

The Natural History of
NOVA SCOTIA

V O L U M E • T W O

THEME
REGIONS



Nimbus • The Nova Scotia Museum

Natural History of Nova Scotia



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INTRODUCTION

THE THEME REGIONS GEOGRAPHICAL CLASSIFICATION SYSTEM

Volume I of the *Natural History of Nova Scotia, Topics and Habitats*, provides a description of the non-living and living elements of the natural environment of the province. In Volume II, *Theme Regions*, the relationships between these elements are described as they actually occur in the landscape. This is achieved by use of a geographical classification system of Regions, Districts, and Units that are defined according to distinctive landscape characteristics. We hope the reader will be able to identify these Regions, Districts, and Units in the field, know when a boundary or transition zone has been crossed, and identify the distinctive environmental relationships that occur.

A map accompanies the description of each Region and shows its component Districts. Figures 1 and 2 are more detailed maps showing Units, and a larger folded 1:500,000 map is included in the back pocket of this volume. Boundaries are necessarily approximate and should be regarded as narrow zones rather than lines.

CLASSIFICATION SYSTEM

A hierarchical system has been developed to demonstrate how these geographical entities have been determined. This approach closely follows the Biophysical Land Classification System that has been widely applied to terrestrial areas since the mid-1960s.^{1,2} It has been extended to include the marine areas adjacent to Nova Scotia.³

The three levels of the hierarchy are as follows:

1. Regions: eight on land and one in the sea
2. Districts: 33 on land and four in the sea
3. Units: 65 on land and 11 in the sea

In some cases Units are geographically dispersed and are coded with letters as sub-Units.

TERRESTRIAL THEME REGIONS

Nova Scotia has eight terrestrial Regions that have been divided into 33 Districts and 65 Units (see Figure 1).

In the Biophysical Land Classification System, land regions are defined on the basis of "regional climate as expressed through regional vegetation." The classification adopted here recognizes six regional climates in Nova Scotia but further divides two of these climatic areas on the basis of regional geology to create eight Regions, as shown in Table 1.

The different Districts within a given Region are defined by "a distinctive landscape pattern." This pattern may be a reflection of geology, surficial materials, soils, hydrology, relief, or vegetation. In each case, one dominant element has been selected as the defining characteristic; other elements are usually closely related. This definition of Districts corresponds closely to the definition of land districts adopted in the Biophysical Land Classification System.

Units are generally fairly homogeneous areas within Districts. Landscapes may vary within them, but they reflect a recurring pattern of landforms, soils, or vegetation. Habitats can be identified and mapped within Units and used as a basis for detailed studies of species association and inventory (see Table 2).

The following example is presented as an aid to the interpretation of the geographical divisions. Looking at the map, one finds:

313a

This area known as the Creignish Hills is located northwest of Bras d'Or Lake on Cape Breton Island.

The number 313a stands for several things:

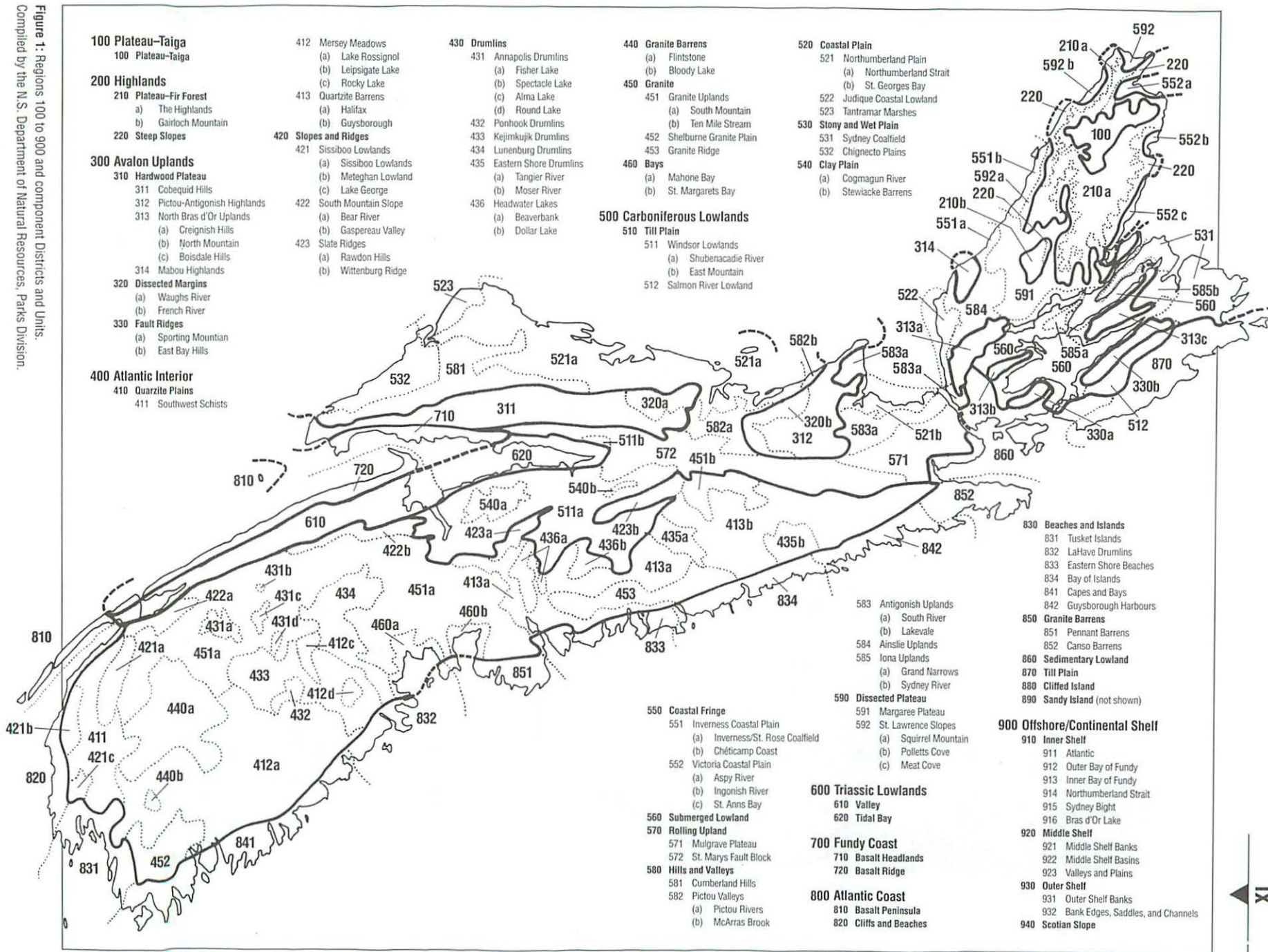
Theme Region 300

The first number, 3, refers to the Avalon Uplands (Region 300). These upland areas experience more severe winters, with greater amounts of precipitation and shorter growing seasons than the surrounding lowlands. Climatic conditions are not as harsh as in the Cape Breton highlands. This climate is reflected in the dominant hardwood vegetation characterized by a Sugar Maple, Yellow Birch-Fir association.

District 310

The second number, 1, refers to the distinctive geology and landforms found in District 310. This

Figure 1: Regions 100 to 900 and component Districts and Units.
Compiled by the N.S. Department of Natural Resources, Parks Division.



100 Plateau-Taiga

100 Plateau-Taiga

200 Highlands

210 Plateau-Fir Forest

- a) The Highlands
- b) Gairloch Mountain

220 Steep Slopes

300 Avalon Uplands

310 Hardwood Plateau

- 311 Cobequid Hills
- 312 Pictou-Antigonish Highlands
- 313 North Bras d'Or Uplands
 - (a) Creignish Hills
 - (b) North Mountain
 - (c) Boisdale Hills
- 314 Mabou Highlands

320 Dissected Margins

- (a) Waughts River
- (b) French River

330 Fault Ridges

- (a) Sporting Mountain
- (b) East Bay Hills

400 Atlantic Interior

410 Quarzite Plains

- 411 Southwest Schists

412 Mersey Meadows

- (a) Lake Rossignol
- (b) Leipsigat Lake
- (c) Rocky Lake

413 Quartzite Barrens

- (a) Halifax
- (b) Guysborough

420 Slopes and Ridges

- 421 Sissiboo Lowlands
 - (a) Sissiboo Lowlands
 - (b) Meteghan Lowland
 - (c) Lake George
- 422 South Mountain Slope
 - (a) Bear River
 - (b) Gaspereau Valley
- 423 Slate Ridges
 - (a) Rawdon Hills
 - (b) Wittenburg Ridge

430 Drumlins

- 431 Annapolis Drumlins
 - (a) Fisher Lake
 - (b) Spectacle Lake
 - (c) Alma Lake
 - (d) Round Lake
- 432 Ponthook Drumlins
- 433 Kejimikujik Drumlins
- 434 Lunenburg Drumlins
- 435 Eastern Shore Drumlins
 - (a) Tangier River
 - (b) Moser River
- 436 Headwater Lakes
 - (a) Beaverbank
 - (b) Dollar Lake

440 Granite Barrens

- (a) Flintstone
- (b) Bloody Lake

450 Granite

- 451 Granite Uplands
 - (a) South Mountain
 - (b) Ten Mile Stream
- 452 Shelburne Granite Plain
- 453 Granite Ridge

460 Bays

- (a) Mahone Bay
- (b) St. Margarets Bay

500 Carboniferous Lowlands

510 Till Plain

- 511 Windsor Lowlands
 - (a) Shubenacadie River
 - (b) East Mountain
- 512 Salmon River Lowland

520 Coastal Plain

- 521 Northumberland Plain
 - (a) Northumberland Strait
 - (b) St. Georges Bay
- 522 Judique Coastal Lowland
- 523 Tantramar Marshes

530 Stony and Wet Plain

- 531 Sydney Coalfield
- 532 Chignecto Plains

540 Clay Plain

- (a) Cogmagun River
- (b) Stewiacke Barrens

583 Antigonish Uplands

- (a) South River
- (b) Lakevale

584 Ainslie Uplands

- 585 Iona Uplands
 - (a) Grand Narrows
 - (b) Sydney River

590 Dissected Plateau

- 591 Margaree Plateau
- 592 St. Lawrence Slopes
 - (a) Squirrel Mountain
 - (b) Polletts Cove
 - (c) Meat Cove

600 Triassic Lowlands

610 Valley

620 Tidal Bay

700 Fundy Coast

710 Basalt Headlands

720 Basalt Ridge

800 Atlantic Coast

810 Basalt Peninsula

820 Cliffs and Beaches

830 Beaches and Islands

- 831 Tusket Islands
- 832 LaHave Drumlins
- 833 Eastern Shore Beaches
- 834 Bay of Islands
- 841 Capes and Bays
- 842 Guysborough Harbours

850 Granite Barrens

- 851 Pennant Barrens
- 852 Canso Barrens

860 Sedimentary Lowland

870 Till Plain

880 Clifed Island

890 Sandy Island (not shown)

900 Offshore/Continental Shelf

910 Inner Shelf

- 911 Atlantic
- 912 Outer Bay of Fundy
- 913 Inner Bay of Fundy
- 914 Northumberland Strait
- 915 Sydney Bight
- 916 Bras d'Or Lake

920 Middle Shelf

- 921 Middle Shelf Banks
- 922 Middle Shelf Basins
- 923 Valleys and Plains

930 Outer Shelf

- 931 Outer Shelf Banks
- 932 Bank Edges, Saddles, and Channels
- 940 Scotian Slope

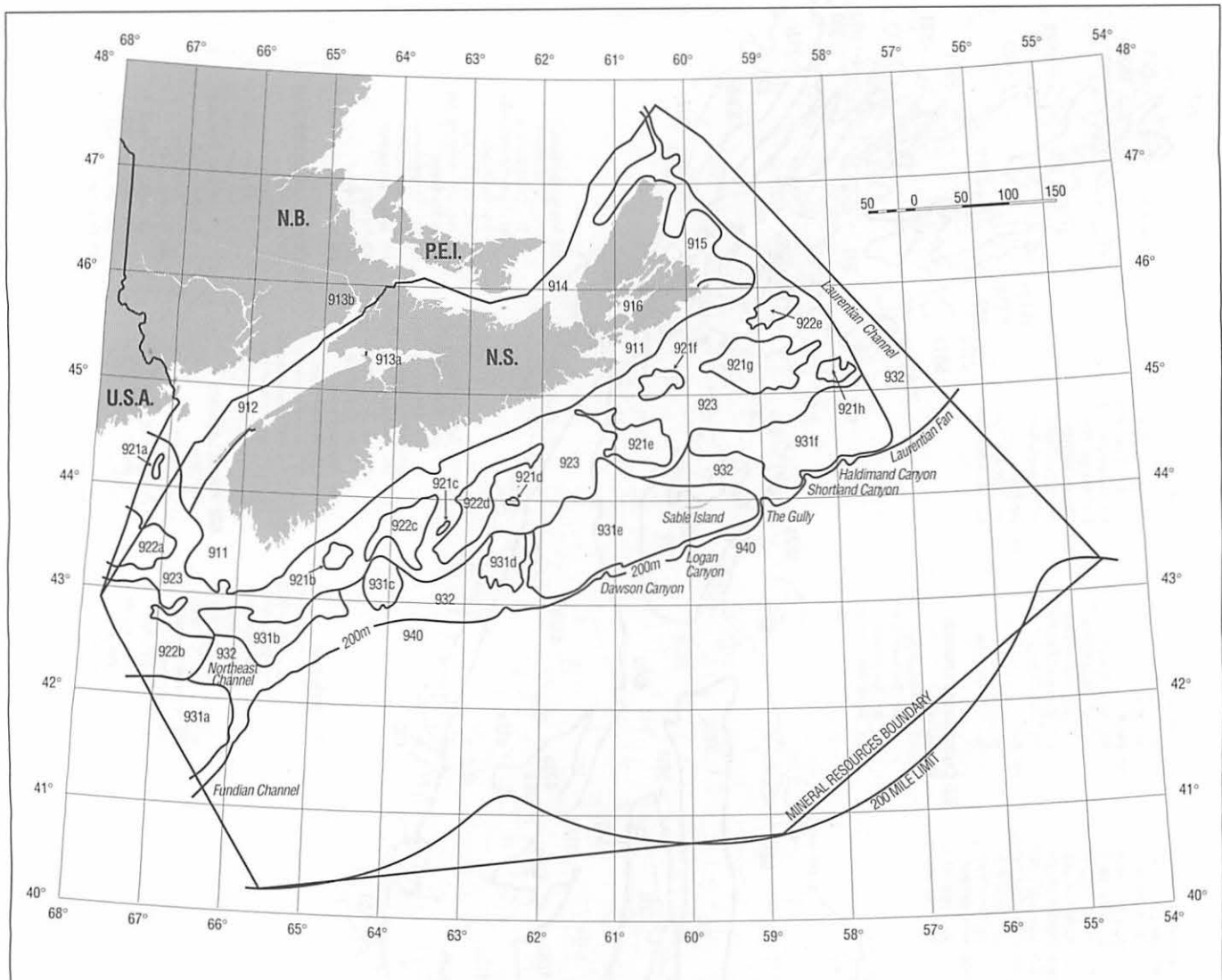


Figure 2: Region 900, Offshore/Continental Shelf, and component Districts and Units. Nova Scotia Geomatics Centre, Amherst, N.S.

District encompasses six of the ten plateaus which make up Theme Region 300. These six plateaus are all sharply defined, with level plateau surfaces at elevations between 200 and 300 m. Margins of the plateaus generally fall abruptly for 150 m or more, with little dissection by stream valleys.

Unit 313

The third number, 3, differentiates the three hill masses on the north shore of Bras d'Or Lake from two larger Units in District 310, one of which is located on the mainland and the other on Cape Breton Island. Differences in geology, glacial history, and soils combine to define the unique combination of features found in Unit 313 from the somewhat similar features found in Units 311, 312, and 314.

sub-Unit 313a

Three hill masses—Creignish Hills, North Mountain, and Boisdale Hills—comprise Unit 313. The hills are separated by the lowland fringes of the Bras d'Or Lake and are differentiated by the suffixes a, b, and c. Thus, sub-Unit 313a is the Creignish Hills.

Note: In some cases, Districts are not divided into Units but into sub-Districts. In these cases the reference number ends with a zero and a letter, for example, Gairloch Mountain (sub-District 210b).

BOUNDARIES

In this classification system, boundaries are defined by biophysical characteristics. For example, the rock types found in Region 300 are more resistant than those in surrounding Regions. As a result, isolated and well-defined hill masses have been formed by differential erosion of the soft and hard rocks. These hill masses are sufficiently elevated above the surrounding landscape to create distinctive climates. The more severe climate of the hills has led to the dominance of forest types quite different from the surrounding lowlands. Bedrock geology is also reflected in the generally thin soils over bedrock.

In the case of Theme Region 300, the distinctive regional climate is created by the elevation, which has evolved from differences in bedrock geology, which in turn have determined the nature of surficial materials. Climatic boundaries are therefore sharply defined and coincide with topography, bedrock geology, and soil boundaries.

Theme Regions

Among the eight Regions, only two sets of boundaries are ill-defined. Both are cases where regional climate is not determined by topographical and geological breaks in the landscape. All other boundaries of regions are easily identified by abrupt topographical breaks attributable to underlying geological structure. The two ill-defined boundaries are:

1. Atlantic Coast (Region 800): Wind and salt spray prevent normal growth of trees along the exposed Atlantic coast. Headlands and islands are frequently barren of trees. Inland, spruce is the most hardy tree and may dominate the forest for up to 8 km from the coast. As conditions become kinder inland, maple and birch begin to appear; other species grow according to local conditions. The inland boundary of the coastal forest varies considerably and cuts across all geological and topographical features. The high water mark provides boundaries with Region 900.
2. Plateau-Taiga (Region 100): Extreme exposure to

No.	Name	Regional Climate	Regional Vegetation	Regional Geology
100	Plateau-Taiga	exposed plateau—high winds	taiga-spruce	ancient high plateau
200	Highlands	highlands—short summers	fir	ancient high plateau
300	Avalon Uplands	uplands—high precipitation	maple-birch-fir	resistant fault blocks
400	Atlantic Interior	interior—warm summers	spruce (maple)-hemlock-pine	Meguma Group and granitic intrusions
500	Carboniferous Lowlands	interior—warm summers	spruce (maple)-hemlock-pine	Carboniferous sediments
600	Triassic Lowlands	interior—warm summers	spruce-hemlock-pine	Triassic sandstones
700	Fundy Coast	Fundy—moderated interior	transition	Basalt and fault blocks
800	Atlantic Coast	Atlantic coast—mild winters, high winds	spruce, barrens, and dunes	Meguma Group and granitic intrusions

Table 1: Terrestrial Theme Region climate, vegetation, and geology.

Region	District	Unit	sub-Unit (geographic)	Habitat	Vegetation association	Plant and animal species inventory
				based upon physical description	based upon biological description	

Table 2: The hierarchical system used in the *Natural History of Nova Scotia* allows landscape features to be mapped at various levels of detail.

winds stunts tree growth on the highest parts of the Cape Breton highlands. Although a large area is identified as taiga in the vicinity of the National Park, a variety of smaller areas of taiga occur in exposed locations to the north and south. Occurrence of wind-dominated taiga does not reliably correlate with topographical conditions.

Districts

Various dominant environmental criteria are used to define Districts. Each District has one defining characteristic, which is usually an element of the physical environment, most often bedrock geology. Surficial materials, landforms, and vegetation are also used in some circumstances. Frequently, the occurrence of the dominant factor is closely linked with other environmental conditions. For example, within the Carboniferous Lowlands (Region 500), a very distinct District (540) is defined by Kingsville soils. These soils are derived from the Scotch Village Formation in which flat-lying strata give a very level surface. The formation produces heavy clay soils which have very poor surface drainage and slow internal drainage. As a result, large organic deposits have accumulated. The Scotch Village Formation occurs over an area wider than the District, and the peat bogs cover an area smaller than the District. Therefore, the District boundary in this case is a compromise between the two soil formations.

The selection of the dominant characteristic on which a District's definition depends is thus a matter of judgement.

Units

Most major environmental factors do not vary within each Unit. A significant change in any one of these factors is in fact what differentiates one Unit from another. This does not imply that Units are homogeneous, but that environmental conditions create recurring patterns. For example, within the Atlantic Coast Region (800), a District with a dominance of abundant coastal sediment (District 830) is recognized; in turn, four Units are recognized as follows:

- 831 long, shallow estuaries with extensive salt marshes
- 832 eroding drumlins, islands, and isolated sand beaches
- 833 shallow large estuaries, salt marshes, and sand beaches
- 834 coastal islands

These Units have many similarities, but at least one major factor is different in each. Within the Unit, a repetitive, recognizable sequence of major envi-

ronmental factors occurs. Boundary conditions are usually well defined as, for example, between Units 833 and 834: coastal islands occur east of Owls Head, and sandy beaches occur west of Owls Head. Estuaries to the west are characterized by salt marshes, but those to the east of Ship Harbour are generally smaller and without significant salt marshes.

OFFSHORE THEME REGIONS

Classification of the Offshore/Continental Shelf (which includes the continental slope) follows a similar approach, using a hierarchy of Districts, Units, and sub-Units (see Figure 2). The Nova Scotia offshore is part of the North Atlantic Ocean, with which it shares broad similarities in physical oceanography, and plant and animal communities. Local variations within the Region principally reflect changes in productivity of the biological communities (e.g., upwelling or mixing zones) or localization of species (e.g., stocks, or localized warm-water fauna). The foot of the continental slope and the area just beyond, as included within political boundaries, has been chosen as a convenient limit of the Region, but, as noted, many of the features of the biological communities can be extended to cover the rest of the North Atlantic. This approach is consistent with biological classification systems for oceans previously developed for marine conservation^{4,5} in which the whole of the Nova Scotia continental shelf falls into the Acadian-Boreal Zone, one of several broad divisions of the ocean based on animal and plant distributions. The Acadian-Boreal Zone extends from Newfoundland to Cape Cod and includes the Gulf of St. Lawrence. The biota is essentially boreal (between tropical and subarctic) in character.

Districts in Region 900 are geographically distinct areas based principally on depth and the topographical divisions of the continental shelf and slope.⁶ The divisions of Inner, Middle, and Outer Shelf have been extended to include parts of the Gulf of Maine and Northumberland Strait. These are areas broadly similar in topography and geological origin and are thus consistent with the "District" definition used for the Nova Scotia landmass. As well, the Districts tend to have distinctive physical oceanographic and biological features, although boundaries often do not exactly coincide, owing to the mobile and variable nature of the ocean. For instance, the waters immediately adjacent to the coast and falling within the Inner Shelf District are biologically different from waters in the Middle Shelf District, owing to freshwater influences and temperature extremes. Similarly, the Outer Shelf and Scotian Slope districts have distinctive physical and biological processes.

Units within Districts are based on both geological and biophysical features. In the Inner Shelf District, Units have a highly local nature, with characteristics reflecting special geological or biological features. The six Units are defined by features such as tidal regime, degree of circulation and heating, and local sediment and bedrock conditions. Districts further offshore (the Middle Shelf and Outer Shelf) have less of a local character, but they are usually distinct in terms of topography and depth (e.g., banks, basins, saddles) and have distinct biological features related to depth and sediment type. For example, banks tend to have significant populations of suspension-feeding organisms such as Sea Scallop and Ocean Quahog that are not present in the deeper areas surrounding the banks.

Many of the Unit divisions support recognized habitat classifications⁶ such as soft bottom, corresponding to the bottoms in basins and deeper areas of the continental shelf (Units 922 and 932); insular environments (Sable Island, District 890, on Sable Island Bank, Unit 931e); submarine canyons (Unit 932); upwelling areas (included in Units 911, 912, and 931); topographic highs (offshore banks, Units 921 and 931); naturally deep holes (basins, Unit 922); and water-circulation bodies (gyres, District 940).

COMPARISON WITH OTHER SYSTEMS

During the preparation of the biophysical classification used in the *Natural History of Nova Scotia*, reference was made to other systems under development. Some apparent differences require explanation.

Systems Plan for Provincial Parks and Protected Areas

The revision of the *Natural History of Nova Scotia* was planned as a parallel and coordinated project with systems planning for provincial parks and protected areas. As the work proceeded, it was found that in some areas the boundaries of Districts and Units on the land were not sensitive enough to adequately meet planning requirements. As a result, some boundary changes were made, and all of the Regions, Districts, and Units were renumbered in a way different from the Theme Regions numbering. The 77 "Natural Landscapes" that have been identified and named for parks planning purposes have been identified at the end of each District or Unit description. Information used to define these "Natural Landscapes" is on file with the Parks and Recreation Division of the Nova Scotia Department of Natural Resources. This information is the basis of a

major initiative for new parks and protected areas in the province.^{7,8,9}

Federal Ecozone and Ecoregion Mapping

The Centre for Land and Biological Resources Research of Agriculture Canada has recently¹⁰ brought together a summation of several years of work by federal agencies through publication of a provisional map of "Terrestrial Ecozones and Ecoregions of Canada." Under this system, Nova Scotia is described as part of the "Atlantic Maritime Ecozone," and the province is further divided into eight "Ecoregions":

- 137 Atlantic Coast
- 141 Cape Breton Highlands
- 142 Nova Scotia Highlands
- 143 Maritime Lowlands
- 145 Annapolis-Minas Lowlands
- 150 Fundy Coast
- 153 Southwest Nova Scotia Uplands

These "Ecoregions" are further subdivided into 25 "Land Resource Areas" (LRAs) which in some cases are the same as the Districts used in the *Natural History of Nova Scotia*. The differences between the two systems result from the level of detail required at the national and provincial levels. The two systems are sufficiently similar to be used together without much difficulty.

Federal Marine Region Mapping

Mapping and description of "Marine Regions" was initiated by Parks Canada as a basis for national marine parks planning and has since been considered for marine environmental quality monitoring by Environment Canada. This work was carefully considered when describing the components of Region 900 of the *Natural History of Nova Scotia*. In the federal system, Nova Scotia waters fall within two "Marine Realms" (26 Gulf of St. Lawrence and 27 Atlantic) or within four "Marine Regions" (4 Gulf of St. Lawrence, 5 Atlantic, 6 Bay of Fundy, and 7 Magdalen Shallows). *Natural History of Nova Scotia* provides detailed descriptions of these areas.

REGIONAL DESCRIPTIONS

Each regional description includes information on the Region's character, geology, landscape development, climate, soils, vegetation, fauna, sites of special interest, associated topics and habitats. Additional subjects are included as required, and in some cases headings are combined.

As previously described, a hierarchical approach is used. For any particular Unit, the reader would

want to first read the Region description, then the District description, and finally the Unit description; more specific information will be found at each succeeding level of description. Associated Topics and Habitats are not repeated in the District and Unit descriptions if they were first noted in the Region description.

Twenty-one figures illustrate the relationship of the Regions, Districts, and Units to each other, topography, and geological structure. The block diagrams are schematic depictions of the landscape; particular locations are used to assist the reader's orientation.

Much is still to be learned about the natural history of Nova Scotia. Readers are encouraged to submit any information that might contribute to a fuller understanding of the Units.

"Sites of Special Interest" listed in each Unit or sub-District description are drawn from several sources: the final report of the International Biological Programmes' Conservation of Terrestrial Environments, Maritime Provinces Committee, which identifies proposed ecological conservation sites; a list of provincial parks and park reserves (where each is named, but for many no detailed information is available); and the personal knowledge of many of the reviewers listed in the acknowledgements.

The information under the "Proposed Parks and Protected Areas System" is a cross-referencing of numbered "Natural Landscapes" and names of "Candidate Protected Areas" currently in use by the Nova Scotia Department of Natural Resources.

"Associated Offshore Units" are offshore areas abutting the coastal part of the District or Unit. "Associated Coastal Units" are land areas abutting offshore Units.

"Associated Topics" are Topics described in Volume I that are of particular relevance to the Region, District, or Unit.

"Associated Habitats" are Habitats that are of particular importance in the Region, District, or Unit.



References

- 1 Lacate, D.S. (compiler) (1969) *Guidelines for Biophysical Land Classification*. Publication 1264. Department of Fisheries and Forestry, Canadian Forestry Service, Ottawa.
- 2 Wiken, E. (1986) *Terrestrial Ecozones of Canada*. Ecological Land Classification Series 19. Lands Directorate, Environment Canada, Ottawa, 26 pp.
- 3 Davis, D.S., P.L. Stewart, R. Loucks, and S. Browne (1994) "Development of a Biophysical Classification of Offshore Regions for the Nova Scotia Continental Shelf." In *Cooperation in the Coastal Zone*, edited by P.G. Wells and P.J. Ricketts. Coastal Zone Canada '94 Conference Proceedings, vol:5:2149-57. Coastal Zone Canada Association, Bedford Institute of Oceanography, Dartmouth, N.S.
- 4 Ray, G.C., B.P. Hayden, and R. Dolan (1982) *Development of a Biophysical Coastal and Marine Classification System*. In *National Parks, Conservation and Development: The Role of Protected Areas in Sustaining Society*, edited by J.A. Mcneely and K.R. Miller. Proceedings of the World Congress on National Parks, Bali, Indonesia, Smithsonian Institution Press, Washington, D.C., 39-44.
- 5 Salm, R.V., and J.R. Clarke (1984) *Marine and Coastal Protected Areas: A Guide for Planners and Managers*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- 6 King, L.H., and B. MacLean (1976) "Geology of the Scotian Shelf." Marine Sciences Paper 7. Geological Survey of Canada Paper 74-3. Canadian Hydrographic Services, Department of the Environment and Geology, Survey of Canada, Ottawa.
- 7 Lynds, A., and J.M. LeDuc (1993) "Understanding and Protecting Biodiversity at the Landscape Level in Nova Scotia." In *Protecting Our Natural Heritage*, proceedings of a workshop on biodiversity and protected areas in Atlantic Canada, Environment Canada, Dartmouth, N.S., 15-19.
- 8 Leduc, J.M., and A.D. Smith (1992) "System planning for protection-oriented provincial parks in Nova Scotia." In *Science and the management of protected areas*, edited by J.H.M. Willison, S. Bondrup-Nielsen, C. Drysdale, T.B. Herman, N.W.P. Munro, and T.L. Pollock, proceedings of an international conference, Acadia University, Wolfville. Elsevier, Amsterdam, 139-144.
- 9 Nova Scotia Department of Natural Resources (1994) *A Proposed Systems Plan for Parks and Protected Areas in Nova Scotia*. Nova Scotia Department of Natural Resources, Parks Division, Halifax, N.S. 20 pp.
- 10 Ecological Stratification Working Group (1993) "Ecoregions of Canada," provisional map, scale 1:7,500,000. Agriculture Canada, Research Branch, Centre for Land and Biological Resources Research, and Environment Canada, State of the Environment Reporting, Ottawa.

A note to the reader

The following list of references is by no means comprehensive, but will assist the reader in finding additional information related to the topics discussed in Volume II of the *Natural History of Nova Scotia*. Readers are also encouraged to refer to "Associated Topics" and "Associated Habitats" in Volume I, as listed at the end of each of the Unit descriptions in Volume II.

Additional References

Benson, D.W. and G.D. Dodds (1977) *The Deer of Nova Scotia*. Department of Lands and Forests, Province of Nova Scotia. Halifax. 92 pp.

Banfield, A.W.F. (1974) *The Mammals of Canada*. University of Toronto Press, Toronto. 438 pp.

Catling, P.M., B. Freedman and Z. Lucas (1984) *The Vegetarian and Phytogeography of Sable Island, N.S.* Proceedings of the Nova Scotian Vol.34:181-247. Halifax.

Erskine, A.J. (1992) *Atlas of Breeding Birds of the Maritime Provinces*. Nimbus Publishing Ltd, and the Nova Scotia Museum. Halifax. 270 pp.

Gilhen, J. (1974) *The Fishes of Nova Scotia's Lakes and Streams*. The Nova Scotia Museum, Halifax. 192 pp.

Gilhen, J. (1984) *Amphibians and Reptiles of Nova Scotia*. The Nova Scotia Museum, Halifax. 162 pp.

Howe, C.D. (1912) in Fernow, B.E. (1912) *Forest Conditions of Nova Scotia*. Commission of Conservation, Ottawa. (Published by permission of the Department of Crown Lands, Nova Scotia)

Loucks, O.L. (1962) *A Forest Classification For the Maritime Provinces*. Proceedings of the Nova Scotia Institute of Science, Vol.25: 85-167. Halifax.

Peterson, R.L. (1966) *The Mammals of Eastern Canada*. Oxford University Press, Toronto. 465 pp.

Rowe, J.S. (1972) *Forest Regions of Canada*. Canadian Forestry Service Bulletin 1300. Ottawa.

Scott, W.B. and M.G. Scott (1973) *Freshwater Fishes of Canada*. Fisheries Research Board of Canada, Bulletin 184, Ottawa. 966 pp.

Scott, W.B. and M.G. Scott (1988) "Atlantic Fishes of Canada" In *Canadian Bulletin of Fisheries and Aquatic Sciences No. 219*. Ottawa. 713 pp.

Wright, B. (1989) *The Fauna of Sable Island*. Curatorial Report #68. The Nova Scotia Museum, Halifax.