

APPENDIX A3 NATURAL RESOURCES

(December 2, 2004)

An understanding of the Town of Sanford's natural resources and the forces which created them is a key component in determining both the limitations and opportunities for the future use of the land. The Town's natural resources are both visible (rivers, lakes, wetlands, plants and animals) and hidden (groundwater, air quality, and soil conditions) and may be quite large or relatively small.

Sanford/Springvale is a series of interrelated natural systems, defined by watersheds, surface and groundwater, soil conditions, vegetation patterns and fisheries and wildlife habitats. Understanding the Town's natural resources is key to identifying and protecting areas of sensitivity and guiding development into areas most appropriate for growth.

The Town's natural systems provide a series of limitations on how the land resource can and should be used. In some cases, these limitations can be overcome by careful design or the use of technology. For instance, the lack of suitable soils for septic systems can be overcome by the installation of public sewers. At the same time, an understanding of these natural systems and the issues they create allow the community to make wise decisions about when the use of technology makes sense and when the natural limitations should be respected.

A. Geologic History

The Town's landform as we know it today is a product of the glaciers. In general terms, Sanford/Springvale consists of a broad, level plain which extends across the entire southern portion of the community (and continues into Kennebunk, Wells, and North Berwick). This plain narrows as it extends northward up the Mousam River Valley and becomes enclosed between Shaw's Ridge on the northeast and Mount Hope, Hanson's Ridge, and Deering Ridge on the southwest. This plain and ridge system are a product of the last glacial age.

At least four separate ice sheets advanced and retreated over parts of North America during the last million years. These glaciers sculpted and resculpted the landscape. The last glacier entered Maine about 20,000 years ago and reached its maximum incursion about 12,800 years ago.

Glaciers both destroy and build as they sculpt. On the one hand, they strip soil and rock from the bedrock and gouge and chisel the landscape. On the other hand, they transport soil and heap it into hills or deposit it across the land. This sculpting depends in part on how soft or hard the bedrock is.

The Town's landform is the result of these glacial processes. The glacier carved the landsurface creating the bedrock ridges and valleys which underlay the community. Then as the glacier retreated, the material that had been accumulated in the ice was deposited and in many cases, modified by glacial meltwater, producing the landscape and soil types we see today.

B. Soil Associations

The Town's major soil associations are a direct product of the area's geologic history. The town is comprised of five soil associations as a result of these geologic processes (Figure A3-1). A soil association is a distinct pattern of soil types, topography, and drainage. Each association forms a unique natural landscape. The five soil associations found in Sanford/Springvale are:

1. The Adams-Colton Association

These soils were formed in materials deposited by glacial meltwater and are found primarily on outwash plains, kame terraces, and eskers. The Adams soils have a surface layers of loamy sand and are underlain by sandy material. The Colton soils have a surface layer of gravelly loamy coarse sand and are underlain by gravelly material. Both soils have rapid or very rapid permeability. Because of the rapid permeability, contamination of the groundwater is a concern in these soils. Large areas of the Adams-Colton association are found in Sanford/Springvale. Both of the Great Works and Mousam River Valleys and much of the area along the Kennebunk and Wells town lines have soils of this type.

2. The Naumberg-Croghan Association

These soils were formed in materials deposited by glacial meltwater and are located primarily on outwash plains and deltas. The Naumberg soils are somewhat poorly drained to poorly drained, have a surface layer of sand and are underlain by sandy material. The Croghan soils are moderately well drained, have a surface layer of loamy sand, and are underlain by sandy material. Both soils have a high water table in the spring and fall, and both have rapid or very rapid permeability. The high water table and rapid permeability make groundwater contamination a major concern. Major areas of the Naumberg-Croghan Association are found in the area of the Sanford Airport and extending eastward toward Estes Lake and northward in the area between the lake and Route 109.

3. The Skerry-Brayton-Becket Association

These soils were formed mostly in coarse-textured, compact glacial till and are located on drumlins and glaciated uplands. The Skerry soils are moderately well-drained and nearly level to sloping. The Brayton soils are somewhat poorly drained to poorly drained, and nearly level to gently sloping. The Becket soils are well

drained and gently sloping to moderately steep. All three soils have a surface layer of fine sandy loam and are underlain by a compact substratum. The soils have moderate permeability in the surface layer and subsoil and slow or moderately slow permeability in the substratum. The Skerry and Becket soils have a coarser textured substratum than the Brayton. This association is located in scattered locations throughout Sanford. A major area of the association is found around Mount Hope, while smaller areas are found at the corners in South Sanford and at Allen Hill.

4. The Marlow-Brayton-Peru Association

These soils were formed in moderately coarse textured, compact glacial till and are found on drumlins and glaciated uplands. The Marlow soils are well drained, the Brayton soils are somewhat poorly drained to poorly drained, and the Peru soils are moderately well drained. All three soils have a surface layer of fine sandy loam underlain by a moderately coarse textured, compact substratum. The soils have moderate permeability in the surface layer and subsoil and slow permeability in the substratum. In York County these soils are widely used for hay, pasture, orchards, strawberries, and blueberries. In Springvale, this association is found primarily on Hanson's Ridge and Deering Ridge.

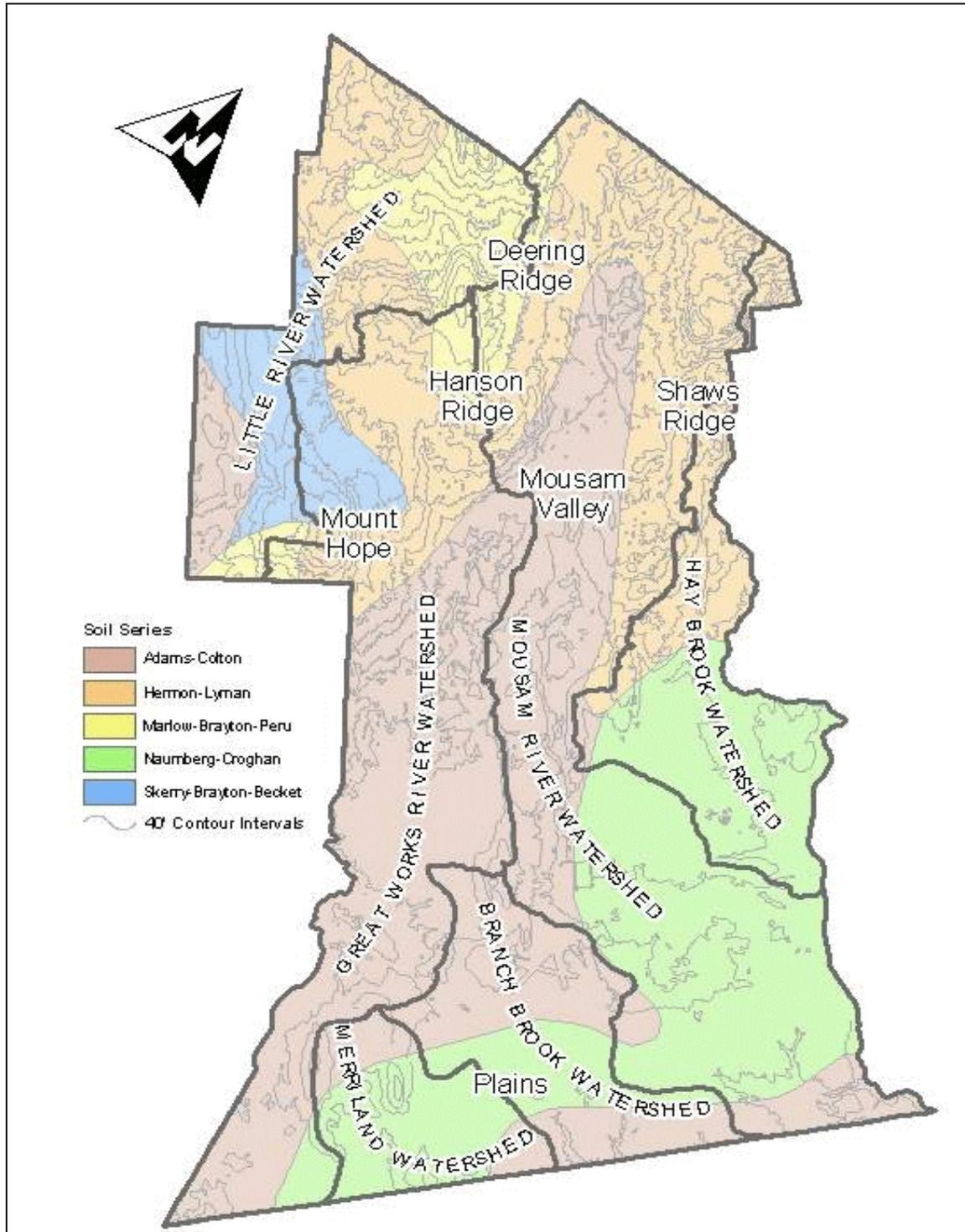
5. The Hermon-Lyman Association

These soils were formed in friable glacial till and are located on plains, hills, and ridges. The Hermon and Lyman soils are droughty during the growing season. The Hermon soils have a surface layer of fine sandy loam underlain by gravelly and sandy material. The Lyman soils have a surface layer of fine sandy loam underlain at a shallow depth by bedrock. The Hermon soils have rapid permeability, and the Lyman soils have moderately rapid permeability. The shallow depth to bedrock of soils in this association can be a constraint for many uses. In Sanford this association is found in the northeast corner of the community (Shaw's Ridge and Beaver Hill) and in the western areas between the ridges and hills.

C. Landform and Watersheds

Topography is the general lay of the surface of the land measured in elevation above sea level. In Sanford/Springvale, the elevation of the land ranges from approximately 160 feet near Old Falls Pond to more than 670 feet atop Mount Hope (Figure A3-1).

Figure A3-1. Landforms, Watersheds and Soil Series



The topography of the land defines the watersheds of a community. A watershed or drainage basin is the area of land within which all water falling on the land ultimately drains to a single water body. The watersheds are separated by watershed boundaries, which are the divides created by the high points of land which separate one watershed from another. Using watersheds as a basis from which to start, land forms and land uses within the town can be examined and their impact on development patterns analyzed.

While the majority of the land of the town is located in two major watersheds, the Mousam River and the Great Works River, portions of the town are located in the Branch Brook Watershed, the Merriland Watershed, the Hay Brook Watershed, and the Little River Watershed.

1. The Mousam River Watershed

The Mousam River is formed by the outlet from Mousam Lake in Shapleigh. The river runs through Springvale and the center of Sanford, ultimately becoming Estes Lake and then continuing into Kennebunk via the Old Mill Pond. The watershed drains the central area of the community and contains much of the built-up area of Sanford and all of the developed area of Springvale. The upstream portion of the watershed extends from Shaw's Ridge and Beaver Hill across to Hanson's Ridge. As the watershed moves south of the Downtown Sanford, the western watershed boundary is located approximately along Main Street (Route 109). Generally, areas east of Main Street drain into the Mousam, while areas west of Main Street drain to Goodall Brook and the Great Works River. In South Sanford, the watershed turns to the east and includes the area behind the industrial park.

2. The Hay Brook Watershed

Hay Brook is a tributary of the Mousam River and forms much of the boundary between Alfred and Sanford. Areas in the north end of the community which are east of Shaw's Ridge drain directly into the brook. As the brook proceeds downstream, the width of the watershed expands to include most of the area along Grammar Road and New Dam Road, including the Trout Pond and Canes Brook area. Most of the land within this watershed is undeveloped, except for scattered development along the roads and the mobile home parks near Trout Pond.

3. The Great Works River Watershed

The Great Works River begins in the wetlands between Hanson's Ridge and Mount Hope, proceeds southeasterly to Bauneg Beg Pond, and continues on into North Berwick. Goodall Brook is a tributary of the Great Works and drains the westerly side of the downtown area of Sanford. Most of the area on the westerly side of Route 109 south of downtown lies in the Great Works River Watershed. The series of ponds, including Curtis Pond and Sand Pond, are located in this watershed.

4. The Little River Watershed

The Little River rises in Acton and flows southerly through Lebanon and Berwick before emptying into the Salmon Falls River upstream of Berwick Village. A substantial area in the northwest part of Sanford/Springvale is within the Little River Watershed, including the Deering Pond and Deering Ridge areas and the areas west of Hanson's Ridge and Mount Hope. Drainage in this area is provided by a network of small streams. Most of the land within this watershed is undeveloped, although there has been a considerable amount of subdivision activity in this area.

5. The Branch Brook Watershed

Branch Brook begins at the small pond on the northerly side of Lion Hill in South Sanford. The brook proceeds under the airport and enters Wells just east of Route 109. Branch Brook serves as the principal water supply for the Kennebunk, Kennebunkport, and Wells Water District. The watershed of Branch Brook in Sanford includes the airport area, the industrial areas along Route 109, as well as much of the industrial park and the residential neighborhood along Route 99. While most of the watershed is undeveloped, a large amount of the land within the watershed is committed to airport and industrial/commercial uses.

6. The Merriland River Watershed

The Merriland River rises in the area between the airport and Sanford Country Club. The river enters Wells approximately midway between Route 109 and Ell Pond. The watershed extends approximately from Route 109 at the town line to the Country Club and along the northerly side of Allen Hill.

D. Surface Waters

The surface waters of the community play a variety of roles. The Mousam River historically was the source of energy which resulted in the development of Springvale and Sanford. Today, the river plays an important role as a recreational resource and as the receptor of the community's treated waste effluent. In the past, Littlefield Pond was a source of drinking water for the community (and is now an emergency source of public water) and Branch Brook is the source of supply for neighboring towns. In the future, surface waters may become important again as a supply source for Sanford/Springvale. The other streams, rivers, ponds, and lakes play important roles as recreational and visual resources. This section looks at the surface water resources of Sanford/Springvale and their current water quality (Figure A3-2).

The State of Maine has established a water quality classification system which allows the State to manage the State's surface water based upon standards for designated uses such as drinking water supply, fishery habitat, and recreational use. The State assigns a water classification to each water body which designates the minimum level of quality for its intended use. Classifications range from AA to C for fresh surface water sources, with AA being the highest classification.

Development and land use can impact surface water quality in several ways. Improperly functioning septic systems may cause bacteria to contaminate surface waters. Poor agricultural practices can result in nutrient loading to ponds and lakes. Construction and development may result in faster runoff because of paving, increasing the possibility of erosion and siltation to water bodies. The first step in managing the community's surface waters is to understand the systems that exist and their existing quality and the factors that influence their quality.

1. Mousam River Watershed

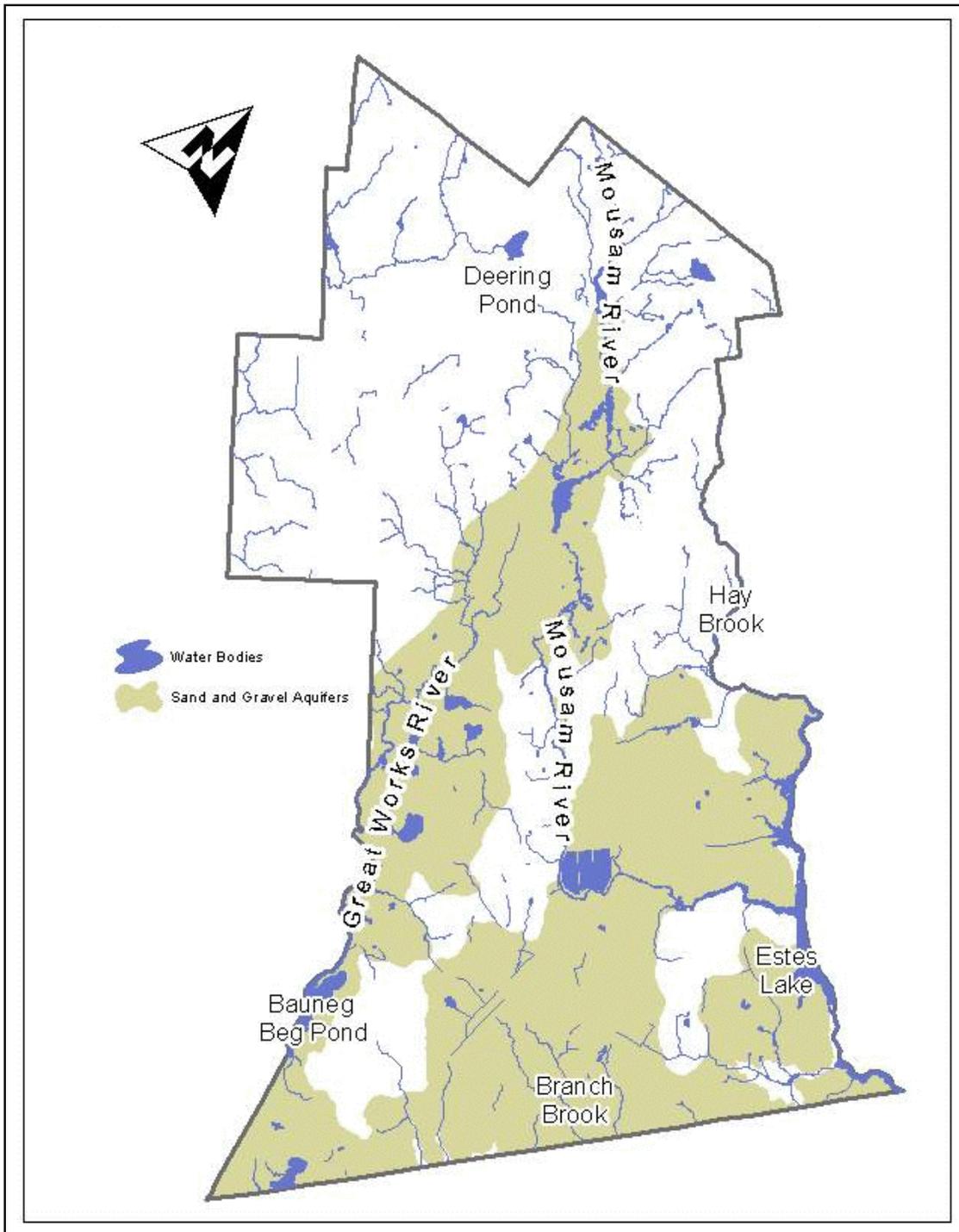
The Mousam River is the principal surface water in the Mousam River Watershed. The river is formed by the outlet from Mousam Lake in Shapeleigh. Through the developed portions of Springvale and Sanford, the river is a series of impoundments created by the mill dams. Below Downtown Sanford, the river is free-flowing until it enters Estes Lake, an impoundment of the river. The Sewerage District's sewage treatment plant is adjacent to this section of the river, and the treated effluent is discharged into the river. Below Estes Lake, the river is free-flowing for a short distance until it is impounded to form Old Falls Pond on the Kennebunk town line.

The Mousam River has two classifications. From Shapeleigh to above Mill Pond in Springvale it is a Class B river. Through the developed portions of Springvale and Sanford and past the treatment plant, it is a Class C river. Below Estes Lake the river returns to Class B status. The many tributaries of the Mousam River are considered Class B waters.

2. Hay Brook Watershed

Hay Brook, a major tributary of the Mousam, is the principal surface water in this watershed. The brook begins in a small pond in Alfred, east of Beaver Hill, and forms the boundary between Sanford and Alfred along much of its length.

Figure A3-2, Surface Waters and Groundwater Aquifers



3. Great Works River Watershed

The Great Works River Watershed contains a number of significant water bodies. The Great Works River rises in the wetland between Hanson's Ridge and Mount Hope and flows southeasterly. The river is joined by Goodall Brook just outside of Downtown Sanford. In addition, there are a number of small streams which are tributary to the river. The Great Works River drains to the south and enters the Salmon Falls River below South Berwick. It is considered a Class B river by the State.

The Watershed also contains a number of lakes and ponds. The largest of these in Bauneg Beg Pond, an impoundment of the Great Works River. The water quality of Bauneg Beg Pond has improved in the last decade and has been removed from the State's nonattainment list (it now meets the State's standards for water quality).

4. Little River Watershed

Surface waters in this watershed consist of a number of small streams and Deering Pond. No water quality data is available in this watershed.

5. Branch Brook Watershed

The surface waters of this watershed consist principally of Branch Brook and a number of small streams which are tributary to the brook. Branch Brook literally runs underneath the Sanford airport. The water quality of Branch Brook is Class A.

6. Merriland River Watershed

The surface waters of this watershed are limited to three small streams which are tributary to the Merriland. The water quality of the Merriland River is Class A.

E. Groundwater

The groundwater which is present both in sand/gravel deposits and in the bedrock is an extremely valuable resource for the community. In the Town of Sanford, the groundwater is the source of supply for both the public water system (Sanford Water District) and individual, private wells (Figure A3-2). In addition, the groundwater is a source of replenishment for surface water bodies. This resource is increasingly at risk from various sources of contamination such as agriculture, hazardous substances, leaking underground storage tanks, road salting, salt storage facilities, septic systems, etc. While the potential for contamination is greater for sand and gravel aquifers, it is also a concern for bedrock aquifers.

1. Mousam River Watershed

A major sand and gravel aquifer underlies much of the Mousam River Watershed. Much of the developed portion of the downtown area of Sanford/Springvale is located over this aquifer. In addition, the aquifer extends under much of this watershed in the South Sanford area. The Sanford Water District has the majority of its active wells located within this watershed. The main well field, the Cobb stations and the Cyro stations are all located in this watershed.

2. Hay Brook Watershed

A substantial portion of this watershed, which is south of Route 4, overlays a sand and gravel aquifer. The Water District's Grammar Road Station is located on the boundary between the Hay Brook and Mousam Watersheds.

3. Great Works River Watershed

Much of the central portion of the Great Works River Watershed, including the developed areas along Goodall Brook and the Curtis Lake/Sand Pond area, overlay a sand and gravel aquifer. The Water District's new well off the Old Mill Road is located within this watershed, as is the well site off the Country Club #2 Road. The North Berwick Water Supply also has its wells located within the portion of the watershed in North Berwick.

4. Little River Watershed

There are no identified sand and gravel aquifers in this watershed.

5. Branch Brook Watershed

The vast majority of the land area within this watershed overlays a large sand and gravel aquifer which extends into Wells and Kennebunk. This aquifer plays a major role in maintaining flow in Branch Brook, the supply for the Kennebunk, Kennebunkport and Wells Water District. The Sanford Water District has identified a possible future well site in this watershed off Route 109 near the Sam Allen Road.

6. Merriland River Watershed

The Merriland River Watershed is underlain by sand and gravel aquifers on both the east side along the boundary with the Branch Brook watershed and along the town line with Wells.

F. Threats to Water Quality

The Town's surface waters and groundwater are both vulnerable to manmade and naturally occurring activities which constitute potential threats to the quality of the water. An understanding of these potential threats will allow the Town to make wise decisions about the use of land which influences the water quality of these resources.

1. Mousam River Watershed

There are a number of potential threats to the quality of the surface waters and groundwater within the Mousam River watershed.

Potential threats to surface waters include:

- X accumulated sediments from the Mill Ponds, municipal stormwater runoff from the highly developed portion of the watershed,
- X the public works facility and adjacent former dump,
- X the Sewerage District's sewage treatment plant,
- X nutrient-rich surface water runoff from residential and nonresidential development,
- X inadequate septic systems adjacent to Estes Lake,
- X mill development adjacent to the river with potential for discharges and accidents.

Potential threats to the groundwater include:

- X extensive development within the well recharge areas of the Water District's main well field and Cobb stations,
- X migration of river water into the groundwater as a result of pumping at the Water District's main well field,
- X the Town's public works complex, including an uncovered salt storage pile,
- X industrial uses in South Sanford over a sand and gravel aquifer,
- X other industrial uses,
- X gravel pit operations,
- X agricultural uses.

2. Hay Brook Watershed

This watershed is relatively free of major potential threats to water quality. The only significant potential threats are inadequate septic systems and the runoff of nutrient-rich surface drainage from agricultural and residential use contributing to cultural algae problems in Estes Lake. Protection of the well recharge area

surrounding the Water District's New Dam Road station is a concern.

3. Great Works River Watershed

The potential threats to surface waters and groundwater in the Great Works River Watershed are relatively minor. Extensive development in the Goodall Brook basin results in the potential for contamination of surface water from stormwater drainage and sewer pump station bypasses. The potential for problems with inadequate septic systems and nutrient-rich surface runoff from residential uses contribute to algae problems in the various lakes and ponds. This is a particular concern for Ell Pond and Bauneg Beg Pond. Protection of the well recharge areas for the Water District's new well sites will be a future concern.

4. Little River Watershed

There are no significant threats to water quality of streams in this watershed. Control of nutrient loading to Deering Pond will be important to maintaining the water quality of this pond, with particular attention to the impacts of nutrient rich runoff from residential development.

5. Branch Brook Watershed

The major potential threat to the water quality in this watershed is the location of major nonresidential uses including industrial uses, the industrial park and the Sanford airport over the sand and gravel aquifer which serves as the source of water for Branch Brook.

6. Merriland River Watershed

There are no significant potential threats to waters quality in this watershed, but the watershed is significant as a major tributary to the coastal wetlands which are part of the Rachel Carson National Wildlife Refuge and the Wells Estuarine Research Reserve.

G. Wetlands

Wetlands are transition zones between terrestrial and aquatic ecosystems where the water table is at or near the surface of the land is covered by shallow water. The definition used by the Environmental Protection Agency (EPA), Army Corps of Engineers (COE), and State of Maine is as follows:

"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that at under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands usually include swamps, marches, bogs, and similar areas.”
–*Army Corps of Engineers*

Implicit in this definition are three parameters which characterize most wetlands. First, the land supports a plant community dominated by hydrophytes (water loving plants). Hydrophytes include obligate wetland species such as cattails, as well as plants which are equally adaptable to wet or dry soils, such as red maple. Second, undrained hydric (wetland) soils are present. Hydric soils have colors or textures which indicate prolonged saturation during the growing season. Third, the soils is generally saturated at or near the surface for a week or more during the growing season.

The definitions of wetlands includes a wide range of wetland types, ranging from deep marshes which are permanently covered with shallow water to stands of red maple and white pine which may have saturated soils for only a brief time during the growing season. The following types of wetlands are found in Sanford/Springvale:

- X **Deep Fresh Marshes** have standing water throughout the growing season and are usually dominated by cattails or other emergent vegetation.
- X **Shallow Fresh Marshes** have standing water for a portion of the growing season and commonly support a mix of cattails, sedges, grasses, rushes, and scattered shrubs.
- X **Wet Meadows** are dominated by hydrophytic grasses, sedges, and rushes but seldom have standing water.
- X **Shrub Swamps** are usually characterized by dense growth of alders, winterberry, highbush blueberry or several species of viburnum. Often transitional in wetness between marshes and forested wetlands, shrub swamps may be found along the margins of streams as inclusions in forested wetlands.
- X **Forested Wetlands** range from red maple swamps which commonly have pools of standing water during the early growing season to dense stands of white pine and red spruce growing in sandy soils with a fluctuating water table.
- X **Bogs** are nutrient-poor wetlands characterized by sphagnum moss and many species of the heath family such as leatherleaf, rhodora, bog laurel, labrador tea, and cranberry. Insectivorous plants such as sundew and pitcher plants are also commonly found in bogs.

Wetland protection regulations are based on the premise that wetlands provide many species important economic and ecological benefits. These benefits usually fall into three broad but closely interrelated categories: biological productivity, water resources, and cultural values.

Biological benefits include fish and wildlife habitat or nutrient export which supports

productive and diverse food webs. Freshwater marshes which are interspersed with open water are examples of highly productive wetland ecosystems which are essential to many fish and wildlife species including waterfowl. Other wetland types, such as shrub swamplands and forested wetlands, provide habitat for fewer water-dependent species but probably support a greater diversity of songbirds than any other wetland type (Golet and Larsen, 1974).

Water resource values include groundwater discharge, stream flow maintenance, flood prevention, water quality maintenance, and shoreline protection. Wetland-groundwater interactions are highly complex and variable, and are influenced by many factors, including soils, underlying geology, topography, and landscape position. In general, wetlands are located in areas of groundwater discharge, although wetlands located on coarse sandy soils may be important recharge areas during summer months. Discharging groundwater helps sustain downstream aquatic ecosystems.

Wetlands help control flooding in two ways. Headwater wetlands act as storage basins which release water slowly to feeder streams, thus helping maintain even stream flows and temperatures. During storm events, wetlands help spread the peak flow volume over a longer period of time. Large floodplain wetlands lower in the watershed also prevent flooding by storing water as rivers spill over their banks. Dense vegetation within floodplain wetlands also tends to impede water movement, thereby increasing effective storage capacity.

Wetlands have been shown to be important in maintaining water quality. Nutrients and chemical contaminants in surface water and discharging groundwater may be taken up by wetland plants or settle out and become bound in wetlands sediments. Sediments carried by surface water may settle in wetlands as stream flow slows or be filtered by dense vegetation. By reducing the flood flow velocity, wetlands help prevent downstream erosion.

Humans directly use and receive many cultural and economic benefits from wetlands. Recreational uses, such as nature study, hunting, fishing, and boating are widely recognized.

Wetlands also provide open space and aesthetic values. While not offering impressive vistas, forested wetlands present the visitor with a rich mosaic of trees, shrubs, ferns, and delicate wildflowers. Wetlands often provide open space buffers between developed areas in what otherwise might have become a continuously developed area.

Wetlands have historically provided important economic values. When agricultural economics dominated New England, wetlands were important for timber and hay production. Forested wetlands are still important producers of spruce-fir timber in northern New England but generally produce lower value forest products such as

firewood. Natural wetland meadows were very valuable hay sources to the early settlers, and some wet meadows are still managed for hay production.

The National Wetlands Inventory provides an inventory of the significant wetlands in Sanford (Figure A3-3).

1. Mousam River Watershed

The Mousam River contains a significant amount of wetlands. In the downstream part of the watershed, there are a number of large wetlands, including Perkins Marsh, Stanley Marsh, and the large wetland northeast of the sewage treatment plant. This part of the watershed also has numerous wetlands along the various streams. In the central part of the watershed, there are significant areas of wetland adjacent to the river and between the river and Route 109. The upstream portion of the wetland is pocked with numerous, small isolated wetlands.

2. Hay Brook Watershed

This watershed contains major areas of wetland associated with Canes Brook. A moderately sized wetland is located at the head of the brook. A large wetland is located on the south side of Canes Brook in the vicinity of Trout Pond, while a second large wetland is located at the confluence of Canes Brook with Hay Brook. This wetland extends upstream along Hay Brook for a considerable distance. There are also a number of small, isolated wetlands scattered throughout the watershed.

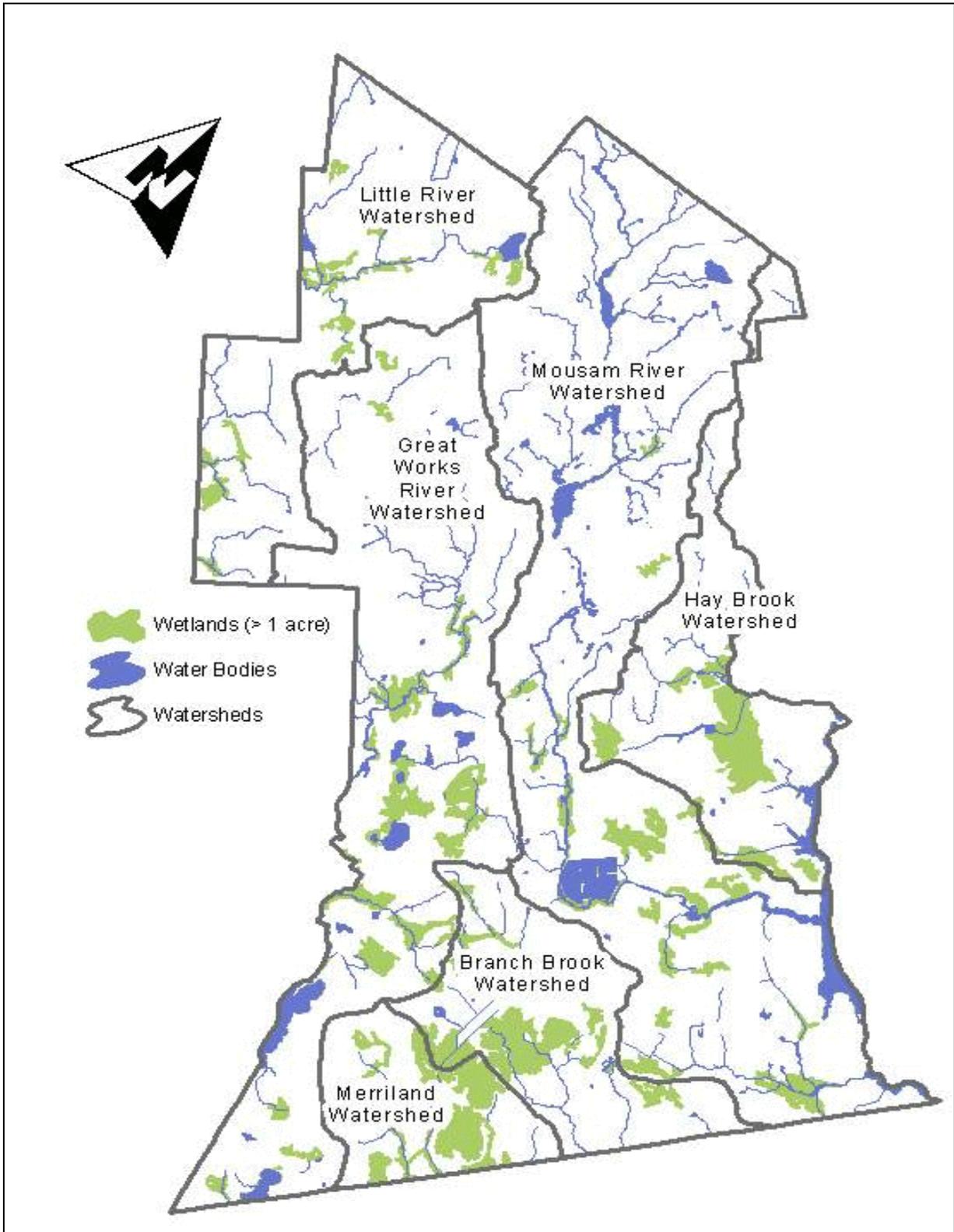
3. Great Works River Watershed

The Great Works River Watershed also contains a significant amount of wetlands. The river originates in a moderate size wetland located between Hanson's Ridge and Mount Hope. At the confluence of the river and Goodall Brook there are significant wetland areas. Throughout the upstream portion of the watershed, there are numerous, small wetlands. In the central portion of the watershed there are large area which are identified as wetlands. In the area extending from Route 4 to the river between Curtis Lake and Sand Pond there is an extensive series of wetlands. There are two other large wetlands on the south side of the North Berwick Road. In the lower end of the watershed, there are a number of small isolated wetlands in the area between Ell Pond and Bauneg Beg Pond.

4. Little River Watershed

There are significant wetlands in the Little River Watershed. Major wetlands are located on the south and west sides of Deering Pond and along the stream which is the outlet from the pond. There are scattered smaller wetlands along the branches of the stream system and on the backside of Mount Hope.

Figure A3-3. Wetlands Greater than One Acre



5. Branch Brook Watershed

There are two large wetland systems in the Branch Brook Watershed. A major wetland is located to the south of the airport which extends into the Merriland River watershed. This is the largest concentration of wetlands in Sanford. There is also a series of wetlands on both sides of Route 109 to the south of Route 99.

6. Merriland River Watershed

There are a number of significant wetlands in this watershed in addition to the wetland shared with the Branch Brook Watershed. A large wetland is located between Sam Allen road and the Wells town like. There are also significant wetlands associated with the streams leading to the Merriland River.

H. Floodplains

Floodplains are mostly flat areas adjacent to rivers, streams, and ponds which are periodically inundated. The Federal Emergency Management Agency (FEMA) has produced maps of the 100 year floodplain. This is the area that has a 1% chance of being flooded during any year.

Improper use, filling, and development within the floodplain created the potential for property damage, downstream contamination, and increasing flooding.

1. Mousam River Watershed

A well defined 100 year floodplain exists along the Mousam. In many areas the floodplain is narrow, conforming closely to the river. There are, however, a number of areas with extensive areas in the floodplain. These areas include the Gowen Park area, the old dump area, areas on both sides of the river downstream of School Street, and areas near and downstream of the sewage treatment plant. There is a limited amount of developed land within the floodplain.

2. Hay Brook Watershed

This watershed contains significant areas that are within the 100 year floodplain. A narrow floodplain exists along the length of the brook, widening as it approaches Canes Brook. The floodplain extends upstream along Canes Brook and includes the marsh to the east of Trout Pond. A large floodplain also exists along the upper reaches of Estes Lake, including developed areas along the lake.

3. Great Works River Watershed

A 100 year floodplain exists along the river and along Goodall Brook. The floodplain is relatively narrow except in the following areas:

- X the wetland at the head of the river,
- X the area between the river and fishing pond,
- X the area between Curtis Lake and the North Berwick Road.

There is little development within the Great Works floodplain.

4. Little River Watershed

The 100 year floodplain in the Little River Watershed is limited to the area around Deering Pong and the major streams tributary to the Little River. The floodplain along these streams is generally narrow.

5. Branch Brook Watershed

There are no significant floodplains in the Branch Brook watershed.

6. Merriland River Watershed

There is a 100 year floodplain along the main tributary of the river, which broadens out into the wetland at its head.

I. Steep Slopes

Slope is a term for the general lay of the land and is the ratio of vertical rise of the land to horizontal distance. Slope is expressed as a percentage. Slope is a factor to be considered in determining areas suitable for developing since areas with steep slopes (those exceeding 15%) have limitations for on-site sewage disposal, require more difficult and expensive roads and utilities, have greater potential for erosion, and may be subject to slumping if they are disturbed. When steep slopes are adjacent to water bodies, erosion can result in siltation and have adverse effects on water quality.

Most of Sanford/Springvale has slopes of less than 15%. There are only a few areas which have any significant amount of land with slope greater than 15%. These areas include:

- X the northeasterly side of Mount Hope,
- X the westerly end of Hanson's Ridge,
- X scattered areas on Deering Ridge,

- X areas across from the middle school along the easterly side of Hanson's Ridge,
- X areas around Beaver Hill,
- X scattered areas along river and stream banks including the westerly side of the Mousam River through Springvale.

J. Fisheries and Wildlife Habitat

The availability of high quality habitat for fish and wildlife is essential to maintaining an abundant and diverse population for both ecological and sport purposes. The Town of Sanford has a number of areas which offer quality habitat for a variety of species (Figure A3-4).

The Maine Department of Inland Fisheries and Wildlife (IF&W) has assessed the value of habitats in Sanford/Springvale. IF&W has considered these areas of special concern because of their importance as recreational resources and their economic importance to the region and the State. Aquatic habitats and the areas immediately adjacent are among the most sensitive to change and vulnerable to degradation.

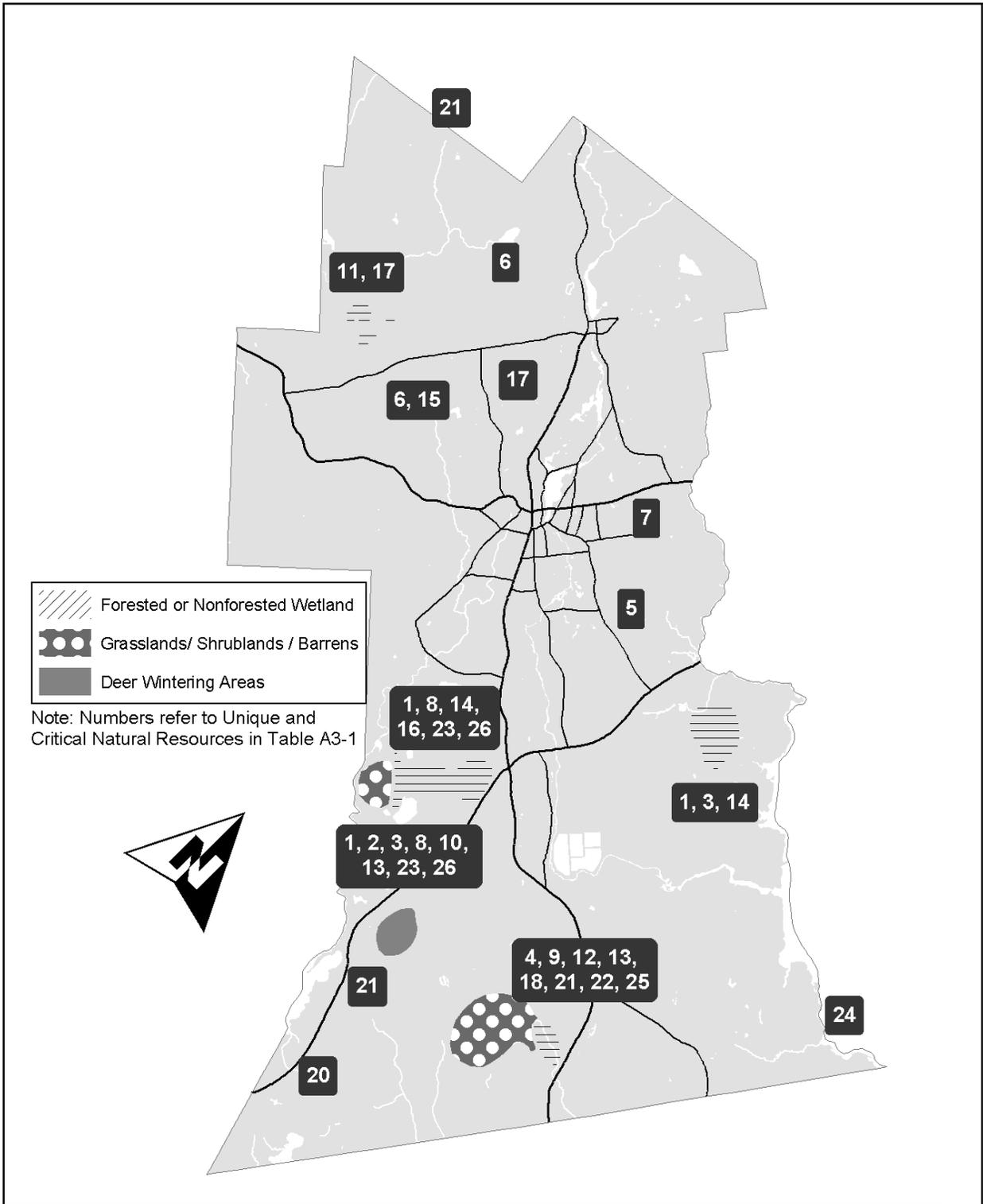
The uplands adjacent to wetlands, streams, and other water bodies, known as the riparian zone, help to protect water quality by filtering groundwater of excess nutrients and sediment before it reaches a water body, maintaining water temperature, and contributing vegetation and invertebrates to the food chain of the aquatic ecosystem. Riparian habitats also are a valuable cover type and serve as an important travel corridor for many species. Land clearing or other forms of development within the riparian zone can degrade the habitat value of water bodies by destroying or altering these functions. Other important wildlife habitats in Sanford/Springvale include:

- X deer wintering areas,
- X grasslands/shrublands/barrerns,
- X freshwater forested and non-forested wetlands, and
- X waterfowl/wading bird habitat,

1. Mousam River Watershed

The Mousam River Watershed contains a number of significant resources. The section of the Mousam above Springvale, the Mill Pond, Stump Pond, Number 1 Pond, the area upstream of the old dump, the area downstream of the sewage treatment plant, and Estes Lake are all rated as having medium value as fisheries. Waterfowl/wading bird habitat is located west of William Oscar Emery Park Drive in the Number 1 Pond, along the Mousam River between Downtown and Route 4, and adjacent to Old Falls Pond. In addition, Littlefield Pond and Perkins Brook are rated as high value fisheries.

Figure A3-4. Unique and Critical Natural Resources



2. Hay Brook Watershed

Hay Brook is rated as medium value as a fishery. Between New Dam Road and Bernier Road is a valuable forested/non-forested wetland.

3. Great Works River Watershed

The Great Works is rated as a high value fishery, with Curtis Lake, Picture Pond, Little Long Pond, Sand Pond, Bauneg Beg Pond, and Ell Pond are all rated as medium value fisheries. Wading bird/waterfowl habitat is located throughout this watershed. Interspersed among these ponds are important forested/non-forested wetlands and grassland/shrubland/barrens. The only identified deer wintering area in Sanford is located in the wetland north of Bauneg Beg Pond. These wetlands provide habitat for an intense concentration of threatened and endangered species, as well as species of special concern.

4. Little River Watershed

Deering Pond is identified as a medium value fishery. The area around the pond was used as an environmental study area by the former Nasson College and has continuing value as a natural resource area. Rare pocket swamps in the watershed below Hanson's Ridge and wading bird/waterfowl habitat on the stream below Deering Pond are important wildlife features.

5. Branch Brook Watershed

Branch Brook (south of the airport) is identified as a high value fishery. The grasslands in and around the airport provide excellent habitat for several endangered and threatened grassland species, including the grasshopper sparrow and the upland sparrow. A pitch pine-heath barren is located in this watershed.

6. Merriland River Watershed

The Merriland River watershed is identified as a medium value fishery. A pitch pine-heath barren forms the headwaters of the Merriland River.

**Table A3-1.
Unique and Critical Natural Resources, Sanford/Springvale**

Note: This table replaces the table in the 2002 version which is deleted in its entirety

Species, Ecosystem	Rarity	Status	Map Reference
Spotted Wintergreen	S1	Endangered	16
Yellow-Eyed Grass	S1	Endangered	19
Hessel's Hairstreak	S1	Endangered	23
Eastern Box Turtle	S1	Endangered	24
Great Rhododendron	S1	Threatened	6
Pitch Pine-Heath Barren	S1	N/A	9
Atlantic White Cedar Bog	S1	N/A	2
Pitch Pine-Scrub Oak Barren	S1	N/A	10
Grasshopper Sparrow	S1B	Endangered	25
Northern Black Racer	S2	Endangered	21
Blanding's Turtle	S2	Endangered	N/A
Eastern Joe-Pye Weed	S2	Threatened	4
Atlantic White Cedar	S2	Special Concern	1
Small Reed Grass	S2	Special Concern	13
Hollow Joe-Pye Weed	S2	Special Concern	7
Fern-Leaved False Foxglove	S2	Special Concern	5
Pocket Swamp	S2	N/A	11
Atlantic White Cedar Swamp	S2	N/A	3
Swamp Saxifrage	S3	Threatened	17
Spotted Turtle	S3	Threatened	N/A
Spicebush	S3	Special Concern	15
Smooth Winterberry Holly	S3	Special Concern	14
Wiegand Sedge	S3	Special Concern	18
Ribbon Snake	S3	Special Concern	26
Sassafras	S3	Special Concern	20
Upland Sandpiper	S3B	Threatened	22
Wood Turtle	S4	Special Concern	N/A

Species, Ecosystem	Rarity	Status	Map Reference
Red Maple Swamp	S4	N/A	12
Leatherleaf Bog	S4	N/A	8
Sandy Lake-Bottom	S5	N/A	N/A

Rarity: S1- critically imperiled in Maine because of extreme rarity or vulnerability to extirpation
S2- imperiled in Maine because of rarity or other factors that make it vulnerable to decline
S3- rare in Maine
S4- apparently secure in Maine

Status: Endangered- rare, in danger of being lost from Maine in the foreseeable future, or federally listed as endangered
Threatened- rare and, with further decline, could become endangered, or federally listed as threatened
Special Concern- rare in Maine, but not sufficiently rare to be considered endangered or threatened

L. Scenic Resources

1. Hanson’s Ridge and Deering Ridge

Some of the Town’s most extraordinary scenic resources are along the ridge that separates the Mousam River, Great Works River, and Little River Watersheds. This confluence of ridge lines occurs in the northwestern part of town, in the vicinity of Hanson’s Ridge Road.

Hanson’s Ridge both offers spectacular views over the Mousam River valley and is itself an important scenic resource. Its high plain (reaching nearly 600 feet in elevation), fertile soils, and long-time farmlands provide a sense of peace and local history that are part of the town’s character, past and present. The scenic value has been altered by a subdivision, whose wide, straight roadway parallels Oak Street.

Moving north, the ridge line drops and meets Deering Ridge, which again rises to 600 feet and above. Through the low point between the two ridges runs the former Boston and Maine rail bed, now used as a recreational pathway. Deering Ridge does not have the plateau of Hanson’s Ridge, but its views are equally impressive. Indeed, the views back and forth between the two ridges are as enjoyable as those to the Mousam River Valley.

2. Mount Hope

Mount Hope separates the Great Works River and Little River Watersheds. The land rises steeply from east to west 670 feet. There is then an extended ridge to the west along Route 202. This area has spotty development, including communications towers atop Mount Hope, but offers vistas over the Little River as well as Downtown and the Mousam River.

3. Deering Pond and Littlefield Pond

Deering Pond, at the headwaters of a tributary to the Little River, has an undeveloped shoreline and, as previously mentioned, is a significant natural resource for its wildlife and surrounding woodlands, as well as its scenic views. Littlefield Pond is perched in the rolling topography above Springvale, between Elm Street and Littlefield Road. The rolling topography itself is scenic, as is the pond.

4. Mousam River

The Mousam River, particularly its dams and the resulting ponds and waterfalls, provides important urban scenery that is enjoyed by thousands of residents each day. Major public roads cross or pass by the ponds– Mill Pond, Stump Pond, and Number 1 Pond– that break up the urban landscape. The public views from these vantage points, as well as nearby recreational areas, are a valued part of living in Sanford and Springvale.

Downstream, refreshing views can be had of the Mousam River and Estes Lake where New Dam Road crosses between them; and, in the southeastern corner of town, of the river and Old Falls Pond from the Witchers Road crossing.

M. Issues and Implications

- X The ridges surrounding the developed areas of Sanford and Springvale have significant areas of shallow to bedrock soils. This constraint will make the extension of sewer and water service into these areas difficult and costly.
- X Water quality in Estes Lake has dramatically improved as a result of advances levels of treatment at the sewage treatment plant. While the major source of phosphorous in the lake is the sewage treatment plant, further activities to control nutrient loading to the lake from surface runoff and poorly functioning septic systems may be desirable to assure that future algae problems are minimized.
- X The water quality in many of the Town's ponds, including Bauneg Beg Pond, Ell Pond, Curtis Lake, Sand Pond, and the small ponds in the Great Works River watershed are vulnerable to degradation due to increased phosphorous levels and possible algae problems. Activities to control nutrient loading to these water bodies may be desirable.
- X Branch Brook is the source of supply for the Kennebunk, Kennebunkport, and Wells Water District. The watershed of the brook probably includes Sanford airport and development in the area of the airport. Development in this area is important to the Town's economic base. Therefore, there is a need to

- balance the Town's interest in seeing further development in this area with the regional interest of water supply protection.
- X The continued existence of combined sewers is a potential water quality problem, despite the progress that has been made. The Town and Sewerage District should work together to continue separating combined sewers to allow the remaining combined sewer overflows to be discontinued.
 - X The Sanford Water District relies on groundwater from sand and gravel aquifers to supply the public water system. Extreme care must be taken to protect the recharge areas of these wells from contamination. Careful regulation of the use of land in these recharge areas will be necessary to balance the need to protect the public water supply with the rights of private property owners within these areas.
 - X The location of the Town's airport and industrial areas over a large sand and gravel aquifer presents the potential for contamination of the groundwater in this area. The Town should consider regulations which assure that new developments in this area incorporate safeguards which reduce the risk of groundwater contamination and protect the groundwater.
 - X The Town contains significant areas of wetlands. These areas are unsuitable for many uses, and some areas have value as fisheries and wildlife habitat. The Town may want to restrict the alteration or filling of identified wetlands to protect against unsound development and to maintain their value as habitat.
 - X Much of the mapped 100 year floodplain in Sanford/Springvale is undeveloped. Unwise use of the floodplain creates the potential for property loss, contamination of the water and increased flooding due to damming action. The Town should consider restricting development in floodplains and regulating activities in these areas to prevent contamination, to minimize property damage, and to assure that flooding of upstream properties is not increased.
 - X The Town contains significant areas in which soil conditions limit the installation of septic systems. The Town should consider restricting new, unsewered development in these areas and should direct growth away from these parts of the Town unless sewers are available or feasible.
 - X The ability of the soils to accommodate on-site sewage disposal varies greatly. The density of development in areas outside of the sewer service area should be tied to the suitability of the soil for septic systems.

- X The Town contains only a very limited amount of prime farmland soils. Only a portion of these areas are in current agricultural use.
- X The riparian zone adjacent to the Town's rivers and streams play an important role in their value as fishery and wildlife habitat. The Town should consider working to retain naturally vegetated buffers along stream segments that have high or medium value as fishery or wildlife habitat.
- X The Town contains significant fisheries and wildlife habitat that is not protected under current regulations. The Town should consider working to protect these resources, especially areas that have high concentrations of threatened and endangered species.