# CHAPTER 9: NATURAL RESOURCES

## Introduction

This chapter summarizes information about the natural and physical systems that determine the form of Waterville's landscape. Information about the City's geology, topography, soils, surface and ground water, land cover, and unique natural areas and wildlife habitat is intended to identify the physical limitations the natural environment imposes that must be addressed in a thorough planning process and, at the same time, the opportunities it creates for special uses or treatment for future development.

High elevation, steep slope, shallow depth to bedrock, and low bearing capacity are all constraints to development in Waterville. Hydric, highly erodible, and floodplain soils not only place constraints on development, but development on these soils can cause environmental damage. On the other hand, some natural features are not only suitable, but offer unique opportunities or significant cost savings for development.

But difficult decisions must be made when a natural resource with high potential for development is also a limited resource which should be conserved. For example, prime farmland and prime forestry soils are often the best soils, and the least expensive, on which to construct a development -- relatively flat, well drained, and in the case of farmland, cleared of woody vegetation.

Other conflicts may arise when there are multiple, incompatible uses for a resource. For example, bedrock and glacial stream deposits not only are a source of building materials, but of groundwater for wells.

City policy must balance competing demands between preservation and development in both the short and long term.

## Geology

There are two major bedrock formations in Waterville, the Waterville Formation, which runs along the Kennebec River and in a parallel band through the middle of the City, and the Mayflower Hill Formation, which runs through the western portion of Waterville in two bands between Fairfield and Oakland. The Waterville Formation is a shaley phyllite, with fractures trending northwest and southeast, which was laid down in the Silurian time then folded and intruded upon in the Devonian and Permian time. The Waterville Formation is visible during low water at Ticonic Falls just below the Two Cent Bridge. The Mayflower Hill Formation can be seen at the Devil's Chair Rock Quarry.

Glacial action was the dominant force that shaped Waterville's land forms and surficial geology. As the Late Wisconsinian glacier advanced, the ice mass scraped off the loose soils and geologic material from the surface of the ground before it. The massive weight of the ice depressed the ground surface to about 400 feet below its present elevation, allowing the sea to follow the

retreating ice margin inland. The glacier left its unsorted debris, called till, on points of high elevations as the ice mass slowly melted and eased its load of sediment and rock down onto the land surface. As the melting continued, water streamed down over the ice and land from the exposed high elevations and deposited material in a stratified sequence from large boulders to fine particles of silt and clay as the stream velocity slowed to standing water in drainage-blocked glacial lakes.

Much of Waterville is covered with till which is made up of a mixture of sand, silt, clay, and stones that are rarely stratified. Till generally overlies bedrock, but may overlie or include sand and gravel, and commonly conforms to the bedrock surface. Thicknesses of till can locally exceed 100 feet. In Waterville, there are also areas of bedrock outcrops or thin surficial deposits, generally less than ten feet thick. The glacial-marine sands and silty clays of the Presumpscot Formation are located at lower elevations. This Formation was deposited on the depressed landscape as the Holocene ocean inundated the land and a blanket of glacio-marine clay, made up of the clays and silts transported to the sea by melt-water slowly rebounded and once again the submerged land was exposed to subaerial weathering. Today these marine sediments occur at low elevations in deposits ranging from 20 to more than 100 feet. Areas of topographic depression are filled with swamp and tidal marsh organic deposits.

The location of bedrock and surficial deposits influences development decisions. Construction costs increase when bedrock, also known as ledge, must be blasted to build basements or to extend water and sewer lines. Shallow depth to bedrock (0 to 15 inches) may cause septic systems to contaminate groundwater. Glacial marine silts and clays have relatively low bearing capacity and cannot support heavy structures. Construction on silts and clays on steep slopes may be unstable. Additionally, silts and clays have poor drainage.

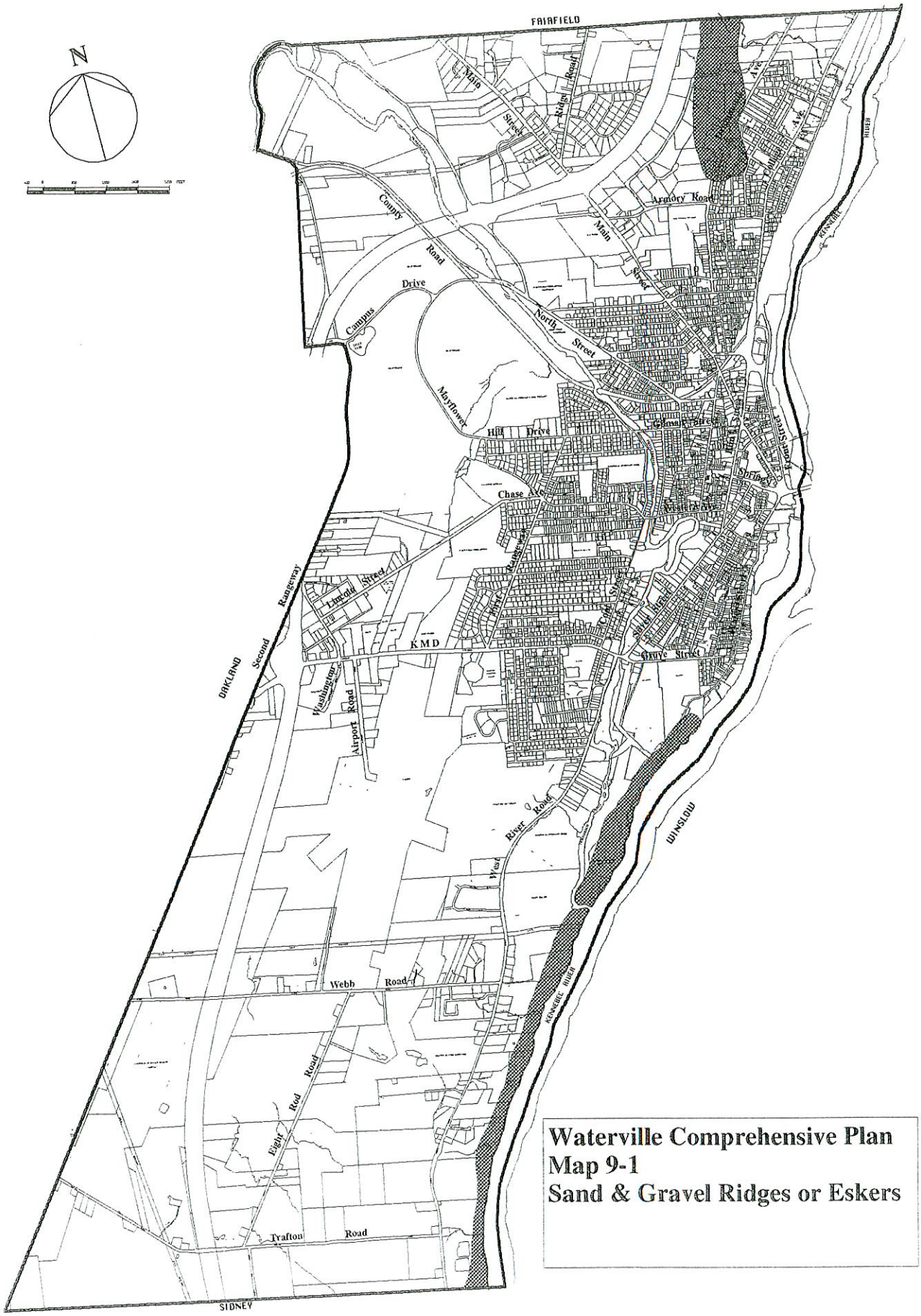
Aside from influencing the location of development, bedrock and surficial deposits are resources. Bedrock may be a source of groundwater for wells. Glacial stream deposits are both aquifer recharge areas and sources of sand and gravel for construction. Map 9-1 shows three sand and gravel ridges, or eskers, that were deposited in meltwater tunnels or rivers beneath glaciers.

These eskers, off Drummond Avenue extending north into Fairfield and along the Kennebec from Couture ball field south into Sidney, have been greatly disturbed over the years by sand and gravel operations.

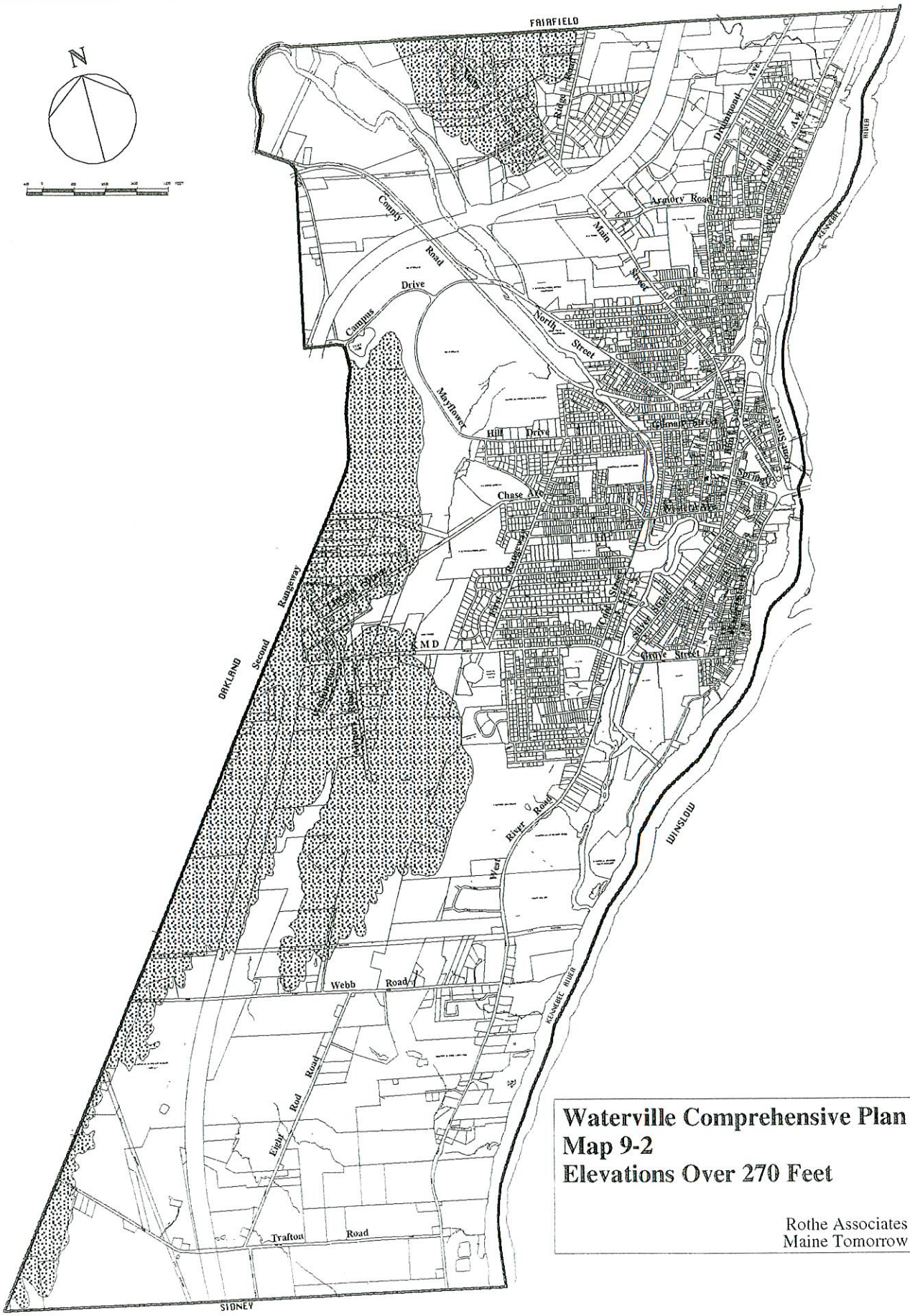
**Topography**

Land in Waterville rises from a low of about 30 feet above sea level along the Kennebec River and Messalonskee Stream to the hills along the City's western and northern borders. The highest elevations include Pung Hill (378 feet), over which Upper Main Street rises to Fairfield; Mayflower Hill, the site of Colby College; and the Airport.

High elevations place constraints on development in Waterville. The Kennebec Water District currently has no plans to provide water in areas of greater than 270 feet in elevation, shown on Map 9-2, where a static pressure of 35 psi cannot be maintained with existing facilities. Currently, the most heavily developed sections of Waterville are concentrated at elevations 100




**Waterville Comprehensive Plan**
**Map 9-1**
**Sand & Gravel Ridges or Eskers**




**Waterville Comprehensive Plan**
**Map 9-2**
**Elevations Over 270 Feet**

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to 200 feet above sea level in the eastern half of the City.

Slope gradient influences the retention and movement of water, potential for slippage and accelerated erosion, and the ease with which machinery can be used. Water may not drain from very flat areas of less that two percent slope. Conversely, slopes of 15 percent or more are costly to develop and highly vulnerable to erosion. On steep slopes, preparing construction sites, building roads, and installing underground utilities all require special design considerations, more grading and filling, and better erosion control. Stormwater management becomes more difficult and road maintenance and snow removal costs rise. Currently the State Plumbing Code prohibits the installation of subsurface wastewater disposal systems on land with a slope of 20 percent or more.

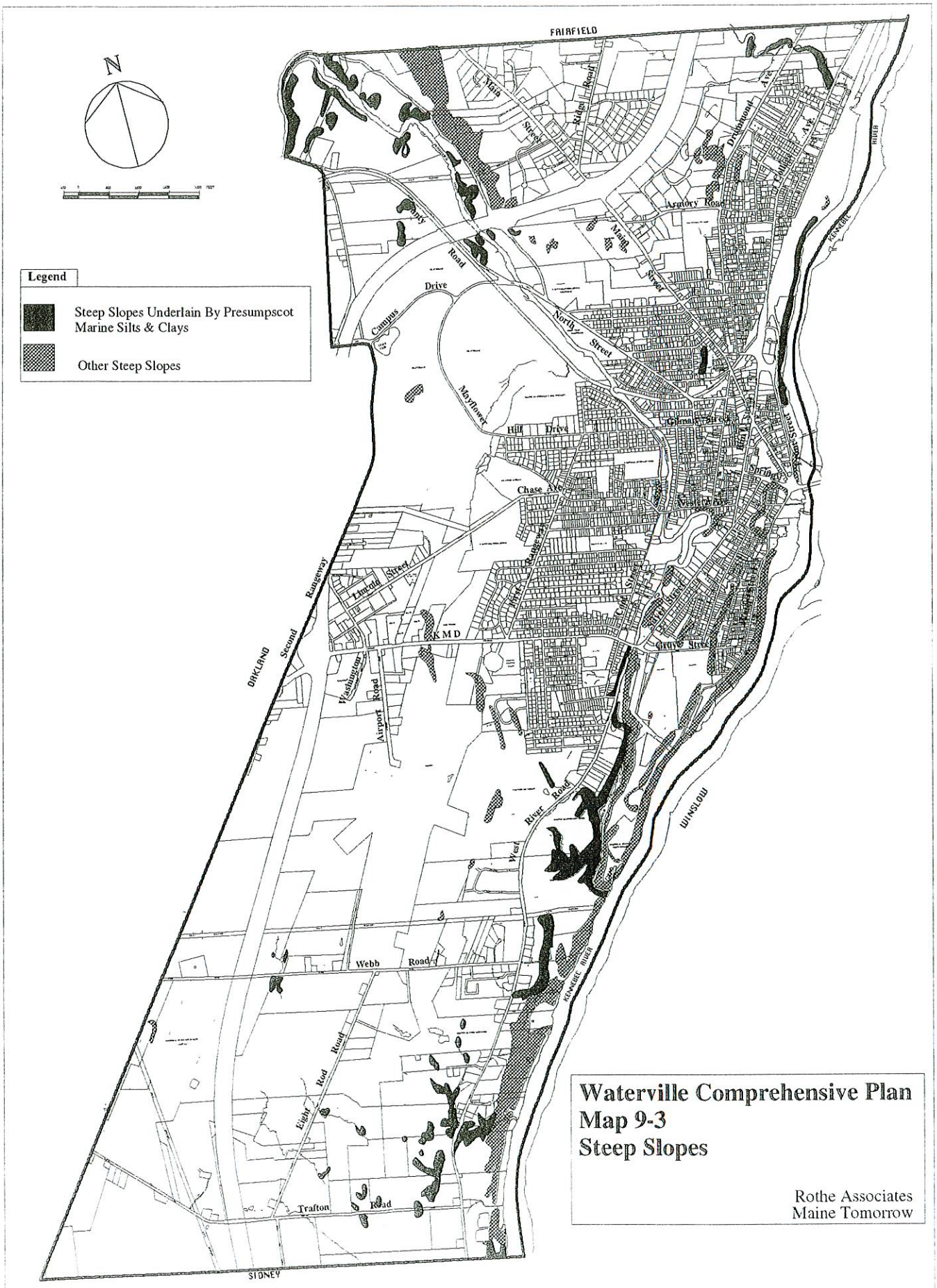
A recent study conducted by four Colby College seniors in the Department of Geology, identifed approximately 560 acres of steep slopes (greater than 20 percent) or about six percent of the total land area in Waterville. As indicated in Map 9-3, most of these steep slopes are located along the banks of the Kennebec River, Messalonskee Stream, and a few tributary streams as well as along the west side of Pung Hill, the east side of the Airport, and in the area between Eight Rod and West River Roads. Steep slopes are particularly problematic when they overlie the Presumpscot Formation because they are susceptible to slumpage or slope failure. Approximately 48% of Waterville's steep slopes are underlain by the Presumpscot Formation. The students recommend "structures, roads, utility lines, and pipes should be set well back from slopes in general, especially slopes composed of the Presumpscot Marine clays...Vegetation should be left in place on and around areas of steep slopes especially along river banks...Lastly, water from drainage systems should not be directed towards steep slopes."

**Soils**

Bedrock geology and surficial deposits are the parent material from which soils develop. Soils in Waterville are dominated by the silty clays of the Presumpscot Formation and by silty loams and gravely sandy loams developed from glacial till and meltwater. Soils of glaciofluvial or marine origin, and the shallow soils of glacial till or outwash tend to have high water tables.

Approximately 60% of the soils in Waterville are in the Buxton-Scio-Scantic Association. The major soils in this Association formed in marine and lacustrine sediments. They are deep, moderately well to poorly drained, nearly level to sloping, medium textured soils, in flat areas and near waterways. Wetness and permeability are the major limitations for septic system absorption fields and cultivated crops. Supplemental drainage and erosion control are the major concerns of management.

The second largest soil association is the Hollis-Paxton-Charlton-Woodbridge Association, which largely occurs on the three hills. The major soils in this Association formed in glacial till. They are somewhat excessively to moderately well drained, gently sloping to moderately steep, moderately coarse textured soils. These soils are mainly in woodland, but may be farmed and used for other purposes. The well drained Paxton and Charlton soils are suited to cultivated crops, orchards, and other intensive uses. The Woodbridge soils have some limitations for both nonfarm and farm uses. Many orchards and dairy farms are on this Soil Association in Kennebec




**Waterville Comprehensive Plan**
**Map 9-3**
**Steep Slopes**

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County.

Other soil associations that are fairly representative of soils in Waterville are the poorly drained Monarda Association, the Scantic-Ridgebury-Buxton Association, and the Berkshire-Lyman-Peru Association which is generally found on upland hills and ridges.

Soils information used in this inventory is based on a countywide medium intensity soil survey prepared by the U.S. Soil Conservation Service (SCS). It should be noted that other soils are present within mapping units and the boundaries of mapping units are imprecise. Additionally, the maps were drafted nearly 40 years ago (1978) and, in some instances, the soil has been stripped or otherwise disturbed since then. Nevertheless, the maps provide generalized information which is helpful in making locational decisions and in determining where more intensive soils investigations are necessary for specific site plans.

Properties of soil are important in engineering because they affect construction and maintenance of buildings, roads, and utilities. Soil properties are also important for crop and wood production.

**Hydric Soils**

Hydric soils are wet and often indicate the presence of wetlands. Map 9-4 identifies wet soils in the area off Webb Road north of the landfill, along I-95 south of Kennedy Memorial Drive, along the Messalonskee Stream at its confluence with the Kennebec River and at the Oxbow Nature Trail, on the island off Water Street, off Drummond Avenue, and off Ridge Road.

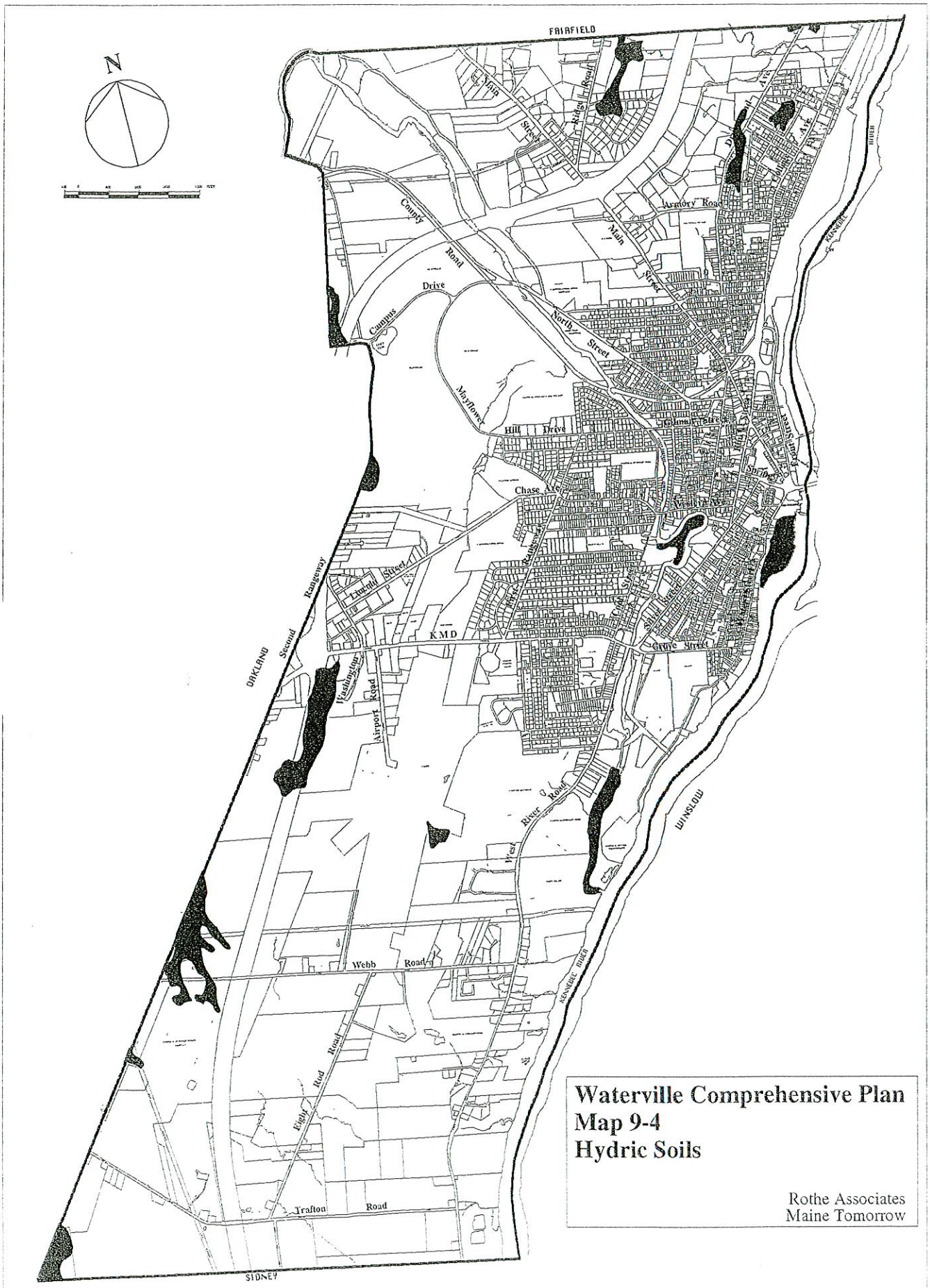
**Highly Erodible Soils**

The Waterville area contains many soils which are considered to be highly erodible, including Buxton, Hartland, Hinckly, Hollis, Paxton-Charlton, Scantic, and Suffield. Map 9-5 indicates that highly erodible soils are found primarily along the banks of rivers and streams throughout the City with some on Mayflower and Pung Hills.

Development on highly erodible soils can be unstable if not carefully designed and constructed. Clearing of vegetation can result in severe soil erosion which may cause sediment to clog drainage systems and degrade water quality. In suspension, sediment reduces the amount of sunlight available to aquatic plants, covers fish spawning areas and food supplies, and clogs the gills of fish. Phosphorus moves into receiving waters attached to soil particles. Excessive amounts cause algae blooms.

**Prime Farmland Soils**

Prime farmland soils are those soils defined by the U.S. Department of Agriculture (USDA) as the best soils for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmland produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment. A large percentage of the land in Waterville is considered prime agricultural land. Because these soils are also good for construction of roads and buildings, much of existing




**Waterville Comprehensive Plan**
**Map 9-4**
**Hydric Soils**

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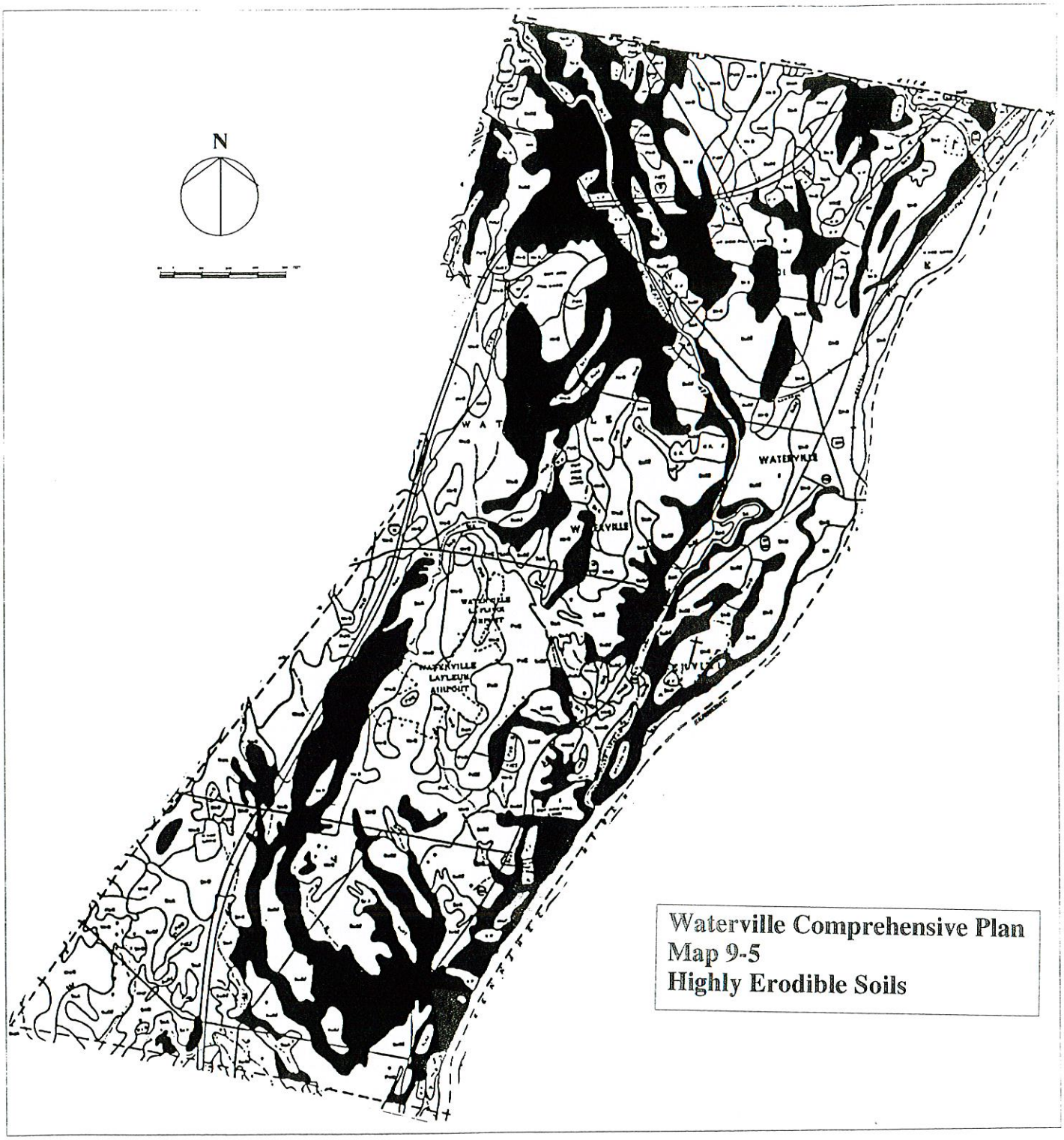
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WATERVILLE
Waterville Comprehensive Plan
Map 9-5
Highly Erodible Soils

development, including the Airport and numerous residential areas, has been constructed on prime farmland soils.

Map 9-6 indicates that undeveloped areas of prime farmland soils are located mostly in the southern area of the City, mainly along West River, Eight Rod, and Trafton Roads. There also is some undeveloped prime agricultural land in the northwestern corner of the City. Unless these areas are rezoned, development will continue to take place on prime agricultural lands. These acres are currently zoned Rural Residential (RR) and General Industrial (I) in the north of the City and RR, Industrial Park (IP), and Contract Zoned Commercial (CZD/CC) in southern areas.

**Prime Forest Land Soils**

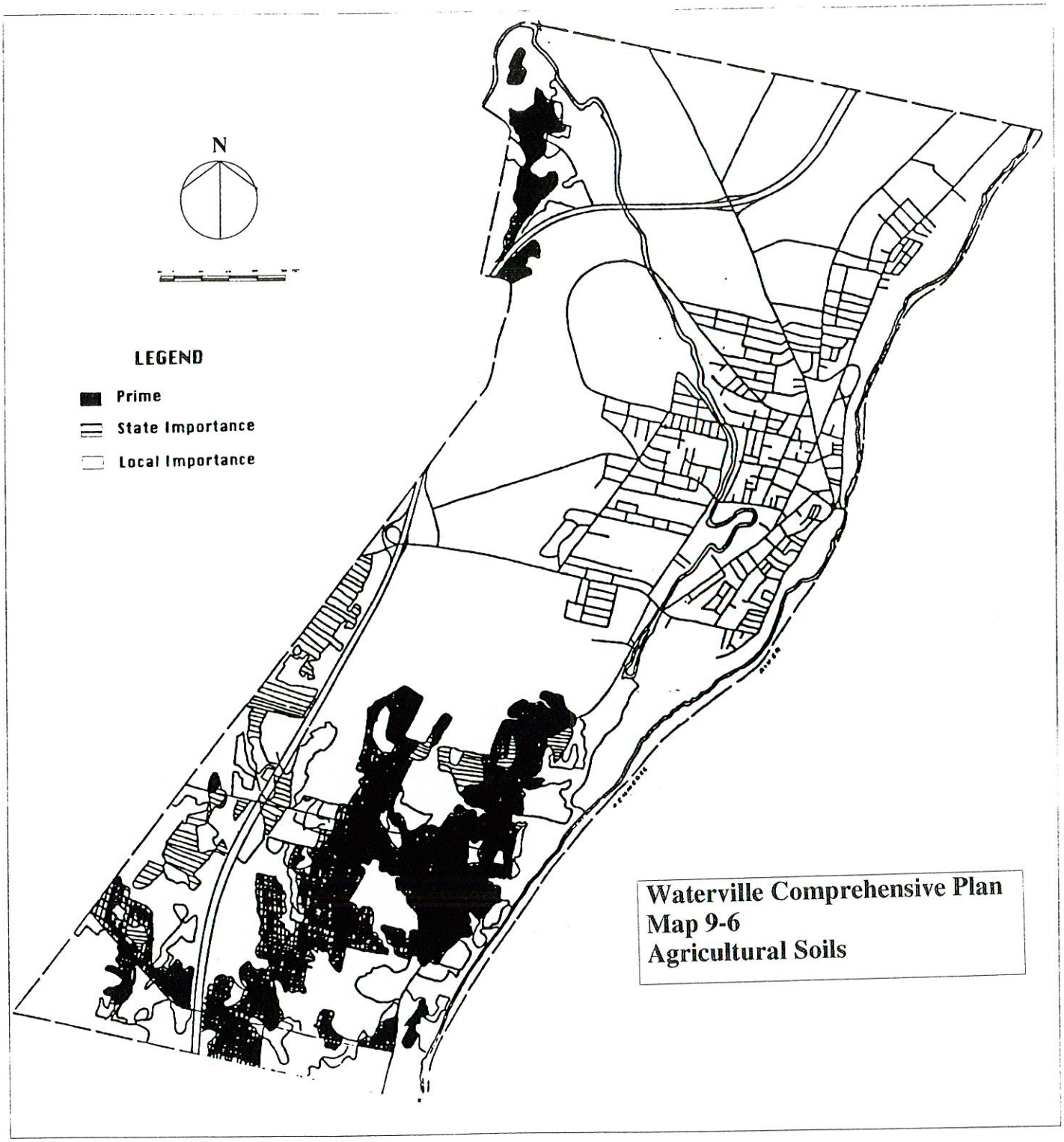
Most of Waterville is covered by prime forest land soils. That is, most of Waterville has soils rated medium, high, or very high for woodland productivity and capable of growing eastern white pine at an economically-productive rate. The best soils for tree growth in Waterville are located along the Kennebec River, from Pine Grove Cemetery south of Grove Street all the way north to Fairfield, and along the Interstate south of Kennedy Memorial Drive, including land owned by the City surrounding the landfill.

The prime forest land soils along the Kennebec for the most part are already developed. Much of the prime forest land soils along the Interstate are still vacant. However, many of these areas are located along the route of the proposed Washington Street Extension to Webb Road and are currently zoned Commercial or Industrial, and are therefore unlikely to be used for forestry purposes.

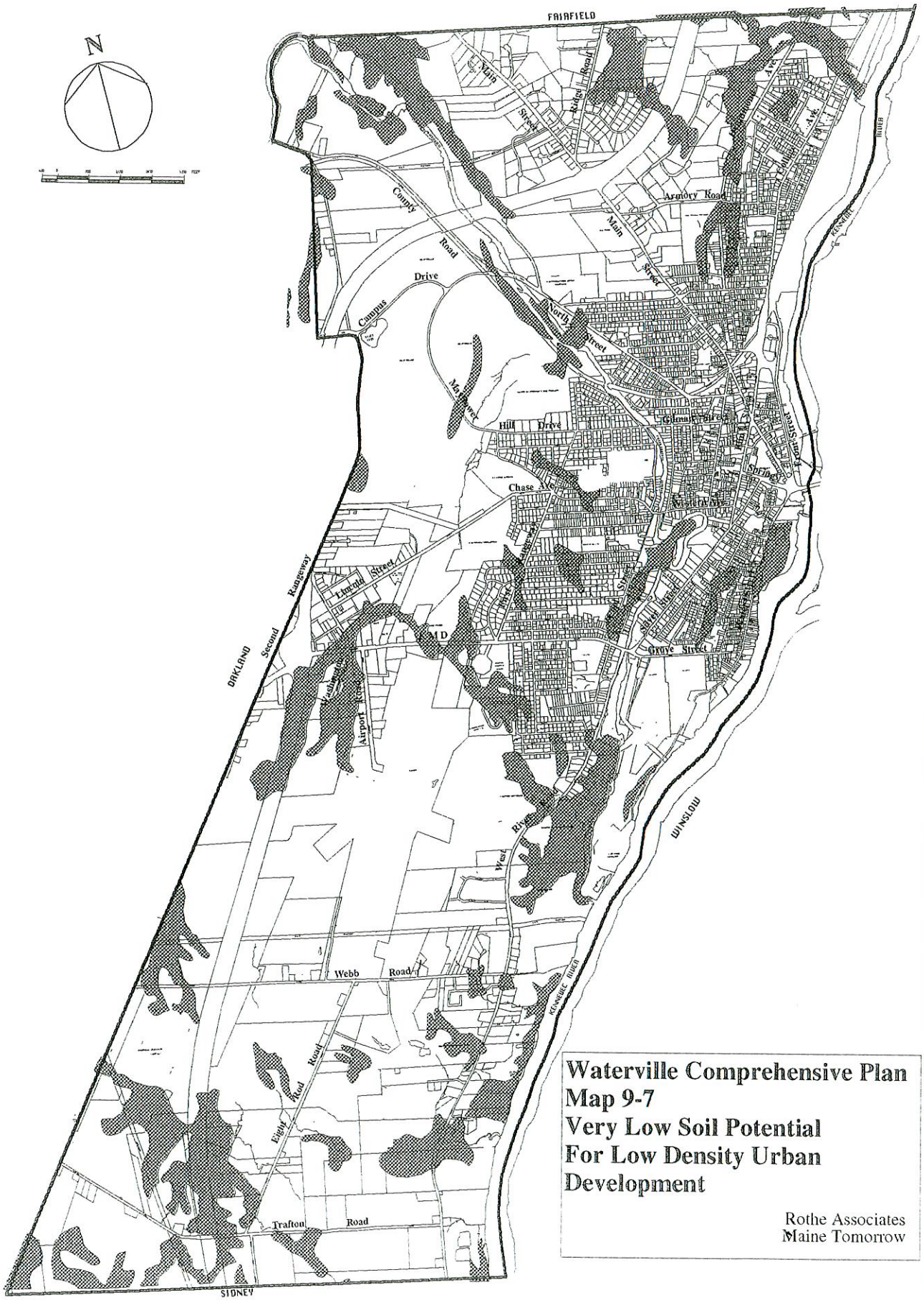
**Soil Potential for Low Density Urban Development**

The SCS has developed a soil potential rating system to identify soil limitations for low density developments. The rating system takes into account soil characteristics such as permeability, slope, texture, depth to water table, flooding, erodibility, and depth to bedrock. Additionally, it considers the potential for development to cause environmental damage and the long term maintenance costs of development constructed on a particular soil type. In this rating system, low density urban development means dwellings with basements, roads, and septic systems. Soils that have the fewest limitations are the least expensive on which to develop. Soils that are rated very low potential for development have the most limitations. They are the soils on which development is both very expensive and potentially damaging to the environment. These soils are located mainly along streams and the Kennebec River (see Map 9-7).

Of the 36 soil types found in Waterville, 15 are rated "poor" or "very poor" for development. (See Table 9-1.) These ratings are a composite of weighted ratings of potential for septic tank absorption fields, dwellings with basements, and local streets. In an area where quasi-municipal sewerage is available, a "very low" rating for septic would not necessarily preclude development, especially if the ratings for dwellings and roads were "medium." A "very low" rating for septic might indicate shallow depth to either water table or bedrock, or poorly drained soils. We might expect to have wet lawns and wet basements in these soils. A "very low" rating for roads might indicate that the soils are poorly drained with seasonally high water table or the soils might be unstable, erodible, susceptible to frost action, or shallow to bedrock.




**Waterville Comprehensive Plan**
**Map 9-6**
**Agricultural Soils**




**Waterville Comprehensive Plan**
**Map 9-7**
**Very Low Soil Potential For Low Density Urban Development**

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Much of the undeveloped land in Waterville is rated high or medium potential for low density development, although it might otherwise be limited by higher elevations.

**TABLE 9-1**

**SOILS WITH LOW AND VERY LOW POTENTIAL FOR LOW DENSITY DEVELOPMENT, BY TYPE OF DEVELOPMENT**

| Soil Type | Symbol * | Septic | Dwellings | Roads | Development |
|---|---|---|---|---|---|
| Biddeford | Bo | Very Low | Very Low | Very Low | Very Low |
| Hartland | Hfd | Very Low | Medium | Low | Low |
| Hinckley | Hkd | Very Low | Medium | Medium | Very Low |
| Hollis | Hrd | Very Low | Very Low | Low | Very Low |
| Limerick | Lk | Very Low | Very Low | Very Low | Very Low |
| Monarda | MoA | Very Low | Medium | Medium | Low |
| Monarda | MrA | Very Low | Medium | Medium | Low |
| Paxton-Charlton | PeD | Very Low | Low | Low | Very Low |
| Ridgebury | RdA | Very Low | Very Low | Very Low | Very Low |
| Saco | Sa | Very Low | Very Low | Very Low | Very Low |
| Scantic | ScA | Very Low | Very Low | Very Low | Very Low |
| Scarboro | Sd | Very Low | Very Low | Very Low | Very Low |
| Suffield | SuD2 | Very Low | Medium | Low | Very Low |
| Suffield | SuE2 | Very Low | Low | Very Low | Very Low |
| Windsor | WmD | Very Low | Medium | Medium | Very Low |

* The first two letters in the symbol indicate the kind of soil; the last letter indicates slope. D and E are steep slopes, 15-45%. The number "2" indicates that the soil is eroded.

Source: Soil Survey Data for Growth Management in Kennebec County, Maine, U.S. Department of Agriculture, Soil Conservation Service, Orono, Maine, December 1989.

**Groundwater**

Chapter 6, Public Facilities and Services, describes the quasi-municipal water supply in Waterville. Kennebec Water District (KWD) serves the vast majority of the City's dwelling units. According to the District, today only a few homes have drilled or dug wells. Those homes are identified on Map 9-14: Wells and Septic Systems produced by the city assessor.

In Waterville, there are no "public water supplies" defined by the Maine Department of Health and Human Resources as systems serving "at least 25 persons per day for at least 60 days per year". In other Maine towns public water supplies provide water for such uses as restaurants, motels, and schools. The Waterville Country Club and the Kennebec Mobile Home Park in Oakland are nearby examples of developments on public water supplies.

The source of water for wells in Waterville is either sand and gravel aquifers or bedrock aquifers. The Maine Geological Survey identified three significant sand and gravel aquifers in Waterville. These aquifers are capable of yielding more than ten gallons of water per minute. (See Map 9-8.)

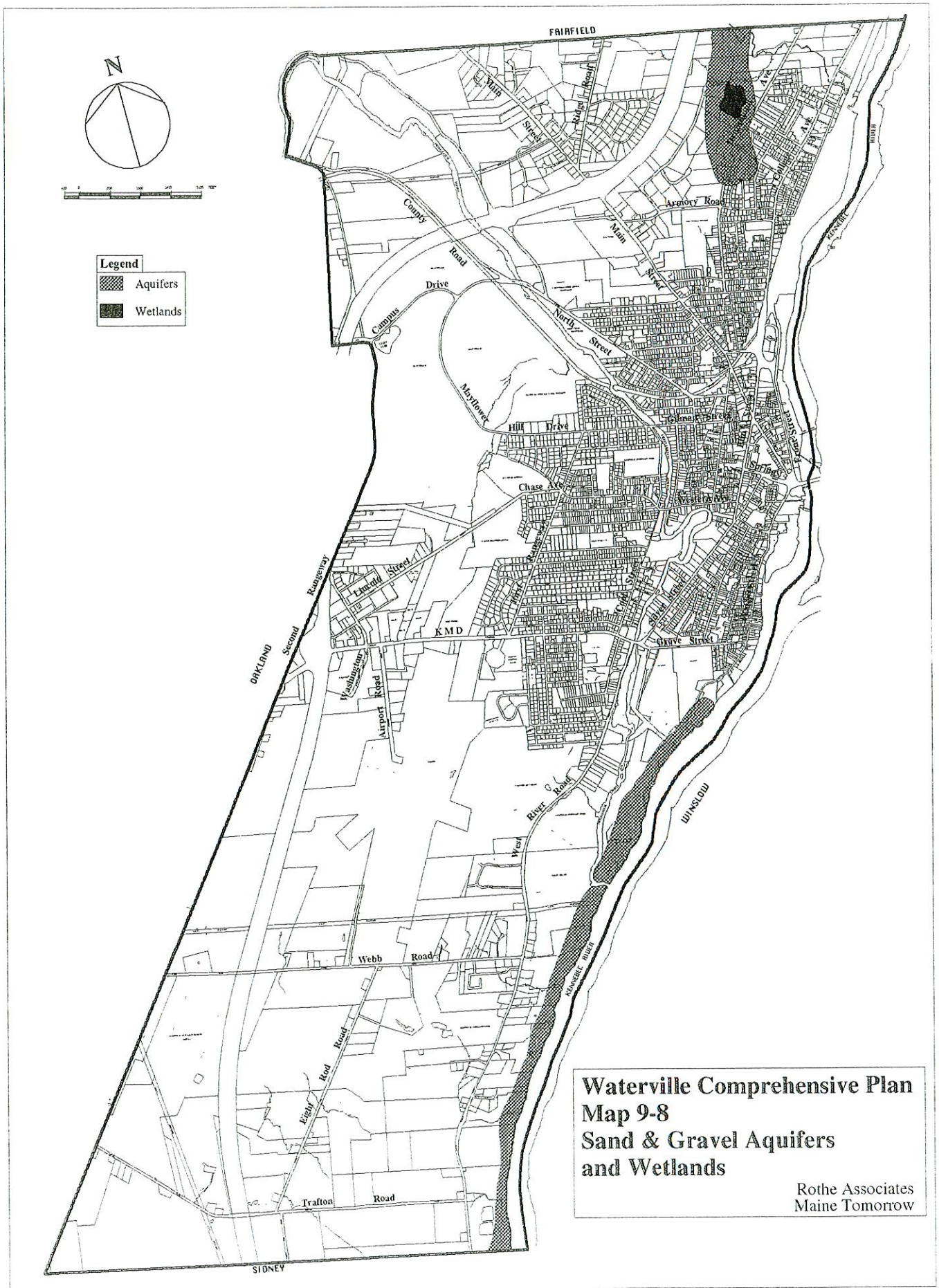
Two of the aquifers are located along the Kennebec River north and south of its confluence with Messalonskee Stream. The depth to water level is 25 feet in the aquifer north of the Stream and 50 feet in the aquifer south of the Stream. The third aquifer is located between Drummond Avenue and I-95 and extends into Fairfield. The portion of the aquifer in Waterville has a ten foot thick sand and gravel deposit. According to the Kennebec Valley Council of Governments, this aquifer may be contaminated by leachate from the Fairfield landfill.

Future development outside the reach of Waterville's quasi-municipal water supply is dependent on groundwater resources. Since sand and gravel aquifers are geographically limited in Waterville, bedrock aquifers must supply the majority of the City's wells.

The City's primary bedrock aquifer is the Waterville Formation. Since igneous and metamorphic bedrock are not very porous, groundwater is stored and flows mainly through fractures and joints in the rock. Fractures in the Waterville Formation are oriented primarily northwest-southeast.

In the late 1990s, four Colby College seniors in the Geology Department conducted research to create a more comprehensive hydrogeological inventory of the City. In cooperation with local homeowners and City officials, the students created a potentiometric surface map for Waterville and reviewed bedrock fracture data to illustrate probable local groundwater flow rates and direction. (See Map 9-9.)

The students concluded that groundwater flows towards the Kennebec River in the southern part of Waterville, where fractures provide a channel for groundwater flow. In the area from Webb road to the Sidney town line, most homeowners rely on groundwater. Since these homeowners are down-gradient of most of the City's potential groundwater contamination sources (landfills, agriculture, gas stations and other petroleum storage facilities, industrial facilities, individual septic systems), they face the greatest risk from groundwater contamination. This situation is




**Waterville Comprehensive Plan**
**Map 9-8**
**Sand & Gravel Aquifers and Wetlands**

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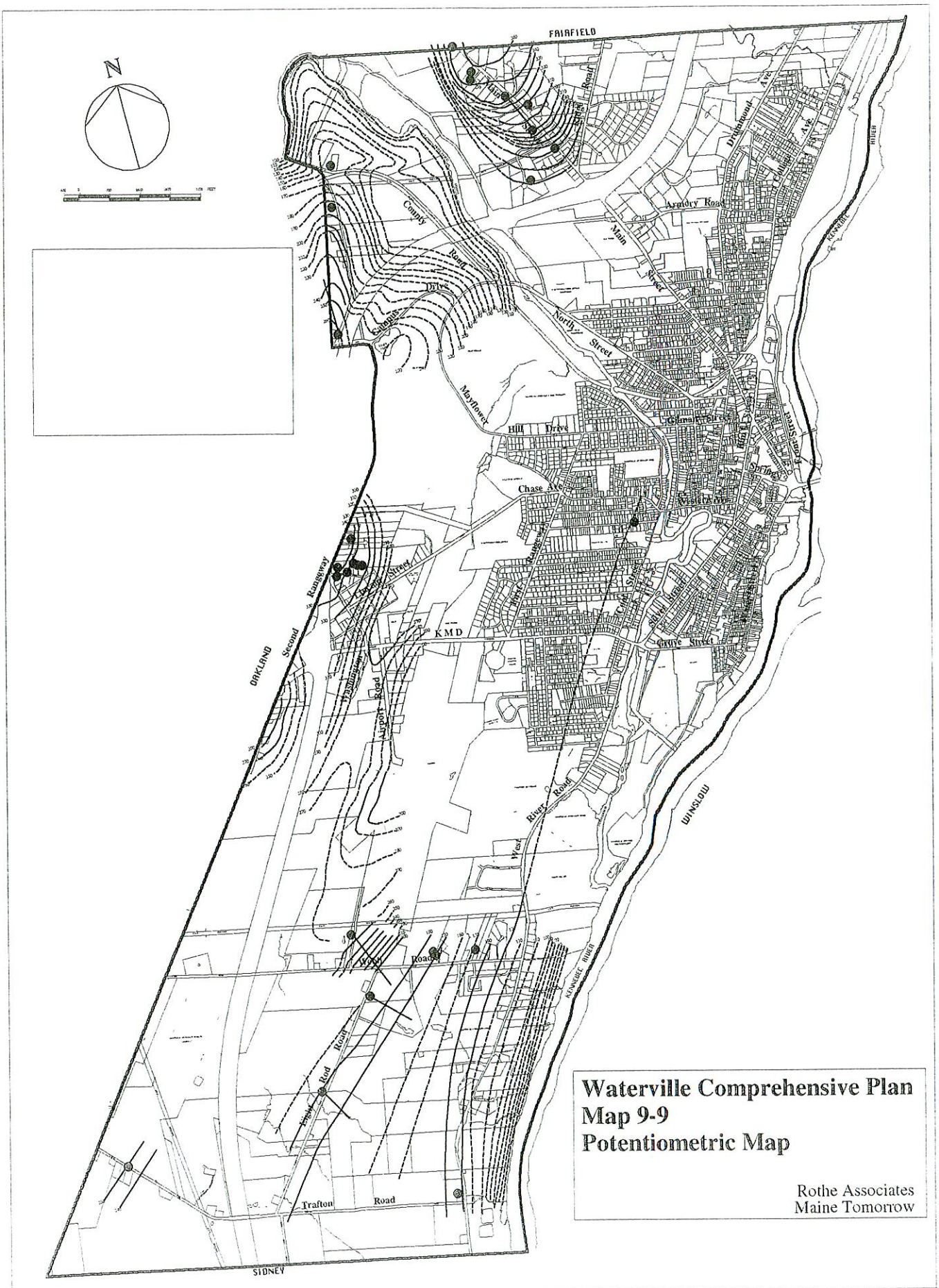


**Waterville Comprehensive Plan**
**Map 9-9**
**Potentiometric Map**

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aggravated by the fact that groundwater seepage velocities in this area are relatively slow and, therefore, likely to result in longer retention times and less thorough flushing of contaminants from the aquifer in areas used for water supply.

The students recommend that either precautions concerning contamination need to be taken (for example, well-head or some other type of protection around aquifer recharge areas along Upper Main Street, Mayflower Hill by Colby College, along the ridge of I-95, and the area around the Airport) or the quasi-municipal water supply should be extended to include development on Webb, Trafton, and Eight Road Roads. They also recommend that existing potential contamination sites should be monitored for possible future contamination.

**Surface Water**

The Kennebec River forms the eastern boundary of Waterville. Other streams and brooks include Messalonskee Stream, Holland Brook, Trafton Road Brook, Runnals (also known as Reynolds) Stream, and numerous unnamed perennial and intermittent streams. The breached Kennebec Water District reservoir, which straddles the Waterville/Fairfield line, Johnson Pond on the Colby Campus, and a number of small ponds are also located in Waterville. (See Map 9-10.)

All of Waterville is located in the Kennebec River watershed (see Map 9-11). This watershed, draining a total of 5,870 square miles or approximately one-fifth of the area of the State, is the second largest in Maine. The Kennebec River originates at the outlet of Moosehead Lake and flows southerly approximately 175 miles through Merrymeeting Bay to the Atlantic Ocean. The Kennebec is dammed in Waterville at the former Scott Paper Company and at Ticonic Falls by the Milstar Dam.

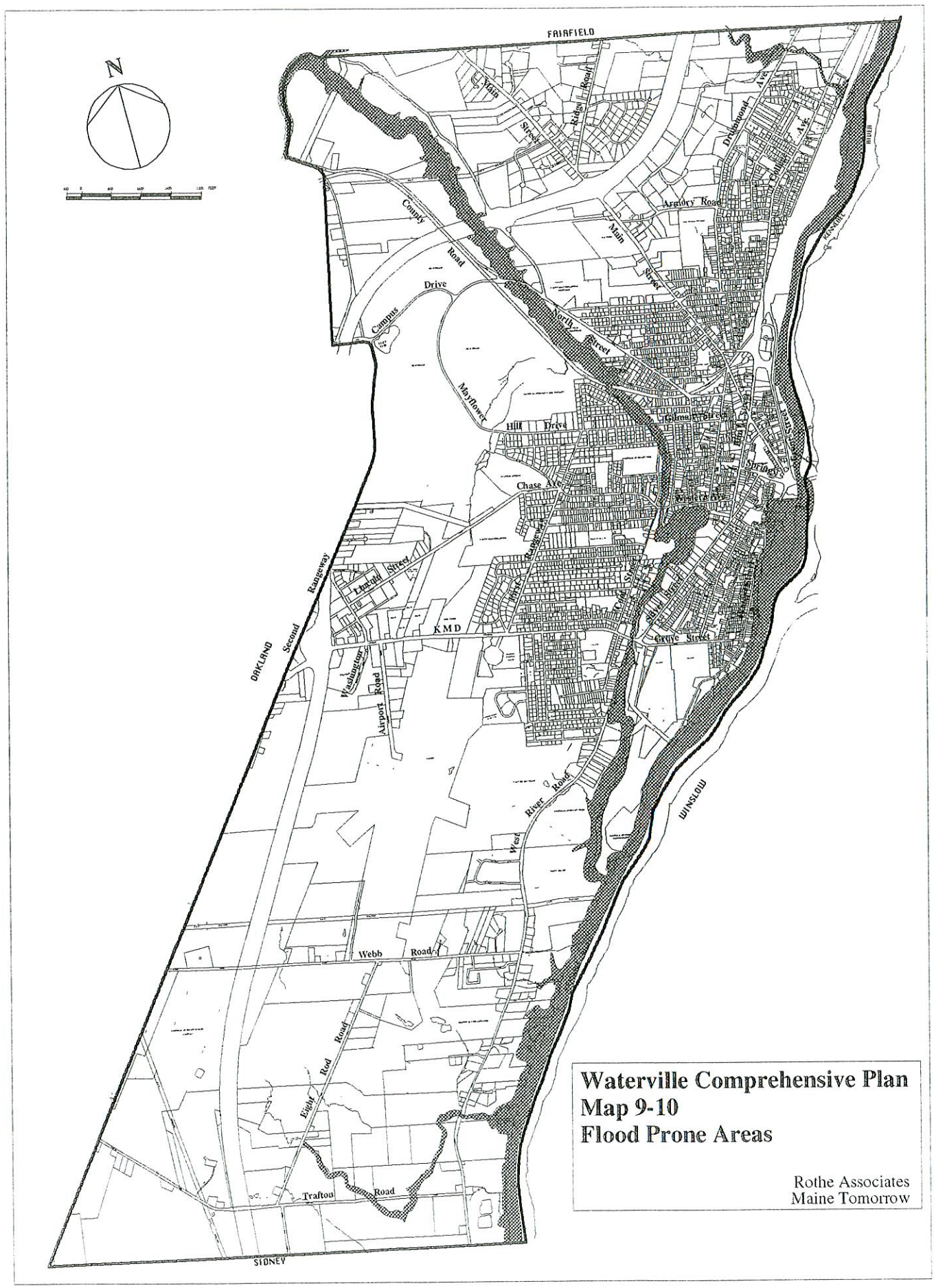
A major tributary of the Kennebec is the Messalonskee Stream. The Messalonskee is 10½ miles long and runs from the outlet of Messalonskee Lake in Oakland to its confluence with the Kennebec River at the south end of Water Street in Waterville. Map 9-12 illustrates the watershed of the Messalonskee Stream, a drainage basin of approximately 210 square miles.

There are four hydroelectric stations on the Messalonskee, two of which are located in Waterville. The two dams in Waterville are the Automatic Dam on Western Avenue at the Kennebec Water District facility and the Union Gas Dam on West River Road, north of Calvary Temple.

The Maine Department of Environmental Protection (DEP) classifies the water quality of the Kennebec River as follows:

1. Class B: from the Fairfield town line to its confluence with the Messalonskee Stream, excluding all impoundments,

2. Class C: waters impounded by the Hydro-Kennebec Dam and the Lockwood Dam in Waterville-Winslow, and




**Waterville Comprehensive Plan**
**Map 9-10**
**Flood Prone Areas**

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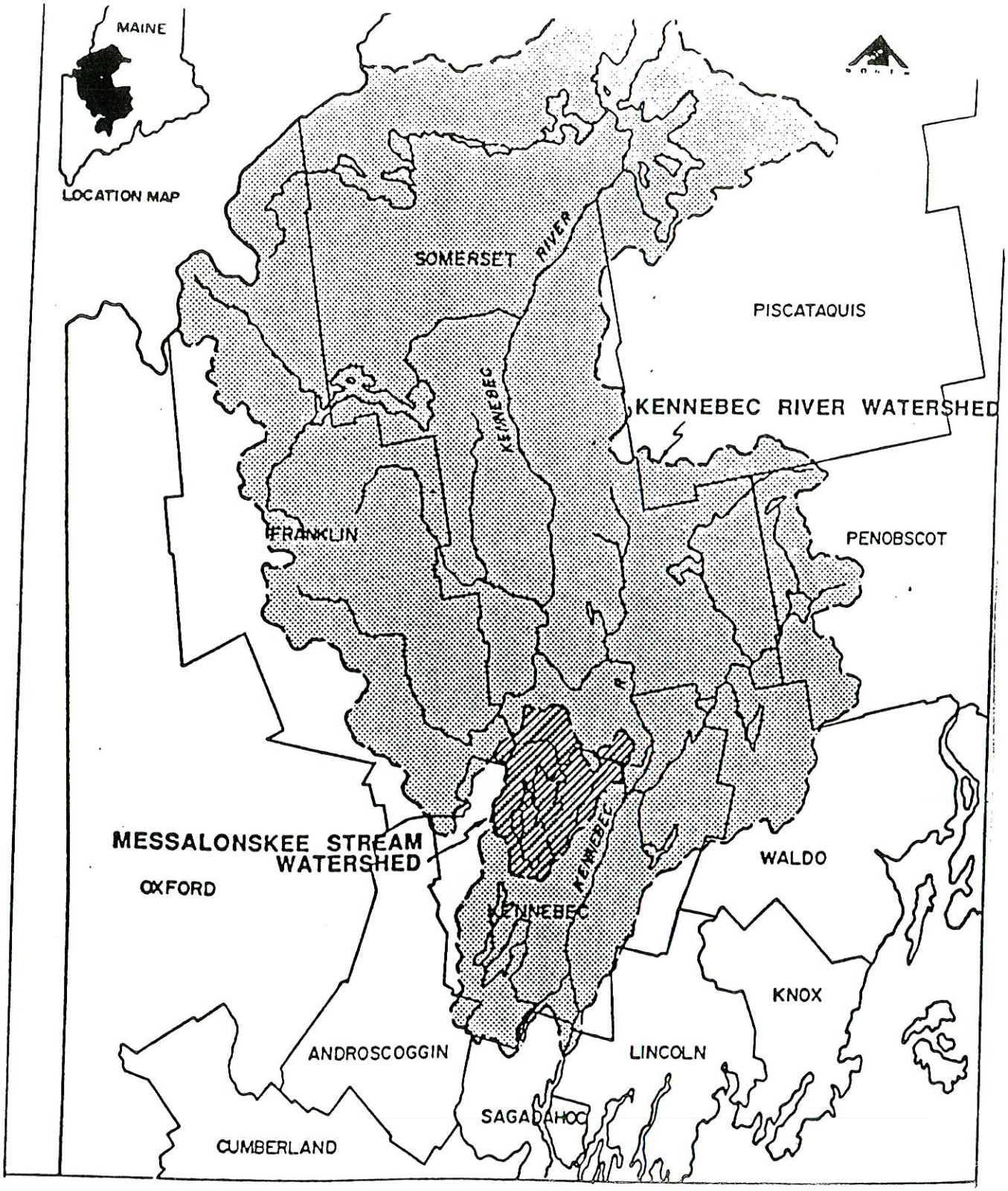
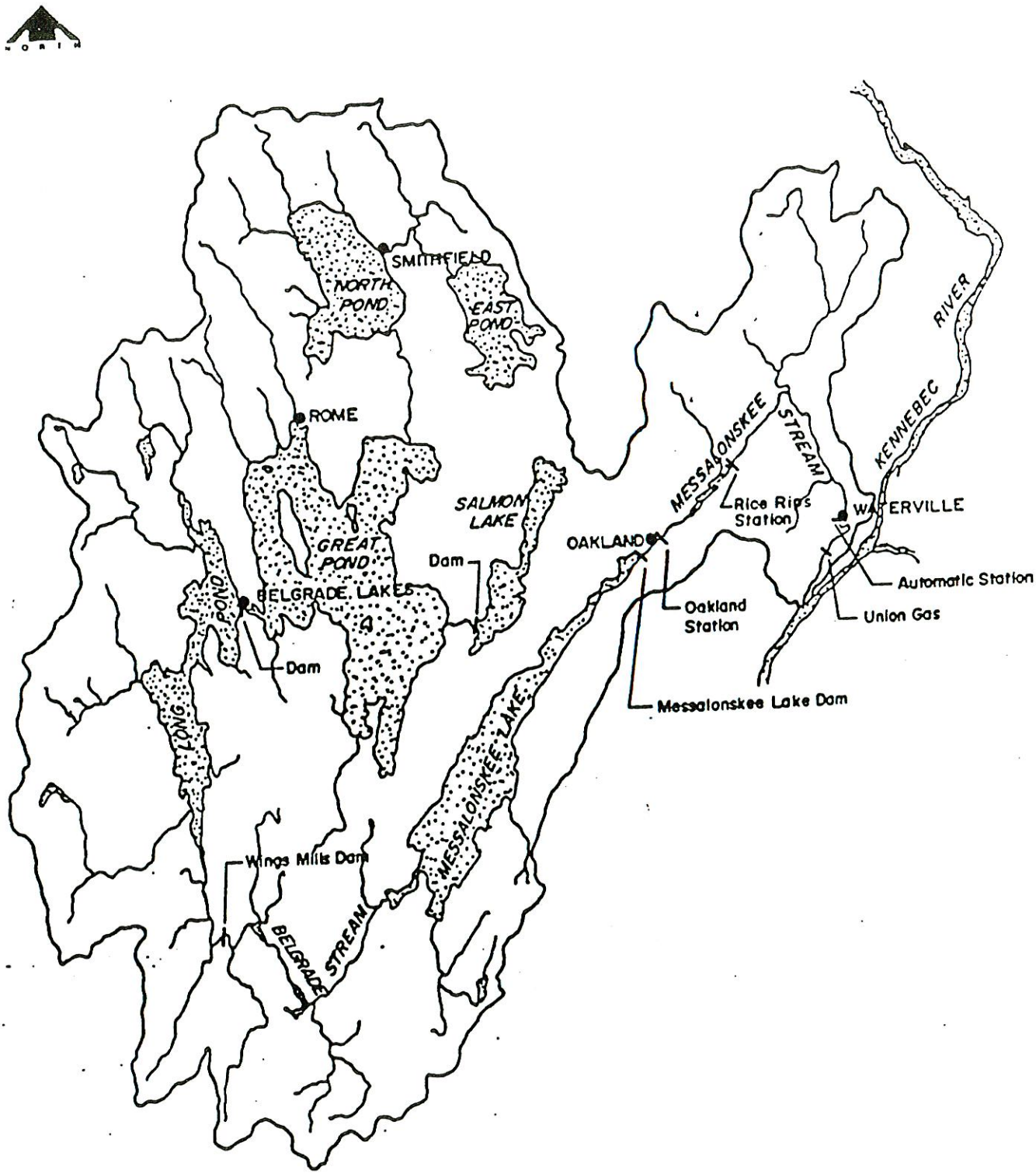



**Waterville Comprehensive Plan**
**Map 9-11**
**Kennebec River Watershed**




Waterville Comprehensive Plan
Map 9-12
Messalonskee Stream Watershed

3. Class B: from its confluence with the Messalonskee Stream to the Sidney-Augusta boundary, including all impoundments.

Class C streams are considered satisfactory for drinking water after treatment, fishing, recreation in and on the water, industrial process and cooling water supply, navigation, and as habitat for fish and other aquatic life. It is considered swimmable, but swimming is not recommended after heavy storm events, because of combined sewer overflows (CSO's). Both the Kennebec Sewerage Treatment District (KSTD) and Scott Paper Company discharge treated wastewater into the Kennebec in Waterville.

Class B is similar to Class C, except that discharges to Class B waters are not permitted to cause adverse impacts to habitat or aquatic life and dissolved oxygen and E. coli bacteria standards are more stringent.

Water quality in the Messalonskee Stream is classified as Class C. Until 2012, the Oakland Sewage Treatment Plant, storm water pipes, and some combined sewage overflows discharged into the Messalonskee, causing high bacteria levels in some locations. The Oakland plant now is connected to the Kennebec Sanitary Treatment District (KSTD).

Streams are classified according to water quality which is affected by contamination from many sources. Water is cleansed by filtering through soil, the thickness of the overburden determining the amount of cleansing that will occur. Contamination of surface and groundwater can occur through direct introduction of wastes through human factors, sediment from soil erosion, dissolved ions from minerals that make up the bedrock geology, and salt intrusion.

Human factors that contaminate water include sewage, untreated runoff from developed surfaces, effluent from solid waste disposal sites and settling lagoons, individual septic systems, oil spills, and farm feed lots as well as fertilizers and pesticides for farming and forestry practices. Dissolved ions originate from the bedrock and are contained in groundwater flowing through fractures. Salt contamination is common from heavily salted highways. Intrusions occur where wells penetrate salt deposits or trapped marine water.

**Flood Prone Areas**

Flood prone areas in Waterville were identified by the Federal Emergency Management Agency (FEMA) as part of the National Flood Insurance Program. (See Map 9-10.) Waterville's Floodplain Management Ordinance implements the regulations of the National Flood Insurance Program. The ordinance requires that structures built or reconstructed in the flood hazard area be built one foot above the elevation of the 100 year flood. A 100 year flood is a flood having a one percent chance of being equaled or exceeded in any given year. As Map 9-10 illustrates, Waterville's flood prone areas are located along the Kennebec River, Messalonskee Stream, Holland Brook, and Trafton Road Brook. The National Flood Insurance Program is designed to provide flood insurance and to discourage development within the 100 year flood plain.

Existing development within floodplains in Waterville consists of single family and multifamily residences, roads, businesses, utilities, several parks, the Two Cent Bridge, and the Hathaway Mill complex.

**Wetlands**

Wetlands are areas with high water table, wetland vegetation (hydrophytes), and hydric soils, which are saturated with water or covered by shallow water at least some time during the growing season of each year. Wetlands in Waterville are located in three major areas -- dispersed intermittently between Kennedy Memorial Drive and Trafton Road; in the floodplains along Runnals (Reynolds) Stream, Messalonskee Stream, and the Kennebec River; and in a low area along Drummond Avenue. The wetlands along Runnals (Reynolds) Stream, Messalonskee Stream, and the Kennebec River are important for flood storage, nutrient removal, and erosion control. Because of the association of wetlands with a sand and gravel aquifer, the wetland adjacent to Drummond Avenue is a valuable area for groundwater recharge and water quality protection.

Aerial Survey & Photo, Inc. estimated that there are a total of 80 acres of wetlands on large parcels they classified as to landcover for the City. Of the 42 parcels found to have wetlands, 27 contained less than 2 acres of wetlands; 14 contain between 2 and 10 acres of wetlands; and only one parcel, the WalMart (now Marden's) site, contained about 10 acres of wetlands. Theoretically, some of the small parcels which Aerial Survey did not classify (parcels less than five acres) might contain as much as four acres of wetlands. It also should be noted that some forested wetlands are not included in the Aerial Survey list because they are not easily detectable on aerial photographs.

Initially DEP identified only the wetlands on Drummond Avenue as ten acres or greater. Subsequently, the DEP stated that this was not a ten-acre wetland after all. However, through the Site Location of Development permit process in 1991 and 1992, consultants identified three ten acre wetlands in Waterville. Two of the wetlands are located on the Colby Campus and the third is on the WalMart (now Marden's) site.

Wetlands serve many functions. They act as natural sponges storing water to prevent flooding downstream and serve as water sources for streams and groundwater supplies. Wetland vegetation stabilizes shorelines, serving as a buffer against shoreline erosion by absorbing storm energy in water currents. Wetlands filter runoff prior to release downstream, removing sediment, organic matter, and pollutants such as waterborne chemicals. Wetlands provide nesting and feeding habitat for waterfowl and other birds, and are inhabited by fish, furbearing animals, and other wildlife. Wetlands are not suitable for development because of poor soil drainage and seasonally high water tables, but they do provide for recreational activities such as hiking and nature study.

**Land Cover**

Land cover is the vegetation or type of development that directly overlies the soil or geological formation. Land cover consists of wooded areas, wetlands, fields, disturbed areas, various types of development, and open water.

Gravel pits are located in naturally occurring surficial geologic deposits. According to the 1982 United States Geologic Society (USGS) map (photo-inspected in 1988), there are six gravel pits

and one sand pit in the City. All of the gravel pits are adjacent to the Kennebec River south of the Kennebec Sanitary Treatment District (KSTD) sewage treatment plant within the eskers described in the Geology section of this chapter. Because these areas are generally excessively drained, they may serve as exposed areas of groundwater recharge, and as such, are areas of potential groundwater contamination. In addition, these areas erode easily if disturbed by human activities.

Wooded areas are functionally divided into softwoods, hardwoods, and mixed forest growths. In Waterville, forests primarily occur in nonagricultural and undeveloped land. These forested areas typically collect water in the landscape by intercepting precipitation, thereby reducing the volume and rate of runoff, as well as reducing soil erosion. Forests also bind up soil moisture in an area that may otherwise be subject to larger seasonal flooding and associated erosion problems.

A number of fields exist in Waterville. These areas include active farmland and farmland homesteads as well as abandoned old fields with their abundant vegetation and wildlife. Other cleared areas include athletic fields, golf courses, and land cleared for development projects. Naturally cleared areas also exist. Clearing vegetation from the land may affect the local water table, drainage, and runoff. Exposed soil is also susceptible to erosion both by increased runoff, and in the case of drier, sandier soils, by the wind.

Development in Waterville is primarily concentrated in the northeast quadrant of the City and along Kennedy Memorial Drive, College Avenue, and Upper Main Street. Table 10-1 in Chapter 10: Existing Land Use shows development by land use category. See also the 2009 aerial photograph of the city posted on the City of Waterville web page.

**Unique Natural Areas and Wildlife Habitats**

**Unique Natural Areas**. There are no unique natural areas in the City of Waterville registered under the State's Critical Areas Program. However, there are three natural areas identified by the State which may have local or regional significance.

**Devil's Chair Rock Quarry**. This is a natural areas inventory site of regional significance located near the old Colby ski slope, between Upper Main Street and Quarry Road. The Quarry, which is the site of the western most graptolite fossils found in Maine, has been used in the past by Colby College for educational purpose. It was tax-acquired by the City and is now part of the Quarry Road Recreation Area.

**Perkins Arboretum**. The Perkins Arboretum, on Mayflower Hill, is a natural areas inventory site of local significance. The Arboretum consists of 128 acres of relatively undisturbed plant and animal habitat, owned and managed by Colby College. There are walking trails through the Arboretum that are open to the public.

**Waterville Esker**. Identified as an area of regional significance by the State Planning Office, this two acre site contains fossils studied by the University of Maine at Orono. Colby

College used this site for geology field trips in the past, but no longer does so because of adverse impacts of housing development and gravel extraction.

The State's Natural Heritage Data Base identified four endangered, threatened, or rare plants in Waterville. These plants have been documented, but their locations are not known.

1) **Calypso bulbos, "Fairy Slipper."** This flowering plant is identified as rare in Maine, and is on the State's "watch list" as a species of concern.

2) **Gleraris spectabilis, "Showy Orchis."** This plant is identified as critically imperilled in Maine because of its extreme rarity. It's State status is "threatened."

3) **Astragalus alpinus, "Alpine Milk Vetch."** This plant was identified by the State Planning Office in 1988 as being found in Waterville.

4) **Gentianopsis crinita, "Fringed Gentian."** This plant was identified by the State Planning Office in 1988 as being found in Waterville.

**Wildlife Habitat**

Preservation of habitat is the key to wildlife survival. Habitat must supply food, water, and shelter. A variety of habitat types, including open field and mature timber, are necessary to meet the habitat requirements of most wildlife species. Since different species have different habitat requirements, loss of habitat will affect each in different ways, ranging from "loss of individual nesting, feeding and resting sites to disruption of existing travel patterns. The Maine Department of Inland Fisheries and Wildlife (IF&W) recommends that sufficient areas of forest and agricultural open space be maintained in addition to the critical habitats, which include deer yards, wetlands, and water courses.

Brooks, streams, and rivers provide habitat for fish and aquatic furbearers and travel corridors connecting other habitat types for numerous wildlife species. Riparian areas are considered critical wildlife habitat because they support a greater diversity of wildlife than most other habitat types. Vegetation in buffer strips along water courses provides cover for wildlife movement and maintains water temperatures critical to fish survival. Buffers protect water and air quality by filtering pollutants and preventing erosion, moderate water temperature, and provide cover and food sources.

The Maine IF&W has not completed a recent or intensive survey of significant wildlife habitat in Waterville. However, IF&W rated the Messalonskee Stream from the north of the City down to Kennedy Memorial Drive moderate value habitat for waterfowl and wading birds. IF&W also rated Johnson Pond on the Colby Campus low value habitat for waterfowl and wading birds (see Map 9-13).

In the past IF&W identified the areas illustrated on Map 9-13 as deer yards; however, no current additional information is available. Deer range freely over most of their habitat during spring, summer, and fall, but according to IF&W, snow cover over 18 inches deep forces deer to seek

out areas which provide protection from snow and wind. These areas provide the food and cover necessary to sustain deer during critical winter months. Since the major factor affecting deer carrying capacity is the quality and quantity of the winter range, protection of deer yards is critical to maintaining a healthy deer population. Threats to deer populations include loss of wintering areas to development or clear cutting, loss of travel corridors, and reforestation of abandoned agricultural lands.

Waterville has no documented animals on the official state or federal list of endangered or threatened species. Therefore, no habitat has been preserved specifically for any endangered animal. However, bald eagles feed at the Kennebec Sanitary Treatment District plant, especially in the wintertime and have been sighted at the closed landfill and along the Messalonskee Stream. Wildlife species found in Waterville are listed in Table 9-2.

**TABLE 9-2**

**WILDLIFE SPECIES IN WATERVILLE: MAMMALS, BIRDS, REPTILES, AND AMPHIBIANS**

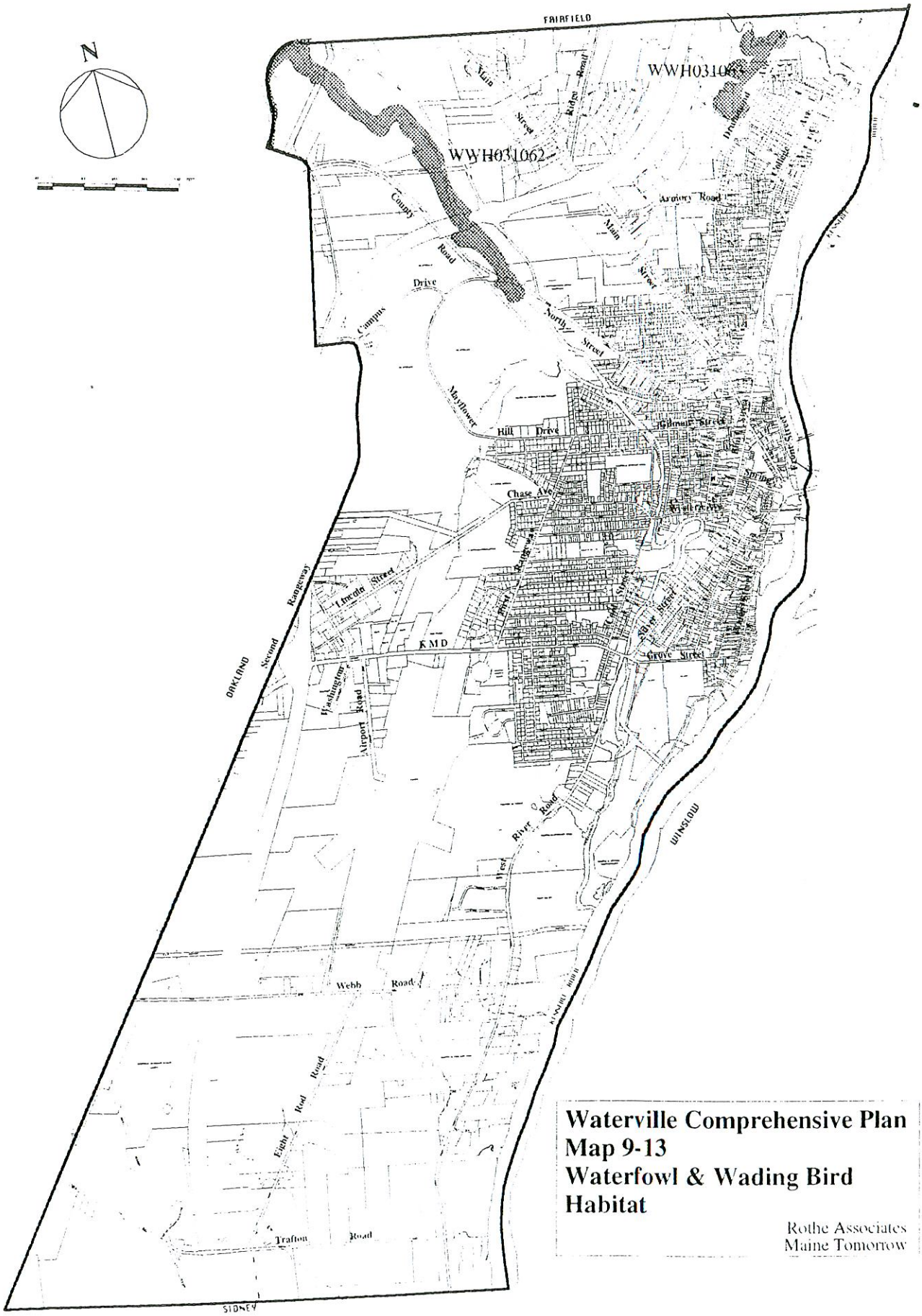
**MAMMALS**

Smokey Shrew, Masked Shrew, Pygmy Shrew, Shorttail Shrew, Starnose Mole, Little Brown Bat, Muskrat, Mink, River Otter, Beaver, Raccoon, White Tail Deer, Moose, Fisher, Short Tail Weasel, Long Tail Weasel, Striped Skunk, Coyote, Red Fox, Bobcat, Wood Chuck, Eastern Chipmunk, Gray Squirrel, Red Squirrel, Flying Squirrel, Deer Mouse, Red Back Vole, Meadow Vole, Porcupine, Snowshoe Hare

**BIRDS**

Black Duck, Mallard, Ring Neck Duck, Wood Duck, Green Wing Teal, Blue Wing Teal, Common Pintail, Hooded Merganser, Common Goldeneye, Canada Goose, Pied Billed Grebe, American Widgeon, American Bittern, Great Blue Heron, Virginia Rail, Sora, Mourning Dove, Black Bill Cuckoo, Common Nighthawk, Ruby Throated Hummingbird, Belted Kingfisher, Pileated Woodpecker, Northern Flicker, Yellow-Bellied Sapsucker, Brown Creeper, Northern Shrike, Black Bellied Plover, Killdeer, American Woodcock, Common Snipe, Greater Yellowlegs, Lesser Yellowlegs, Solitary Sandpiper, Pectoral Sandpiper, Spotted Sandpiper, Ruffled Grouse, Bald Eagle, Turkey Vulture, Red Tailed Hawk, Red Shouldered Hawk, Broad Winged Hawk, Cooper's Hawk, Northern Goshawk, Sharp Shinned Hawk, Northern Harrier, Osprey, Merlin, American Kestrel, Short Eared Woodpecker, Flycatcher, Swallow, Crow, Jay, Chickadee, Nuthatch, Grosbeak, Sparrow, Finch, Tanager, Wren, Kinglet, Mockingbird, Thrush Species, Starling, Waxwing, Vireo, Warbler, Blackbird.

**REPTILES AND AMPHIBIANS**




**Waterville Comprehensive Plan**
**Map 9-13**
**Waterfowl & Wading Bird Habitat**

Rothe Associates
Maine Tomorrow

Snapping Turtle, Eastern Painted Turtle, Northern Red Bellied Snake, Northern Water Snake, Eastern Garter Snake, Spotted Salamander, Red Spotted Newt, Northern Two Lined Salamander, American Toad, Spring Peeper, Pickerel Frog, Northern Leopard Frog, Green Frog, Wood Frog, Bull Frog

Source: Species Range Maps, Maine Department of Inland Fisheries and Wildlife, 1992; Field surveys by consultants for Colby College; Waterville Conservation Commission members; Ron Joseph; and Oxbow Nature Trail Brochure.

**Fisheries Habitat**

Fisheries habitat types in Waterville range from river and stream riffle and run to flat water pool environments mostly located upstream of impoundments. A wide variety of fish are found in the Kennebec River although warm water species such as small mouth bass and white and yellow perch predominate.

Warm water species are predominant in Messalonskee Stream and mainly include black bass, perches, pickerel, and hornpout. Fish Brook in Fairfield and Red Brook in Oakland have notable populations of brook trout in Messalonskee Stream. The IF&W currently stocks brown trout in both the Kennebec River and the Messalonskee Stream. Fish species found in Waterville are listed in Table 9-3.

A 1989 Fisheries Management Report for Messalonskee Stream recommended continued stocking of brown trout. The report also recommended that full bank water levels be maintained to assure the health of the fishery. Water drawdowns for dam inspections were considered allowable as long as they were only temporary disruptions in water level.

**TABLE 9-3**

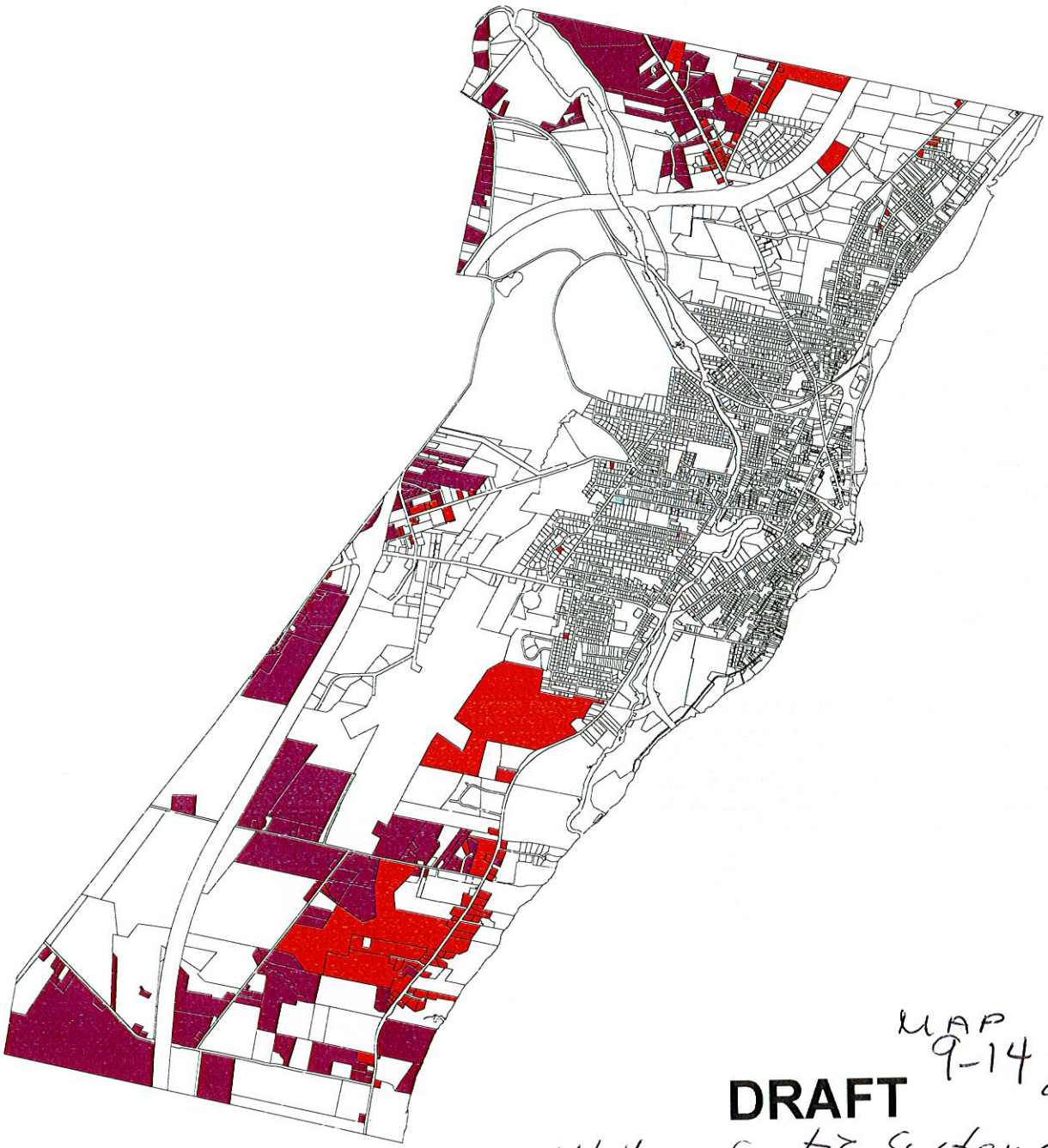
**FISH SPECIES IN WATERVILLE**

**FISH**

Atlantic Salmon, American Shad, Alewife, Sea Lamprey, Atlantic Sturgeon, American Eel, Blueback Herring, Round Whitefish, Lake Whitefish, Rainbow Trout, Brown Trout, Brook Trout, Lake Trout, Rainbow Smelt, Redfin Pickerel, Chain Pickerel, Lake Chub, Carp, Golden Shiner, Common Shiner, Blacknose Shiner, Northern Redbelly Dace, Finescale Dace, Fathead Minnow, Blacknose Dace, Longnose Dace, Creek Chub, Failfish, Pearl Dace, Longnose Sucker, White Sucker, Creek Chubsucker, Brown Bullhead, Burdot, Banded Killfish, Mummichog, Brook Stickleback, Bluefish, 3-Spine Stickleback, 9-Spine Stickleback, White Perch, Striped Bass, Redbreast Sunfish, Pumpkinseed, Smallmouth Bass, Largemouth Bass, Black Crappie, Swamp Darter, Yellow Perch, Slimy Sculpin.

Source: Species Range Maps, Maine Department of Inland Fisheries and Wildlife, 1992; Field surveys by consultants for Colby College; Waterville Conservation Commission members; Ron Joseph; and Oxbow Nature Trail Brochure.

# City of Waterville Maine



MAP 9-14 c

**DRAFT**

Wells + Septic Systems

Septics on Public Water

Wells on Public Sewers

Wells & Septics

**MAPS**

Map 9-1 Sand & Gravel Ridges or Eskers

Map 9-2 Elevations Over 270 Feet

Map 9-3 Steep Slopes

Map 9-4 Hydric Soils

Map 9-5 Highly Erodible Soils

Map 9-6 Agricultural Soils

Map 9-7 Soil Potential for Low Density Urban Development

Map 9-8 Sand & Gravel Aquifers and Wetlands

Map 9-9 Potentiometric Map

Map 9-10 Flood Prone Area

Map 9-11 Kennebec River Watershed

Map 9-12 Messalonskee Stream Watershed

Map 9-13 Waterfowl & Wading Bird Habitat

Map 9-14: Wells and Septic Systems