Getting Up to Speed

PROTECTING GROUND WATER

As you have worked your way through this ground water program, we hope that you have gained an understanding and respect for the role that ground water plays in this interrelated and interwoven composition that is the Earth. For too long, our ground water resources have been out of sight and out of mind, and, as is often the case, our wake-up call has come in the form of accumulated ground water pollution crises.

Over the past few decades, we have learned some important lessons. We have learned, for example, that because it is located deep in the ground, ground water pollution is generally difficult and expensive to clean up. We have learned that it is much easier and less expensive to protect aquifers from pollution and harmful development than to find new water supplies or restore ground water quality after it has been contaminated. We have also learned that governments, industries, businesses, and individuals can all benefit from working together to protect this invaluable resource. In fact, ground water protection requires the active cooperation of all of the above.

In this final section of *That Magnificent Ground Water Connection,* we will zero in on what we as a society and as individuals can do to protect our ground water resources. For starters, educating children and young adults, as this curriculum does, is a critical step in the process. Once we all understand the value of our water resources, how the water resource system works, and how our actions can affect water quality, we can begin to work together to protect these resources now and for generations to come.

Federal and state governments play the "big picture" roles in ground water protection. Federal laws and U.S. Environmental Protection Agency regulations authorize or mandate many programs to protect ground water and help provide funding. In general, the states have responsibility for implementing ground water programs that are, at a minimum, consistent with federal requirements. States also have responsibility for developing ground water management plans that are based on their hydrologic conditions and water needs. State agencies implement ground water protection through permit programs, technical assistance, monitoring, and enforcement.

But the greatest means of protecting ground water is at the local level, where potential pollution sources must ultimately be managed, where most land-use decisions are made, and where water resources can benefit from community vigilance and stewardship. At the local level, individuals can easily get involved and make a difference. As anthropologist Margaret Mead said: "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."

As high school students, it won't be long before you will assume the responsibilities that go with being an adult. As adult members of your community, there are many ways in which you can make a difference on issues that matter to you—by voting; serving on various boards, commissions, or legislative bodies; organizing citizens groups and volunteer efforts; or taking part in citizens groups and volunteer efforts. If good intentions are to become realities, they must be translated into actions...effective actions. In the following reading you will learn about how citizens can get involved in protecting important natural resources in their community. This reading focuses on protecting ground water resources.

A Strategy For Protecting Ground Water Resources In Your Community

Ground water protection is a significant undertaking that may, indeed, affect many people for many reasons. It pays to have a well-planned strategy! Here's a plan of attack that has worked well in many communities:

STEP 1. Get People Involved

At the local level, the first step in developing any resource protection program is to form a community planning team. Since your ultimate goal is to have a ground water protection program that everyone in the community will support, it is important that the planning team represents as many diverse interests in the community as possible—town officials, community activists, residents, businesses, water suppliers, special interests.

STEP 2. Determine What Should Be Protected and Why

Once the team is formed, it should set about identifying its goals and objectives. The first important question that must be answered is: What ground water resources need to be protected and why? That is, is the goal to protect the drinking water supply? Is the goal to preserve critical resources such as wetlands, lakes, rivers, or coastal estuaries?

Communities may have varying reasons for wanting to protect their ground water. Your team will need to look at the local ground water resources in terms of identifying their functions and then protecting those functions based on present and future needs. For example, one community may want to protect its ground water supply by delineating and protecting the wellhead protection area, (a recharge area that supplies a municipal well(s) with water). Another community may want to protect its surface water supply by protecting all of the source water that flows into that surface water body, including, of course, the ground water. Another community may want to protect its estuarine areas by managing activities in its ground water recharge areas—the land areas that provide ground water recharge to the estuary.

After a community decides why it is protecting its ground waters, the next and perhaps most difficult task will be to identify ground waters which must be protected and determine what that protection area encompasses. Because ground water is not easily seen, many communities do not know where their most valuable ground waters are located or in which land areas polluting land-use activities will directly affect these ground waters.

Ideally, we should strive to protect all ground water and take precautions, whenever and wherever, to prevent pollution. In reality, however, we must often choose our battles, and direct our energies where the desired result will be most effective. In time, through education, our environmental vigilance will be enhanced. In the meantime, we must make choices.

If the protection goal is directed at ground waters that contribute to the community's wetlands, the protected area might include the land area where ground water recharges the wetland. If surface water protection is the goal, then the protected area might include the entire watershed that contributes to the community's streams and rivers. Here are the major types of protection areas used by communities:

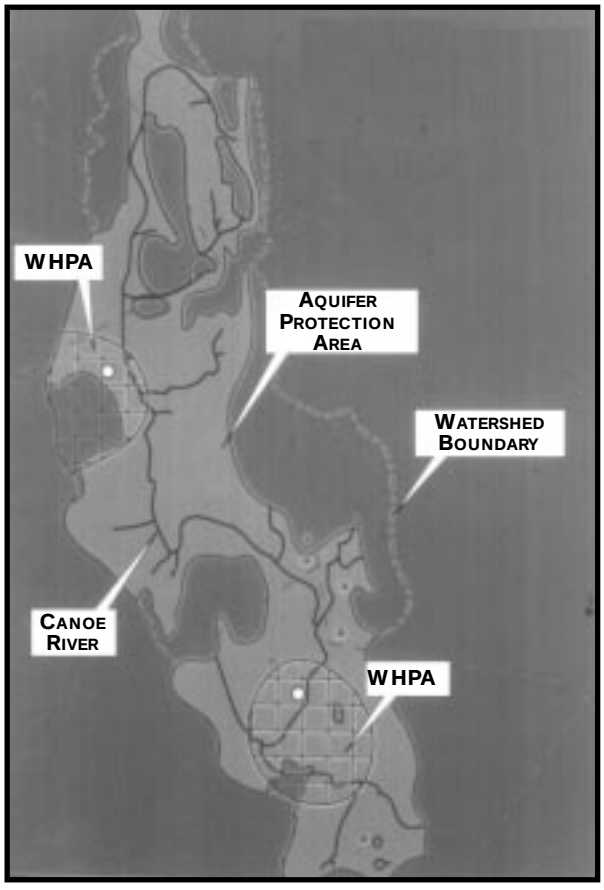
- **Surface watersheds** are best used to protect surface waters and the ground waters that support them. A watershed is typically much larger than the area that supports a town's aquifers or drinking water wells. The advantage of using a watershed boundary to protect ground water resources is that it can be delineated fairly easily and at low cost.

- **Aquifer protection** areas are used to protect potential community drinking water sources. The cost and difficulty in identifying these areas varies according to the amount of available information.

Communities that depend on private wells for drinking water may wish to identify and protect all of their aquifers, inasmuch as all landowners are dependent on the water on their properties for drinking water. In a case where a community has large supply wells, only a portion of an aquifer may be supplying water to the well. In this case, protection of the entire aquifer may provide more protection than a community feels it needs.

■ **Wellhead protection areas** are used to protect only the ground water that recharges a community's supply wells. If communities choose this method of protection, it is important that they determine their existing and future supply needs when identifying their wellhead protection areas.

Figure 1 AQUIFER VS. WELLHEAD PROTECTION AREA (WHPA)



If a community does not consider its future needs, it may not protect enough of its aquifers to support future development. In a case where a fairly inexpensive and inaccurate method is used to delineate the wellhead protection areas, the community may not truly understand which land areas may have an impact on its wells and may therefore achieve incomplete protection of critical ground water resources. Figure 1 provides an example of the different types of protection areas in a given community.

STEP 3. Collect Information About Your Ground Water Resources

The primary goals of most ground water mapping programs are to identify and map relevant watersheds, aquifers, wellhead protection areas, wetlands, and surface water areas. Much of the information you need to collect is already available in map form, but these maps may be at many different scales, making relationships hard to see. The best way to display these data is to purchase a topographic base map and then map the other information at the same scale on acetate overlays. The use of Geographic Information System (GIS) computer technology, if available to your community, allows you to easily view and evaluate mapped information.

Several types of maps that may be available for your community are described in the activity, "Revealing Stories—Resource Maps Tell All," and may be available in GIS form. These maps include the following:

■ Topographic Maps

These maps, prepared by the United States Geological Survey (USGS), use contour lines to show the elevation of the land surface at 10-foot intervals (or in newer maps, 3-meter intervals). By observing the contour lines closely, the map user can learn the shape of the land surface (topography). And, by connecting the points of highest elevation, watershed boundaries to rivers, streams, and coastal embayments can be mapped.

Topographic maps also show the location of major wetlands, rivers, roads, buildings, and other details.

■ Surficial Geologic Maps

These maps, prepared by USGS for portions of New England, are drawn by professional geologists who observe and interpret land forms and soil profiles. Permeable soils, indicative of good recharge areas, are usually identified on the map. The maps show only types of surficial deposits. They do not provide numerical data on soil permeability, nor do they identify aquifer recharge areas.

■ National Wetland Inventory Maps

National Wetland Inventory Maps, prepared by the U.S. Fish and Wildlife Service, are available at scales of 1:24,000 or 1:25,000 and show the location of medium and large-sized wetlands. Digital data may be available through the Internet for portions of New England.

■ Soil Maps

In communities where USGS surficial geology maps are not yet available, soil maps from the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service can be used to locate permeable soils that could be recharge areas. Soil maps have been prepared for much of New England. The maps show soil types on an aerial photograph. The soil survey report, which describes the soil classifications in terms of permeability and other characteristics, also includes a general soils map of the community. Both the USGS surficial geologic maps and the USDA soil maps show soil types within a few feet of the surface, but they do not contain information about deeper geologic deposits. This is a problem because one cannot assume that soils at deeper levels will be the same as those directly above. In fact, layers of different soils are common in New England.

■ Hydrologic Atlases

These maps, published by the USGS, are available for portions of New England and show the location of aquifers. The location of aquifers is estimated by examining surficial geology, depth to bedrock, and depth of the water table. It is important to realize that these maps show only aquifers that are considered favorable for ground water development for drinking water based on the geologist's interpretation. Actual well yield may differ from the estimated yield. Despite these limitations, the hydrologic atlases identify all the major aquifers within a given river basin. Thus, rather than hiring consultants to find an "undiscovered" aquifer, the USGS hydrologic atlas can be used to locate aquifer areas in a community.

■ Additional Sources of Information

Your community may already have a library of natural resource information. If you have a planning department, it would be the first place to look. Regional planning agencies often have an extensive collection of resource information. Some state environmental departments in New England have collected extensive information about the location and quality of aquifers, wetlands, and coastal recharge areas. Call your state ground water program (usually the program that implements the state's wellhead protection program), wetlands program, geologic survey, and coastal zone management program to determine what additional water resource information is available for your community.

STEP 4. Map Your Ground Water Resource Protection Areas

Once you have evaluated your ground water resource information and determined how that information will be applied to your community's ground water protection needs, you will need to transfer this information onto a separate Ground Water Resource Protection Areas **overlay map**. Depending on the amount of information available, the community may want to hire a consultant to map the resource protection area or seek

assistance from the regional planning agency or state environmental agency. Assuming that this map is eventually adopted by the community, it will become an important land-use decision-making tool.

Communities use maps to identify a variety of land-use features, including zoning, existing land uses, water supply watersheds, wetlands, potential ground water supplies, and open space and recreation areas. When these maps are laid one on top of another, they provide local land-use decision makers with a critical body of information. You can use this overlay procedure to immediately identify areas where overlapping existing or intended land uses pose potential conflicts with ground water protection goals. Here are some examples of the kinds of ground water protection area maps that can be developed:

■ Surface Watershed Areas

Because any resource protection area will lay within one watershed or other, the first step of the ground water mapping process is to map the boundaries of the watershed in which the area(s) is located. Watershed boundaries (drainage divides) define the land area that drains surface water to a river, stream, pond, lake, or embayment. We are fortunate in New England because watershed boundaries generally correspond with ground water divides, so they can be used to identify the ground water basin as well as the surface drainage basin. (See the activity, "Watershed Basics," to find out how to delineate a watershed.)

■ Estuarine Protection Areas

In coastal communities where estuary protection is a concern, watershed maps and maps that show ground water recharge areas to estuaries can be used to establish estuarine protection area maps. The watershed maps allow communities to identify surface and ground water flow shoreward as well as land areas that could be potential sources of pollutant discharges, particularly stormwater runoff. Ground water recharge maps provide information on ground water discharge areas.

■ Aquifer Protection Areas

It is difficult to determine the exact limits of aquifers and their recharge areas because ground water systems are dynamic. Although the geology of an area does not change perceptibly, the water table fluctuates. In addition, the porous, permeable materials that constitute aquifers do not end abruptly at a given point in the watershed; rather, they often blend into adjacent deposits.

Aquifer recharge areas usually include most of the land directly above the aquifer and also extend beyond the aquifer into the adjacent upland areas. If USGS surficial geology maps and USDA soil maps are available, they can be used to supply basic information on the location of permeable deposits. Depending on the amount and detail of existing information, additional soil data may be needed to map aquifer recharge areas. When a local ground water study is conducted by a consultant, existing information is often supplemented by field tests to verify the permeability of the soil at various depths.

■ Source Water/Wellhead Protection Areas

Source water protection areas are the lands necessary for protecting drinking water sources—wells, reservoirs, rivers. Surface water supply protection areas typically include the watershed upstream of the water intake. The term "wellhead protection area" is used to describe the area needed to protect ground water supplies. It is very important to know how much of an aquifer is affected by a well, because in addition to drawing water to the well, pumping will also pull any contaminants to the well that might be leaching from the land surface. Therefore, by defining the wellhead protection area as precisely as possible, you can focus your protection program on the land that is most critical and that affects the quality of your drink-

ing water supply. By narrowing the focus of your protection program to those areas that have a direct impact on a resource, you are more likely to win support from your community as a whole for adopting protection strategies.

The process of wellhead delineation is extremely important, but it can also be difficult and expensive, depending on the needs of the community. Accuracy becomes important if management tools, such as land-use restrictions, are adopted to protect the water supply. In such cases, it is important to have a delineated wellhead protection area that can stand up to potential legal challenges by landowners. While there are some delineation techniques that the community can undertake itself, the more sophisticated techniques will probably require the town or water company to hire a ground water consulting firm.

Under the federal Safe Drinking Water Act, states are asked to develop Wellhead Protection Programs to enhance protection of the nation's drinking water supplies. All of the New England states have developed Wellhead Protection Programs and regulations or guidelines for delineation of wellhead protection areas for new and/or existing wells. Ground water planning teams should check the particular requirements and guidance materials applicable to their state before proceeding with the delineation process. There may be special assistance programs in your state to aid in the delineation process, as well as legal requirements you have to meet.

■ Wellhead Protection Areas for Bedrock Aquifers

Many communities in New England do not have high-yielding sand and gravel aquifers but depend instead on wells drilled into bedrock. Water is drawn from fractures within the rock, which may be difficult to identify and locate precisely. A bedrock geology map can, however, provide a general sense of the direction and size of the fractures in the bedrock, which may help to determine the land area where water actually enters the bedrock fractures. Unfortunately, there are no widely agreed-upon methods for delineating wellhead protection areas for bedrock wells.

■ Private Wells—Vulnerable Areas

If your community is served by private wells, it is important to identify vulnerable resource areas. While it may be difficult and unrealistic to draw a wellhead protection area around each individual well, there are other options.

If private wells are spread throughout the town, you may choose to identify the whole town as a protection area. If residential development is limited to a portion of town, then you may choose to delineate that area for more protection.

If you anticipate future growth, or if private well owners are experiencing water quality problems, it may be prudent to locate high-yielding areas for a future public water supply well, and take the steps to protect them to ensure that they will yield safe water in the future. To identify such areas, you can consult aquifer and surficial geology maps, or hire a consultant to do the necessary research.

STEP 5. Inventory Existing and Potential Pollution Threats to Ground Water Protection Areas

What happens on the surface of the land has the potential to contaminate the water below. Your team needs to determine which land-use activities pose a threat to your ground water protection areas. You need to know what kinds of materials are being used; how they are being handled, stored, and disposed; and where potentially harmful activities are located with respect to your ground water protection areas.

To get a handle on this information, you need to develop a map that shows land uses and activities within your resource protection areas. First, check and see if your community has a current land-use map. Otherwise, obtain a town/city assessor's map or a zoning map from which to create your exist-

Table 1

Relative Risks of Land-Use Activities

RISK PRIORITY

Moderate to High			Low	Very Low
Agriculture	Industrial manufacturers	Railroad yards	Churches	Forest land
Airports	Junkyards and salvage operations	Repair shops (engines, appliances, etc.)	Field crops (non-intensive chemical and water use)	Open space
Animal feedlots	Land application of sludge	Residential (moderate to high density)	Low-density residential	Public parks
Auto-body shops	Landfills	Restaurants	Non-industrial office space	Water utility owned land
Automotive repair shops	Laundromats	Retail malls		
Auto parts store	Logging operations	Road salt storage		
Beauty salons	Machine shops	Rust proofers		
Boat builders and refinishers	Marinas and boatyards	Sand and gravel operations		
Bus and truck terminals	Medical and research labs	Schools and colleges		
Car dealership	Metal and drum cleaning operations	Service stations (gas)		
Cemeteries	Metal plating operations	Shopping centers		
Chemical manufacturers	Military facilities	Snow dumps		
Concrete companies, asphalt, coal and tar	Mining	Stormwater management facilities		
Dredge disposal sites	Nursing homes	Utility rights-of-way		
Dry cleaners	Oil and sewer pipelines	Utility substations, transformers		
Dumps	Paint shops	Waste storage, treatment, recycling		
Food processors	Photographic processors	Waste transfer stations		
Forestry	Plant nurseries	Wastewater treatment plants		
Fuel oil distributors	Printers, blueprint shops	Wood preservers		
Funeral homes	Prisons			
Furniture strippers	Public works garages			
Golf courses				
Highways				
Hospitals				
Hotels, motels				

Source: NEIWPCC. *Source Protection: A Guidance Manual for Small Surface Water Supplies in New England.* March 1996.

ing land-use base map. It always helps to double-check any of this information with a drive-by or walk-by survey. Aerial photos are also very useful. Once you have your existing land-use map, you can superimpose potential threats to resource protection areas onto the map. (Table 1 lists the types of land uses that typically pose a risk to both ground and surface waters.) You may want to

identify general land-use types (for example, residential, agricultural, industrial, open space) on your map so you will know where to concentrate your efforts. Areas with industrial and commercial land uses will probably be the ones to focus on first.

Many of the land uses that might be a concern in your ground water protection area(s) may be already regulated, or at least registered, by a government program (for example, underground storage tanks, use and storage of hazardous materials, or transport and discharge of hazardous materials). Discharges to ground water are regulated by state environmental agencies through the issuance of ground water discharge permits. Superfund and other known hazardous waste sites are also registered with state environmental agencies.

You need to locate any facilities such as landfills, junkyards, sludge lagoons, and disposal areas by visual inspection or by contacting the solid waste division of your state environmental agency or your local health department. Residential development poses a host of potential threats from sources such as septic systems, road salt, lawn fertilizers and pesticides, improper disposal of hazardous materials, and stormwater. In terms of industrial and commercial development, those of greatest concern to ground water quality are the ones that use hazardous substances. Agricultural operations pose potential risk in terms of pesticide use and nutrient management.

Once you have inventoried your potential risks, you need to assess these risks in terms of which risks pose the greatest threat to your ground water resources. (See Table 1 on page D•7.)

STEP 6. Develop a Ground Water Resource Protection Area Management Strategy

After your team has established its ground water resource protection goals, identified and mapped ground water resource protection areas, and inventoried and rated or ranked the potential threats to these resources, your next step will be to develop a management strategy for these areas. Much of this work involves choosing mechanisms to control existing or future risks to your ground water resource areas. You may well discover that some mechanisms are already in place through federal, state, and local regulations and ordinances. But it is also likely that you will need to fine-tune protective measures to meet the needs of the site or even work with the community to implement new controls.

There are an infinite number of ways to structure your ground water protection program. What you choose depends on existing regulations in your state, the character of your community, your community's goals for future economic development, the kinds of threats you have identified, and the extent of your protection area. Also, you will have to consider how much your management program will cost, if there is a staff to implement and enforce it, and whether you have the legal authority in your state to do so.

In the section, "Your Ground Water Protection Toolbox," we list a variety of management approaches that have been used by communities throughout New England. Some of these options can stand alone, but most are like parts of a puzzle and work best when carried out in conjunction with other options as part of an overall protection program. There is not just one approach—each community must construct the mix of options that best suits its unique situation.

As members of a community ponder their management strategy, they should keep in mind the following questions:

- What sort of statutory authority does your state grant communities for controlling land use?
- What are the results of your inventory of potential threats, and what kind of current and/or future risks does your ground water protection area face?

- If you restrict future land uses in the ground water protection areas, are there other areas in the community that are more suitable for high-risk uses?
- Does your community already have, or will it support, a local zoning ordinance to protect ground water?
- If you have a zoning ordinance, are there portions of your ground water protection area that are zoned for dense residential development, industrial, or commercial use that are not yet developed?
- Does your town have staff with the time and expertise to undertake inspections, monitor ground water quality, and implement and enforce performance standards?
- Will voluntary programs be effective in ensuring that harmful activities do not occur?

STEP 7. Ensure That the Strategy Will Be Implemented

No strategy is "worth its salt" if it is not ultimately put into practice. Educating the public, and convincing individuals to care about their ground water resources, are the key to successful implementation and will be among your team's greatest challenges. The success of any program depends, to a great extent, on the involvement and awareness of the citizens in the community and, on how much support there is in the community for the adoption and implementation of the program. There are many ways to educate the public. Here are a few possibilities:

- Invite the local paper to cover your ground water protection team meetings so that it will keep the community up-to-speed on progress and issues. Encourage the paper to run a series of short articles about ground water—what it is, how it interrelates with the overall aquatic environment, how it becomes contaminated, and the ways to protect it.
- If there is a water company, ask it to insert information on ground water into the water bills.
- Teach the community about household water conservation practices and nontoxic alternatives to household products through the local paper and/or water bills.
- At key points in the resource protection process, sponsor a community meeting and invite state or local officials to explain why protecting ground water is important.
- Publish a newsletter that goes out to all residents and businesses in the community.

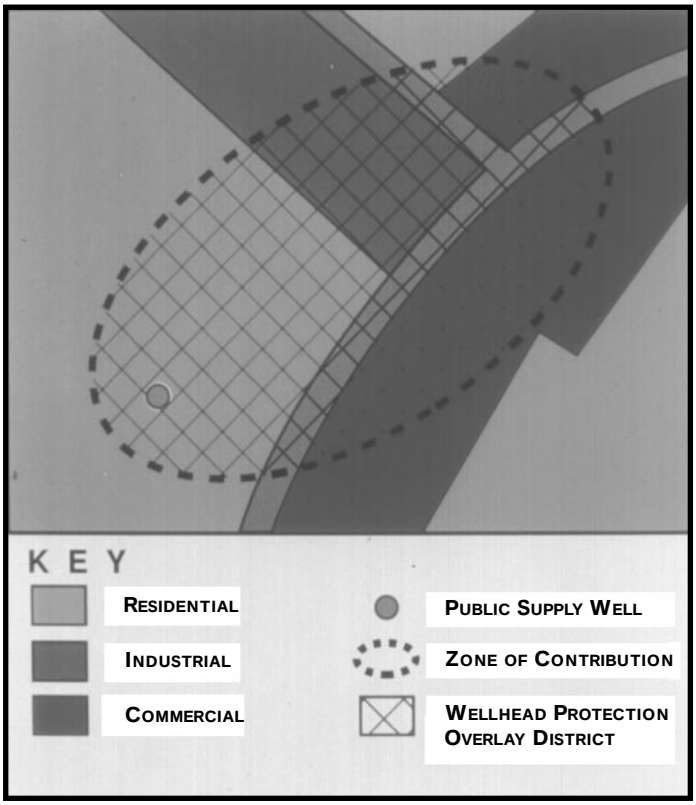
YOUR GROUND WATER PROTECTION TOOLBOX

Resource protection strategies can be implemented using a variety of tools that should consist of control measures and education and outreach strategies. Control measures may be both regulatory or nonregulatory. Regulatory controls at the local level generally involve the use of bylaws and ordinances designed to exclude or manage certain noncompatible land uses or activities in areas of concern. Nonregulatory controls are voluntary and do not involve the regulation of property. Here are some examples of both regulatory and nonregulatory resource protection tools.

■ Regulatory Tools

- **Zoning** is probably the most widely employed method of protecting ground water. Zoning is used to control the type of development allowed in a particular area and to separate incompatible land uses. Zoning typically controls future land-use, not the way already-developed land is used. Thus, if your resource protection area is currently undeveloped, an effective means for protecting ground water is to zone the area for land-use activities that pose little or no threat to the resource, such as low-density residential development, certain kinds of commercial use, or open space. Other uses may also be compatible if precautions are taken against the storage or use of hazardous substances. Some zoning techniques that are often

Figure 2 ZONING MAP



used for ground water protection are described below:

- **Overlay Zoning** supperimposes boundaries of the protection area on the zoning map. Preexisting zones are not actually changed; rather, new conditions are imposed on future development. (See Figure 2.)

- **Large Lot Zoning** limits water resource degradation by reducing the number of buildings and, therefore, septic systems within the critical resource area.

- **Cluster Zoning** increases the density of living units in a particular portion of a zone while allowing the remainder to be open space. This development approach tends to be less disruptive to the natural environment and aquatic ecosystems, in particular.

- **Special Permits** allow certain uses and structures upon the issuance of a permit or special exception. Special permits are usually granted only if safeguards are taken to reduce risk to the environment and if the use or structure is in harmony with the general purpose of the protected area.

- **Prohibition of Various Land Uses** (for example, gas stations, or industrial operations that handle, store, and transport hazardous substances) may be applied to the resource protection area.

- **Performance Standards** are based on the assumption that any given resource has a threshold, beyond which its ability to function deteriorates to an unacceptable level. This control method assumes that most uses are allowed in a designated area, provided that they do not or will not overload the resource of concern. It focuses additional regulations on specific impacts without burdening all uses in a zoning district and regulates land development impacts without prohibiting development.

- **Transfer of Development Rights** is used to transfer development from the resource protection area to locations outside that area. This mechanism allows a landowner to sell his or her right to develop the land as permitted by zoning, but maintain other rights associated with the land (e.g., ownership, existing use, open space).

- **Subdivision Regulations** focus less on land-use and more on engineering concerns such as street construction (for example, grade, width, intersection angles, stormwater control, drainage), utility placement, and traffic patterns of individual subdivisions. Subdivision controls are generally less effective for controlling potential environmental threats than zoning controls. Subdivision controls that address

drainage from roads and lawns and performance standards that address nitrogen and phosphorus loading associated with roads, lawns, and septic systems provide excellent means for keeping significant contaminants from entering the ground water.

- **Health Regulations** can be very effective in protecting ground water quality. These controls are usually contaminant source-specific (for example, septic systems, underground storage tanks, toxic and hazardous materials).

- **Wetland Bylaws** can greatly enhance water quality through the judicious regulation of proposed activities within wetland buffer zones. Specific steps that wetlands commissions may take include requiring vegetated buffer strips adjacent to wetland areas, imposing stringent controls on surface water discharges to wetlands, and restricting the use of fertilizers, pesticides, and herbicides in close proximity to wetlands.

- **Best Management Practices (BMPs)** are structural designs, nonstructural designs, or guidance for the operation of a specific business, industry, or land-use activity that prevent or control threats to ground water resources. The term "best management practices" applies to protective measures that have worked best over time. Through the use of BMPs, pollution from many land-use activities can be controlled. BMPs can be structural (for example, creating a **detention pond** to hold stormwater long enough so that many of the pollutants are removed by the soil and vegetation) or nonstructural (for example, establishing zoning ordinances that allow certain types of activities in certain areas, based on resource considerations). BMPs can serve as both regulatory and nonregulatory tools.

■ Nonregulatory Tools

- **Water Conservation Practices** Communities can provide the public with information, suggestions, and programs on conserving water resources. During severe droughts, some New England communities have instituted emergency water conservation measures (for example, limiting lawn and gardening watering). However, communities should also remind the public that water conservation is not only for emergencies—being water-wise should be everyday behavior. In cases where ground water or surface water is withdrawn from one drainage basin and used and then discharged into another, maintaining the **water budget** can become a serious concern for both the losing and the receiving basins.

- **Household Hazardous Waste Collection** If a large portion of your delineated area is residential, and particularly if it is unsewered, hazardous waste collection days can be an important way of reducing threats to your ground water protection area. Typical household hazardous wastes include:
  - Pesticides and herbicides
  - Paints and thinners
  - Solvents and degreasers
  - Septic system cleaners
  - Art supplies
  - Used oil and antifreeze

  These wastes, when disposed of in the trash, septic system, sewer, or backyard, can cause costly and sometimes irrevocable water quality problems. The organic chemicals used in these materials are some of the most common and persistent ground water contaminants. Household hazardous waste collection days can be organized by a community, a coalition of communities, or the state.

- **Recycling** Recycling programs can reduce the amount of toxins that might end up in landfills, incinerators, or backyards, or that might be flushed down sinks or toilets, where they can eventually leach into ground water and surface water.

- **Education and Outreach** You can conduct education programs and workshops to inform community residents about the importance of protecting ground water.

- **Land Donations** Landowners are sometimes able to donate a piece of land (as part of a development project or a developable parcel) either to the community or to a nonprofit organization such as the Nature Conservancy. Giving the land for preservation can provide the landowner with a variety of tax-saving and cost-share benefits.

- **Outright Sale of Land** Many communities are committed to the acquisition of selected parcels that are deemed so significant to the community's future that it is willing to purchase them outright, at market prices.

- **Tax Deferments** All New England states currently provide for some degree of real estate tax reduction for lands used, in general terms, for conservation.

- **Conservation Easements** An easement is a limited right to use or restrict land owned by a private landowner. The granting of a conservation easement by a community does not involve the transfer of ownership of the land; instead, it means giving up certain development rights of the property.

- **Protection Area Signage** Signs may be posted along roadways and property boundaries to educate residents and visitors about the location of protection areas. Signs may also include information about who to notify in the event of a hazardous material spill.

KEY TERMS

- **Best Management Practices (BMPs)**
- **Conservation Easement**
- **Detention Pond**
- **Overlay Map**
- **Water Budget**
- **Wellhead Protection Area (WHPA)**