AQUATIC ECOLOGY LEARNING OBJECTIVE	TERMS AND CONCEPTS	USEFUL RESOURCES (not an exhaustive list)
Describe the chemical and physical properties of water and explain their importance for freshwater and saltwater ecosystems		http://ga.water.usgs.gov/edu/waterproperties.html http://earthguide.ucsd.edu/earthguide/diagrams/watercycle/index.html http://www.ec.gc.ca/WATER/en/manage/effic/e_weff.htm http://www.ec.gc.ca/WATER/en/manage/poll/e_poll.htm http://www.ec.gc.ca/WATER/en/info/pubs/FS/e_FSA4.htm http://www.statcan.gc.ca/pub/16-401-x/2008001/5006932-eng.htm http://www.aquatic.uoguelph.ca/habitat.htm http://atlas.nrcan.gc.ca/site/english/maps/environment/hydrology/watershed/1 http://ga.water.usgs.gov/edu/earthgwaquifer.html http://ga.water.usgs.gov/edu/watercycle.html http://www.env.gov.nl.ca/parks/rivers/ http://www.dfo-mpo.gc.ca/oceans/events-evenements/oceansday-journeedesoceans/list-liste-eng.htm http://www.dfo-mpo.gc.ca/zone/under-sous-eng.htm http://www.dfo-mpo.gc.ca/oceans/marineareas-zonesmarines/mpa-zpm/atlantic-atlantique/leadingtickles-eng.htm http://www.env.gov.nl.ca/parks/wer/r_csme/ http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policies-politique/index_e.asp http://atlas.nrcan.gc.ca/site/english/learningresources/theme_modules/wetlands/index.html http://www.soil.ncsu.edu/publications/BMPs/buffers.html http://www.fao.org/fishery/topic/2880/en http://www.dfo-mpo.gc.ca/science/enviro/habitat-eng.htm http://www.env.gov.nl.ca/Env/env/waterres/Policies/WQ-Standard-PhysicalChemical.asp http://www.dfo-mpo.gc.ca/species-especes/species/species_searchLocation_e.asp http://www.dfo-mpo.gc.ca/seal-phoque/faq_e.htm http://www.ec.gc.ca/soer-
Identify the processes and phases for each part of the water cycle	Hydrologic Cycle	
Discuss methods of conserving water and reducing point and non-point pollution		
Analyse the interaction of competing uses of water (hydropower, navigation, wildlife, recreation, waste assimilation, irrigation, industry etc.) and propose solutions for wise use of the resource		
Understand and describe the main components of aquatic habitats including fish (see below), plants and non-living elements (chemical and physical properties, geology)		
Identify common aquatic organisms through the use of a key	Groundfish, pelagics, invertebrates, diadromous, marine mammals, freshwater species	
Deliniate the watershed boundary for a small water body and describe how characteristics of the watershed would affect management approaches		
Explain the different types of aquifers and how each type relates to water quality and quantity		
Briefly describe the benefits of wetlands, both function and value		
Understand the purpose of a stream buffer	Riparian buffer	
Describe how land use practices impact aquatic ecosystems		
Describe the main commercial uses of aquatic/marine resources in NL	Aquaculture, Hydropower, fisheries (ocean, river), oil and gas, marine	

	transportation etc.	ree/English/Indicator_series/new_issues.cfm?issue_id=6&tech_id=25#bio_pic http://www.ec.gc.ca/soer-ree/English/Indicator_series/new_issues.cfm?issue_id=7&tech_id=28#bio_pic http://www.ec.gc.ca/soer-ree/English/Indicator_series/new_issues.cfm?issue_id=3&tech_id=10#bio_pic For a slide show on Stream buffers, try http://www.riparianbuffers.umd.edu/slide.html For information on water quality testing, see the following links http://www.nrw.qld.gov.au/education/teachers/water/resources/sheet_08.pdf http://www.nrw.qld.gov.au/education/teachers/water/resources/sheet_09.pdf http://www.nrw.qld.gov.au/education/teachers/water/resources/sheet_10.pdf
Know methods used to assess and manage aquatic environments and use water quality information to assess the general water quality of a given body of water	Sampling techniques, water quality parameters (physical, chemical, biological), point and non-point source pollution	
Understand why marine environments are important and describe methods to maintain or improve them.		
Be familiar with the laws and methods used to protect water quality (surface, ground) and aquatic environments and use this information to make management decisions to improve the quality of water or aquatic environment in a given situation		
Be familiar with some aquatic species at risk in NL		

‘BIODIVERSITY IN A CHANGING WORLD’ LEARNING OBJECTIVE	TERMS AND CONCEPTS	USEFUL RESOURCES (not an exhaustive list)
What is biodiversity?	Species, genetic and ecosystem biodiversity	http://canadianbiodiversity.mcgill.ca/english/index.htm http://www.ec.gc.ca/soer-ree/English/Indicator_series/new_issues.cfm?StrPrint=true&issue_id=1&tech_id=1 http://www.sierraclub.ca/national/programs/biodiversity/index.shtml http://www.envirothon.org/WhyShouldWeCareaboutbiodiversity.pdf http://www.sararegistry.gc.ca/involved/education/Q3_e.cfm http://www.biodiversity.ru/coastlearn/bio-eng/benefits.html http://internt.nhm.ac.uk/eb/biodbenefit.shtml http://www.cbin.ec.gc.ca/index.cfm?lang=eng http://www.nature.com/nature/journal/v405/n6783/full/405212a0.html http://www.nhm.ac.uk/research-curation/research/projects/worldmap/diversity/index.html http://www.pc.gc.ca/progs/np-pn/eco/eco5_e.asp http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1186577581900&lang=eng http://www.cbd.int/ http://www.eman-rese.ca/eman/reports/publications/rt_biostrat/intro.html http://www.epa.gov/bioindicators/aquatic/pollution.html http://www.nature.nps.gov/benefitssharing/whatis.cfm http://www.state.hi.us/lrb/rpts06/bioconfs.html http://canadianbiodiversity.mcgill.ca/english/ecozones/ecozones.htm http://www.heritage.nf.ca/environment/ecoregions_nfld.html http://www.nr.gov.nl.ca/forestry/publications/appendix5.pdf
Discuss ways that biodiversity can be measured		
Describe the benefits that we get from biodiversity		
Understand the value in all natural systems regardless of the level of diversity	Species Rich, Species Poor	
Explain how soil/land use, forestry, wildlife and aquatics are affected by biodiversity		
Describe how a natural or man made event (Eg. Wildfire, building of a dam, oil spill, harvesting of a forest etc.) affects biodiversity		
Explain how natural changes in our environment (Eg. excess rain, drought, unusually high or low temperatures etc.) affect biodiversity		
Explain the main causes of biodiversity loss and provide some solutions to rectifying these losses		
Understand the impact of removing just one species from an ecosystem, providing a possible example from an ecosystem in Newfoundland and Labrador		
Identify the main alien/exotic species in NL and the problems they are causing in the province.	Alien (exotic) species	
Explain how streams play a big role in maintaining species biodiversity	Riparian zones	
Describe the process of ecosystem collapse. What may result when several ecosystems collapse?		
Explain the importance of plant conservation		
Where do most of our medicines come from? Provide examples of pharmaceuticals or nutroceuticals that come from plants found in Newfoundland and Labrador	Pharmaceuticals, Nutraceuticals,	
What is bioprospecting?	Bioprospecting	
Explain how biodiversity plays a role in sustaining our food supply		
Explain how pollutants affect our aquatic systems		

What is an extinction event? Describe how many extinction periods we have had in the past and what has caused them	Extinction Event	
Describe the expected impacts of climate change on biodiversity generally and with a with a particular focus on species that are already at the Northern Southern and/or eastern extent of their ranges in NL		
Understand the Canadian system of Land Classification (Ecozones) and provincial land classification (Ecoregions and Districts)		
Understand the main national and international commitments made to conserve biodiversity	Convention on Biodiversity, Canadian Biodiversity Strategy	

FORESTRY LEARNING OBJECTIVE	TERMS AND CONCEPTS	TOOLS	USEFUL RESOURCES (not an exhaustive list)
Identify the major forest regions of Canada			http://www.canadianforestry.com/html/forest/forest_regions_e.html http://www.sfmcanada.org/english/map.asp http://www.sfmcanada.org/english/bp_ecosystem.asp http://atlas.nrcan.gc.ca/site/english/learningresources/theme_modules/borealforest/forest_regions.jpg/image_view http://www.nr.gov.nl.ca/forestry/ourforest/treespecies/default.stm http://www.nr.gov.nl.ca/forestry/industry/services.stm http://www.nr.gov.nl.ca/forestry/ourforest/history.stm http://www.nr.gov.nl.ca/forestry/publicinfo/valueadded/ http://cfs.nrcan.gc.ca/news/296 http://cfs.nrcan.gc.ca/subsite/nontimber http://cfs.nrcan.gc.ca/subsite/nontimber/interest http://cfs.nrcan.gc.ca/index/education3 http://cfs.nrcan.gc.ca/index/newfoundlandmarten http://www.sfmcanada.org/english/topics-harvesting.asp http://www.sfmcanada.org/english/pdf/SFMBooklet_E_US.pdf http://www.nr.gov.nl.ca/forestry/management/silviculture/ http://canadaforests.nrcan.gc.ca/articl
Identify the main tree species and forest types in Newfoundland and Labrador	Boreal Forests		
Describe typical forest stand types	Softwood, Mixed wood, Hardwood		
What is forest ecology? What concepts, factors and relationships are important in forest ecology?	Tree communities, Regeneration, Competition, Succession, Even/uneven aged forest		
Be able to explain the importance of the forests to the people, history, natural environment and economy of Newfoundland and Labrador			
Describe the value added industry in NL	Value Added manufacturing		
Identify non-timber products derived from the forests of NL	Non-timber forest products		
Provide common and Latin names for the most common NL trees (Balsam fir, white spruce, black spruce, larch, white birch) and identify these trees (without a key) from needles, leaf and bark etc.			
Identify less common NL trees and shrubs through the use of a key			
Explain tree growth from photosynthesis to branch growth, from trunk growth to the role of roots			
Understand how wildlife habitat relates to forest communities, forest species, forest age structure and availability of food/homes	Snags, Den trees, Riparian zones		
Discuss harvesting techniques/methods and where/why selected	Clear cutting, selective harvesting, riparian zones		
Describe the uses of the main tree species harvested in NL	Hardwood, softwood, pulp, lumber		
What is silviculture? Understand the various components of silviculture	Scarification, Site preparation, pre-commercial thinning, harvesting techniques, Best		

	Management Practices etc.		etrend/top_suj/22 http://www.nr.gov.nl.ca/forestry/management/ http://cfs.nrcan.gc.ca/news/588 http://www.borealforest.org/index.php?category=world_boreal_forest&page=overview http://www.cnr.vt.edu/dendro/forsite/Equip.htm If you want to practice tree identification using the needles or twigs, try these sites: http://forestry.about.com/library/treekey/bltree_key_id_pfs.htm http://www.cnr.vt.edu/dendro/dendrology/syllabus/twigkey/key1.cfm
Identify the different concerns and issues that are incorporated into forest management	Environmental Recreation Wildlife Aesthetics Economic Sustainable Forest Management		
Explain the role that fire and insects play in boreal and other forest ecosystems			
Describe and be able to identify the principle insects, diseases and other wildlife that affect NL's forests.	Balsam Fir Sawfly Hemlock Looper Spruce Budworm Spruce Bark Beetle Butt Rot Moose browsing		
Explain forest certification and briefly describe the three most common certification systems in Canada	CSA, FSC, SFI		
Be able to use basic forest equipment, tables and forest type maps in order to measure tree diameter, height, age, volume and location etc.Summarize the history of a tree by looking at growth rings (periods of growth, faster growth, scarring etc.).	Diameter tape, increment borer, prism, clinometer, tree cookie, stocking charts, volume tables, compass, GPS		
Understand the difference between clear-cutting and deforestation. Explain why clear-cutting is the main harvesting method in NL			
Examine current forestry issues from the perspectives of different user groups (forest companies, Department of Natural Resources, general public, recreational groups, tourist operator etc.)	Harvesting techniques, pesticide use, old growth forests, prescribed burns, protected areas etc.		
Be familiar with forestry safety equipment	Boots, first aid, safety glasses, chainsaw pants etc.		

SOILS/LAND USE LEARNING OBJECTIVE	TERMS AND CONCEPTS	TOOLS	USEFUL RESOURCES (not an exhaustive list)
What is soil? What are the main components of soil?			http://www.realtrees4kids.org/ninetwelve/soil.htm http://sis.agr.gc.ca/cansis/glossary/ http://sis.agr.gc.ca/cansis/taxa/genesis/pmdep/atlantic.html http://www.soilcc.ca/resources.htm http://www.mun.ca/botgarden/plant_bio/ http://www.nr.gov.nl.ca/agric/soil_land_new/pdfiles/Beneficial.pdf http://www.nr.gov.nl.ca/agric/soil_land_new/pdfiles/nl_riparian_brochure.pdf http://www.nr.gov.nl.ca/agric/soil_land_new/pdfiles/atlantic_soils_lime.pdf http://www.nr.gov.nl.ca/agric/soil_land_new/pdfiles/fertilguide.pdf http://www.nr.gov.nl.ca/agric/soil_land_new/envseries/horticulture/soilmanagement.pdf http://www.nr.gov.nl.ca/agric/soil_land_new/envseries/livestock/SLM053.pdf http://www.borealforest.org/index.php?category=world_boreal_forest&page=overview http://soilerosion.net/ http://www.omafra.gov.on.ca/english/engineer/facts/87-040.htm https://www.msu.edu/user/dunnjef1/rd491/soile.htm http://www.ext.vt.edu/pubs/envirohort/426-722/426-722.html http://www.nsac.ns.ca/pas/staff/cmi/cs320nut.htm http://www.ag.ohio-state.edu/~prec/soil/n_cycle.htm
Recognize soil as an important resource.			
Gain a level of understanding of the main factors that influence soil development	Climate, parent material, topography, organisms (including humans), and time.		
What is parent material?	Know the main parent material types		
Understand soil formation processes.	Weathering, illuviation, eluviation, organic matter enrichment, gleying.		
Understand terms used to describe soils and soil properties Be able to identify and describe these soil properties in soil from a pit	Horizon, texture, colour, structure, consistence, permeability, porosity, bulk density, pH, mottles, gleying	Munsell Color Chart, Measuring Tape	
Understand soil water and factors that affect its movement, storage and availability for plants.			
Understand soil drainage classes and the soil/site features that can be used to assess drainage class.			
Understand the role of soils in maintaining or enhancing water quality.			
Understand the nature of plant nutrients and how they are made available in soil.			
Understand the role of soil microbes and the process of decomposition in a healthy soil ecosystem.			
Recognize some general characteristics and distinguishing features of wetland soils, forest soils, agriculture soils, and urban soils.			
Appreciate the concept of matching land use to soil type.			
Gain a level of understanding of the ways soils can be damaged	Erosion, compaction, organic matter loss, nutrient depletion,		

	salinization, pollution, acidification		http://www.ec.gc.ca/soer-ree/English/Indicator_series/new_issues.cfm?issue_id=10&tech_id=40#bio_pic
Understand some of the ways soil damage can be avoided or reduced	Best management practices, cultivation patterns, buffer zones, fertilization, incorporation of organic material, limited cultivation		
Understand how to use soil survey reports to glean information on different soils and their sustainability for different uses.			
Identify types of soil erosion and discuss methods for reducing erosion.			
Understand boreal forest soil types and the main soil type/s found in Newfoundland and Labrador			
Identify the major land based industries in NL and how these are affected by the soil.	Forestry, Mining, Agriculture		

WILDLIFE LEARNING OBJECTIVE	TERMS AND CONCEPTS	USEFUL RESOURCES (not an exhaustive list)
Define wildlife.	Wildlife	http://www.env.gov.nl.ca/env/wildlife/ourwldlife/index.htm http://www.env.gov.nl.ca/env/wildlife/ourwldlife/exotic.htm http://www.wildspecies.ca/ http://www.env.gov.nl.ca/env/wildlife/biodiversity/biodiversitymon.htm http://www.naturewatch.ca/english/ http://www.env.gov.nl.ca/SNP/ http://www.env.gov.nl.ca/env/wildlife/specialplaces/wilderness.htm http://www.env.gov.nl.ca/env/wildlife/publications/coyotenews2.pdf http://www.env.gov.nl.ca/env/wildlife/publications/collisions.htm http://www.nr.gov.nl.ca/nr/enforcement/ http://www.env.gov.nl.ca/env/wildlife/wildlife_r_m/index.htm http://www.ducks.ca/conserve/index.html http://www.cbin.ec.gc.ca/index.cfm?lang=eng http://www.ec.gc.ca/eee-ias/Default.asp?lang=En http://www.nwf.org/ http://www.env.gov.nl.ca/env/wildlife/wildlife_at_risk.htm http://www.cosewic.gc.ca/ http://www.cwf-fcf.org/en/ http://www.hww.ca/index_e.asp http://www.ns.ec.gc.ca/wildlife/index.html http://wwf.ca/ Wild Species 2005 CD - sent to all Envirothon teams
Identify common species and signs of wildlife of Newfoundland & Labrador (keys will be used for more extensive identification).	Common animal signs include: Scat, tracks, sounds, patterns on trees, nests, fur, feathers	
Identify native and non-native mammals in Newfoundland		
Identify native and non-native mammals in Labrador		
Understand habitat types and associated wildlife, explaining how each habitat is suited to the needs of the species found in that habitat	Habitat, wetlands, riparian	
Describe specific adaptations of wildlife to their environment and role in the ecosystem.	Ecosystem, hibernation, migration	
Describe predator/prey relationships and examples.	Predator, prey, herbivore, carnivore, omnivore, succession	
Describe the potential impact of the introduction of non-native species.	Native species, non-native species	
Describe the major factors affecting threatened and endangered species, and methods used to improve the populations of these species.	Threatened species, endangered species, wilderness and ecological reserves, no hunt zones	
Identify some rare, threatened and endangered species (terrestrial and aquatic) in NL as listed by the Committee on the Status of Endangered Wildlife in Canada	Terrestrial species, aquatic species, COSEWIC	
Describe ways habitat can be improved for specific species by knowing their requirements.		
Discuss the concepts of carrying capacity and limiting factors.	Carrying capacity	

Understand the impact that non-native species (plants, mammals, amphibians, birds and insects) have had on our ecosystems and on other wildlife species		
Describe the food chains/webs and cite examples.	Food chain, food web	
Describe factors that limit or enhance population growth.		
Define species richness	Species Richness	
Discuss various ways the public and wildlife managers can help in the protection, conservation, management, and enhancement of wildlife populations.	Canada Wildlife Act, Wildlife Act (provincial)	
Discuss conservation and management issues, including regulation of hunting and fishing, habitat protection and provincial, federal and non-government groups that protect wildlife resources.		
Understand the role of hunting in wildlife management in NL		
Understand that wildlife species are an important component of biodiversity	Biodiversity	
Discuss issues surrounding the conservation of Species at Risk.		
Describe the levels of protection for Species at Risk under the Endangered Species Act.		
Many of the species in Newfoundland and Labrador are at the northern, southern and eastern edge of their range. Explain what this means and describe the challenges this places on wildlife managers		