Sandy Lake - Marsh Lake Lands and Jack Lake Land Assembly:

an Environmental Inventory, Analysis and Synthesis

Prepared by

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for

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Fall 2001

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Acknowledgements

The author would like to acknowledge the following people and organizations for their assistance, advice and support during the preparation of this report.

Professors Patricia Manuel and John Zuck of Dalhousie University

Curt Speight of Land Information Services in Amherst, N.S.

Classmates in EP 1 Studio

Representatives of the Sandy Lake Area Residents Association

Halifax Regional Municipality for providing base maps and source maps at 1:25,000 scale, and for supporting some costs incurred in the project

Stephen, Celina, Kendal and Stuart Thompson

Summary

The Sandy Lake - Marsh Lake Lands and the Jack Lake Land Assembly are 26.5 square kilometers of mainly forested lands to the west of Bedford, Nova Scotia. The south and west portions of the study area include some unserviced residential subdivisions, light industrial land and recreational properties, but the central region comprises a relatively natural landscape of woodlands, lakes, streams and wetlands that is crossed by power corridors. The Sandy Lake Residents Association anticipates future development in the area, which is immediately adjacent to the rapidly urbanizing areas of Bedford and Sackville in the Halifax Regional Municipality. The residents group is concerned with the impact of development in the watershed lands on water quality. Sandy Lake is a residential and recreational area and a source of drinking water. Marsh Lake is a wetland with good potential for wildlife habitat; it also filters water and controls flow volume as it discharges to the Sackville River. The association is also interested in protecting mature tree stands.

Water quality in watershed lands is maintained by natural processes and structures: for example, wetland vegetation filters pollutants, and roots of vegetation in stream riparian zones anchor soil and glacial till to prevent erosion and sedimentation. Disturbance of natural structures such as steep slopes adjacent to watercourses may result in water quality lowered beyond the capacity of the natural processes in the watershed to restore. This, in turn, has an impact on the health of the wetland habitats and of the residents who use the lakes for recreation and as source of drinking water.

This project was carried out by students of the Nova Scotia College of Art and Design, Environmental Planning Studio 1, for the Sandy Lake Area Residents Association. Its purpose was to prepare an inventory of environmental attributes that influence water quality, to analyze the information, and to develop a synthesis of this knowledge to understand how to maintain water quality in the valued habitats of wetlands and watercourses. The synthesis produced a picture of the sensitivity of these natural areas to development. Mature forest stands are included in the consideration of sensitivity because they contribute to the biodiversity of the area, .

The synthesis outlines two zones of protection for the valued habitats: one of highest priority, in which development is very difficult without causing damage to the habitats, and a second zone, in which there is significant potential for damage to the habitats by development.

Little of the present development in the area impacts directly on the valued habitats and protection zones. Future development could be directed into areas where there is little chance of harming the wetlands and watercourses and their water quality, and the valued habitats could be retained as part of an open space plan. Where development is unavoidable in these sensitive areas, precautions taken during construction and in property maintenance may reduce the environmental impact. Existing development that occurs in protection zones, wetlands or watercourses should be examined to determine whether it is harming the ecological health of the watershed lands. Along with monitoring water quality, the Residents Association may consider a detailed habitat inventory that includes forest stands and an investigation of the viability of Sandy and Marsh Lakes as habitat for Atlantic salmon.

Introduction

The Sandy Lake - Marsh Lake Lands and the Jack Lake Land Assembly constitute a relatively natural area within an increasingly urbanized region. Development in the form of large lot, upscale residential subdivisions, light industrial districts, highways and commercial strips surrounds the area. Within the study area, the Hammonds Plains, Lucasville and Kearney Lake Roads are lined with ribbon development. The Residents Association is concerned with this burgeoning development and the effect it will have on the capacity of the watershed to maintain the quality of the water entering Sandy and Marsh Lakes. Lowered water quality affects not only the health of the wetland habitats, but also impacts on human well being. Sandy Lake is a source of drinking water and a recreational area for swimming and fishing. Homeowners along the shore are concerned about water level variations as well as deterioration of water quality. The Marsh Lake wetland habitat is in the lower reaches of the watershed and, thus, vulnerable to impact from development throughout the watershed. The residents value the scenic beauty of the lake areas, and they appreciate and wish to preserve mature tree stands. These stands are aesthetically pleasing, and although small in size, they are the sole representatives of mature forest habitat in the area, and may be a seed source to expand forest biodiversity.

Because the outflow from this watershed joins the Sackville River, which is currently being restored as a spawning area for Atlantic salmon, water quality in this watershed has an influence beyond its boundaries. The wetlands in this watershed help buffer the Sackville River from flooding, and the Jack Lake bog helps maintain water quality and water levels in Paper Mill Lake in Bedford.

The objectives of the Environmental Planning Studio 1 of the Nova Scotia College of Art and Design were: to investigate, document and interpret the biophysical and land use characteristics of the Marsh Lake-Sandy Lake Lands and the Jack Lake Land Assembly; to understand the natural processes, biophysical structures and land uses that affect the ecological health and water quality of the watershed that contains Sandy and Marsh Lakes; to identify areas sensitive to development; and to make recommendations that will assist the Sandy Lake Area Residents Association in their environmental stewardship of the land.

The project approach to the environmental inventory, analysis, and synthesis was informed by the goals of maintaining water quality in the watershed and conserving the habitats of wetlands, watercourses and mature forest. We followed the environmental planning method of inventory, overlay and synthesis developed by Ian McHarg.[1]

1. Ian McHarg, *Design With Nature* (New York: Garden City Publishing, 1969).

Inventory

We compiled an inventory of biophysical and land use characteristics, documented through a series of maps. A written description of each resource inventory is included in the Appendix. The project group used both primary and secondary source material. Previously mapped soil, geological, and elevation data were the sources for the inventories of elevation, slope, geology, soils, hydrology and climate. We made several visits to the site. A studio interpretation of aerial photographs followed by ground truthing was the source of information on habitats. We obtained land ownership information from the Halifax Land Information Centre.

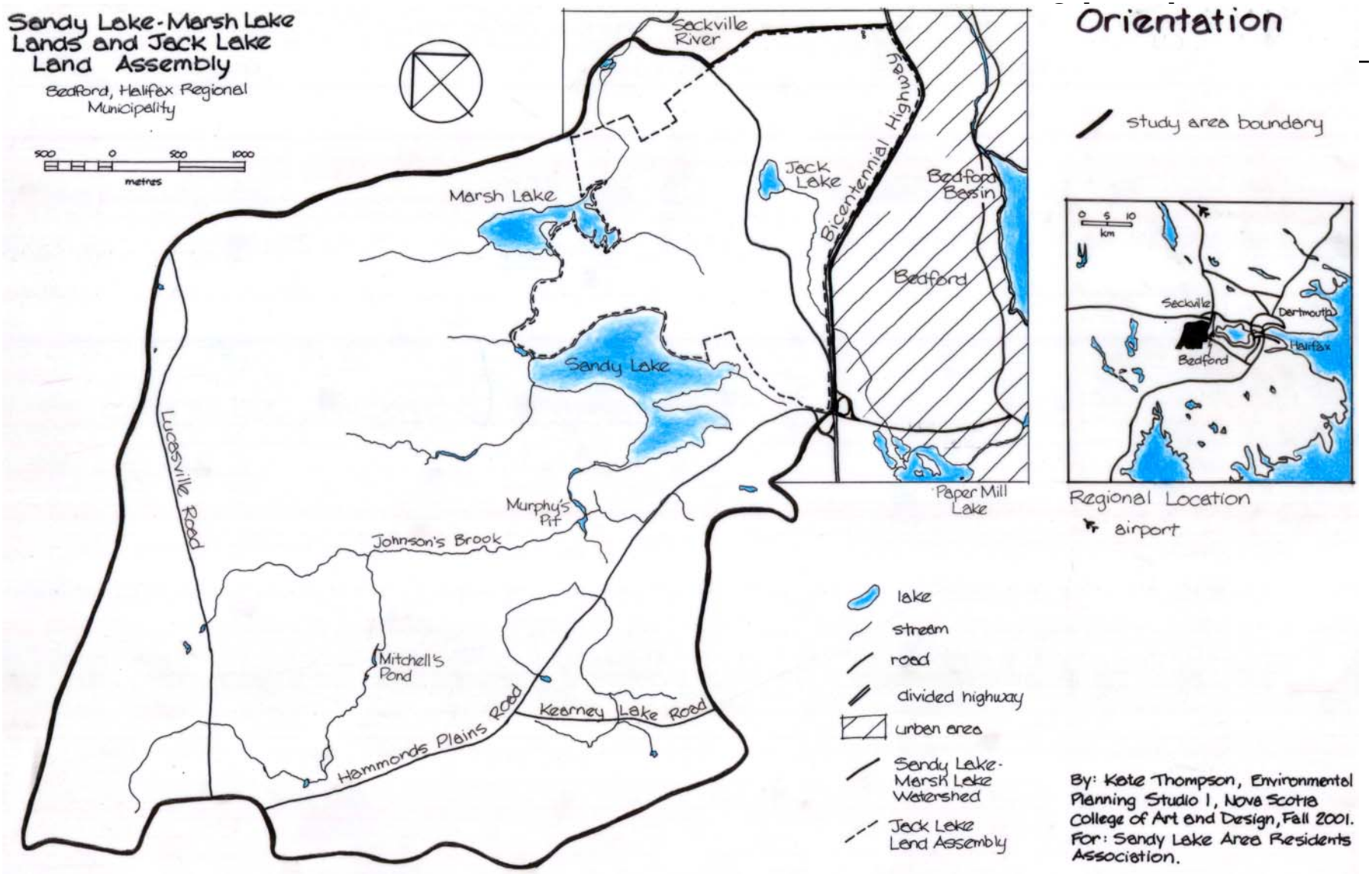
Analysis

We interpreted each inventory element by examining constraints and opportunities with respect to development, thus gaining an understanding of the relationship between land use

and environmental resource characteristics. Each inventory map is followed by a written description and an interpretation of land capability for development.

Synthesis

The purpose of the synthesis was to combine information from the inventory and analysis to produce a picture of areas sensitive to development. We overlaid inventory maps of slope, hydrology, and surficial geology, and bedrock geology to identify valued habitats of wetlands and watercourses and two zones of protection for the habitats. Specific rules of combination that defined each habitat and sensitivity zone are described in the synthesis section that follows.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bicentennial Highway
Jack Lake
Bedford Basin
Marsh Lake
Bedford
Sandy Lake
Lucasville Road
Murphy's Pit
Paper Mill Lake
Johnson's Brook
Mitchell's Pond
Hammonds Plains Road
Kearney Lake Road
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
Orientation
study area boundary
0 5 10
km
Sackville
Dartmouth
Halifax
Bedford
Regional Location
airport
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.

Site Description

The site is located to the northwest of Bedford, as shown in the inset on the orientation map. Most of the study area encompasses a watershed draining though a tributary of the Sackville River and containing the low-lying Sandy and Marsh Lakes. Numerous streams originating in the upland areas drain into the lakes. The Jack Lake Land Assembly includes some land outside of the Sandy Lake-Marsh Lake watershed that drains directly into the Sackville River, or, through Jack Lake, into Paper Mill Lake and the Bedford Basin.

The overall rise of the land to the west of Sandy and Marsh Lakes is interrupted by several small knolls, but generally the land is flat or gently sloping. Some slopes of significant steepness occur on drumlin hills surrounding the lakes; these hills provide pleasant vistas of the lakes and surrounding forests.

Quartzite bedrock of the Goldenville Formation underlies the eastern area, while slate of the Halifax Formation underlies a smaller upland area to the west. Thin quartzite and slate till covered with soils that are generally well drained and have low fertility support extensive forests. Because of frequent cutting and burning in the past, the forest communities are in varying stages of succession, so a variety of forest types exist. Generally, black spruce stands grow in poorly drained sites; mixed softwood and hardwood forests grow on slopes; and hardwood stands grow on well drained upland sites. Some areas are covered by rejuvenating clear cuts and old fields. In wet areas, sphagnum moss and shrubs grow in bogs, and there are small areas of marsh vegetation. Other vegetation includes small stands of mature forest (over 80 years), and a hemlock grove on a peninsula in Sandy Lake.

The area has a Maritime climate with cool summers and mild wet winters; precipitation is high throughout the year. Slopes are mostly south and east facing. Prevailing winds are from the south in summer and from the northwest in winter.

In the area of Sandy Lake, the largest lake, there are recreational and year round homes, a private school and a large dairy operation. The lake is used for recreational fishing, boating, and swimming; it is also a source of drinking water for some residents. A public use park including a parking lot, walking trails and a beach area is currently under construction on the west side of the lake.

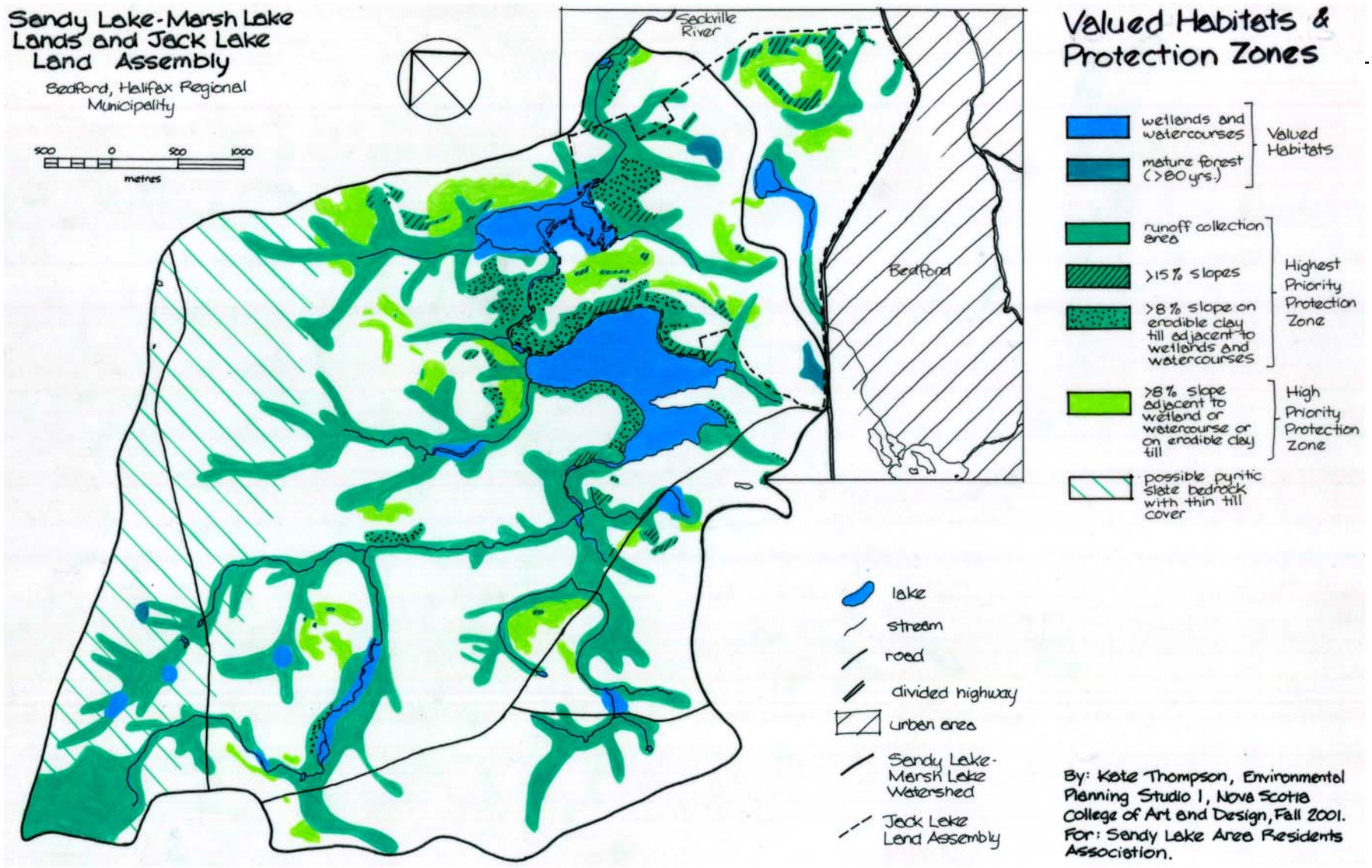
The outflow from Sandy Lake drains north into Marsh Lake, in the lowest reaches of the watershed. Marsh Lake is a wetland habitat of bog, shrub swamp, marsh and open water that is also surrounded by drumlins. It is relatively isolated from most human use, except for a nearby power substation that is connected to several power lines running through cleared corridors.

Jack Lake, a bog set in high hilly terrain to the east of the other lakes, is the headwater for Paper Mill Lake in Bedford. An extensive hiking and biking trail system occupies the area around Jack Lake, extending to Sandy and Marsh Lakes.

South of Sandy Lake and extending back from Hammonds Plains Road are a small industrial park and unserviced, large lot residential subdivisions. Houses, a mobile home park, an abandoned quarry, and a theme park extend back from the Lucasville Road.

A divided highway to Halifax defines the eastern perimeter and separates the study area from the urbanized area of Bedford. The main water transmission line to Halifax from Pockwock Lake to the north runs through the western part of the study area.

Publicly owned lands are located in the eastern portion of the area; large corporate holdings dominate the central area, and small individual holdings make up the remaining area.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Valued Habitats & Protection Zones
wetlands and watercourses
mature forest (>80 yrs.)
Valued Habitats
runoff collection area
>15% slopes
>8% slope on erodible clay till adjacent to wetlands and watercourses
Highest Priority Protection Zone
>8% slope adjacent to wetland or watercourse or on erodible clay till
High Priority Protection Zone
possible pyritic slate bedrock with thin till cover
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.

Synthesis

Understanding that some development is inevitable, the Residents Association would like to see development directed into areas of least impact to the health of the watershed, thus conserving areas of natural habitat and providing for public recreational use. Since the Association values mature tree stands as valued habitats, they are included in the synthesis.

In order to maintain the water quality in all wetlands and watercourses, they need to be protected as valued habitats, along with their shores, banks and the surrounding riparian vegetation for at least 30 meters. Mature tree stands are also valued habitats. The wetlands and watercourses are sensitive to damage from:

- infilling
- sedimentation from erosion
- pollution including nutrient loading from commercial fertilizers, pesticides, salt, hydrocarbons from road runoff and acidification from exposed pyritic slate bedrock
- destruction of the riparian vegetation that provides shade to help regulate water temperature, anchors soil to slow flow and help prevent flooding, filters pollutants, and provides energy inflow and nutrient balance.

The first task in the synthesis was to identify areas of value that need to be protected: mature forest stands and wetlands and watercourses.

Our interpretation of the inventory of environmental resource components revealed constraints to development as they affected these valued habitats. The interdependence between components, for example, slope steepness and erodibility, is accounted for in the synthesis.

To plan for responsible development that minimizes damage to these valued places, yet allows for human occupation and recreational use, we suggest two zones of protection: highest priority, in which it would be very difficult to develop without causing damage to the habitats; and high priority, in which there is significant potential for damage to the habitats. The third zone might be included in the highest priority, depending on analysis of the underlying bedrock.

1. Zones of highest priority protection include all areas of:
    - runoff collection, including the riparian zones and any organic soil. Vegetative growth in areas of water concentration filters pollutants from runoff before it is discharged into the watercourses.
    - steep slopes (>15%). Since most of the watershed is covered with erodible glacial till, all steep slopes are vulnerable to erosion if vegetation is removed, or if construction disturbs the surface.
    - moderate or greater slopes (>8% to 15%) on erodible till with a clay matrix (Lawrencetown) and adjacent to wetlands and watercourses. There is a high risk of sedimentation and resulting ecological damage to water bodies from this type of silty material.
2. Zones of high priority protection include all areas of
    - slopes >8% to 15% adjacent to wetlands or watercourses on any till material other than Lawrencetown. Although less silty and erodible than Lawrencetown till, other tills still present a risk of erosion and sedimentation.
    - slopes >8% to 15% in any area of Lawrencetown till (not necessarily adjacent to wetlands and

watercourses) because eroded silt may be transported from other areas of the watershed into wetlands and watercourses.

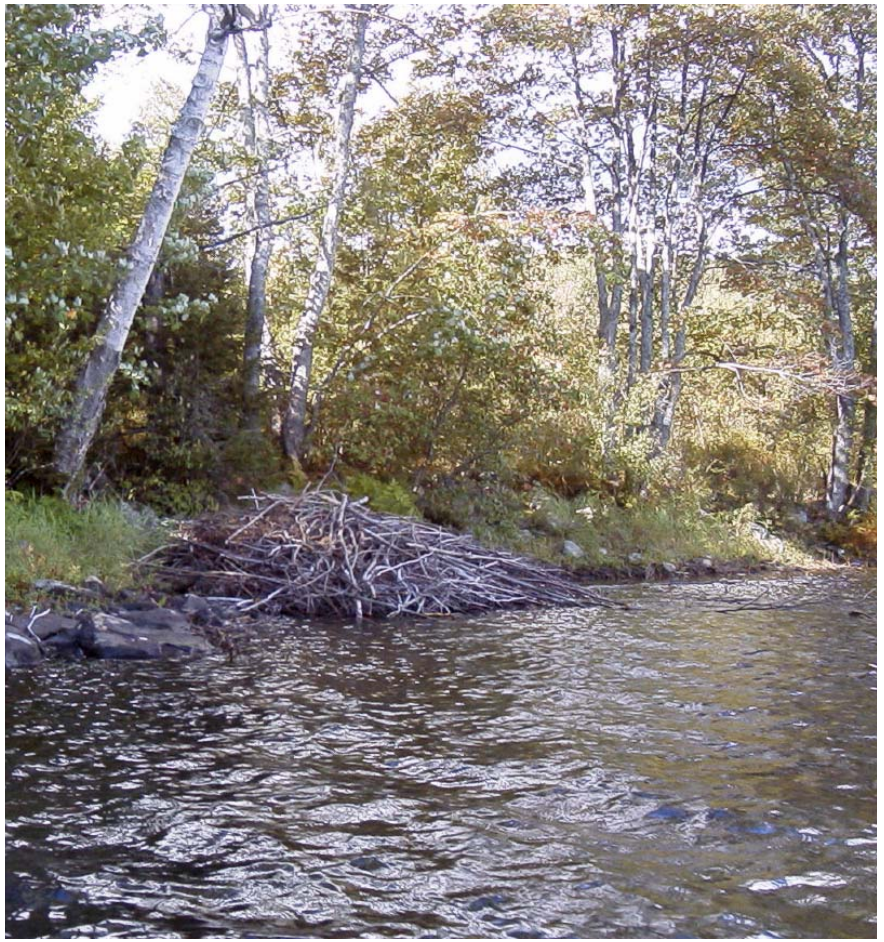
3. The area with thin till cover underlain by slate bedrock in the western portion of the study area may become a zone of high priority if the slate is pyritic. In this case, exposure of the slate bedrock to oxygen and water would produce acidic runoff damaging to wetland ecosystems.

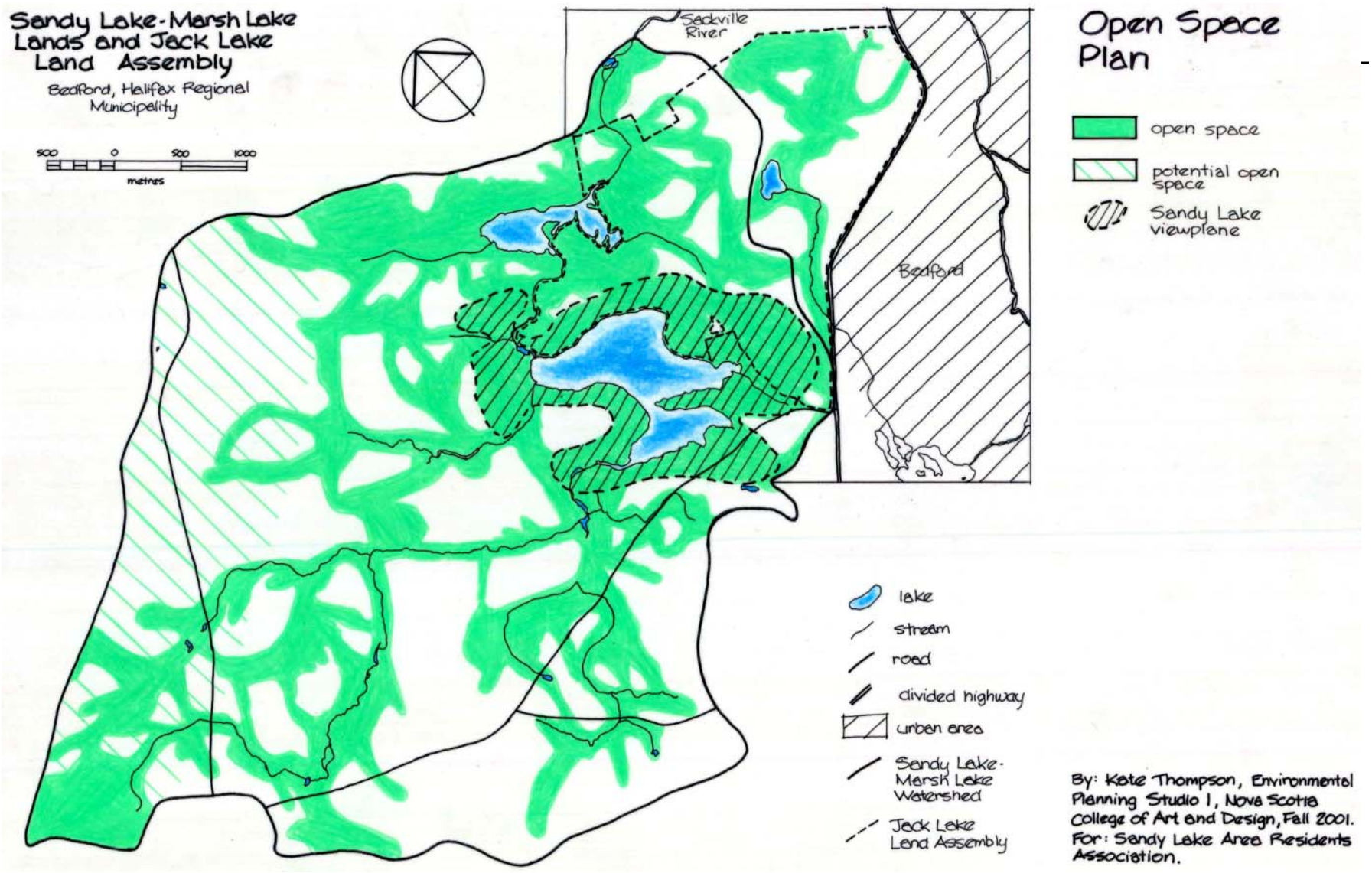
The resulting sensitivity map presents a picture of the valued habitats and their protection zones. Areas of sensitivity have a finger-like pattern that relates to the hydrology of the watershed. The lake area is most sensitive, because of the possibility of erosion on steep slopes. Upland areas, because of their function as runoff collection zones, also have a high degree of sensitivity. A considerable proportion of the land is, however, compatible with responsible development.

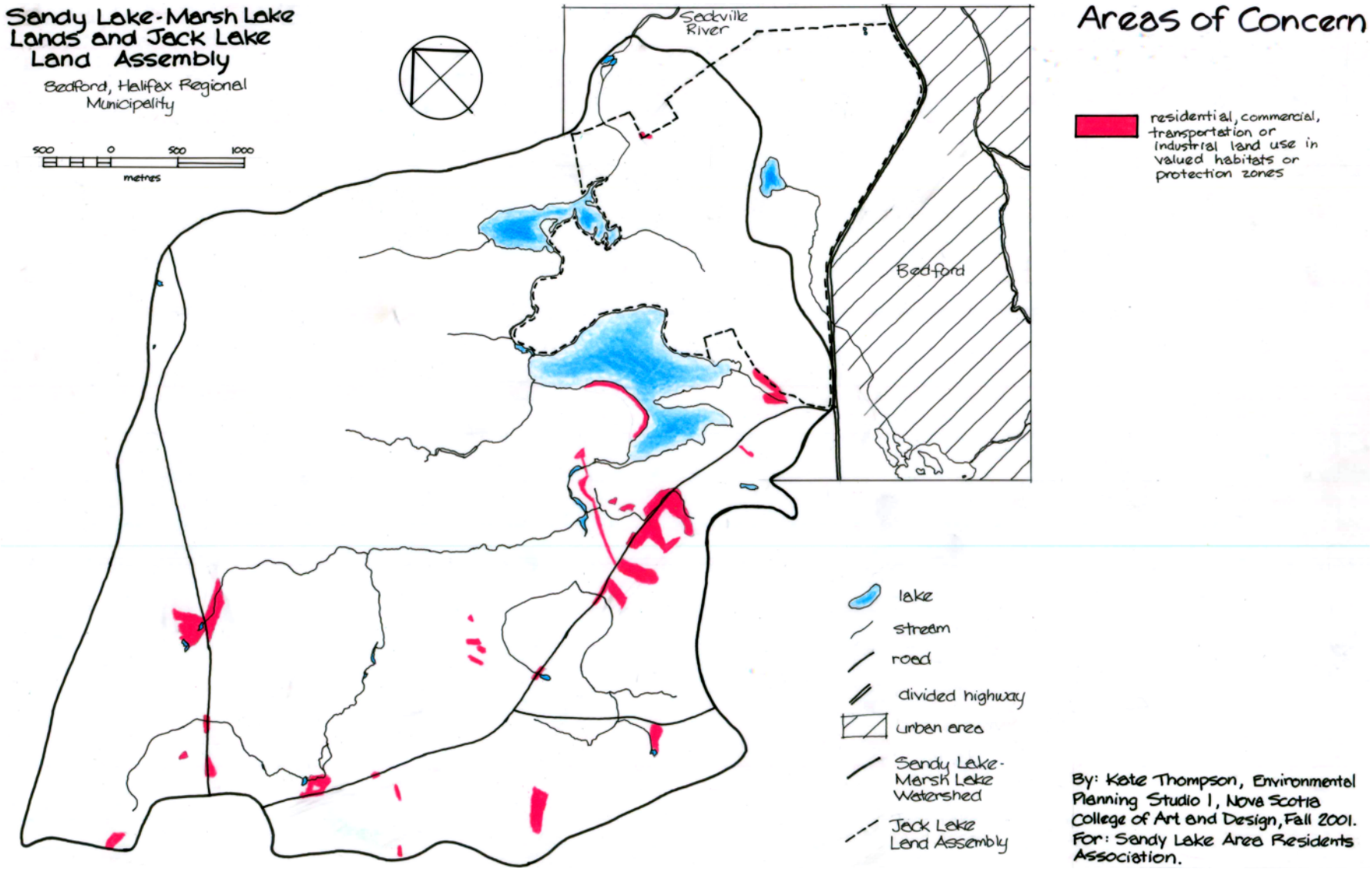
Translating sensitivity into potential land use leads to the suggested Open Space Plan that delineates areas proposed for natural vegetation and habitat. Connections between lobes of the protection areas provide for species movement between areas of natural vegetation. For example, mature forest stands are linked with the vegetation network, allowing for seed dispersal throughout the area. Corridors of natural vegetation could also serve for light recreational use, for example, as a network of trails. Patches within the matrix would be suitable for residential development. Since the Association is also concerned with maintaining the natural aesthetic value of the lake area, the Open Space Plan also includes a view plane from Sandy Lake

When sensitivity is compared with present land use, certain areas of concern are presented. The Sandy Lake Area Residents Association has documented a decline in the lake water quality since 1975;[2] an investigation of the areas of concern may reveal problems that contribute to the decline in water quality.

2. The decline in water quality is documented in correspondence of the Sandy Lake Residents Association with The Bedford Water Advisory Committee, Feb. 25, 1990.




Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Open Space Plan
open space
potential open space
Sandy Lake viewplane
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Areas of Concern
residential, commercial, transportation or industrial land use in valued habitats or protection zones
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.

Recommendations

Fortunately, present land use does not conflict with most of the sensitive areas, so there is an opportunity to direct future development to areas that are easiest to develop without adverse effect on the water habitat, water quality and valued vegetation. Presented here are suggestions for policy, planning and development approaches to protect watersheds in urbanizing areas, recommendations for education about development and property maintenance practice, comments on the role of citizens in further planning, and suggestions on areas into which further study should be undertaken.

General Policy and Planning

The regional development plan for the Halifax Regional Municipality, currently in the development stage, could accommodate sensitivity of the area and serve as a model for environmentally responsible development in other jurisdictions: a watershed protection and development plan following from this study could be incorporated into the local plan for Bedford. Water quality issues have been prominent in Canadian communities in the recent past; the general public may be ready to accept limits on development to maintain high quality water supplies.

The land in the lake area is mainly publicly owned, so an opportunity exists for parkland to embrace the most sensitive areas, with light recreational use such as walking trails. Park interpretation could also inform the public about the valued habitat being protected here.

Privately owned land in zones of high priority for protection, where development may be difficult without damage to the water habitat or to valued forest stands, could be traded for public land that could be more easily developed - parts of the Jack Lake Land Assembly, for example. This land is also closer to services and amenities in the urbanized area of Bedford.

The Open Space Plan proposed in this document outlines areas that should be reserved for natural vegetation and habitat. We have suggested that light recreational use of minimal impact on the sensitive areas would be appropriate. However, any plan for the use of these open spaces should be informed by the values of the people who live there and by local knowledge of the valued habitats.

Development and Maintenance Practice

Water quality can be maintained or improved by land owners who are knowledgeable about responsible maintenance and construction practicesthat include: avoiding disturbance of steep slopes, retaining vegetated buffer zones around valued habitats, limiting the use of pesticides and fertilizers, surfacing with permeable materials to reduce runoff, and preserving natural vegetation to anchor soil and prevent washouts.

Throughout the watershed, any construction of roads, trails, or buildings should occur should limit soil exposure, and occur at times when erosion is least likely, for example, when the weather is dry.

Scientific Projects

A study to determine the recreational carrying capacity of Sandy Lake would provide a guideline for environmentally responsible development of the beach park currently under construction on Sandy Lake.

An inventory of present conditions, such as water quality, and habitats for vegetation and wildlife should be prepared and monitored to determine the negative or positive impacts of future development.

Development that presently occurs in protection zones or the valued habitats should be examined to

determine whether it is producing negative effects on ecological health. The abandoned slate quarry near the Lucasville Road may be feeding acidic runoff into the watershed - a headwater stream originates in the quarry. Another significant area of concern is the industrial park located on the bog south of Sandy Lake. Several road crossings may be feeding polluted runoff into streams.

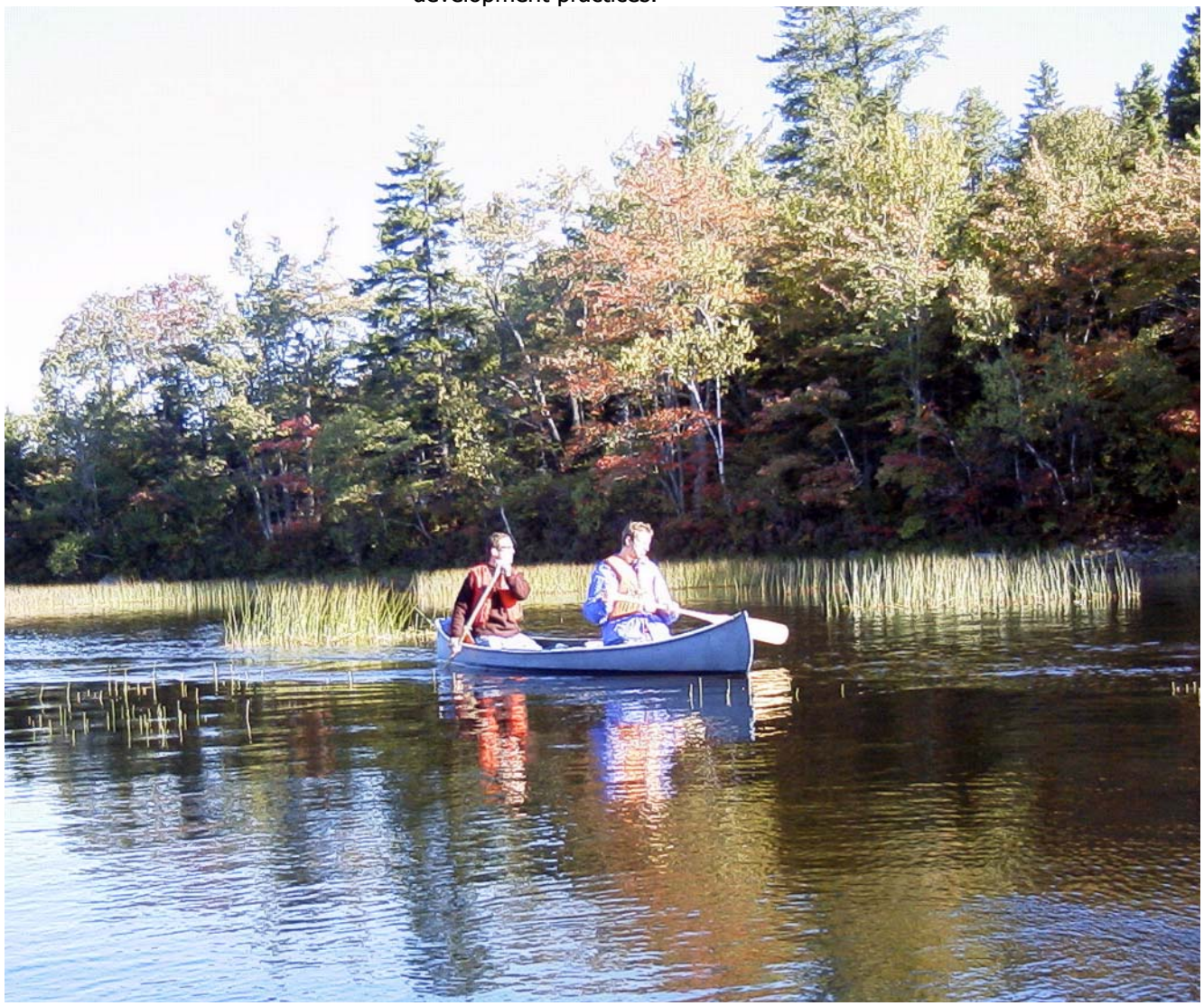
Citizen Projects

The Residents Association may wish to prepare a more extensive and detailed inventory of valued habitats (especially older growth tree stands) than those identified in this document.

The Sackville Rivers Association is currently restoring the Sackville River as a habitat for Atlantic Salmon; both groups may wish to investigate the viability of Sandy and Marsh Lakes as salmon habitat.

A community-based water monitoring program for the watershed areas is recommended.

Residents may help provide land owners with information on responsible maintenance and development practices.



References

Base Map:

1:25,000 map (5m contour interval) compiled by Planning Services, Halifax Regional Municipality, 2001 from 1997 1:10,00 aerial photography by Nova Scotia Department of Natural Resources .

Hydrology:

Wetlands Atlas for Nova Scotia, ed. 4. 1:50,000 Maps 11D/12 and 11D/13, Environment Canada, 1986.

Soil:

Macdougall, J.I. et al. Soil Survey of Halifax County, N.S., Report #13. 1963.

1:63,360 Soil Map of Halifax County, N.S., Halifax County West Sheet. Provincial Department of Agriculture, N.S., 1964; recompiled 1980.

Bedrock and Surficial Geology:

1:100,000 map Pleistocene Geology, Sheet 4 (Central Nova Scotia). Canadian Department of Regional Economic Expansion, 1980.

1:50,000 Geological Map of Halifax and Sambro 87-6. Nova Scotia Department of Mines and Energy, 1987.

Nova Scotia Geology Map. Province of Nova Scotia and Atlantic Geoscience Sociey, 1994.

Climate:

Environment Canada Data (1953 to 1990) for Halifax International Airport (Station 1545), 44° 53' N, 63° 53' W.

Habitat:

1992 1:10,000 Aerial Photography. Nova Scotia Department of Natural Resources and Environment. Roll 329, frames 66-70; Roll 330, frames 131-140; Roll 331, frames 10-19.

1:10,000 Forest Cover Type Map: Middle Sackville, Halifax County. Nova Scotia Department of Natural Resources, Forestry Division, 1996.

Land Ownership:

1:8,000 Land Ownership Map of Bedford West Area. Halifax Land Information Centre, Registry and Information Management Services Division, Nov. 1, 2001.

General:

Davis, Derek S., and Sue Browne, *Natural History of Nova Scotia, Vol. 1: Topics and Habitats and Vol 2: Theme Regions.* Halifax: Nova Scotia Museum and Nimbus Publishing, 1996.

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McHarg, Ian, *Design With Nature.* New York: Garden City, 1969.

Correspondence and reports of the Sandy Lake Area Residents Association with the Bedford Water Advisory Committee, Feb. 25, 1990.

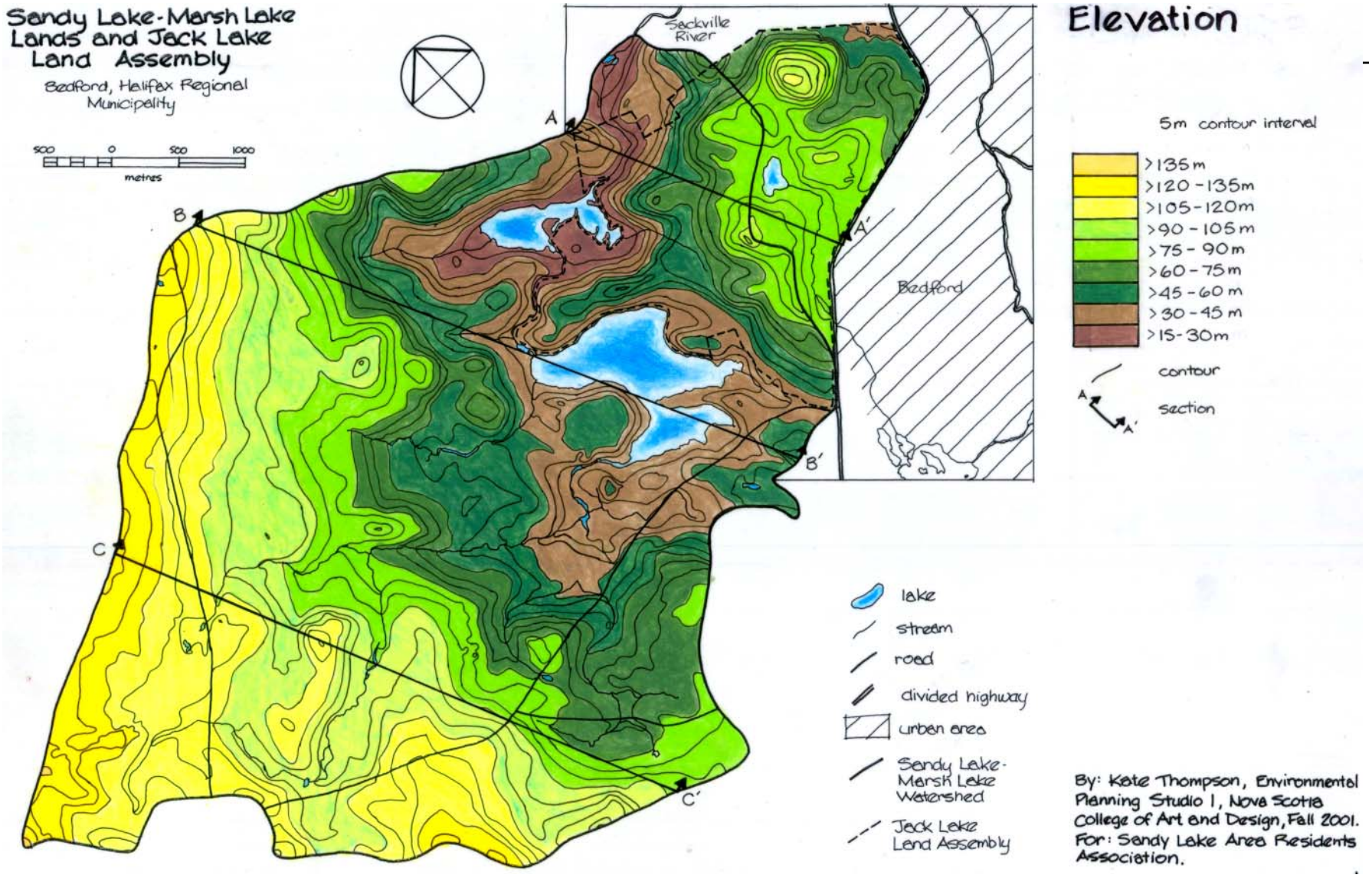
Appendix

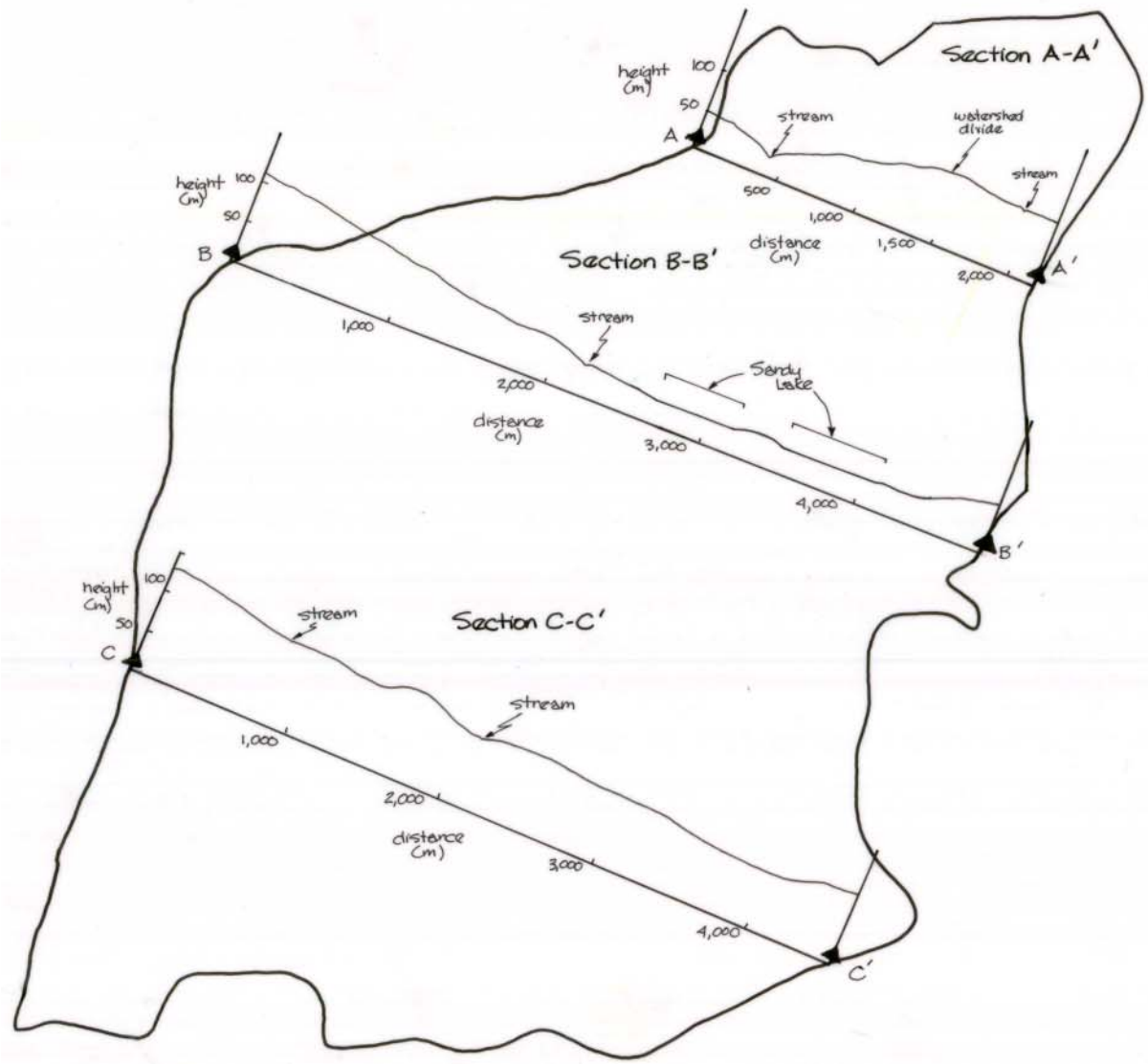
Inventory and Interpretation

Maps

- Elevation ..... A 1
- Site Sections ..... A 2
- Slope ..... A 3
- Bedrock and Surficial Geology ..... A 4
- Soil ..... A 5
- Typical Soil Profiles ..... A 6
- Hydrology ..... A 7
- Climate ..... A 8
- Climate Data ..... A 9
- Slope Aspect ..... A 10
- Habitat ..... A 11
- Land Ownership ..... A 12

Inventory Description and Interpretation ..... A 13


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
A
A'
B
B'
C
C'
Elevation
5m contour interval
>135m
>120-135m
>105-120m
>90-105m
>75-90m
>60-75m
>45-60m
>30-45m
>15-30m
contour
section
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.

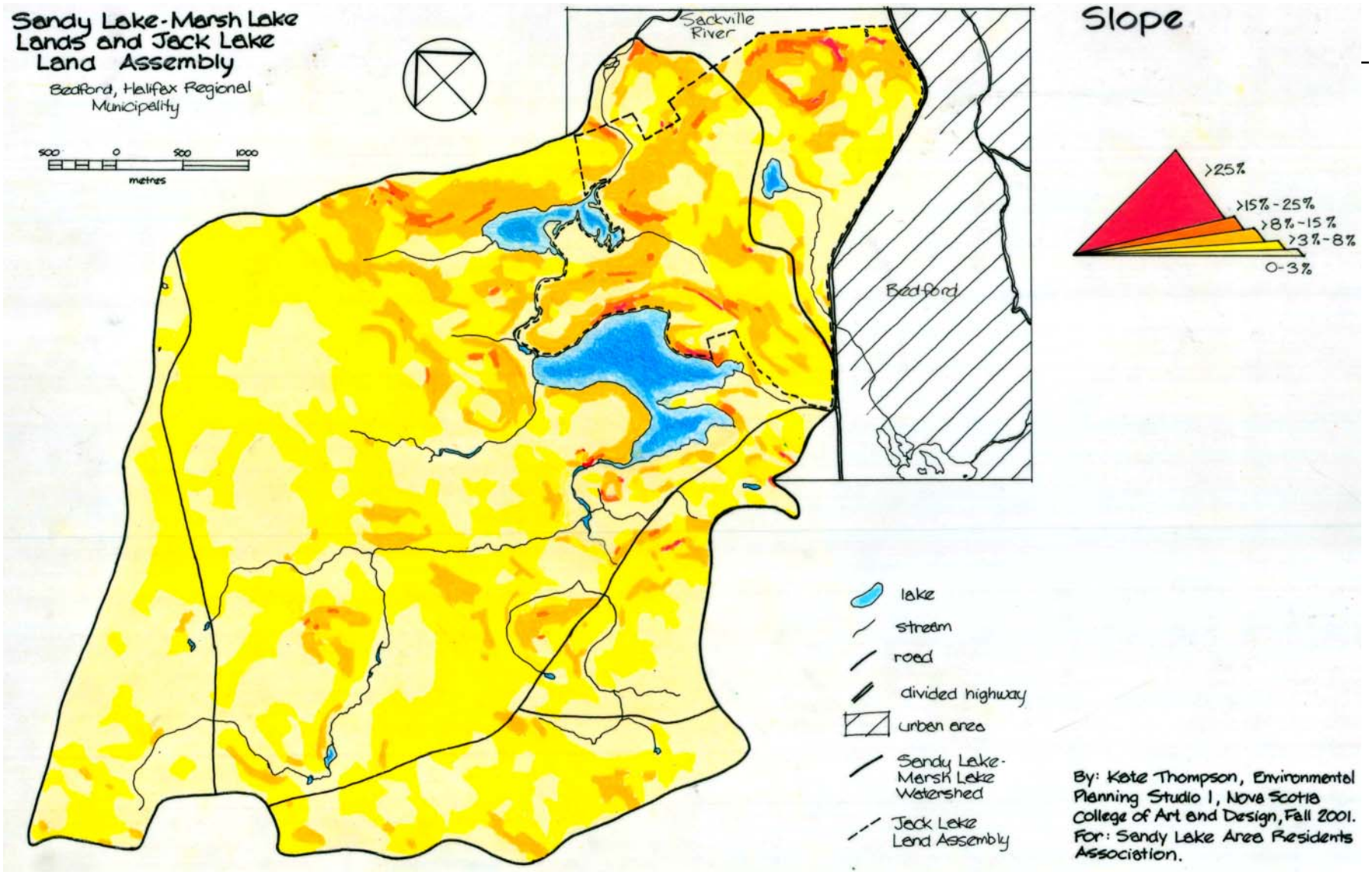


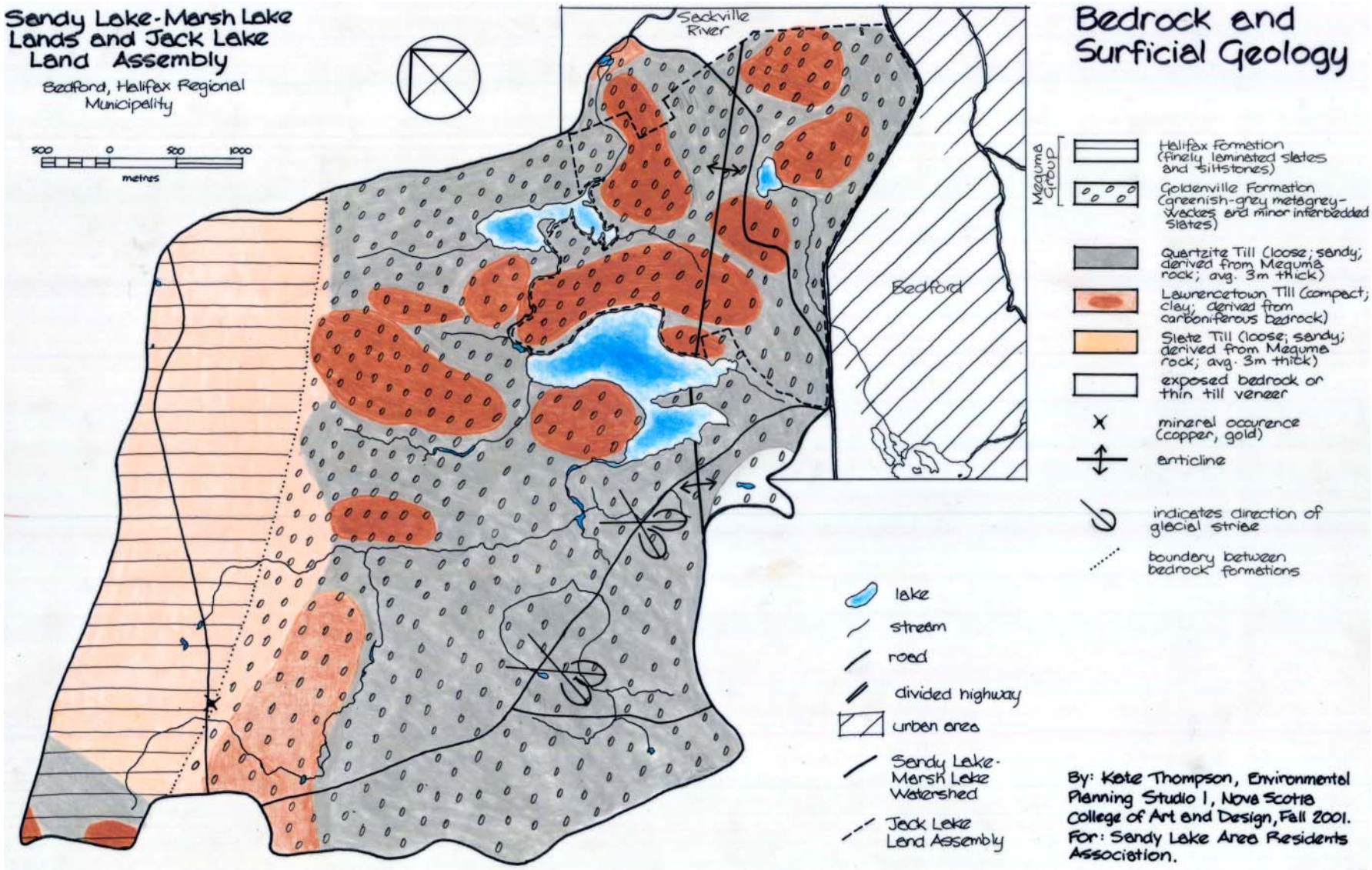
Elevation: Sections

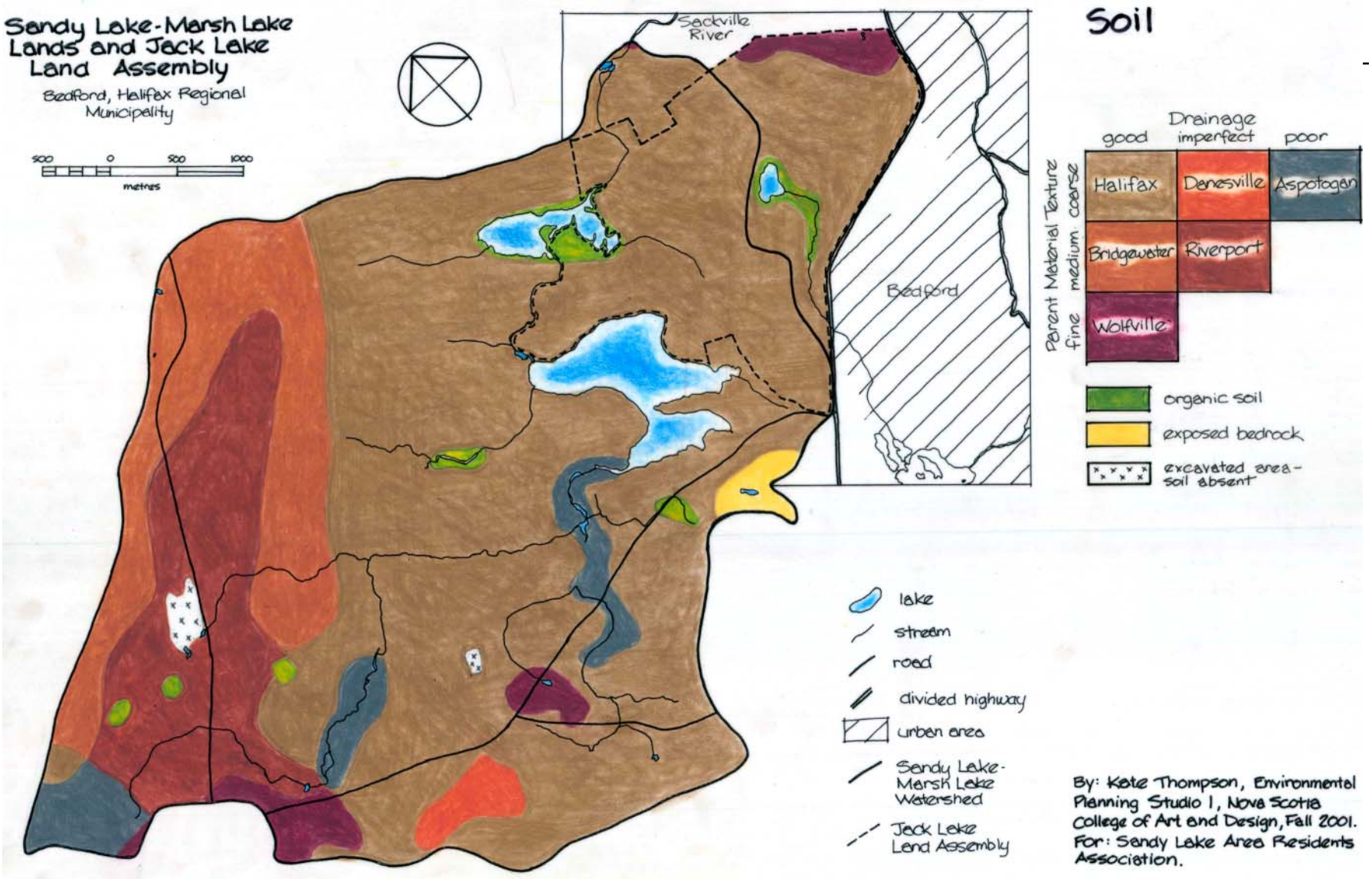
Vertical exaggeration = 5 x

study area boundary

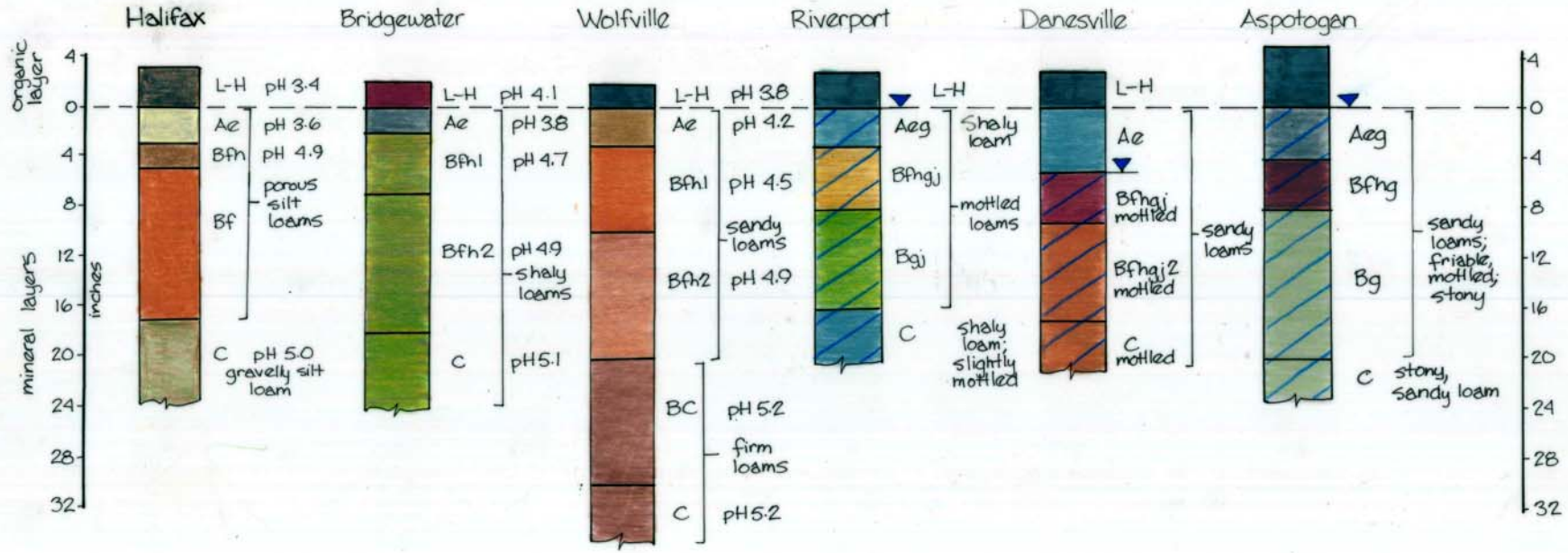
By: Keke Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Slope
>25%
>15%-25%
>8%-15%
>3%-8%
0-3%
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Bedrock and Surficial Geology
Meguma Group
Halifax formation (finely laminated slates and siltstones)
Goldenville Formation (greenish-grey metagrey-wackes and minor interbedded slates)
Quartzite Till (loose; sandy; derived from Meguma rock; avg. 3m thick)
Lawrencetown Till (compact; clay; derived from carboniferous bedrock)
Slate Till (loose; sandy; derived from Meguma rock; avg. 3m thick)
exposed bedrock or thin till veneer
mineral occurence (copper, gold)
anticline
indicates direction of glacial striae
boundary between bedrock formations
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Soil
Drainage
good
imperfect
poor
Parent Material Texture
coarse
medium
fine
Halifax
Denesville
Aspotogan
Bridgewater
Riverport
Wolfville
organic soil
exposed bedrock
excavated area - soil absent
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
By: Kate Thompson, Environmental Planning Studio I, Nova Scotia College of Art and Design, Fall 2001.
For: Sandy Lake Area Residents Association.

Typical Soil Profiles and Characteristics

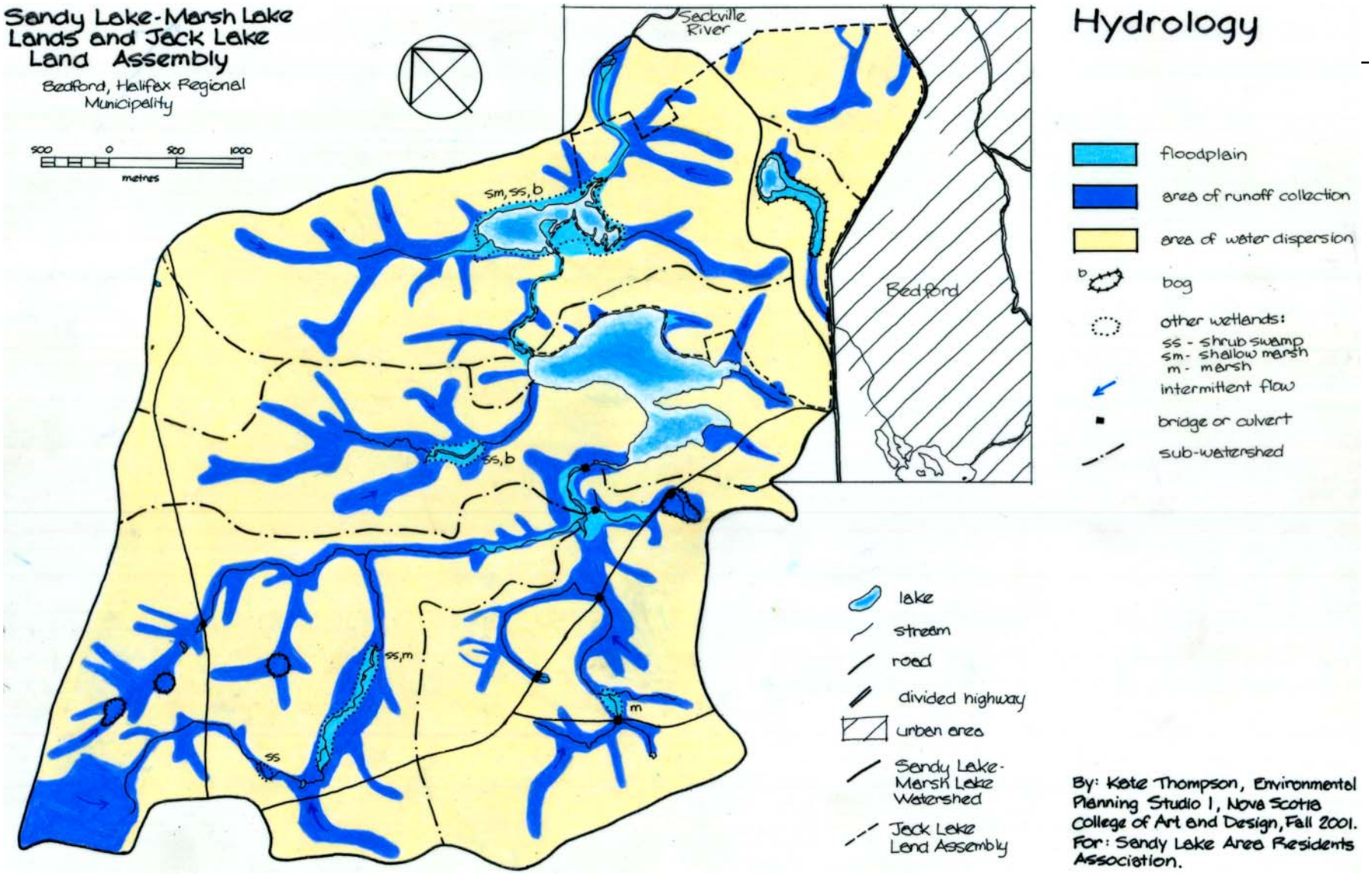


Topography	gently undulating	undulating with ridges and slopes	gently undulating to gently rolling	undulating with ridges and slopes	undulating	depressional
Fertility	low	fair to good	fair to good	fair to good	low	low
Structure	friable; porous; very stony	Bfh1: friable Bfh2: firm; structureless; very stony	Bfh2: fine granular Ae, Bfh1: friable, porous Bc, C: firm, very stony	friable; very stony	friable, very stony	friable, excessively stony

Note:
- A - layer of mineral soil with high content of organic matter
- B - layer of mineral soil; zone of accumulation from A layer
- C - weathered parent material

- L-H organic layer
- e eluviated (leached)
- f ferrous; iron rich
- g gleyed; water saturated; reduced; mottled
- j weakly expressed characteristics
- h humic material leached from upper levels

- ▼ indicates level of seasonal high groundwater
- gleying


Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
sm, ss, b
ss, b
ss, m
ss
m
Hydrology
floodplain
area of runoff collection
area of water dispersion
b
bog
other wetlands:
ss - shrub swamp
sm - shallow marsh
m - marsh
intermittent flow
bridge or culvert
sub-watershed
lake
stream
road
divided highway
urban area
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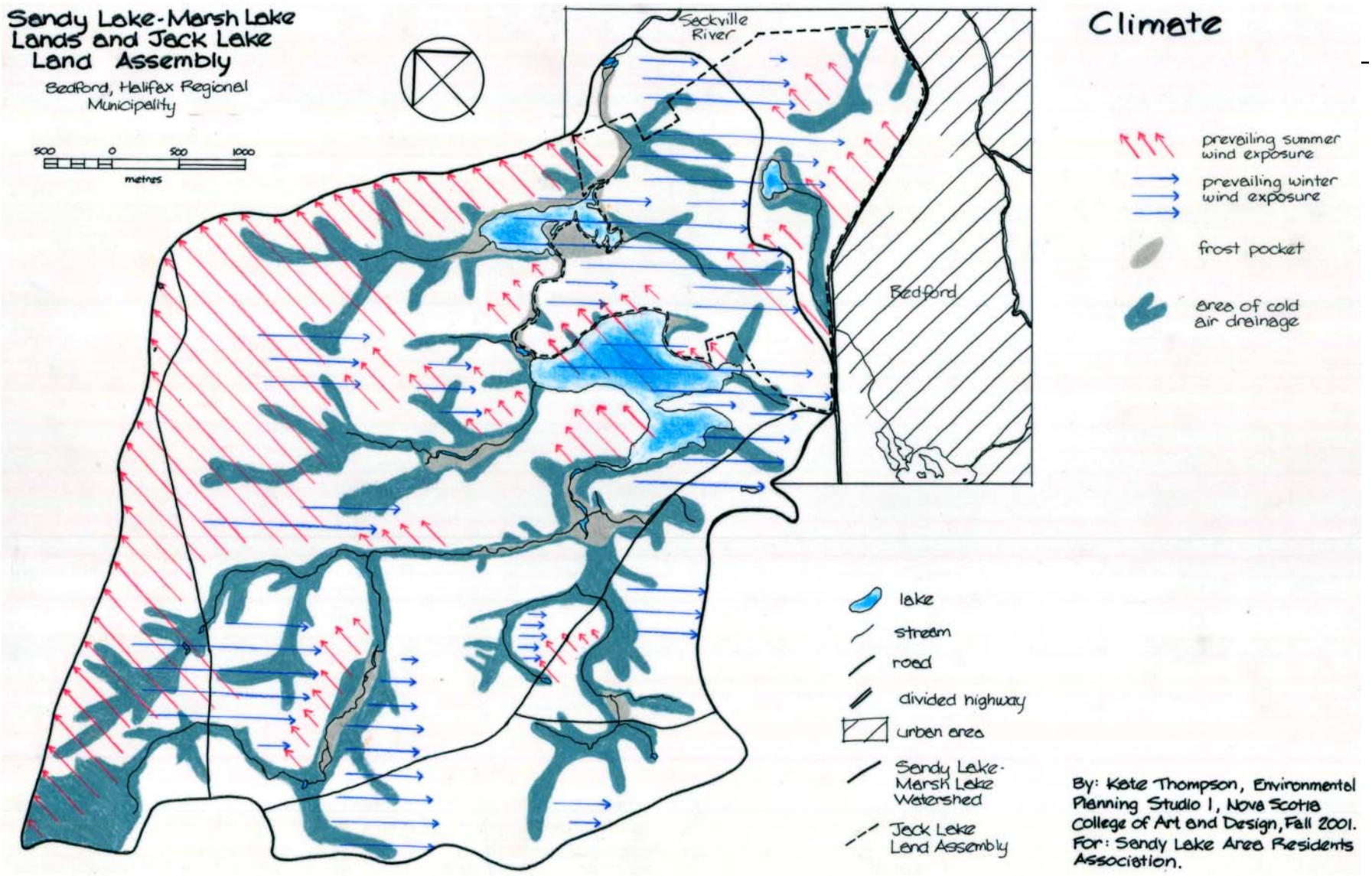
Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Climate
prevailing summer wind exposure
prevailing winter wind exposure
frost pocket
area of cold air drainage
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
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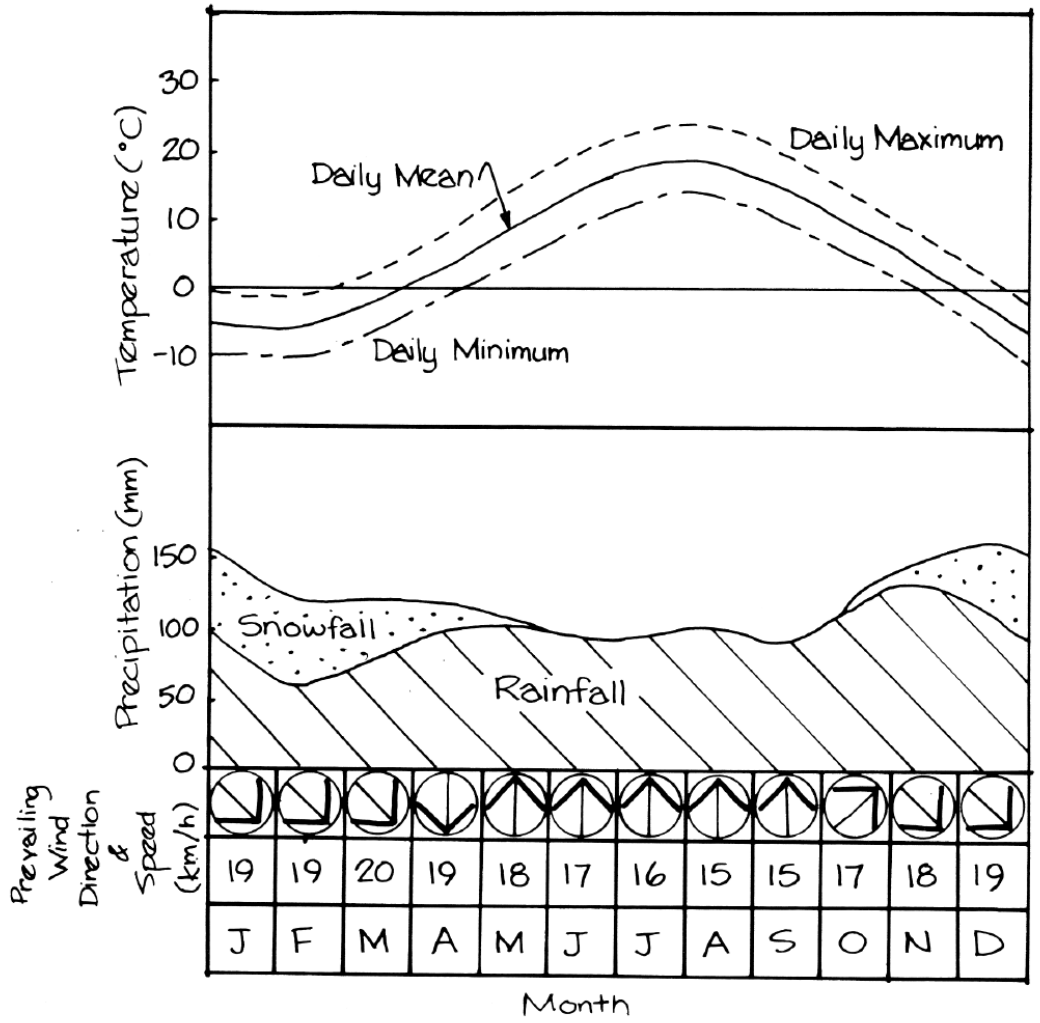
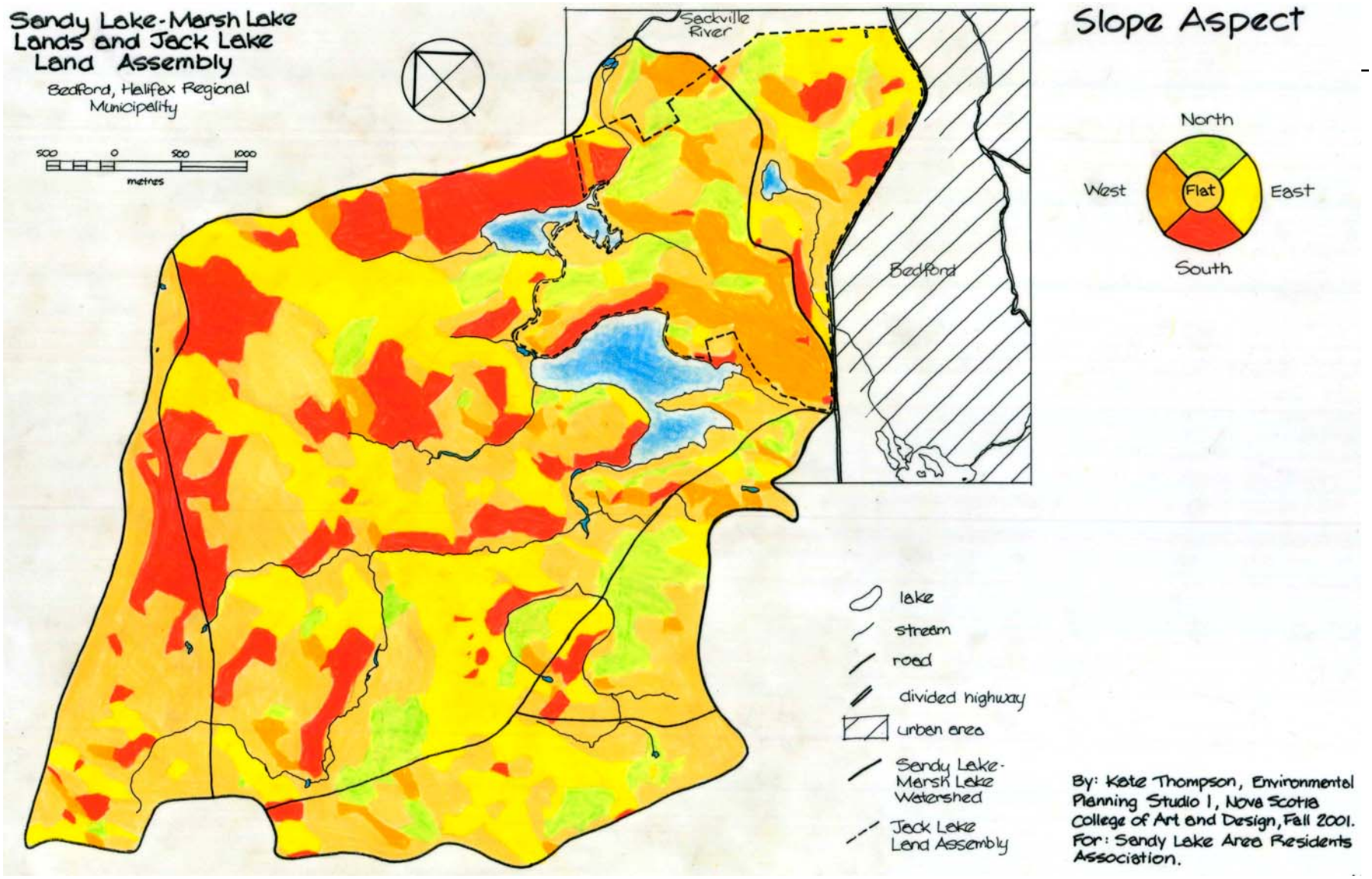
Climate Data




Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
lake
stream
road
divided highway
urban area
Sandy Lake-Marsh Lake Watershed
Jack Lake Land Assembly
Slope Aspect
North
West
Flat
East
South
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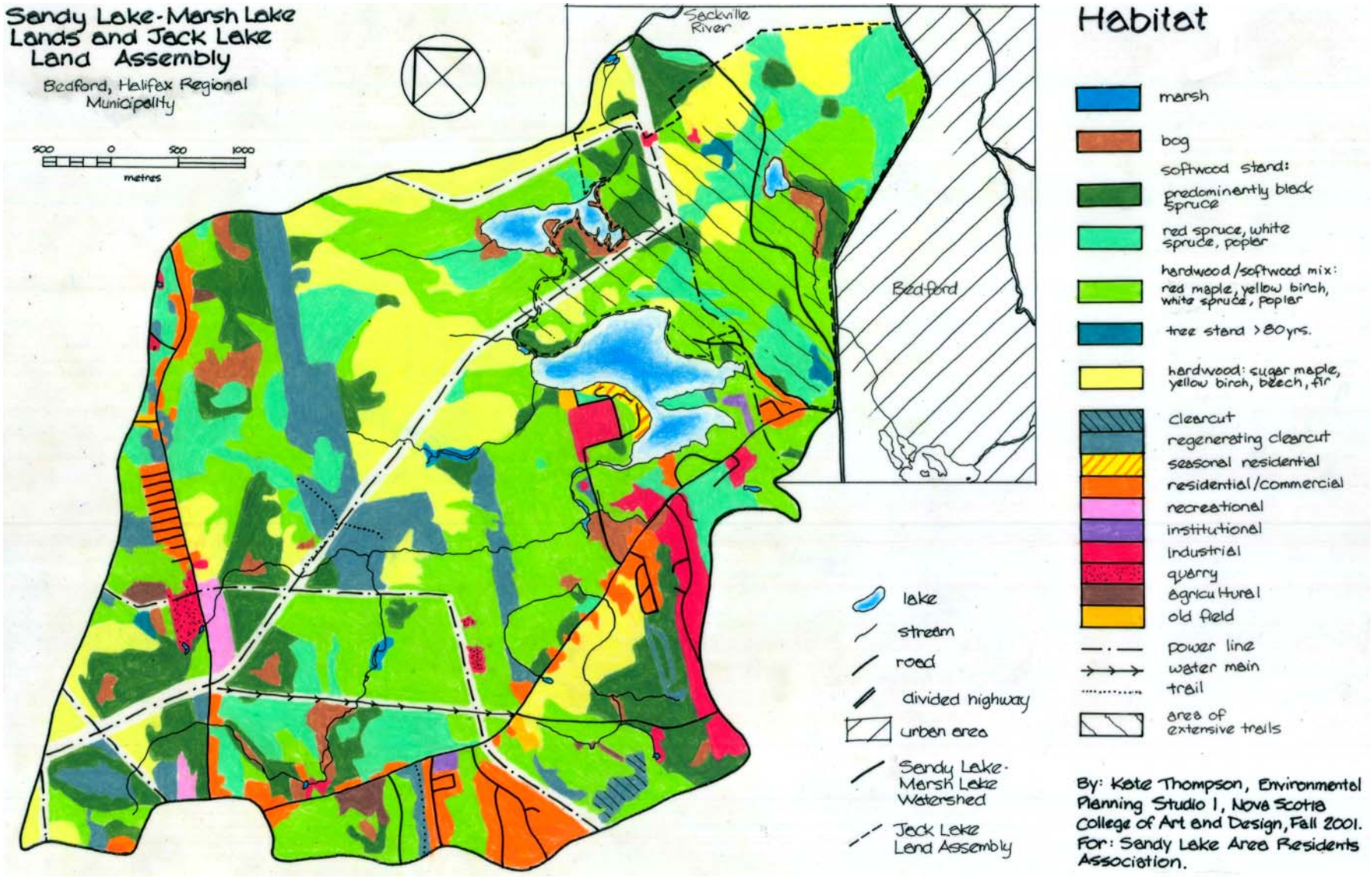
Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Habitat
marsh
bog
softwood stand:
predominantly black spruce
red spruce, white spruce, poplar
hardwood/softwood mix: red maple, yellow birch, white spruce, poplar
tree stand >80yrs.
hardwood: sugar maple, yellow birch, beech, fir
clearcut
regenerating clearcut
seasonal residential
residential/commercial
recreational
institutional
industrial
quarry
agricultural
old field
power line
water main
trail
area of extensive trails
lake
stream
road
divided highway
urban area
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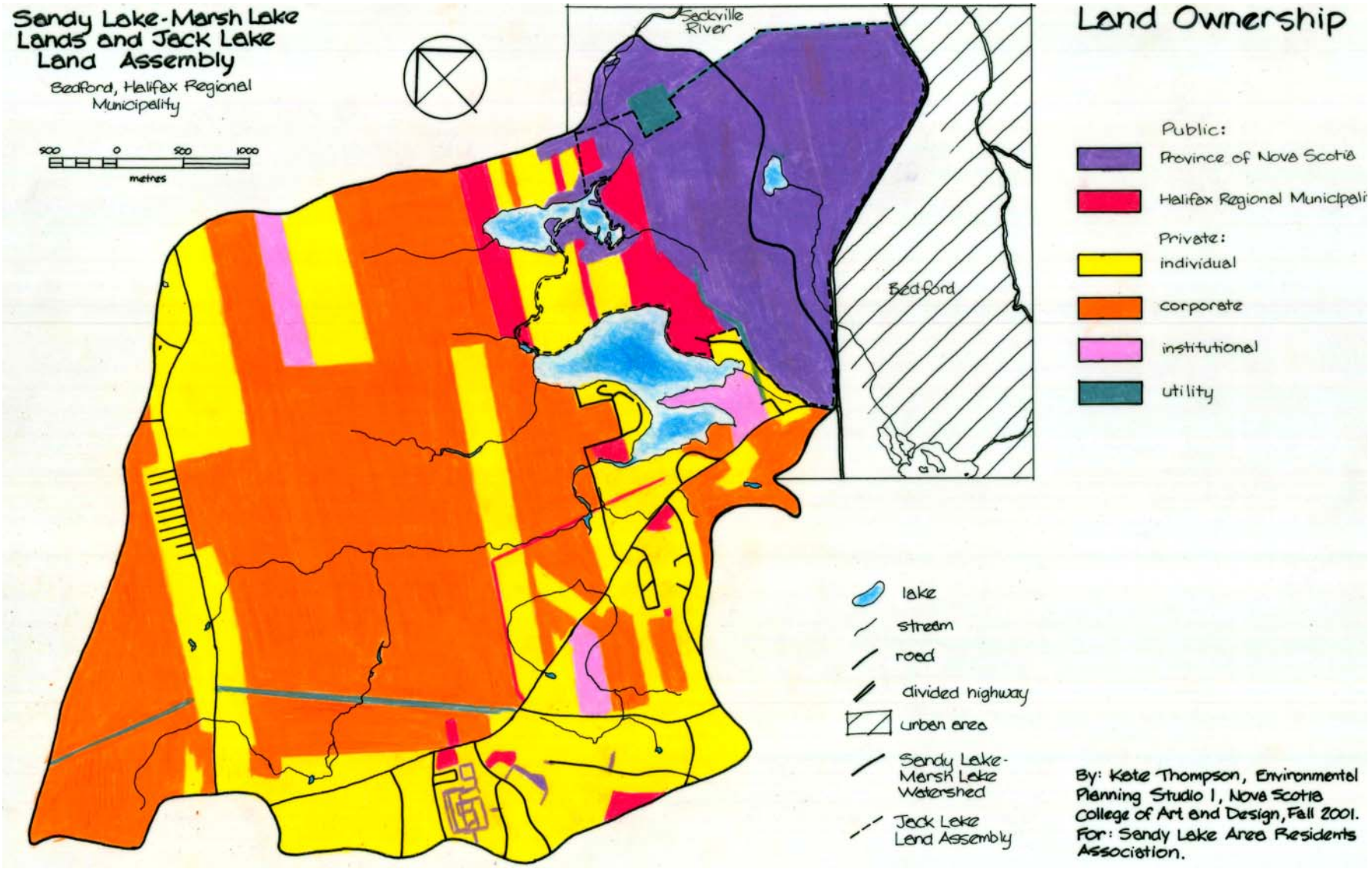
Sandy Lake-Marsh Lake Lands and Jack Lake Land Assembly
Bedford, Halifax Regional Municipality
500 0 500 1000
metres
Sackville River
Bedford
Land Ownership
Public:
Province of Nova Scotia
Halifax Regional Municipali
Private:
individual
corporate
institutional
utility
lake
stream
road
divided highway
urban area
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Elevation

The land rises from an elevation of 20m at the north boundary (where the outflow from Sandy and Marsh lakes joins the Sackville River) to 140m at the western perimeter; several hills interrupt the overall rise. A broad ridge of height 120 -140m forms the northwest boundary of the area near the Lucasville Road.

Within the Sandy Lake-Marsh Lake watershed, the general trend is a steady rise to the northwest and west from the lowland marshy areas of the lakes, and a steeper incline to the east as this watershed meets the Jack Lake Lands. An area approximately 500m in width around Marsh Lake is significantly lower than the remaining watershed.

Jack Lake is at a higher elevation than Sandy Lake, and the Jack Lake Lands consist of hilly terrain, sloping steeply down at its eastern edge.

As this area is under urbanization pressure, elevation is of interest because of the constraints on the placement of roads, buildings and recreational access to the lakes (in the form of parkland) and the associated risk of damage to natural areas from this type of development. The rolling terrain provides opportunities for vistas of the lakes. The upland areas to the west and northwest would provide a better area for roadways and buildings than the steep slopes adjacent to the lake areas. The lowland areas around the lakes, in particular Marsh Lake, and the connected stream floodplain would preclude development without damaging the wetland ecosystem. The rugged Jack Lake Lands would provide a challenge to the placement of roadways and buildings.

Topography/Slope

Most of the study area is flat or gently sloping (0-8%). Slopes greater than 8% are generally found on the sides of knolls and ridges, primarily in the area of the three lakes. Two areas of very steep slopes (>25%) are within 50m of Sandy Lake, and another area of significant steepness occurs on a knoll in the Jack Lake area, close to the eastern limit of the area. Other areas of significance include several slopes of 15 to 25% that occur within 250 m of streams.

Flat terrain (3% and less) is suitable for all uses, including the placement of large commercial and industrial buildings. Flat and gently sloping land (3 to 8%) is suitable for the placement of primary roads. Moderately sloping land (8-15%) is suitable for location of secondary roads and dwellings. In areas of steep slopes (15 to 25%), building would be difficult, but pathways and trails would be possible. Very steep slopes (above 25%) are not suitable for the placement of roads or buildings.

Much of the land is relatively flat, providing a significant area that would be suitable (in terms of slope) for the placement of roadways and buildings. However, in the more attractive area adjacent to the lakes, very steep slopes preclude any reasonable use of the land for development; even the construction of walking trails may lead to slope failure and possible sedimentation in the lake. Moderate slopes near the lakes and streams may be suitable for placement of roads and dwellings (and attractive in terms of vistas of the lakes); however, slope composition and vegetative cover should be investigated since erosion of slopes would be especially deleterious in this sensitive portion of the study area. Relatively level areas near the lakes and streams limit development because of flooding during high water periods. Care must be taken in development of very steep slopes which occur adjacent to streams .

Bedrock and Surficial Geology

The bedrock in areas to the north and west of Sandy Lake consists of slate, schist and migmatite of the

Halifax Formation. In the larger area east and south of the lakes, the bedrock consists of greywacke, quartzite, slate, schist and gneiss of the Goldenville Formation. Both of these rock formations belong to the Meguma group of metamorphosed sedimentary rocks. A broad anticline (up-fold in the rock beds) runs NNW-SSE through the western part of the study area. The land is almost completely covered in sand and gravel textured glacial till. Quartzite till covers two-thirds of the area and slate till covers a small area in the north. This distribution corresponds to the bedrock geology. Drumlins, which are rounded hills of Lawrencetown till (consisting of fragments of carboniferous material, silt and clay) surround the lakes. There is a small area of exposed bedrock south of Sandy Lake.

The presence of Halifax Formation slate bedrock underlying the upper reaches of the Sandy Lake watershed area may indicate the presence of iron pyrite which, when exposed to rain and air, generates an acidic runoff which harms freshwater habitats. There is potential for damage to the entire watershed from blasting or excavating pyritic slate in this headwater area. The drumlin landscape restricts some forms of land use: loose, stony slopes may preclude the placement of buildings because of erosion, and removal of vegetation may create a potential for washouts and gullying. Because the drumlins contain Lawrencetown till, they are likely to be more fertile than the surrounding area of Quartzite till, and may support a greater variety of vegetation. Where the till sheet is thick and level, excavation for building and roads should not be impaired. Thin till or exposed bedrock necessitates blasting, which may result in signficant environmental damage and high development costs.

Soil

All of the soils in the study area, except Aspotogan, are podzols, indicating strong leaching of the upper A horizon to the lower levels. Aspotogan soils are gleysols, defined by their saturated condition. There are small areas of peat at Marsh Lake and an area of exposed bedrock south of Sandy Lake.

The lower reaches of the watershed are covered mainly by soils of the Halifax, Danesville and Aspotogan series. These are stony, shallow, sandy loams of low fertility formed from parent material of coarse-textured quartzite and slate glacial till. Halifax soils on higher elevations are well to excessively-well drained, and suited to a mixed forest growth of coniferous and deciduous species. Imperfectly-drained Danesville soils, found at lower elevations, support a similar forest cover. Aspotogan soils, found in depressions, are poorly drained and often saturated to the top of the mineral layer. A thick layer of semi-decomposed organic matter covers these infertile soils. Both Aspotogan and Danesville soils are mottled, gleyed by the chemically reducing effect of water saturation. Bridgewater and Riverport soils, formed from parent material of medium-textured glacial till, are stony, shallow, shaly loams of fair to good fertility. Bridgewater soil is well drained, while Riverport soil is imperfectly drained, with gleying in the A and B horizons. The deepest and most fertile soils in the area are well-drained sandy-loams of the Wolfville series, developed from moderately fine textured glacial till.

Soil anchors vegetative growth, and strongly influences the vegetation community. Deep and fertile soils may support the widest variety of plant growth. For example, Wolfville soils are suitable for agricultural use as well as forest cover; the relatively thin and infertile Halifax and Danesville soils support forest growth only. Soil acidity limits plant growth by restricting nutrient availability, and poor drainage lowers oxygen levels; thus waterlogged Aspotogan soils support only well adapted sphagnum moss, sweet fern, fir,

black spruce, tamarack and alder. Soil texture influences water retention and nutrient availability; a balanced loam with relatively equal quantities of silt, sand and clay is ideal.

Soils high in organic content such as Aspotogan are compressible under the weight of buildings, and are not suitable for building. Because they indicate wetland areas and poorly drained sites, Riverport, Danesville and Aspotogan soils are not suitable for development.

Wolfville, Bridgewater and Halifax soils, because of their stony texture, are best suited for construction of roadways and buildings. However, these soils are susceptible to slumping and erosion. When vegetative cover is removed, sandy soils such as Wolfville and silt soils such as Halifax erode rapidly, especially on slopes; silt from Halifax soil is easily carried into waterways where it is deposited.

Soil depth may limit construction where thin soils over bedrock necessitate blasting for level roadbeds or foundations.

Unserviced development relies on soils such as medium-textured loams, which have a filtering capacity for wastewater. Thin and rapidly draining soils such as Halifax are less than ideal for on-site sewage disposal.

Since Wolfville and to a lesser extent, Bridgewater, are fertile soils, using these soil areas for road and building development displaces possible agricultural use.

Ornamental horticulture around residences is limited in areas of infertile or thin soil.

Hydrology

The Sandy Lake - Marsh Lake watershed contains five sub-watersheds. Four main streams and their tributaries originate in the upland area to the west and southwest of Sandy Lake (7.5 hectares) and flow into the lake. Sandy Lake drains to the east, into Marsh Lake (3.0 hectares). Two streams to the northwest and southeast also feed directly into Marsh Lake.

The Jack Lake Lands contain part of the Jack Lake watershed; a stream draining Jack Lake flows south to Paper Mill Lake, in Bedford.

The study area also includes a small portion of another watershed draining directly to the Sackville River.

Wetlands in the study area include bogs, shrub swamps (dominated by shrubs, and permanently or seasonally flooded up to 12”), and Marsh Lake, a complex of open water, shallow marsh (with an average water depth of less than 6”), shrub swamp and bog. A provincial wetland evaluation identifies Marsh Lake as a wetland with good wildlife habitat potential.

With its numerous streams and lakes, the area is attractive for recreational uses such as boating, fishing, and swimming, as well as residential subdivision development. However, Marsh Lake is a valuable wetland, and it is downstream from the vast portion of the Sandy Lake- Marsh Lake watershed. Removal of vegetation or disturbance of soil in sensitive areas of the watershed (water collection areas) or release of pollutants from human activities may result in sediment or pollutants being carried into streams and from there into Sandy and Marsh Lakes. Paved road surfaces cause an increase in the overland flow into watershed streams, especially during high flow periods, creating a flood risk in the stream floodplains. Building in water collection zones must be avoided, as ground here is generally wet and flooded during times of high runoff. Since Jack Lake flows into a lakeside residential area in Bedford, residents there may have concerns with development activities higher

in the watershed. The Jack Lake bog functions as a buffer that controls water quality and flow rates to lower waterways.

Climate

Nova Scotia's climate is strongly influenced by the ocean: summers are cool and winters are relatively mild and wet. Relative humidity is high throughout the year. July and August are the warmest months with daily average temperatures of 18° C, and prevailing winds from the south; January and February are the coldest months with average temperatures of -6° C, and winds from the northwest. Variation between daily highs and lows is greatest in the summer (10.2 C° in July) and least in the winter (8.4 C° in January). From November to April, there is significant snowfall (more than 10 cm), although most precipitation year-round is in the form of rain. Even in January, rain accounts for 59 percent of the total precipitation. Winter storm winds gust from the southeast or southwest; summer storm winds are north, southeast or southwest.

Local climate influences the comfort level, aesthetics and heating requirements of individual dwellings; it has an influence on outside recreational activities such as boating and picnicking. Local climate is influenced by slope orientation, wind patterns, vegetation and cold air drainage. In this area, about one-third of the land is flat; the predominant slope orientation for the remaining areas is to the south and east, with some west and north facing slopes to the east of Sandy Lake. Cold air drains along stream courses and connected water collection areas throughout the district, and there are frost pockets in the lowest areas.

In summer, south winds sweep across the south facing slopes throughout the area, creating well ventilated, sunny locations for dwellings and recreational areas such as parks and playgrounds. In winter, these areas are also protected by higher hills and ridges from cold northwest winds. Conversely, north facing slopes are oriented in the path of winter winds, and subject to cold air drainage. These slopes would be poor choices for dwellings and recreational areas. The east facing slopes in the area are sheltered from the north wind, and so would be good choices for homes and parks.

Winter weather may influence location of roads and dwellings: snow drifts over hills and trees and settles into sheltered locations; rainfall in winter causes excessive runoff because the frozen ground cannot absorb water; roads on steep slopes become dangerously icy as rain sheets across them and freezes. Storm winds in all seasons may blow down trees left standing in or at the edge of a cut over area.

Habitats

Forests cover most of the area, with black spruce stands in low, poorly drained areas; softwood stands of primarily white and red spruce revegetating old cutovers adjacent to settlements; a mixed forest of red maple, poplar, birch, pine, spruce and fir on slopes; and hardwood stands of sugar maple, red maple, beech and birch in upland areas and well drained drumlin tops. Typical of most of Nova Scotia, the area has been cut over many times, and the variety of tree communities indicates that the forests are in various stages of succession.

Wet areas, including the land surrounding Marsh and Jack Lakes, support bog vegetation of sphagnum moss, shrubs and black spruce.

The area is characterized by a diversity of land uses. Homes and businesses line Hammonds Plains Road, Lucasville Road and Kearney Lake Road. Cottages and year round homes occupy the shores of Sandy Lake, and a large dairy operation is located near the lake. Groomed and ungroomed

hiking and biking trails traverse the Jack Lake Lands and Sandy Lake area. Two small areas of land under cultivation utilize the most fertile soils. A small industrial park is located south of Hammonds Plains Road, a gravel excavating operation mines the glacial till just north of the road, and there is an abandoned slate quarry west of the Lucasville Road. A power station, connected to four power lines passing through the area, is located east of Marsh Lake; the main water line that supplies Halifax Regional Municipality crosses the district. Highway 102, the primary divided highway route to Halifax, runs along the eastern edge of the Jack Lake Lands.

Small areas of natural habitat are vulnerable in the face of impending development. These include the relatively natural area around Sandy Lake, tree stands older than eighty years, and the wetland ecosystem of Marsh Lake, which are all valued by the surrounding land owners. Such areas, rare in a rapidly growing area, are threatened by development encroaching on the watershed.

The large areas of woodland and the land around the lakes and streams are attractive for future residential development, but they are also valuable for hiking, biking, nature appreciation, and environmental protection. The area is within a short commuting distance of Halifax and Dartmouth, which makes it even more attractive for residential development. Powerline cuts provide cleared land for hiking, but powerlines and the water line crossing the area may restrict residential development.

Land Ownership

Publicly owned land in the eastern portion of the watershed occupies about one-fifth of the study area. Small private holdings extend back from Lucasville and Hammonds Plains Roads; residential subdivisions and a grouping of light industrial lots lie south of Hammonds Plains Road. One-half of the area consists of large lots (owned primarily by corporations) running southwest to northeast between the Lucasville Road and Sandy Lake. Interspersed among these corporate-held parcels are smaller pieces of land held by individuals. Corporate held land also borders the west and south side of Sandy Lake.

Hammonds Plains Road to the west of the study area provides access to several large residential developments constructed in the past decade. These developments offer good examples of the kind of development that could occur in the study area. The current trend in housing is for estate style lakefront lots. Areas that are not near lakes are less attractive for development, as are lots bordering on industrial parks.

Large areas of land held by corporations suggest land speculation prior to development. However, the configuration of these parcels make development difficult, and current land owners in the central region and around the lakes may be unwilling to sell to developers, thus preventing land consolidation. It is worth noting that there is a large area of developable land in the Jack Lake Land Assembly that is publicly owned. This may offer an opportunity to secure additional open space around Sandy Lake by trading development parcels there for land in the Jack Lake Land Assembly.