Land and Environment of the Circumpolar World I

Instructor:	TBA	**Classes:**	TBA
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COURSE DESCRIPTION

This 3-credit course provides a multidisciplinary study of the biophysical environment of the Circumpolar North. Course materials examine the processes operating at the Earth's surface and within the atmosphere and oceans as well as their roles in structuring northern ecosystems. General Circulation Models (GCMs) predict that the Arctic will be severely affected by ongoing environmental change. Course materials examine some of the impacts of environmental change on the processes shaping northern landscapes and the human populations that inhabit these landscapes.

The primary aim of this course is to provide students with a more in-depth understanding of the land and environment that defines the Circumpolar North as well as the key issues involving interaction between humans and environment that were introduced through modules of NOST 101/BCS 100: Introduction to The Circumpolar World.

COURSE DESCRIPTION – BANNER

This is the first of a two-part, upper-level University of the Arctic multidisciplinary course focussing on the biophysical environment of the Circumpolar North. The course begins with an examination of the processes operating at the Earth's surface and within the atmosphere and oceans, and of their roles in structuring northern ecosystems. The course next explores some of the impacts of climate change on the processes shaping northern landscapes and the human populations that inhabit these landscapes.

COURSE OUTCOMES

Upon successful completion of The Circumpolar World, students will have:

- A better understanding of the land, seas, climate, ecology, and natural resources of the Circumpolar North;
- An appreciation of the diverse methods that contribute to and underpin understanding lands and environments in the Circumpolar North;
- Insight into the challenges presented by the physical and natural universe,

- General understanding of human influence on circumpolar lands and environments; and
- A basic knowledge of circumpolar lands and environments to promote an integrated and multidisciplinary understanding in further studies of Peoples, Cultures and Contemporary issues in the Northern Studies program.

COURSE TRANSFER

UARCTIC BCS 311 (3 credits/ 6 ECTS)

This course is accepted at all University of the Arctic member institutions. Transfer to non-member institutions will be sought at the earliest opportunity. For more information about transferability, please contact the Arts and Science Division.

COURSE PREREQUISITES

BCS 100/NOST 101. This is an advanced course; students will normally have successfully completed a minimum of 45 credits of university-level coursework.

COURSE FORMAT

This course has been designed for web-based delivery. It consists of weekly modules, each comprised of a "lecture" or module text, required and suggested readings, and study questions. Students will discuss the module text in online fora. Alternatively, the course may be offered consisting of in-class lectures and discussions of readings.

COURSE INSTRUCTOR

This is a 3rd-year multidisciplinary natural history course. Suitable instructors would include individuals with a MSc or PhD in a related discipline and working/research experience in such fields as are covered by this course (see the syllabus).

ASSESSMENT

The model of student activities and assessment for the distance-delivered version is the following:

First In-class Examination 15%

Second In-class Examination 15%

Participation in Class Discussions 10%

Essay/Research Paper 20%

Final Examination 40%

TOTAL 100%

Midterm and final examinations will consist of multiple-choice questions, the interpretation of maps and graphs, short essay questions (about one page in length), and long essay questions (3–4 pages in length). Midterm Examination 1 will be held after the class has completed Module 5. Midterm Examination 2 will be held after the class has completed Module 10. The final examination will be held during the regularly scheduled final examination period. All of the materials presented in the course

(assigned reading, self-study questions, class discussions, research papers) will be examined on the midterm and final examinations.

Evaluation will normally be done in English. However, students may request, with the approval and support of their site coordinators and with the approval of the instructor, to submit their papers in their own languages.

REQUIRED TEXTS

- BCS 311/NOST 326 course reader;
- S. B. Young. 1989. *To the Arctic: An Introduction to the Far Northern World*. Wiley Science Editions. New York: John Wiley & Sons, Inc.;
- CAFF (Conservation of Arctic Flora and Fauna). 2001. *Arctic Flora and Fauna: Status and Conservation* [online]. http://www.caff.is/. Helsinki: Edita; and
- AMAP (Arctic Monitoring and Assessment Programme). 1998. *AMAP Assessment Report: Arctic Pollution Issues*, chapters 2, 4, and 5 [online]. http://www.amap.no/. Oslo, Norway.
- Recommended: E. C. Pielou. 1994. *A Naturalist's Guide to the Arctic*. Chicago: The University of Chicago Press.

COURSE SYLLABUS

Module 1: Concepts of Nordicity

Module developed by Alec E. Aitken, Associate Professor, Department of Geography, University of Saskatchewan

The concept of what constitutes the North has proven difficult to define precisely. The vast region of the circumpolar North includes portions of three continents—North America, Europe, and Asia—as well as the Arctic Ocean basin and its marginal seas, and the world's largest non-continent island, Greenland. Various classification schemes have been promoted to define the boundaries of the North. Several of these classification schemes will be examined in this module with a view to developing an appreciation of the various approaches adopted by researchers to define the North.

This introduction begins with a general overview of the lands, seas, physical and natural environments of the circumpolar North. Students are then introduced to the major physical forces shaping the circumpolar northern environment (water, snow, ice, climate). Basic concepts of Arctic ecology and survival strategies of Arctic organisms are introduced. Characteristics, functions and contents of three main ecosystems: terrestrial, freshwater, and marine are discussed and how these provide the basis for human occupation are considered. Finally, the module describes the non-living resources of the Circumpolar North.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The various criteria employed to distinguish between Subarctic and Arctic environments;
- The module key terms and concepts;
- The components of the coordinate grid system used on maps of the Earth's surface;

- The effects of the Earth's seasonal positions in relation to the Sun; and
- The different climate classification systems and explain the measurements and notations they use to classify regional climates.

Readings

- Hamelin (1978), *Canadian Nordicity: It's Your North, Too*.
- Young (1989), chapter 1: "Bears, Boreas and Celestial Mechanics," in *To the Arctic: An Introduction to the Far Northern World*, 1–24.

Module 2: Northern Climates

Module developed by Alec E. Aitken, Associate Professor, Department of Geography, University of Saskatchewan

Northern climates are generally categorized into Subarctic, Low Arctic, and High Arctic climate zones. These climate zones are largely defined by annual variations in temperature and precipitation, soil water balance, the nature of the vegetation cover, and the nature of the underlying permafrost. Average summer temperatures of less than 10°C, small soil moisture deficits, tundra vegetation, and continuous permafrost characterize Low and High Arctic climates. Average summer temperatures greater than 10°C, moderate soil moisture deficits, boreal forest vegetation, and discontinuous or sporadic permafrost, on the other hand, characterize Subarctic climates.

This module examines the influences of the flux of solar radiation and sensible and latent heat on northern climates. The nature and magnitude of the processes that affect temperature and precipitation are examined using examples from northern Canada.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The components of radiation and energy balances and the influence of these energy fluxes on seasonal variations in air temperatures;
- The distinguishing characteristics of maritime and continental climates;
- The principles of atmospheric circulation and the processes that generate precipitation in northern environments;
- Strategies and techniques for interpreting climographs; and
- The definitions of the key words of this module.

Readings

- Rouse (1993), chapter 3: "Northern Climates," in *Canada's Cold Environments,* 65–92.
- Young (1989), chapter 2: "Polar Weather and Climate," in *To the Arctic: An Introduction to the Far Northern World*, 25–43.

Module 3: Northern Hydrology

Module developed by Alec E. Aitken, Associate Professor, Department of Geography, University of Saskatchewan

Snow and ice play a major role in the hydrologic cycle of northern environments. Thawing of snow and ice involves the flux of latent heat; hence the energy and water

balances are strongly linked in northern environments (see Module 2). The presence of snow and ice at the Earth's surface also influences the radiation balance: high albedos reduce insolation in the spring and early summer, allowing for the persistence of cold temperatures in these seasons. For much of the year, water is stored in snowbanks; lake, river, and sea ice; and glaciers. The duration of the snow cover in the Canadian Subarctic is 180 days; in the Canadian Arctic it is approximately 270 days. There is only a short period each year when air and ground temperatures rise above the freezing point (0°C), hence most hydrologic processes operate over a much shorter period of the year in Subarctic and Arctic environments than in temperate environments. Given the importance of these atmosphere-surface interactions, it comes as no surprise that Hamelin included measures for snow and ice cover into his calculation of the Nordic Index (see Module 1).

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The physical processes that influence precipitation, evapotranspiration, groundwater storage and flow, and surface runoff;
- Nival, proglacial, and wetland flow regimes as illustrated in stream hydrographs;
- Methods, techniques and goals of interpreting hydrographs; and
- The module key words and concepts.

Readings

- Woo (1993), chapter 5, "Northern Hydrology," in *Canada's Cold Environments*, 117–142.
- Young (1989), chapter 3, "Ice and Snow," in *To the Arctic: An Introduction to the Far Northern World*, 45–54.

Module 4: Physical Oceanography

Module developed by Alec E. Aitken, Associate Professor, Department of Geography, University of Saskatchewan

The Arctic Ocean is a large ocean basin connected primarily to the Atlantic Ocean. An unusual feature of this ocean basin is the presence of sea ice. Sea ice covers less than 10% of the world's oceans and 40% of this sea ice occurs in the Arctic Ocean basin. There are several effects of this sea ice cover on the physical oceanography of the Arctic Ocean and its marginal seas (e.g., Baffin Bay, Hudson Bay, Barents Sea):

- The temperature of surface water remains near the freezing point for its salinity;
- Brine rejection from sea ice increases the density of surface waters and contributes to thermohaline circulation;
- Winds must transfer momentum from the atmosphere to the ocean surface through the sea ice cover; and
- The seasonally variable albedo of sea ice affects the exchange of insolation at the ocean surface and the quantity of energy available to melt the sea ice cover.

This module examines the physiography of the polar seas, the physical processes that contribute to oceanic circulation and water mass formation, and the physical processes

that influence the growth and decay of sea ice and the formation of polynyas.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The physiography of the Arctic Ocean basin and its marginal seas;
- The physical processes that influence the temperature and salinity of water masses formed in the Arctic Ocean basin and its marginal seas;
- The influences of atmospheric circulation on oceanic circulation and the interaction of water masses within polar seas;
- The physical processes that contribute to the growth and decay of sea ice and the formation of polynyas; and
- The key words and concepts for this module.

Readings

- Barry (1993), chapter 2: "Canada's Cold Seas," in *Canada's Cold Environments*, 29–61.
- Coachman and Aagaard (1974), "Physical Oceanography of Arctic and Subarctic Seas," in *Marine Geology and Oceanography of the Arctic Seas*, 1–72.

Module 5: The Land

Module developed by Alec E. Aitken, Associate Professor, Department of Geography, University of Saskatchewan

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- Glacier and permafrost distribution in the Circumpolar North;
- Mass balance and flow of glaciers and the processes that influence them;
- Glacial erosion, transport, and deposition and morphology, composition, and distribution of glacial landforms;
- Glaciofluvial processes and landforms;
- Permafrost and its development and persistence in northern environments;
- Periglacial processes and the landforms created by those processes; and
- Critical vocabulary and key terms used in discussions of cold region landscapes.

Readings

- Young (1989), chapter 4, "Glaciers and Glaciology," in *To the Arctic: An Introduction to the Far Northern World*, 65–83.
- Young (1989), chapter 5, "Polar Landscapes: Glacial Geology and Geomorphology," in *To the Arctic: An Introduction to the Far Northern World*, 85–109.
- Young (1989), chapter 6, "The Periglacial Environment," in *To the Arctic: An*

Introduction to the Far Northern World, 111–136.

- Young (1989), chapter 7, “Ice Ages,” in *To the Arctic: An Introduction to the Far Northern World,* 137–149.

Module 6: Ecological Principles

Module developed by Bill Heal, Visiting Professor, School of Biological Sciences, University of Durham

There are many different ways to consider the tundra, its lakes and rivers, the coast, the seas, and the ocean. You could describe them in your own way, but it is important to remember that there are general scientific rules or principles that apply to ecological systems and that help you to explore them systematically. In this module, a series of basic principles are outlined as a framework for the contents of other modules. Three practical approaches are widely applicable: (1) Always consider how patterns or processes change as they move up or down the scales in space and time, from local to regional to global or from minutes to years to decades. (2) Environmental conditions change along small or large gradients, from the air, through the vegetation and into the soil, or up mountains. (3) Interactions and feedback are a normal part of ecology. Changes in one part of the system affect other parts, often causing a chain of effects, with positive or negative feedback to the original part.

While completing this module, students will develop an understanding of and be able to explain:

- The ecological principles or rules that help us to understand the structure and function of ecological systems in the Arctic;
- The hierarchy of scales in space and time and the challenge it poses for understanding circumpolar ecological systems;
- Environmental gradients and ecological interactions and feedback effects;
- How the main ecological principles studied apply to the terrestrial and aquatic systems in the Arctic; and
- The vocabulary, concepts and key terms used in discussions of ecological principles.

Readings

- AMAP (1997), *Arctic Pollution Issues: A State of the Environment Report*.
- CAFF (2001), *Arctic Flora and Fauna: Status and Conservation*.

Module 7: Life on Land

Module developed by Bill Heal, Visiting Professor, School of Biological Sciences, University of Durham

Life on land is a continuum that includes the wetlands, rivers, and lakes. In the Arctic, life is certainly dominated by climate, but climate is not simply temperature. Water in all its forms, as well as radiation and wind, each plays a part in defining climate. Locationwhere you are in the landscapealso has significance. This module explores three aspects of life on land: climate variation and its ecological effects, survival strategies of Arctic flora and fauna and ecosystems, food webs, and nutrients.

Students will first examine the ways climate influences plants and animals at a large scale, over landscape and continental scales. You will then consider climate at a micro-scale, particularly the effect of small changes in topography. The module then

discusses how organisms adapt to the climate, and which characteristics have been selected over time. Adaptations may be physical, physiological, reproductive, or behavioural and they vary in combination and from place to place. Examples are taken from different taxonomic groups: mammals, birds, invertebrates, microflora, and plants. Finally, the class will consider how the ecological principles are applied to two major ecosystems on land. The two examples are Lake Myvatn in Iceland, and Toolik Lake in Alaska. Their names suggest that they are freshwater ecosystems. The lakes are certainly the focus of attention, but it is soon apparent that what happens in the lakes is strongly influenced by what happens in the surrounding land—the catchment area—and vice versa. Where do these systems begin and end? Is it a question of scales of space and time and of gradients?

While completing this module, students will develop an understanding of and be able to explain:

- How life manages to survive and thrive in an apparently severe environment;
- The characteristics of the climate that is experienced by plants and animals above and below the ground (micro-scale) and over landscapes (macro-scale);
- iThe main climatic factors that influence aquatic environments on land;
- The intimate relationship between land and water for individual species, ecosystems, and landscapes;
- How different animals and plants have evolved strategies that enable them to thrive with the extreme climate on land; and
- How general ecological principles can be applied to consideration of life on land.

Readings

- AMAP (1997), *Arctic Pollution Issues: A State of the Environment Report*.
- CAFF (2001), *Arctic Flora and Fauna: Status and Conservation*.

Module 8: Life in the Ocean

Module developed Snorri Baldursson, Assistant Director General, Icelandic Institute of Natural History

This module explores some of the fundamental aspects of marine ecology and biodiversity. It begins with contrasting Arctic seas with temperate and Antarctic waters and explains a few key factors that characterize the physical marine environment. Most of the chapter, however, is devoted to a description of the Arctic marine ecosystem, from primary producers (phytoplankton, macroalgae), through grazers (zooplankton, gastropods, etc.), to fish and top predators (such as marine mammals and seabirds).

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The major features that set the Arctic seas and ecosystems apart from other marine systems, including those of the Antarctic;
- The major differences between terrestrial and marine life;
- The importance of light (or lack there of) and sea ice for marine life;
- The global importance of Arctic seas;

- The major habitat types and nutritional groups in the marine environment;
- The function of phytoplankton—and that of other primary producers—and its major types; be able to list a few species important in Arctic and Subarctic seas;
- The function of zooplankton (and other grazers), its major types, and be able to list a few species important in Arctic and Subarctic seas;
- At least ten Arctic and Subarctic fish species, and explain their importance in the Arctic marine ecosystem
- At least ten major Arctic marine mammals, and briefly describe their distribution and life history.
- At least ten Arctic seabirds, and briefly describe their distribution and importance; explain the role of seabirds in linking the marine and terrestrial ecosystems.

Readings

- AMAP (1998), *Assessment Report: Arctic Pollution Issues*, chapters 2.6 (pages 20–23) and 4.6 (pages 128–135).

Module 9: Non-Living Natural Resources of the Arctic and Their Use

Module developed by Snorri Baldursson, Assistant Director General, Icelandic Institute of Natural History

The Arctic is rich in natural resources: living and non-living, renewable and non-renewable. Human life and prosperity in the Arctic is dependent on the use of these resources, be it for sustenance consumption, export, or trade for other goods. Use of natural resources will always have some effects on the environment. Use of a non-renewable resource is fundamentally unsustainable, because the resource will eventually be depleted.

In order to be sustainable, the use of a renewable resource must harvest less than what is added through growth or recycling. The natural resources of the Arctic and their use will be discussed in this module as well as in Modules 10 and 11. In this module, we will explore non-living resources—water, oil and gas, and minerals—and their use.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The difference between living- and non-living, renewable and non-renewable resources;
- The various uses of fresh water and its potential for the Arctic;
- The similarities and differences in energy production of hydro power, geothermal heat, and fossil fuels (oil and gas);
- The main environmental benefits and costs of hydro power and geothermal energy;
- The main oil and gas regions in the Arctic;
- The potential effects of oil and gas development;
- The main minerals that are mined in the Arctic and some major mining regions; and

- The effects of mining activities.

Readings

- There is no reading assignment for this module, though you might be interested in exploring the items in the References section for supplementary reading.

Module 10: Living Terrestrial Resources of the Arctic and Their Use

Module developed by Snorri Baldursson, Assistant Director General, Icelandic Institute of Natural History

In this module, we focus on the terrestrial living resources, including the northern boreal forest and its use; the grasslands and lichen heaths and related agriculture and reindeer husbandry; and, finally, the hunt of terrestrial wildlife.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The main vegetation zones of the circumpolar Arctic, and name the species of trees that form the treeline;
- The various functions and uses of the boreal forest at global and regional levels;
- The main forest resource in each Arctic country and its economic significance;
- The different types of agriculture and the significance of each in the Arctic region;
- The main environmental impacts of agriculture and forestry in the Arctic, especially in the North Atlantic region;
- The areas and indigenous peoples involved in reindeer herding in the Arctic, and discuss the significance of reindeer herding for these peoples;
- The main subspecies/herds of caribou and reindeer in the Arctic region and explain their significance as wildlife; and
- Other major terrestrial wildlife species in the Arctic and discuss their uses.

Readings

- Bernes (1996), “The Nordic Arctic Environment—Unspoilt, Exploited, Polluted.” *Nord* 26: 101–128; read the chapters on agriculture and forestry.
- Freese (2000), *The Consumptive Use of Wild Species in the Arctic*, “Part III: A Review of Consumptive Use in the Arctic”; only the parts dealing with terrestrial wildlife and reindeer herding are required reading.

Module 11: Living Resources in the Circumpolar Marine Environment

Module developed by Snorri Baldursson, Assistant Director General, Icelandic Institute of Natural History and Hjalmar Vilhjalmsson, Senior Research Scientist, Icelandic Marine Research Institute

During the last century, global fisheries, including those in the Arctic, have increased rapidly because of technological innovations. Steamboats, then trawlers, and finally modern otter trawlers replaced open rowboats. Fishing gear changed from hook-and-line to trawl and purse seine. The skipper’s eye and “sixth sense” has been largely

replaced by radar and sonar equipment, able to locate the fish with great accuracy. All this technical improvement has enabled enormous amounts of fish to be caught from the Arctic and Subarctic oceans. Arctic fisheries probably reached a peak, in terms of amounts caught, in the late 1950s through the 1960s, but the fishing technologies are still evolving.

In general, the harvest of marine wild species is the single most important form of natural resource use across all the regions and peoples of the Arctic. Commercial fisheries, including whaling and sealing, are currently and historically a major economic activity. The fisheries are conducted in two major ocean systems—the North Atlantic Ocean and the Bering Sea. In this module, we will explore these fisheries, their national importance, the type and amount of fish caught, and the status of these resources. We will also discuss the history of commercial whaling and sealing to some degree, as well as the subsistence use of marine living resources, especially whales and seals, by Indigenous peoples and local residents.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The main fishing grounds of the Circumpolar region;
- The functioning of Arctic fisheries and their economic importance for the Circumpolar countries;
- Key fisheries species and their basic biology and relative economic importance;
- Trends in catch (landings) from key stocks, such as cod, walleye pollock, herring, and capelin, over time and across regions, and discuss the impacts of fisheries on these stocks;
- The main species of harvested marine mammals and seabirds in the waters of the circumpolar North;
- The commercial whaling of Arctic and non-Arctic nations; and
- The effects of commercial whaling on Arctic whale stocks.

Readings

- Freese (2000), The Consumptive Use of Wild Species in the Arctic; selected marine-related chapters as assigned by the instructor.

Module 12: Arctic Biodiversity in a Global Context

Module developed by Bill Heal, Visiting Professor, School of Biological Sciences, University of Durham

The Arctic is intimately connected to the rest of the world in all its dimensions. It interacts through climate, ocean circulation, animal migration, pollution, industry, and policies. Tthe Arctic supports many unique and highly adapted species. It has some parallels with other cold-dominated regions of the Antarctic and alpine/high mountain areas, but these three regions are distinct in their biogeography. The Arctic constitutes only 3–4% of global land and 4% of all oceans. For many taxonomic groups on land, the Arctic contributes less than 1% of global species diversity, but some groups are more strongly represented. Their ability to thrive in extreme environments and their genetic diversity are important features for conservation.

The dominant threat to Arctic biodiversity is from climate change—in contrast to other biomes, where land use and pollution are bigger threats. The response of organisms is usually individualistic and is often greatest at the edge of their range with

extension northwards. Such movement can compromise the aim of protected areas. Climate change is occurring over much of the Arctic, and more there than in other parts of the world. But change is not uniform, and some areas are experiencing cooler conditions than others.

Other threats to biodiversity include chemical pollutants generated locally and in lower latitudes. Persistent organic pollutants (POPs) are particularly important because of their concentration within food chains. Introduction of species from lower latitudes is increasing through tourism and imports. Human populations in the Arctic have doubled in the last 30 years, causing increased pressures on terrestrial and marine resources. Industrial development and land use has increased and could become more extensive in response to climate change.

Risk assessment is an important tool in assessing potential impacts of various factors in different regions. Environmental protection and nature conservation must now be considered in relation to economic, cultural, and social development. The needs and knowledge of indigenous peoples are being increasingly recognized. It is the balance between all these dimensions that determines sustainable development.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- The main features that distinguish Arctic biodiversity from that in similar environments and in other biomes of the world;
- The causes and relative importance of different threats to biodiversity in the Arctic compared to other regions of the globe;
- The potential effects on biodiversity of different threats and the potential of Arctic biodiversity to resist change;
- The implications for conservation and resource management of the forthcoming publication of the Arctic Climate Impact Assessment (ACIA); and
- The proper place of the conservation of biodiversity in the wider context of the rights of indigenous peoples and of sustainable development.

Readings

- AMAP (1997), “Petroleum Hydrocarbons,” in *Arctic Pollution Issues: A State of the Arctic Environment Report,* [online] http://amap.no/.
- CAFF (2001), “Conservation,” in *Arctic Flora and Fauna: Status and Conservation*, 77–109, [online] http://www.caff.is.
- Caulfield (2000), “Political Economy of Renewable Resources in the Arctic,” in *The Arctic: Environment, People, Policy*, 485–513.
- Nuttall (2000), “Indigenous Peoples’ Organisations and Arctic Environmental Co-operation,” in *The Arctic: Environment, People, Policy*, 621–637.

Module 13: Conservation in the Circumpolar North

Module developed by Snorri Baldursson, Assistant Director General, Icelandic Institute of Natural History

This module explores various approaches to nature conservation with a focus on habitat and species conservation, co-management, and environmental impact assessments. Protected areas represent the most common habitat conservation approaches worldwide. The network of protected areas in Circumpolar countries is described and discussed as well as species conservation instruments, such as Red

Lists. On a global and regional Arctic scale, several intergovernmental conventions and treaties aim to protect biodiversity in its various forms. These are briefly identified, with a focus on the recently established Arctic Council, which provides a forum for the Arctic nations to discuss environmental protection and sustainable development initiatives in the region.

While completing this module, students will develop an understanding of and upon its completion should be able to explain or describe:

- Why conservation is needed, and identify the forms it takes;
- The various types and purposes of protected areas and their distribution in the Arctic;
- IUCN protected area management categories and species threats categories;
- How the approach to species and habitat conservation has been changing in recent years and why;
- What co-management is and how it differs from other approaches to conservation;
- What an EIA is and its purpose;
- At least three globally endangered species of birds, mammals, and fish in the Arctic;
- The main international conservation conventions and treaties; and
- The structure of the Arctic Council and discuss its importance.

Readings

- CAFF (2001), “Conservation,” in *Arctic Flora and Fauna: Status and Conservation*, 77–109, [online] http://www.caff.is/.
- CAFF (2001), “The Tundra and the Polar Desert,” in *Arctic Flora and Fauna: Status and Conservation*, 147–150, [online] http://www.caff.is/.