
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.

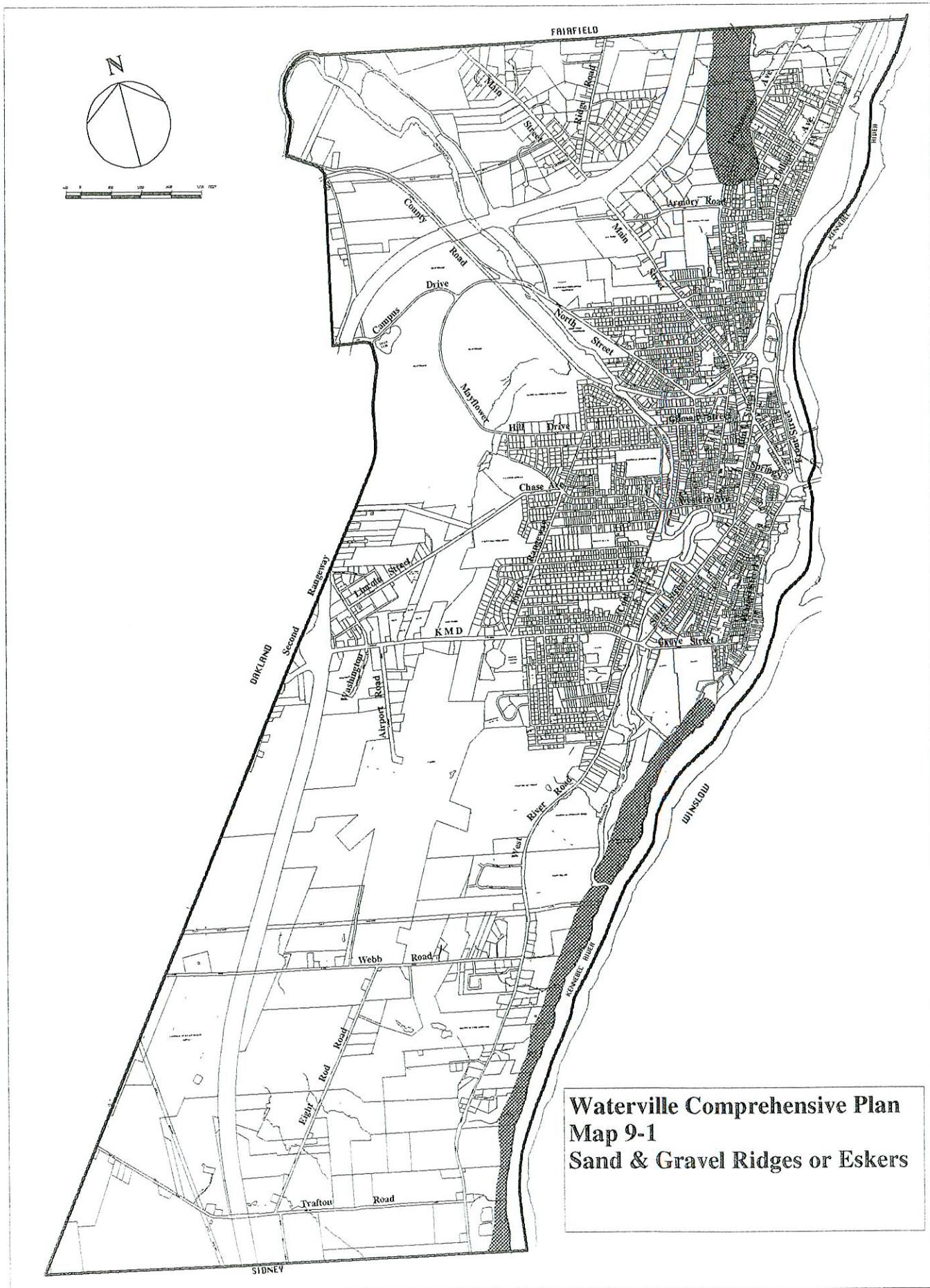
Aside from influencing the location of development, bedrock and surficial deposits are resources. Bedrock may be a source of groundwater for wells. Glacial stream deposits are both aquifer recharge areas and sources of sand and gravel for construction. Map 9-1 shows three sand and gravel ridges, or eskers,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

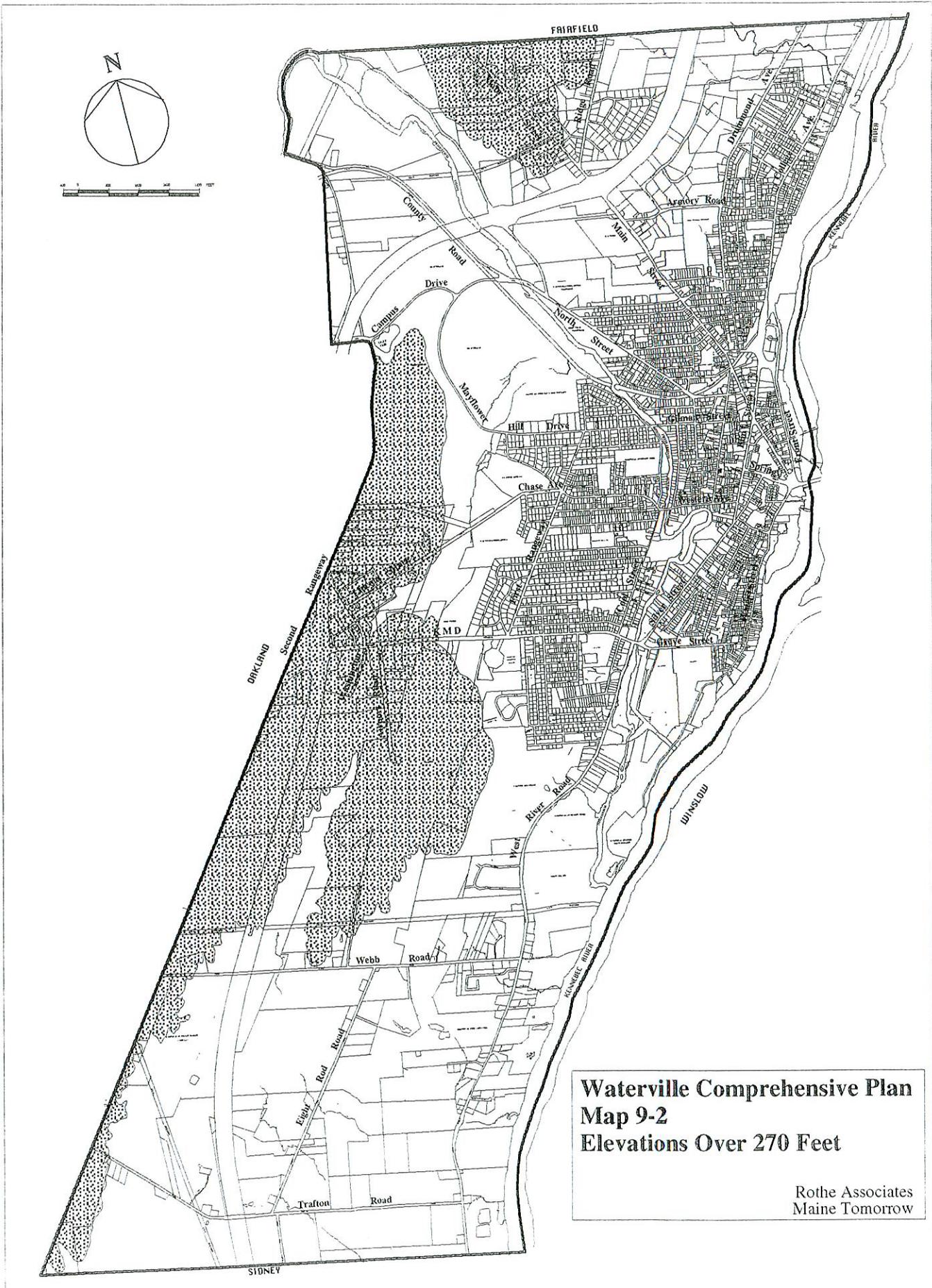
Topography

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 than 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.

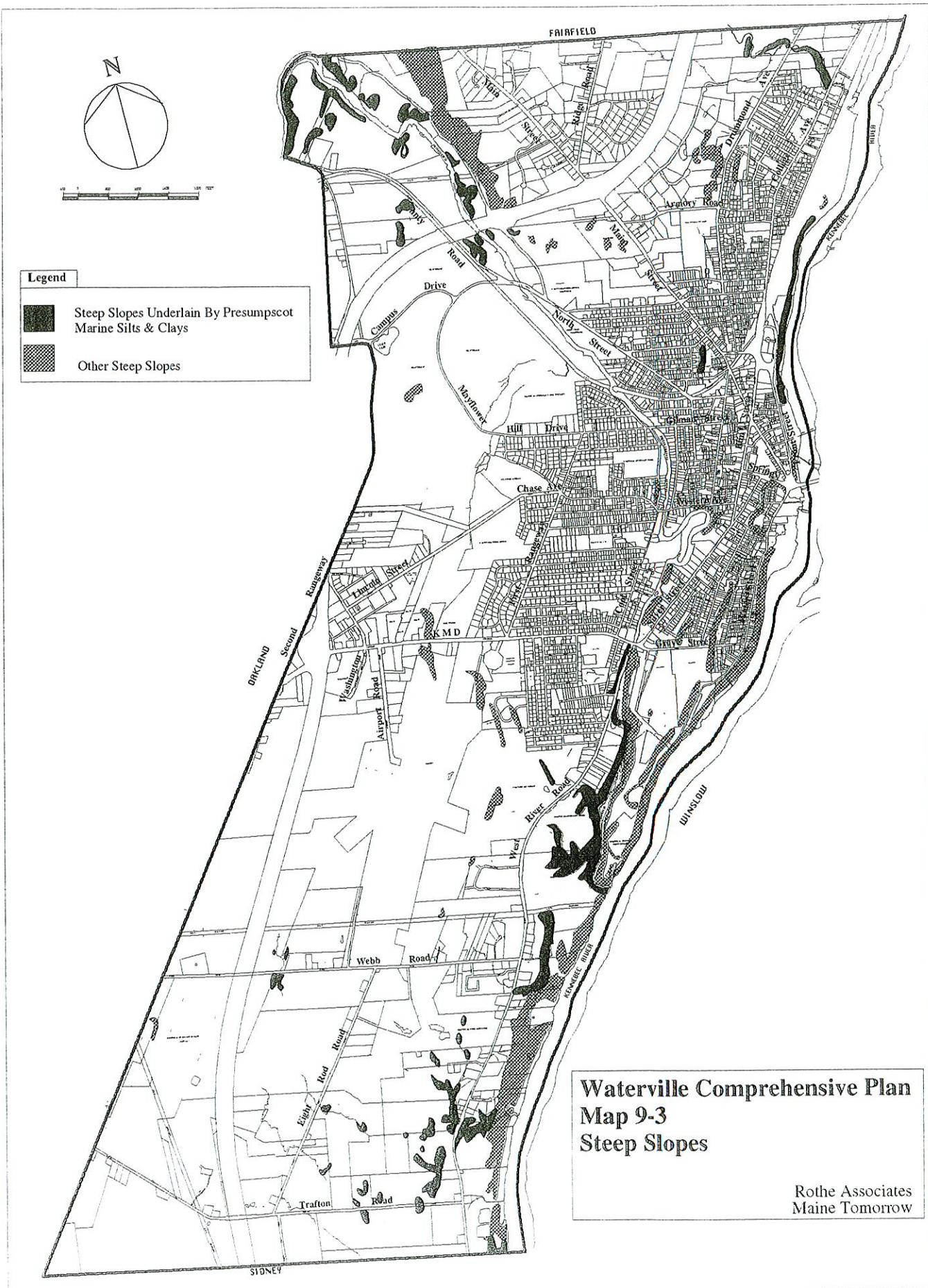
In the late 1990s, four Colby College seniors in the Geology Department identified approximately 560 acres of steep slopes (greater than 20 percent) or about six percent of the total land area in Waterville. As indicated in Map 9-3, most of these steep slopes are located along the banks of the Kennebec 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.

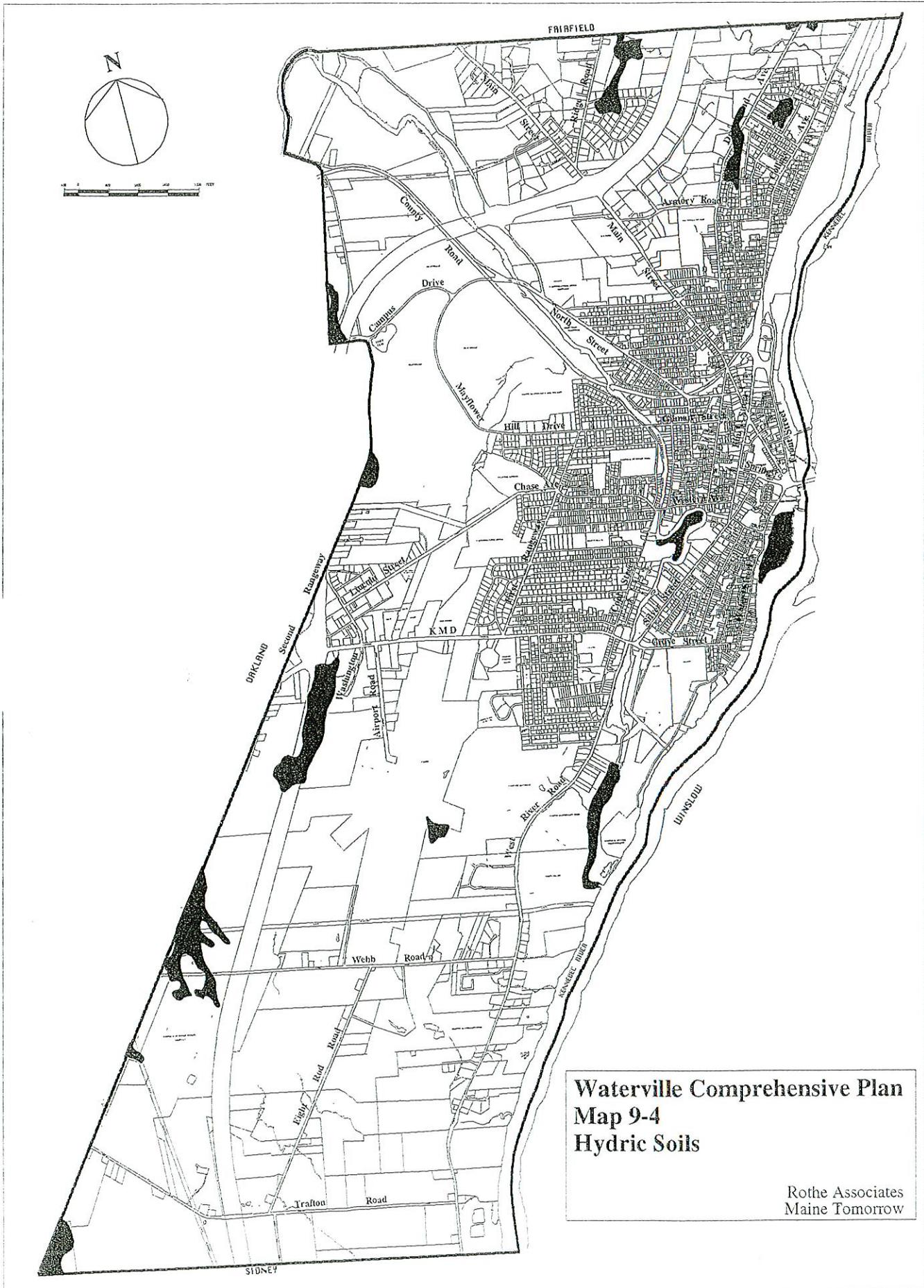
Highly Erodible Soils

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.

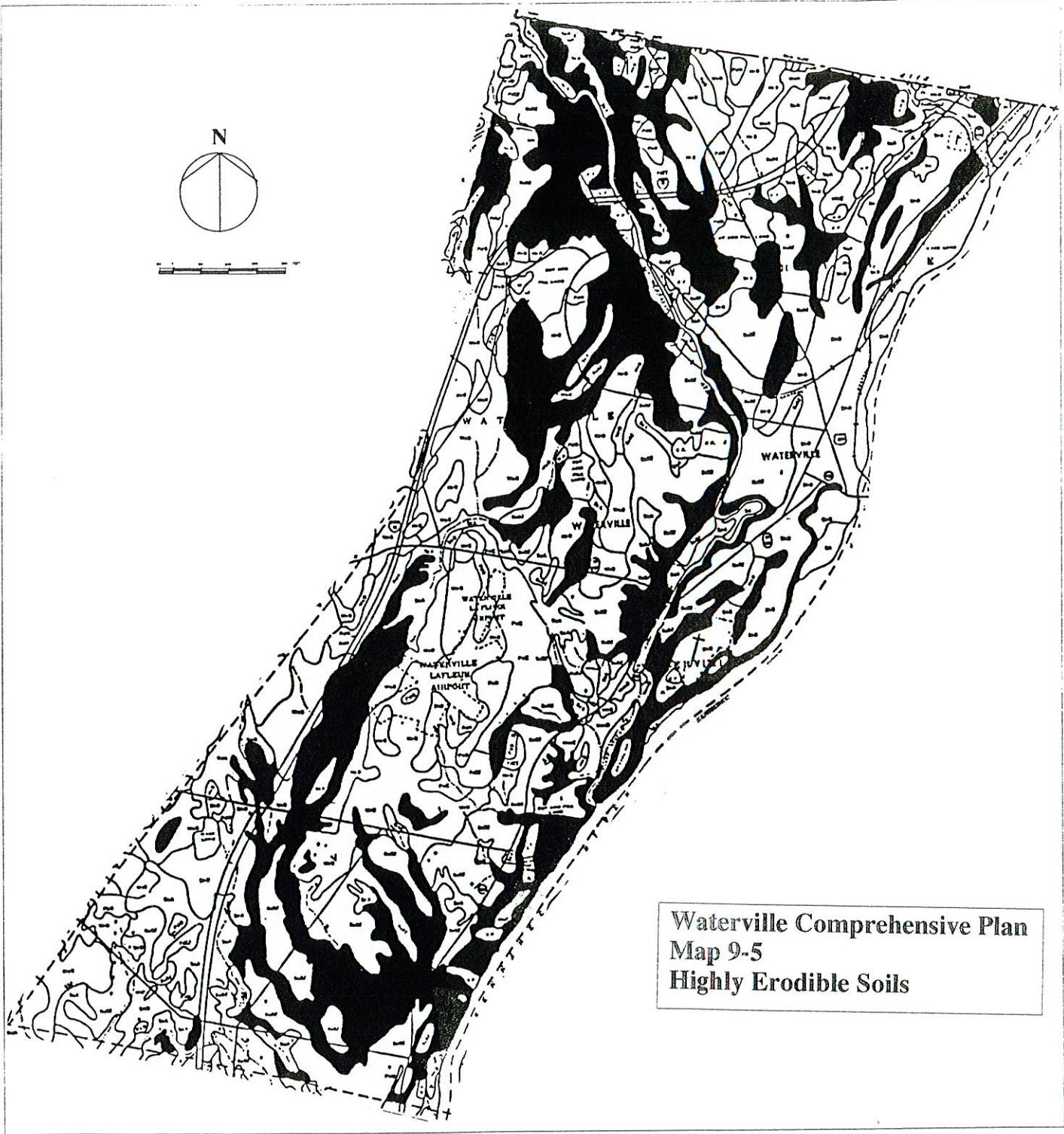
Prime Farmland Soils

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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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

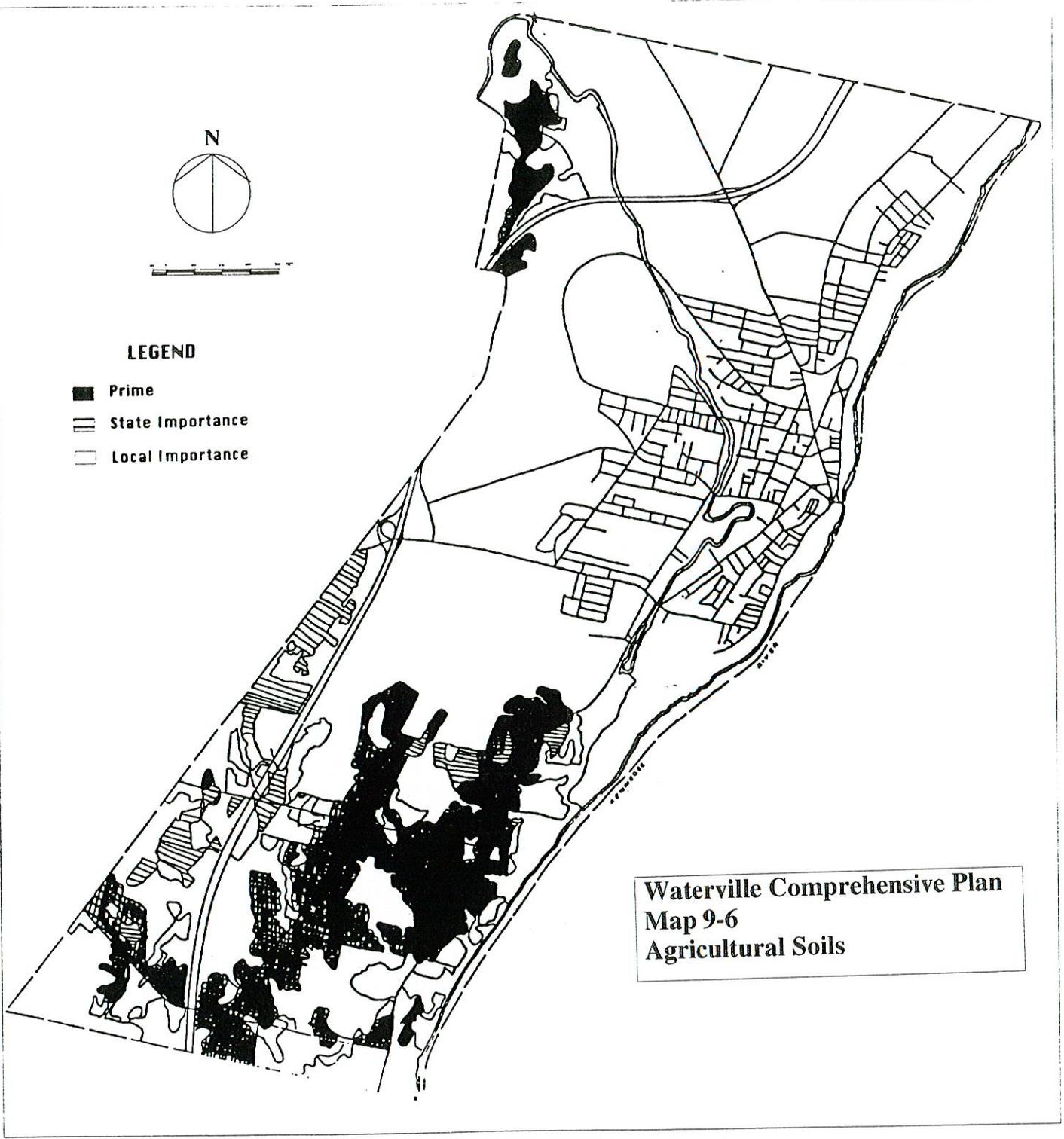
Most of Waterville is covered by prime forest land soils. That is, most of Waterville has soils rated medium, high, or very high for woodland productivity and capable of growing eastern white pine at an economically-productive rate. The best soils for tree growth in Waterville are located along the Kennebec 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).

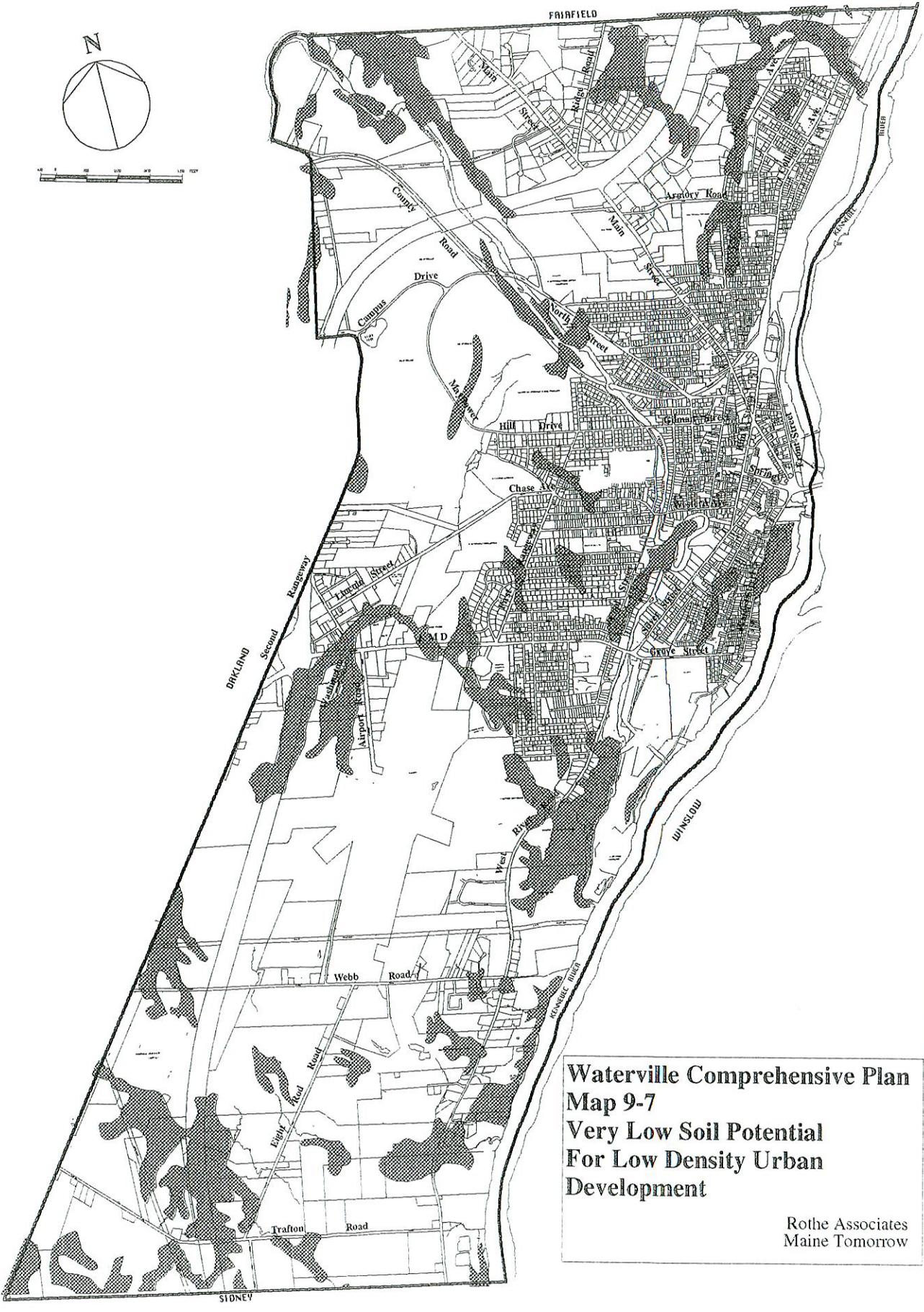
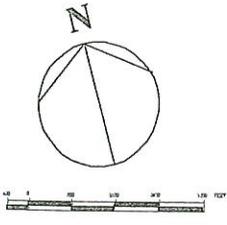
Of the 36 soil types found in Waterville, 15 are rated "poor" or "very poor" for development. (See Table 9-1.) These ratings are a composite of weighted ratings of potential for septic tank absorption fields, dwellings with basements, and local streets. In an area where quasi-municipal sewerage is available, 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.



LEGEND

- Prime
- ▨ State Importance
- Local Importance

**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 9-7.5: 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.

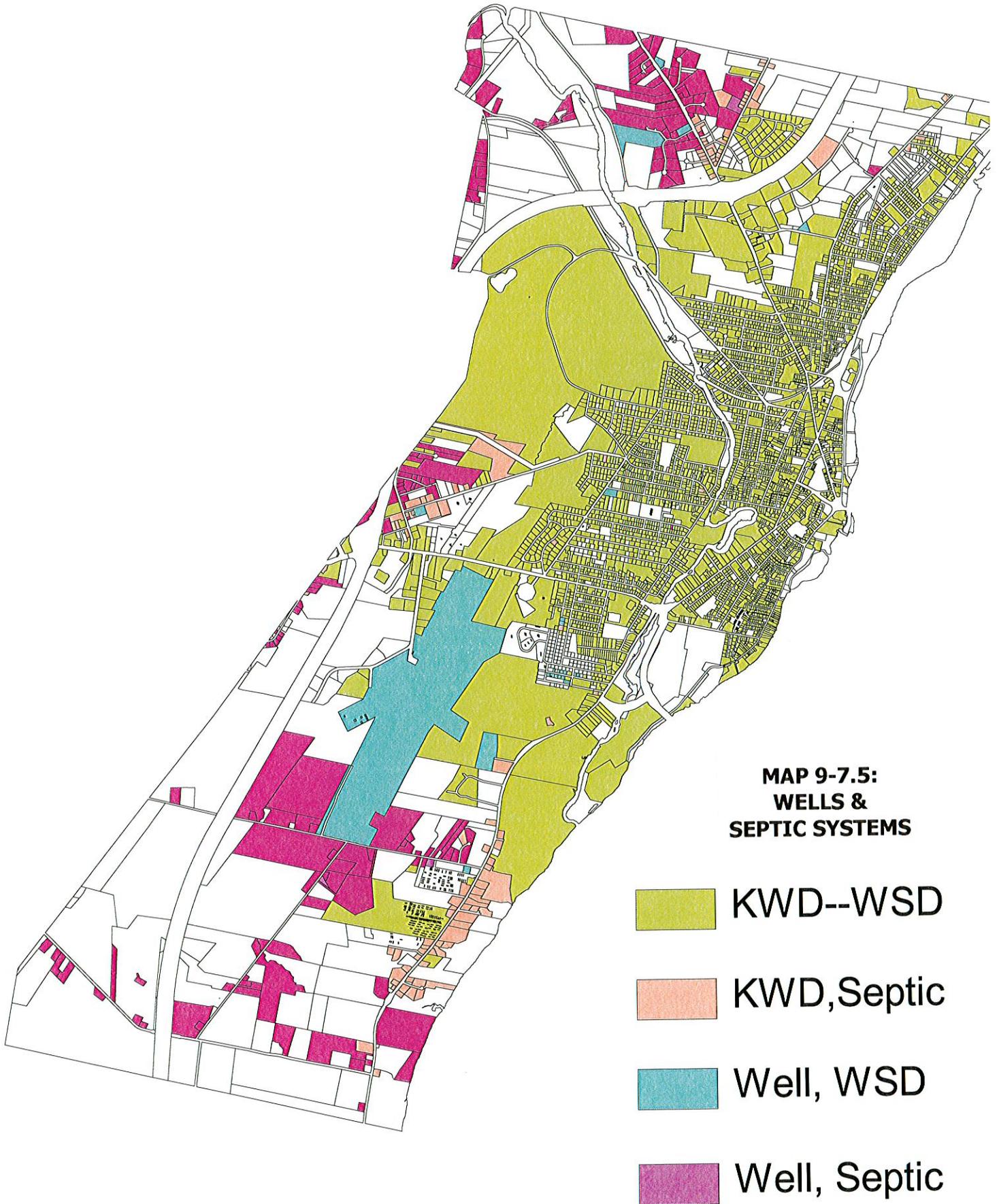
Future development outside the reach of Waterville's quasi-municipal water supply is dependent on groundwater resources. Since sand and gravel aquifers are geographically limited in Waterville, bedrock aquifers must supply the majority of the City's wells.

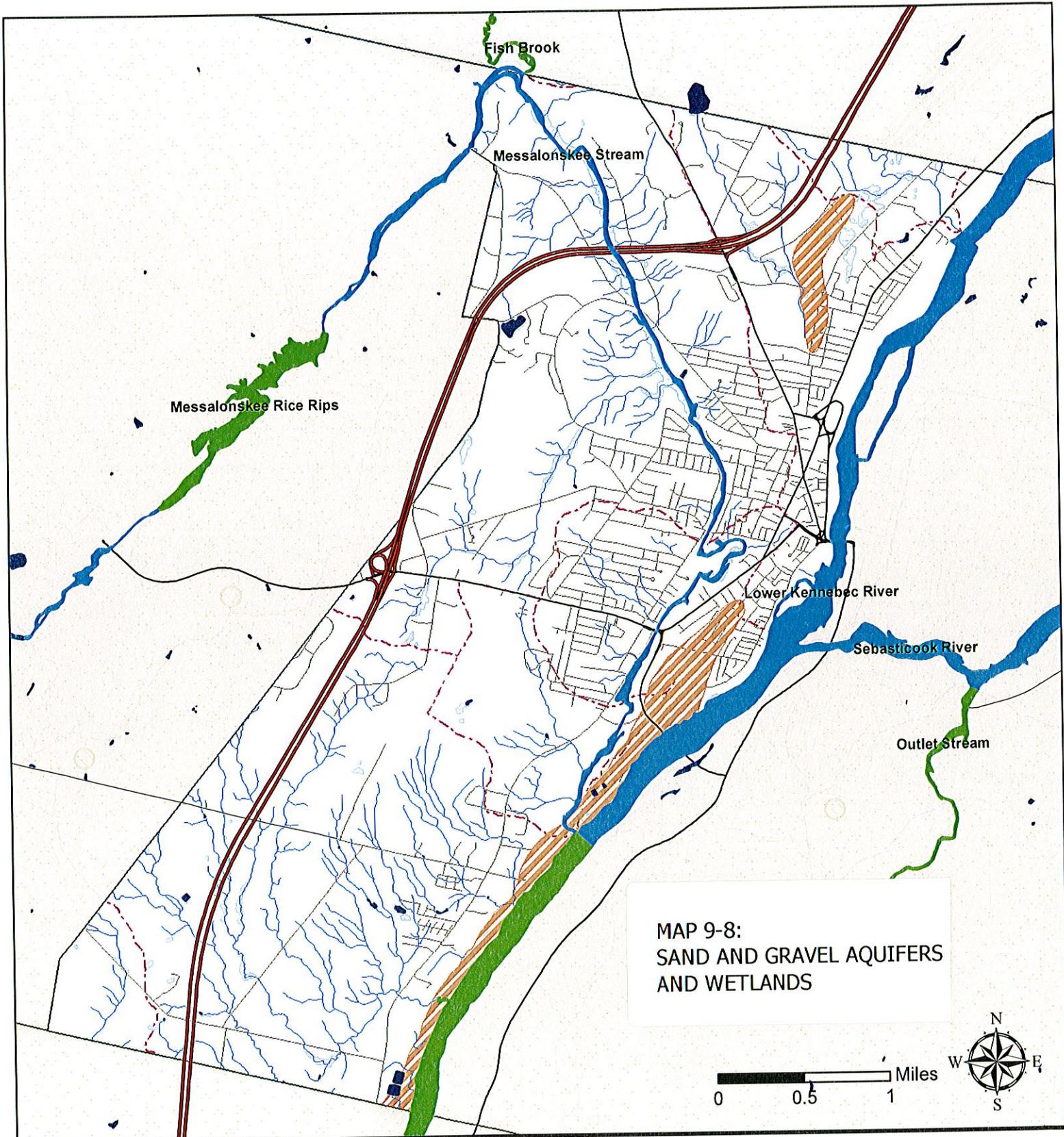
The City's primary bedrock aquifer is the Waterville Formation. Since igneous and metamorphic bedrock are not very porous, groundwater is stored and flows mainly through fractures and joints in the rock. Fractures in the Waterville Formation are oriented primarily northwest-southeast.

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 Maine





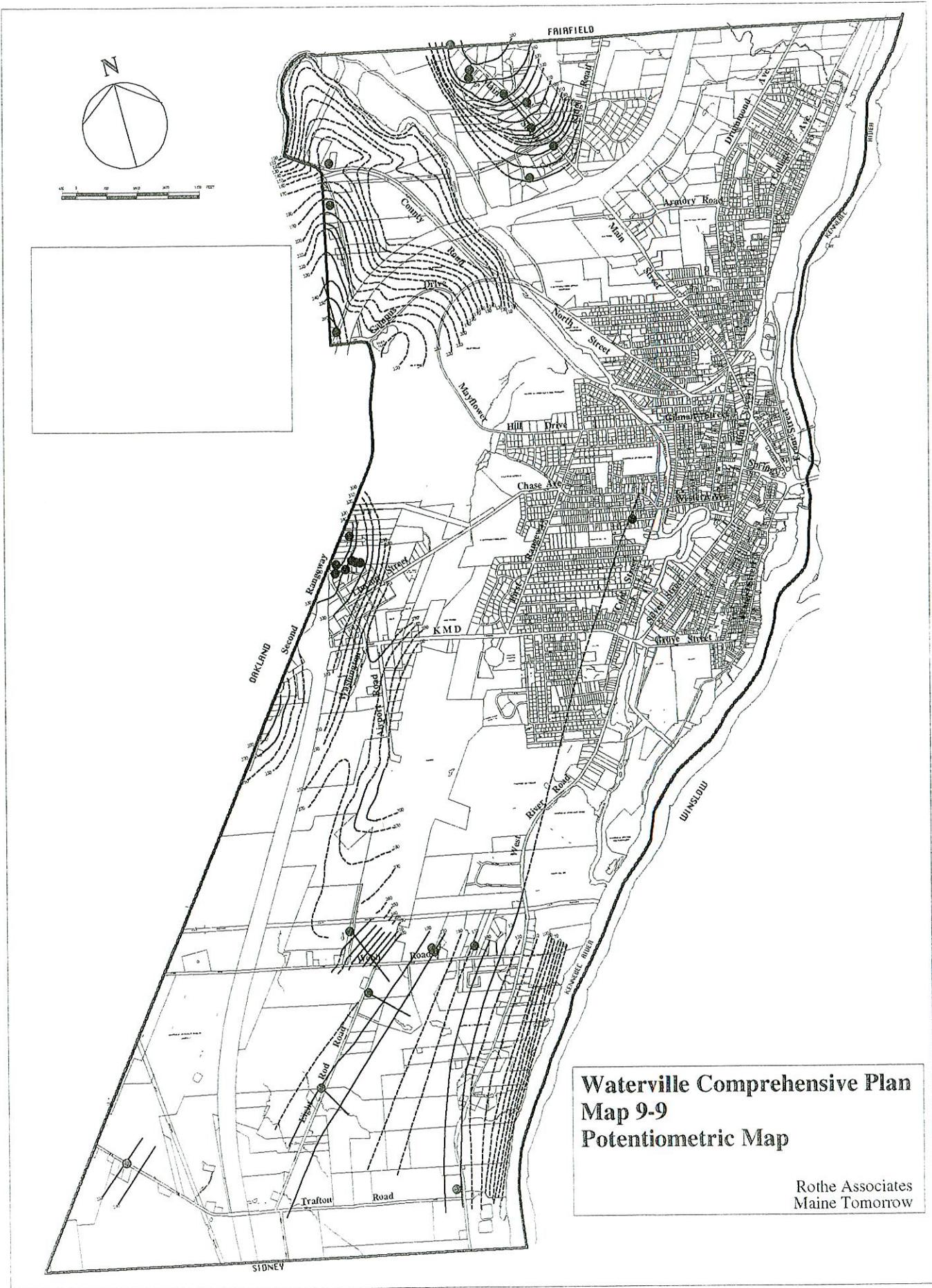
**MAP 9-8:
SAND AND GRAVEL AQUIFERS
AND WETLANDS**

**City of Waterville
Kennebec County, Maine
Water Resources Map
2014 Comprehensive Plan**

Map Legend	
Rivers	Streams
Class B (second lowest level of water quality)	Class B (second lowest level of water quality)
Class C (lowest level of water quality)	Aquifers
Ponds	Watersheds
National Wetland Inventory	



Neither KVCOG nor the City of Waterville assume any liability for the data delineated herein. This map is intended for planning purposes only and does not represent a survey. Features may not always line up exactly due to multiple data sources.
Data Sources: Maine Office of GIS, MIF&W, Beginning with Habitat Created 07-2014 by JWG



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

Rothe Associates
Maine Tomorrow

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, Hayden Brook, Runnals (also known as Reynolds or Perkins) Stream, Trafton Brook, 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.

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.

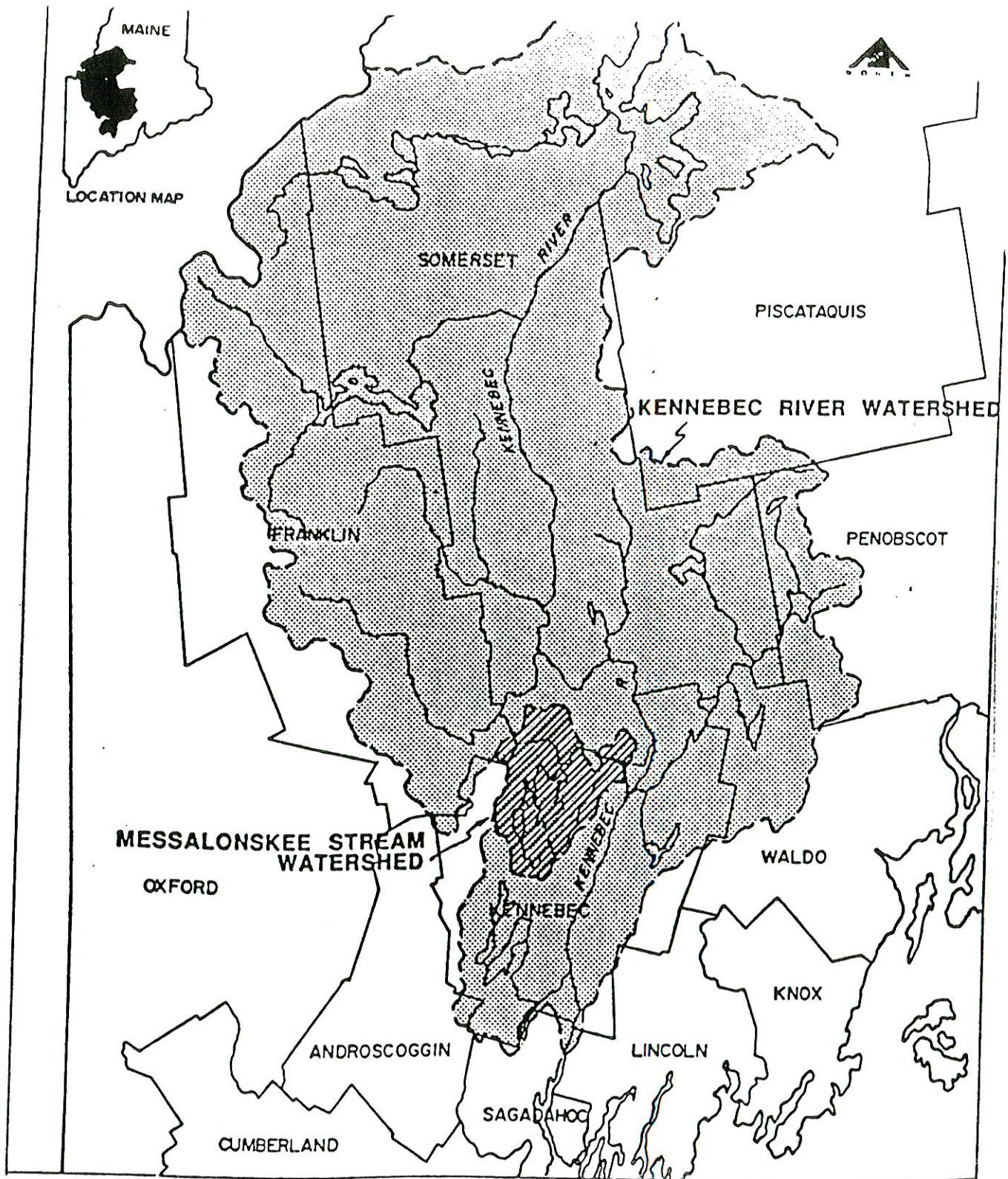
A major tributary of the Kennebec is the Messalonskee Stream. The Messalonskee is 10½ miles long and runs from the outlet of Messalonskee Lake in Oakland to its confluence with the Kennebec River at the south end of Water Street in Waterville. Map 9-12 illustrates the watershed of the Messalonskee Stream,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

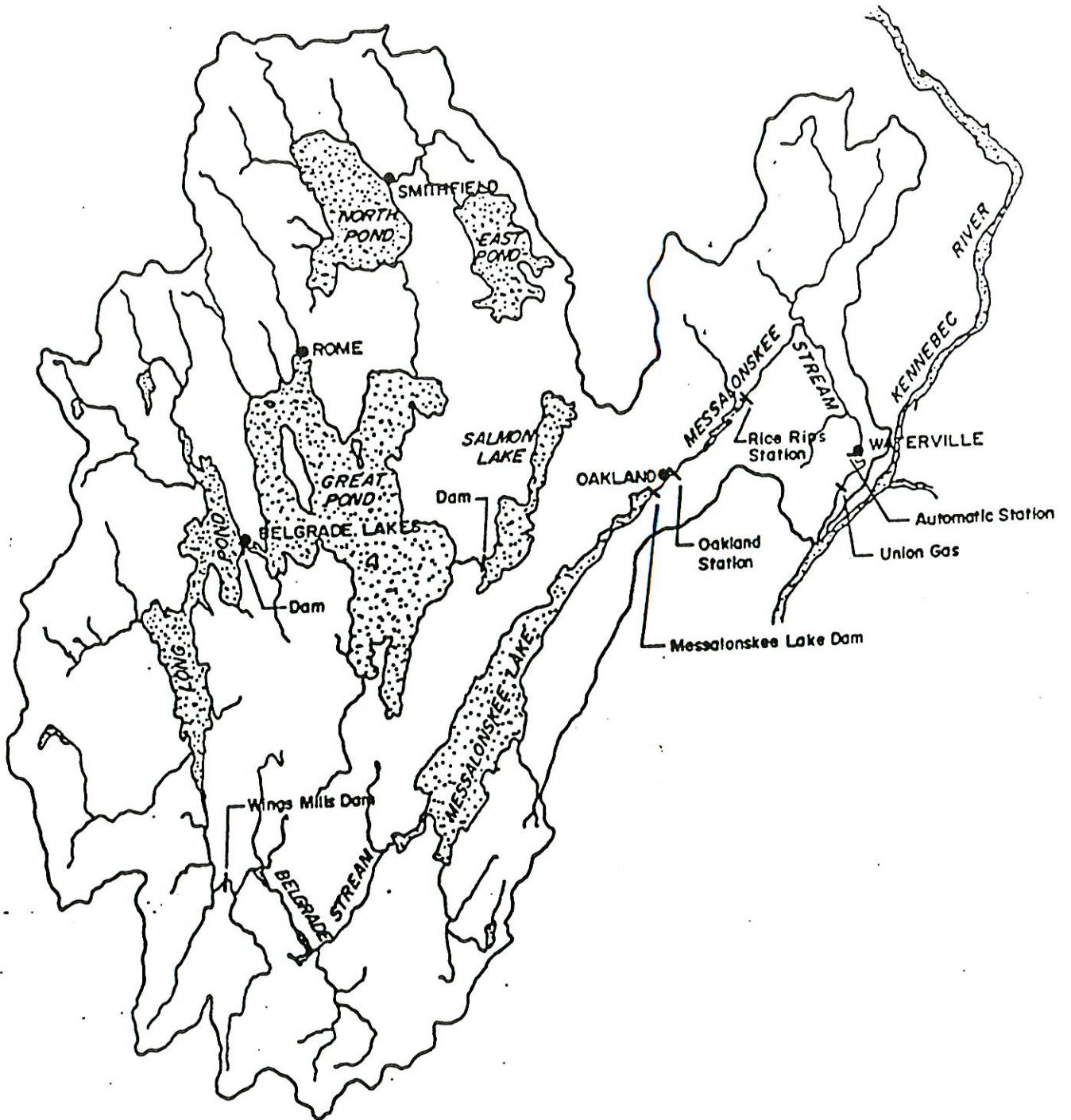
Surface Water Quality

“All rivers and streams in the State are assigned to one of four water quality classes (AA, A, B or C) which are water quality goals. The waters of the State are then assessed to determine whether or not they are meeting their water quality goals. This is done biannually by the Maine Department of Environmental Protection (DEP) which produces a report called the Integrated Water Quality Monitoring and Assessment Report.” (Source: Mary Ellen Dennis, DEP, Bureau of Land & Water Quality, Division of Environmental Assessment, May 6, 2014)

The DEP classifies the water quality of the Kennebec River as follows:



Waterville Comprehensive Plan
 Map 9-11
 Kennebec River Watershed



Waterville Comprehensive Plan
Map 9-12
Messalonskee Stream Watershed

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
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). The Kennebec Sewerage Treatment District (KSTD) discharges 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).

Waters Not Meeting Water Quality Goals

The Kennebec River is listed in DEP's Integrated Water Quality Monitoring and Assessment Report in two categories as follows:

Category 4-B: Rivers and Streams Impaired by Pollutants/Pollution Control Requirements Reasonably Expected to Result in Attainment-Kennebec River main stem from Sebecook River to Augusta [Cause-Dioxin]

Category 5-D: Rivers and Streams Impaired by Legacy Pollutants-Kennebec River main stem from Fairfield-Skowhegan boundary to Sebecook River [Cause-Polychlorinated biphenyls (PCBs)]

Two streams are likely to be listed as impaired in the next biannual Integrated Report:

Runnals (also known as Reynolds or Perkins) Stream: This stream originates in a large wetland near Marden's, crosses under KMD, Lincoln Street and Mayflower Hill Drive, and flows through Colby's Perkins Arboretum to the Messalonskee. A DEP water quality assessment conducted in 2012 determined that this Class B stream is not attaining aquatic life standards.

Hayden Brook: This stream originates off Industrial Road, runs under Armory Road, across the Mitchell School property, and into a pipe just north of High Street near Drummond

Avenue. “The upper part of the stream is largely impacted by high stormwater flows that have affected stream stability and degraded habitat.”

(Source: DEP, Water, Biological Monitoring Unit, 2014)

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 originating from the bedrock 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.

Water is cleansed by filtering through soil. Factors determining the amount of cleansing that will occur include soil type, thickness of the overburden, width of buffers, and whether or not the water becomes channelized.

Development increases the quantity and decreases the quality of stormwater runoff. Future development must meet the stormwater performance standards contained in both the City’s Subdivision and Site Plan Review Ordinance and the Maine Stormwater Management Law and Stormwater Rules. In addition, mitigation will be necessary to meet the water quality classification of the two already impaired streams, Runnals Stream and Hayden Brook.

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 9-12.5.) 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 9-12.5 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



**MAP 9-12.5:
Flood Prone Areas**

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 the company classified as to land cover 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 former 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.

Through the Site Location of Development permitting 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 former 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. See Map 9-8: Sand and Gravel Aquifers and Wetlands.

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 and Map 10-1 in Chapter 10: Existing Land Use show development by land use category. See also the aerial photograph of the city posted on the City of Waterville's web page.

Wildlife Habitat

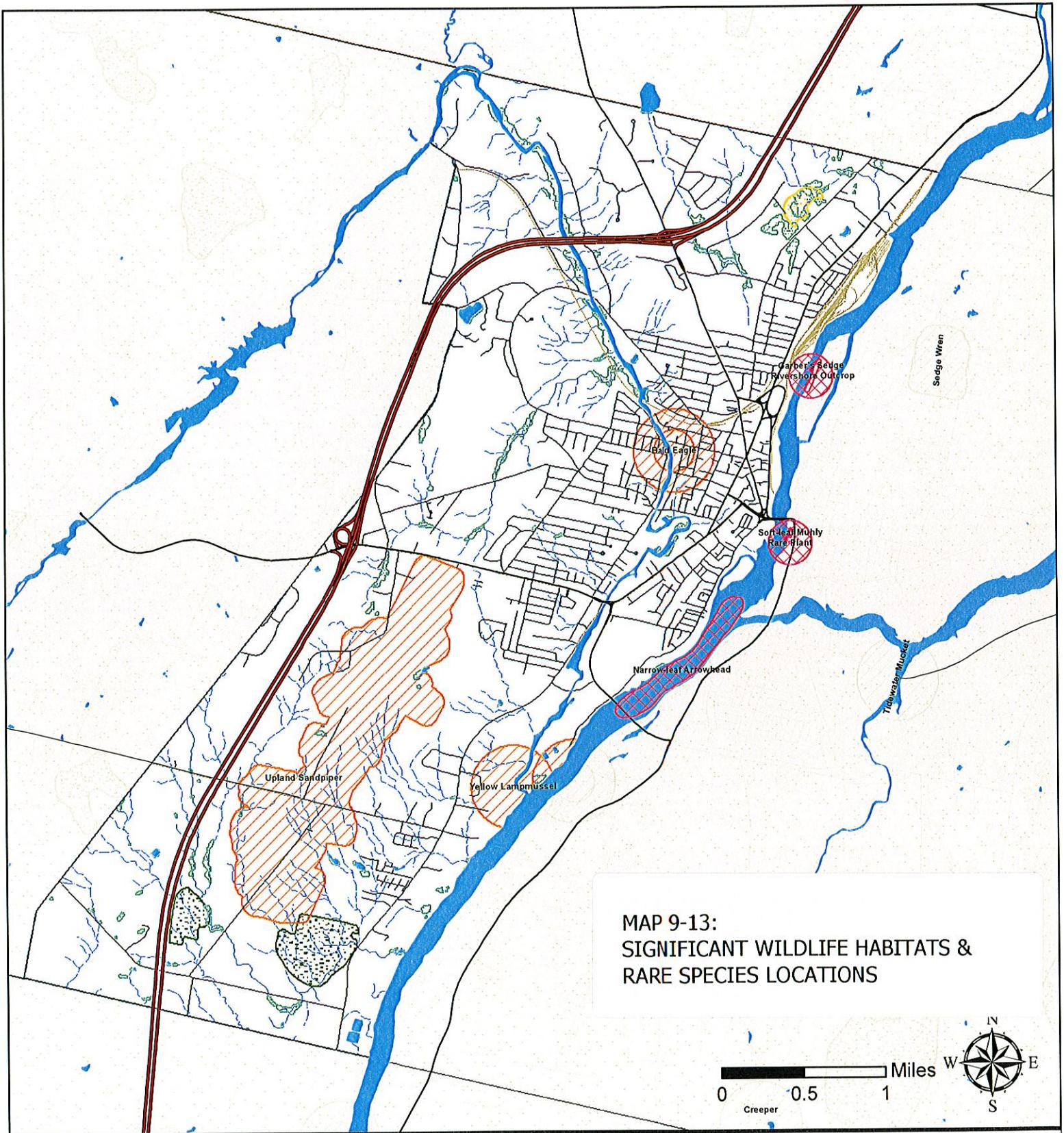
Preservation of habitat is the key to wildlife survival. Habitat must supply food, water, and shelter. A variety of habitat types, including open field and mature timber, are necessary to meet the habitat requirements of most wildlife species. Because different species have different habitat requirements, 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.

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.

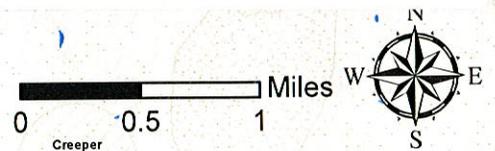
Vegetation in buffer strips along water courses provides cover for wildlife movement and maintains water temperatures critical to fish survival. Buffers also provide cover and food sources and protect water and air quality by filtering pollutants and preventing erosion. These buffer areas are protected by shoreland zoning and Natural Resources Protection Act (NRPA) regulations.

Maine IF&W identified a moderate value inland wading bird and waterfowl habitat in the wetlands off Drummond Avenue north of Armory Road. See Map 9-13. This habitat includes both open water and wetlands. As discussed on pages 9-10 and 9-11, the many functions of wetlands include providing nesting and feeding habitat for waterfowl.

IF&W has not completed a comprehensive survey of vernal pools in Waterville and therefore has not yet identified any significant vernal pools in the city. However, significant vernal pools likely are present here. DEP describes vernal pools or "spring pools" as "shallow depressions that usually contain water for only part of the year. They are often associated with forested wetlands." DEP's fact sheet, available on-line, states that vernal pools serve as essential



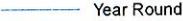
**MAP 9-13:
SIGNIFICANT WILDLIFE HABITATS &
RARE SPECIES LOCATIONS**



**City of Waterville
Kennebec County, Maine
Critical Natural Resources Map
2014 Comprehensive Plan**



Map Legend

- | | | |
|---|--|--|
|  | Rare Plants and Ecosystems | Streams |
|  | Rare Animals |  Year Round |
|  | Inland Wading Bird and Waterfowl Habitat |  Intermittent |
|  | National Wetland Inventory |  Rivers and Ponds |
|  | Deer Wintering Areas | |

Neither KVCOG nor the City of Waterville assume any liability for the data delineated herein. This map is intended for planning purposes only and does not represent a survey. Features may not always line up exactly due to multiple data sources.
Data Source: Maine Office of GIS, MIF&W, Revisions with Habitat Created 07-2014 by IWG

breeding habitat for species such as salamanders and frogs. Vernal pools are protected in accordance with State law.

Deer wintering areas identified by IF&W are shown on Map 9-13. 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. Because 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.

Permits Required

Deer wintering areas, inland wading bird and waterfowl habitat and significant vernal pools are defined and protected as significant wildlife habitat under the Natural Resources Protection Act. Certain activities within these areas may require a permit from the Maine DEP.

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. The IF&W currently stocks brook trout in the Messalonskee Stream. Wild brook trout also are found in many small tributaries in Waterville. Fish species found in Waterville are listed in Table 9-3 below.

Rare Wildlife

IF&W reports that there are three rare wildlife species known to be in Waterville. Bald eagles, a species of special concern in Maine, have a nest on the Messalonskee Stream. Upland Sandpipers, a threatened bird species, have been documented at the airport. Yellow Lampmussel, a threatened species, is known to inhabit the Messalonskee Stream. See map 9-13. Wildlife species found in Waterville are listed in Table 9-2.

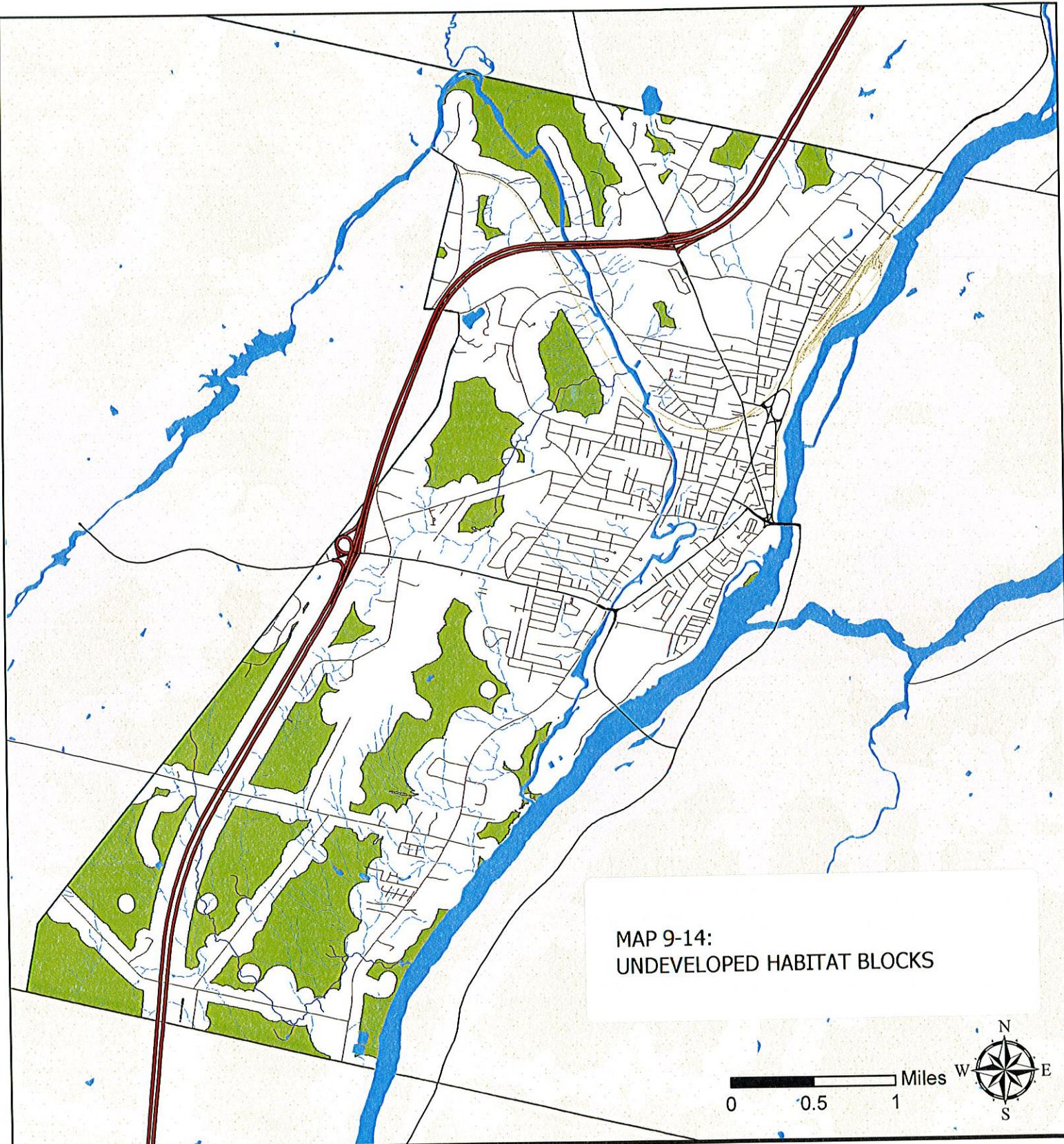
Rare Plants

Maine Department of Conservation's Maine Natural Areas Program (MNAP) has documented only one rare plant species in Waterville, Narrow-Leaf Arrowhead. The plant, which is found in the shallow waters of slow moving rivers, was identified in the Kennebec River in the area between its confluence with the Sebasticook River and the Carter Memorial Bridge. The Natural Areas Program lists its status as "special concern". Other rare plants are found nearby in Winslow. See Map 9-13. (Source: Beginning With Habitat web site.)

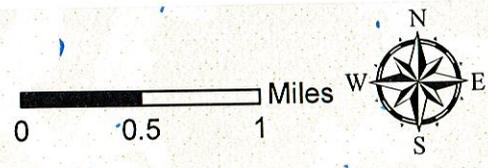
Undeveloped Habitat Blocks

In addition to the critical habitats, which include deer wintering areas, inland wading bird and waterfowl habitats, wetlands, significant vernal pools, rare wildlife, and rare plants, the Maine Department of Inland Fisheries and Wildlife (IF&W) recommends that sufficient areas of forest and agricultural open space be maintained. Undeveloped habitat blocks of more than 100 acres, buffers around roads and developed areas, and connectors between habitat areas are shown on Map 9-14. Those habitat blocks, with their approximate acreage noted, are listed north to south on Table 9-1.5.

Several methods exist to preserve large habitat blocks. Among those are acquisition of the land or conservation easements by the City or by trails and land conservation groups. The City also can encourage developers to cluster new development. See the cluster development regulations in the City's Zoning Ordinance.



**MAP 9-14:
UNDEVELOPED HABITAT BLOCKS**



**City of Waterville
Kennebec County, Maine
Undeveloped Habitat Blocks
2014 Comprehensive Plan**

Map Legend	
	Roads
	Undeveloped Habitat Blocks
	Rivers and Ponds
	Streams
	Year Round
	Intermittent



Neither KVCOG nor the City of Waterville assume any liability for the data delineated herein. This map is intended for planning purposes only and does not represent a survey. Features may not always line up exactly due to multiple data sources.
Data Sources: Maine Office of GIS, MIF&W, Beginning with Habitat Created 07-2014 by JWG

TABLE 9-1.5

LARGE HABITAT BLOCKS

LOCATION	APPROXIMATE NUMBER OF ACRES	OWNERSHIP/PROPERTY IDENTIFIER
North of Lincoln Street	147	Colby College, Central Maine Power (CMP), and others own this property. This land is west of Runnals (aka Reynolds) Stream.
Between KMD & Webb Road, East of the Airport	214	This area includes land of Faith Evangelical Free Church, the airport, Pine Ridge Recreation Area, and the City-owned former Runser Property, among other parcels.
Between KMD & Webb Road, West of the Airport	105	This area includes the City-owned land that wraps around a runway and through which the extension of Airport Road to Webb Road is likely to run. It also includes a second parcel zoned Industrial and a parcel zoned Rural-Residential which is bisected by a CMP easement.
Between Webb Rd and Trafton Rd & between I-95 and Eight Rod Rd	174	This habitat block includes three parcels owned by Trafton Realty LLC, one zoned Rural Residential (127 acres) and two farther south zoned for commercial development.
Between Webb Rd and Trafton Rd & between the Oakland town line and I-95	290	The southerly portion of the City's landfill, portions of the Colford and Brown family properties, and a CMP easement comprise this habitat area.
Between Webb Rd and Trafton Rd & West River Road and Eight Rod Road	279	This area drains into Trafton Brook before it flows under West River Road to the Kennebec River just south of Thomas Drive.

Source: Property ownership is from the City Assessor's database. Acreage and selected locations are described using Map 9-14: Undeveloped Habitat Blocks which was generated by Joel Greenwood of KVCOG using a Beginning with Habitat map by the Maine Dept. of Inland Fisheries & Wildlife, April 2014.

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

Bald Eagle, Upland Sandpiper, 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, Ruffed Grouse, 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

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.

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.