pollution from sewage and industry has decreased, thanks in large part to State and Federal environmental regulations, attention has turned to other sources of water pollution. Rainwater and melting snow flowing off of roofs, parking lots, streets, lawn, agricultural land, and construction sites remains a primary source of pollution. This type of diffuse pollution is known as "nonpoint source" pollution. While regulations such as the State Pollution Discharge Elimination System (SPDES) Phase II are meant to address these types of pollution, there is much that municipalities can do to protect water resources. Much of the pollution described above comes from buildings, streets, and development sites, all of which are activities that municipalities, especially in New York State, have a great deal of control over.

B. CAUSES OF WATER POLLUTION: POINT AND NONPOINT SOURCES

Water resource pollution can be defined as the introduction of substances into a body of water that adversely affects its intended use. In general, two types of water pollution exist, defined according to the pathway of contamination.

Point sources of pollution occur when harmful substances are introduced directly into a body of water, such as from sewage treatment plants, industrial facilities, or an accidental spill. Point sources are often thought of as "end-of-pipe" sources of pollution.

Nonpoint sources deliver pollutants indirectly through environmental processes, such as runoff flowing over surfaces such as pavement, roofs, agricultural land, and construction sites. Nonpoint sources are often thought of as "diffuse" sources of pollution.

Point sources of pollution can be more easily monitored and regulated using existing technologies because pollutants enter the environment at a specific location. Nonpoint sources are more difficult to evaluate and regulate because pollutants enter the environment over a broad area. With nonpoint source pollution, the underlying sources and systems that contribute to the pollution must be controlled, rather than just the "end of the pipe." The United States Environmental Protection Agency has proclaimed nonpoint source pollution to be the greatest cause of water quality degradation in the United States, thereby highlighting the importance of its abatement.

Water pollution occurs from a variety of activities. Human practices are often responsible for the contamination of water bodies. Rain water flowing over land, for example, picks up a wide array of contaminants ranging from salt used for de-icing roads, to leaked motor oil and gasoline on driveways and parking lots, to agricultural and lawn chemicals, to large amounts of silt from open construction sites. The streams, ponds, and wetlands that are polluted by runoff can subsequently suffer from salinization (abnormally high levels of dissolved salts), eutrophication (excessive nutrient levels), and siltation (large deposits of silt). Eutrophication results from water that has received high levels of phosphorus and nitrogen, often from animal wastes in agricultural areas or untreated sewage in urban areas. Higher nutrient levels induce the prolific growth of aquatic plants and algae. When these plants die and are consumed by bacteria, oxygen is used, resulting in lower levels of dissolved oxygen in the water. The depletion of oxygen kills the small aquatic invertebrates consumed by fish.

C. CLASSIFYING POLLUTANTS

Regardless of the manner in which they enter the water, pollutants can be classified according to their properties:

- ***Toxic***
- ***Nutrient***
- ***Sediment***
- ***Bacterial***

Toxic pollution includes chemicals that poison and kill organisms in and near streams, rivers, and lakes. When a body of water has a high level of toxic pollution taken up by fish and accumulating in fish tissue, fishing for the purpose of human consumption is banned to protect human health. Even low levels of toxicity can be lethal over time when the chemicals accumulate in predators that consume large amounts of slightly poisoned organisms. This build up is known as "bio-accumulation." Examples of toxic pollutants include pesticides and herbicides; gasoline, oil, and other automotive products; household cleaning products; paints and solvents; battery acid; industrial waste chemicals; and some substances in car exhaust and solid waste incinerator smoke.

Sediment pollution includes soil, sand, silt, clay, and minerals eroded from the land surface and washed into water. Sediment is typically derived from areas with exposed soils. Without a cover of vegetation, rainwater flows quickly off the land surface, picking up particles of soil, rather than slowly soaking into the ground. In addition, hard surfaces (also known as impervious surfaces) such as roofs, streets, parking lots, prevent rainwater from slowly soaking ("infiltrating") into the ground. In many cases, the rain is channeled through gutters and drains to a nearby stream or ditch. Unless appropriate practices are put in place to slow the flow and dissipate the energy, this sudden increase in quantity and speed of water can erode the banks of a previously healthy watercourse.

Sediment overload causes a number of problems for aquatic organisms. Because fine sediment particulates are suspended in water, the resulting cloudiness decreases the amount of sunlight that can reach aquatic plants that provide food and oxygen for aquatic animals. As sediment settles, it fills the

voids between rocks, destroying habitat used by many invertebrates. Sediment also clogs the gills of fish, crayfish, and other underwater organisms. Sediment can bury fish and insect eggs, and prevent them from hatching. Sediment particles also often pick up other forms of pollution such as toxic substances, nutrients, or bacteria. These pollutants are washed with the sediment into a water bodies.

Nutrient pollution results from an overabundance of elements in water, such as nitrogen and phosphorus. All organisms require nutrients to survive, but high levels can be detrimental by stimulating excessive aquatic plant growth, particularly algae and vascular plants. A water surface that has been clouded by "algal blooms" blocks sunlight from reaching deeper levels of the water column, effectively retarding plant growth in these zones. When large quantities of algae die, bacterial decomposition uses dissolved oxygen, depriving aquatic organisms of oxygen needed for survival. This "feeding" or fertilizing of surface vegetation also makes water related recreation, such as swimming or fishing difficult. Sources of nutrient pollution can include effluent from sewage treatment plants, leakage from improperly maintained onsite wastewater treatment (septic) systems, industrial discharges, and agricultural and home lawn-care fertilizers.

Bacterial pollution occurs when an excess of harmful bacteria is present in a water body. Although there are several species of benign and beneficial bacteria in water, larger concentrations of certain types can be lethal to animals (including humans) that drink or accidentally ingest contaminated water. Sources of bacterial pollution include sewage treatment effluent, leakage from improperly maintained septic systems, animal wastes (including excessive and invasive waterfowl), and discharge from watercraft toilets.

D. The Watershed Approach to Planning

There is a growing emphasis to plan for and manage surface and ground waters on a watershed basis, rather than the traditional administrative political unit. The use of political boundaries in natural resource management has worked effectively when dealing with remediation of point source pollution, since easily-identified discharge points (i.e. the outfall pipe) usually fall exclusively within an administrative boundary, such as a city, town, or village.

However, combating nonpoint source pollution within the framework of the individual municipality is considerably less efficient as a result of:

- Multiple diffuse origins of the pollution;
- Multiple points-of-entry of the pollution; and
- Considerable distances between the pollution source and the affected water bodies.

Because water does not recognize political boundaries, a watershed-level, inter-municipal effort can be most effective to successfully manage nonpoint source pollution. Their key role in regulating activities that affect water resources (land and water use and development patterns) makes local governments a critical part of this cooperative effort. In New York State, with its tradition of "home rule," municipalities have a great deal of control over development. With this authority, however, comes responsibility. In order to protect the water resources of the State, municipalities need to follow good planning processes and adopt and enforce responsible land use regulations. Local governments can also protect water quality by establishing guidance and oversight that ensures the implementation of best management practices (BMPs) for municipal activities, such as road maintenance and de-icing, and municipal construction activities.

MAP 3.1: OVERVIEW OF MAJOR WATERSHEDS INTERSECTING SENECA COUNTY