

2019 Manitoba Envirothon
Regional Field Test

Team #

STOP #

AQUATIC ECOSYSTEMS

This question requires materials provided at the stop

CODE
Do not
change
A - A

5

A food web can contain many different organisms occupying a variety of trophic (feeding) niches or roles. Energy flows through this web in various directions as living species feed on other species, and decomposers feed on dead organisms. In an aquatic ecosystem, such as a Manitoban lake, the following trophic levels can normally be found within the food web:

- primary producers (autotrophs)
- primary consumers (herbivores)
- secondary consumers (e.g., planktivores)
- higher level consumers (e.g., piscivores)
- decomposers

1) Primary producers use solar energy to create the oxygen and carbohydrates that support the energy and biomass needs of the food web.

- a) What is the name of the process by which they do this? (0.5 pt)

- b) List the two essential chemical ingredients required by primary producers for this process. (1 pt - 0.5 pt each)

2) Examine the various organisms pictured on document A-D. All of these species could be part of a food web in a Manitoban lake. Use the spaces provided next to each organism below to indicate to which trophic level each belongs (use the trophic levels listed above question 1). (3 pts - 0.5 pt each)

- a) zooplankton (Daphnia sp.): _____
- b) fish (fathead minnow): _____
- c) freshwater algae: _____
- d) freshwater fungi: _____
- e) fish (northern pike): _____
- f) freshwater bacteria: _____

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3. Which of the five listed food web trophic levels contains the least amount of total biomass/energy? (0.5 pt)

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Table required?	Y
Supervisor required?	Y
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	A_foodweb_D_LAMINATE.pdf
Difficulty of question	Medium
Answer to question	<p>1) a) photosynthesis (0.5 pt) b) water, carbon dioxide (1 pt - 0.5 pt each)</p> <p>2) (3 pts - 0.5 pt each) a) primary consumers b) secondary consumers c) primary producers d) decomposers e) higher level consumers f) decomposers 3) higher level consumers (0.5 pt)</p>
Reference to student material	<p>1) Aquatic Ecology document, p 25 2) Aquatic Ecology document, p 26-29 3) Aquatic Ecology document, p TBD (figure needs to be inserted into the document)</p>
Directions for printing and laminating	print in colour 3 copies of A_food webs_D_LAMINATE.pdf
Equipment supplied by Discipline	n/a
Direction for stop set-up	make document A_food webs_D_LAMINATE.pdf available to teams at stop
Directions for attendant	n/a

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AQUATIC ECOSYSTEMS

This question requires materials provided at the stop

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Do not
change
A – B*

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Photosynthetically active radiation (PAR) represents the portion of the solar (light) spectrum that can energize photosynthesis in autotrophic organisms. As light travels through the water column, it is "attenuated" (i.e., lost) because of particulates and colour present in the water column, meaning that light often does not reach the bottom of a water body. Scientists often measure PAR at different depths in a water body using a specialized instrument, but it is also possible to estimate the maximum depth that light reaches using a simple piece of equipment (A-E).

- 1) What is the piece of equipment labeled A-E called? (0.5 pt)

- 2)
 - a) Look at the images on document A-F. Using what you know about reading this piece of equipment properly, record the depth at which it would be appropriate to take a reading. (1 pt)

 - b) You can calculate the maximum depth at which photosynthesis can occur in the water column by multiplying this depth reading by two (2). Based on the depth measurement you determined in question 2a, calculate the maximum depth that photosynthesis may occur in the lake. (1 pt)

 - c) In this same lake, indicate whether photosynthesis would occur at the following depths by writing "yes" or "no" next to each depth: (1.5 pt - 0.5 pt each)
 - i) 1.75 m
 - ii) 2.75 m
 - iii) 6 m

- 3) Give one reason light does not tend to reach deeply into the water column of eutrophic lakes. (1 pt)

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Table required?	Y
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	Secchi disk labeled A-E A_light attenuation_F_LAMINATE.pdf OR A_light attenuation F LAMINATE greyscale.pdf
Difficulty of question	Difficult
Answer to question	1) Secchi disk (0.5 pt) 2) a) 2.25 m (1 pt) b) 4.5 (1 pt) partial marks: if they selected the wrong depth but did the calculation correctly (i.e., multiplied that depth by 2) they get 0.5 pt c) (1.5 pt - 0.5 pt each) i) yes ii) yes iii) no 3) something along the lines of: algal blooms in surface/shallow waters block light transmission to deeper depths (1 pt) partial marks: 0.5 pt may be given at the discretion of the marker if the answer is close but not really there (e.g., discussion of turbidity, excess nutrients, etc.; what we're looking for is the physical blocking of light from algae)
Reference to student material	1) Aquatic Ecology Regionals document p 66-68, Livestream video 2016 2) a) Aquatic Ecology Regionals document p 66-68, Livestream video 2016 b) ability to follow instructions, Aquatic Ecology Regionals document p 68 c) ability to follow instructions, Aquatic Ecology Regionals document p 68 3) Aquatic Ecology Regionals document p 40, Livestream video 2016
Directions for printing and laminating	print in colour 3 copies of A_light attenuation_F_LAMINATE.pdf If there is concern for colour-blind students, this document may be printed in greyscale (A_light attenuation_F_LAMINATE_greyscale.pdf)
Equipment supplied by Discipline	Secchi disk (1) labeled A-E
Direction for stop set-up	set Secchi disk on table with label A-E showing
Directions for attendant	There is only one A-E for each Region, so the teams will have to take turns looking at it. One of the questions asks the students what the piece of equipment labeled A-E is called. If you know what it's called, try not to call it by its name when the students are within earshot.

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AQUATIC ECOSYSTEMS

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CODE
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A – C

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1) Provide the common or scientific name for the aquatic macrophytes labeled A-A, A-B, and A-C. (1.5 pts - 0.5 pt each)

A-A:

A-B:

A-C:

2) There are three main categories of aquatic macrophytes as defined by their structure: submerged, emergent, and floating. For each labeled image (A-A, A-B, and A-C), identify which category the aquatic macrophyte shown belongs in. (1.5 pts - 0.5 pt each)

A-A:

A-B:

A-C:

3) Plants play important roles in aquatic ecosystems, but the presence of too many plants can cause problems in water bodies. List one (1) benefit and one (1) problem that can be attributed to macrophytes in aquatic ecosystems. (2 pts - 1 pt each)

a) benefit:

b) problem:

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Table required?	Y
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	document combining images A-A, A-B, and A-C (A_macrophytes_ABC.pdf) *note: if regions can provide actual specimens of the macrophytes and label them appropriately (A-A, A-B, A-C), they would be acceptable in place of the images.
Difficulty of question	Easy
Answer to question	1) A-A: Common cattail or Typha latifolia; A-B: Yellow Water Lily or Nuphar lutea; A-C: Coontail or Ceratophyllum demersum (1.5 pt - 0.5 pt each) 2) A-A: emergent; A-B: floating; A-C submerged (1.5 pt - 0.5 pt each) 3) a) Any 1 of the following: important habitat, food source, nesting material, prevent turbidity, stabilize sediment, protect shorelines, improve water quality, produce oxygen (1 pt) b) Any 1 of the following: swimming nuisance, navigation/boating difficulty, reduce water quality, impede water flow (1 pt)
Reference to student material	1) Aquatic Ecology Regionals document p 61-62 2) Aquatic Ecology Regionals document p 59-62 3) a) Aquatic Ecology Regionals document p 60 b) Aquatic Ecology Regionals document p TBD (section needs to be added to Regionals document)
Directions for printing and laminating	Print in colour 3 copies of A_macrophytes_ABC_LAMINATE.pdf
Equipment supplied by Discipline	n/a
Direction for stop set-up	make document A_macrophytes_ABC.pdf available to teams at stop
Directions for attendant	n/a

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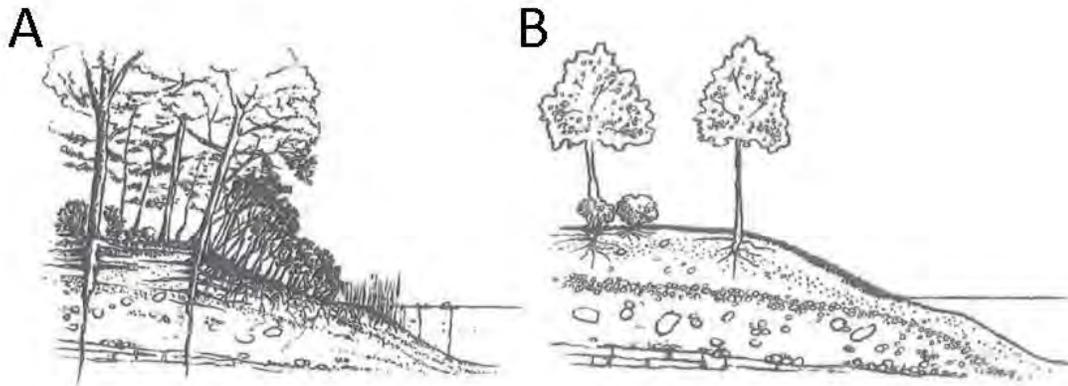
STOP #

AQUATIC ECOSYSTEMS

CODE
Do not
change
A – D

- 1) Review the images below. Which of these two pictures depicts a healthy, natural riparian zone? Circle the best response. (0.5 pt)

5



- 2) The value of riparian areas in the landscape far exceeds their relatively small size. List two (2) benefits of a healthy riparian zone. (2 pts – 1 pt each)
- 3) You are a livestock farmer in southwestern Manitoba and you frequently mow your shoreline so your cattle can access a small stream that runs through the property. Lately you have noticed an increase in sediment in the water downstream of your land and suspect that some of your actions may be causing this. Outline a riparian zone management strategy that you could undertake to improve the quality of water downstream. Include three (3) actions/characteristics that you will undertake. (1.5 pts – 0.5 pt each)
- 4) As outlined above, improper management of riparian zones can lead to sedimentation. List one (1) negative impact of sedimentation in stream environments. (1 pt)

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Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	<p>1) A (0.5 pt)</p> <p>2) Any 2 of the following: protection of water quality (filter water/filter sediment out of water, trap sediment), protection from erosion (build and maintain banks, stabilize shoreline, store water/energy), protection from flooding (slow floodwaters, vegetation soaks up water), protection of water supply (maintain stream flows late in season, recharge groundwater), protection of animals (provide habitat, maintain biodiversity, create primary productivity, maintain water temperatures) (2 pts - 1 pt each)</p> <p>3) Any 3 of the following: restrict cattle access (construct a livestock watering system), stop mowing the riparian area, return the riparian area to its natural state, increase the size of the riparian zone, increase the presence of natural vegetation, plant vegetation of varying heights, plant a mixture of land-based and aquatic plants (1.5 pts – 0.5 pt each)</p> <p>4) Any 1 of the following: High turbidity blocks light from entering the water (reduces the ability of plants and algae to photosynthesize and altering the base of the food web), eliminates habitat for many aquatic insects, hinders the maturation of fish eggs (1 pt)</p>
Reference to student material	<p>1) Aquatic Ecology Regionals document, p TBD</p> <p>2) Aquatic Ecology Regionals document, p TBD</p> <p>3) Aquatic Ecology Regionals document, p TBD</p> <p>4) Aquatic Ecology Regionals document, p TBD</p>
Directions for printing and laminating	n/a
Equipment supplied by Discipline	n/a
Direction for stop set-up	n/a
Directions for attendant	n/a

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PLANT ECOLOGY

1) What are mycorrhizae and how do they help plants? (2 pts)

*CODE
Do not
change
P – A*

2) Pollination is an essential process for plants.

a) What is pollination? (1 pt)

b) Name two (2) groups of species participate in pollination? (1 pt)

c) How have pollinators co-evolved with plants? (1 pt)

5

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Table required?	No
Supervisor required?	No
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Difficult
Answer to question	<p>1) Fungi (1 pt); Any one of the following (1 pt): Benefit their host plants by increasing its ability to capture water and essential elements; help protect the plant from pathogenic fungi and nematodes</p> <p>2) a) Pollen, which is from the stamen (male portion of the flower), is transported to the pistil (female portion of the flower). This allows a plant to produce seeds that become the next generation. (1 pt) b) Any two (2) of the following: (1 pt - 0.5 pts each) Bees, butterflies, moths, flies, beetles, wasps, ants, hummingbirds, bats</p> <p>c) A flower wants the pollinator to spread its pollen to other flowers of the same species. As the flower evolves to be deeper, the pollinator responds and evolves a longer proboscis (mouth part) to match this change and access the pollen and nectar. (1 pt)</p>
Reference to student material	Pages 28 to 29 Regional
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

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PLANT ECOLOGY

This question requires materials provided at the stop

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Do not
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P – B

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A 70 year old White Spruce tree is pictured (P-F).

- 1) What type of plant is pictured? (circle correct answer) (0.5 pts)

Seed-free

Seed producing

- 2) What group of plants does this tree belong to? (circle correct answer) (0.5 pts)

Angiosperms

Gymnosperms

- 3) This type of tree is often called an 'evergreen'. What does 'evergreen' mean? (1 pt)

- 4) What term best describes this this tree (circle correct answer) (0.5 pts)

Annual

Perennial

A Big Bluestem plant is pictured (P-G).

- 5) What type of plant is pictured? (circle correct answer) (0.5 pts)

Forb

Graminoid

Tree

- 6) What is Manitoba's provincial grass? (1 pt)

- 7) What is Manitoba's provincial tree? (1 pt)

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Table required?	Yes
Supervisor required?	No
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	P-F - Image of white spruce tree P-G - image of big bluestem grass
Difficulty of question	Medium
Answer to question	<p>1) Seed producing (0.5 pts)</p> <p>2) Gymnosperms (0.5 pts)</p> <p>3) They retain their foliage all year (1 pt)</p> <p>4) Perennial</p> <p>A Big Bluestem plant is pictured (P-G).</p> <p>5) Graminoid (0.5)</p> <p>6) Big Bluestem (1 pt)</p> <p>7) White Spruce (1 pt)</p>
Reference to student material	Pages 15, 16, 18, 40
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

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PLANT ECOLOGY

This question requires materials provided at the stop

CODE
*Do not
change*
P – C

1) What type leaf edges are found on these leaves (P-A & P-B)? (2 pt)

P-A _____

P-B _____

2) What term would be used to describe the veins on the leaf, P-C? (1 pt)

P-C _____

3) What kind of leaf arrangement is present on this compound leaf, P-D? (1 pt)

P-D _____

4) What kind of leaf arrangement around the stem is shown here, P-E? (1 pt)

P-E _____

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Supervisor required?	No
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	P-A, P-B Image of Leaf Edges P-C Image of Leaf Veins P-D Image of Leaf Blades P-E Image of Leaf Arrangements
Difficulty of question	Easy
Answer to question	1) P-A: Entire (1 pt) P-B: Lobed (1 pt) 2) P-C: Palmate (1 pt) 3) P-D: Pinnate (1 pt) 4) P-E: Whorled (1 pt)
Reference to student material	Pages 20 to 23
Directions for printing and laminating	Print images on a full page and laminate
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

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PLANT ECOLOGY

This question requires materials provided at the stop

*CODE
Do not
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P – D*

- 1) Earthworms, dung beetles, and nematodes are examples of (1 pt)
- a) Decomposers
 - b) Primary Producers
 - c) Plants

5

- 2) True/False: Indicate whether the statement is true (T) or false (F) by circling the correct answer. (1 pt)

T F Fungi, such as this Conk (P-H, also known as a Bracket fungus, or shelf fungus) are plants.

- 3) Name two plant species listed under Manitoba's Endangered Species & Ecosystems Act (2 pt)
- 4) What is the difference between a species considered 'Extinct' and a species considered 'Extinct in the Wild' (1 pt)

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Table required?	No
Supervisor required?	No
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	Conk (Bracket fungi/shelf fungi/) labelled P-H
Difficulty of question	Medium
Answer to question	<p>1. Decomposers (1 pt)</p> <p>2. False (1 pt)</p> <p>3. Any two (2) of the following: (2 pts - 1 pt each): Gastony's Cliffbrake, Gattinger's Agalinis, Great Plains Ladies'-Tresses, Rough Agalinis, Smooth Goosefoot, Small White Lady's-slipper, Western Ironweed, Western Prairie Fringed-orchid, Buffalograss, Culver's-root, Hackberry, Hairy Prairie-Clover, Riddell's Goldenrod, Western Silvery Aster, Western Spiderwort</p> <p>4. Extinct: a species or taxon is extinct when there is no reasonable doubt that the last individual of this group has died. Exhaustive surveys of known and expected habitat during appropriate times will have failed to record the presence of this species. Extinct in the Wild: a species is considered to be extinct in the wild when they are only known to survive in cultivation (e.g. farming), in captivity (e.g. zoo), or as a naturalized population well outside their past range. As with extinct animals, exhaustive surveys of known and expected historical habitat during appropriate times will have failed to record the presence of this species. (1 pt)</p>
Reference to student material	Pages 27, 52, 53
Directions for printing and laminating	
Equipment supplied by Discipline	Conks labelled P-H
Direction for stop set-up	
Directions for attendant	

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STOP #

SOILS AND GEOLOGY

CODE
Do not
change
S - A

5

- 1) Mature soils take centuries or millennia to form from their parent geological material. During this time four (4) basic soil forming processes are happening. An example of the Translocation process is when fine clay particles leach out of the surface of the soil and are added to a lower soil depth. Name two (2) other soil forming processes, and give a brief description OR example of each. (2 pts - 1 pt each)

- 2) Soils in the Regosolic Order have the least amount of development because their parent geological material is more recently deposited or exposed. Name three (3) landscapes or landscape features that would have soils from the Regosolic Order. (1.5 pts - 0.5 pt each)

- 3) A soil from the Gleysolic Order is older, and is found in depressional areas.
 - a) What environmental condition that you find in a depression is needed to create a Gleysol? (0.5 pt)

 - b) List two (2) things you might see when looking at a Gleysol, that help to define it as that type of soil. (1 pt - 0.5 pt each)

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Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	<p>1) two of the following processes and related descriptions or examples (2 pts - 0.5 pt each process and 0.5 pt each description/example): Process1: Addition; Example/Description: things being added to the soil OR organic matter from dead plants/animals OR precipitation OR solar energy OR another reasonable answer Process2: Loss OR Removal; Example/Description: things being removed (or disappearing) from the soil OR water OR nutrients/chemicals OR soil particles OR carbon dioxide OR methane OR another reasonable answer Process3: Transformation OR Change; Example/Description: changes taking place within the soil that don't involve movement OR weathering OR decomposition of dead plants/animals OR oxidation/reduction of soil cations OR other chemical changes OR other reasonable answers that don't involve movement of soil or its chemicals (movement is covered in addition, loss, and translocation which is the example given in the question)</p> <p>2) Three of the following (1.5 pts - 0.5 pt each): river valley/flood area; banks/steep slopes; sand dunes; eroded hill tops</p> <p>3a) wet/water (0.5 pt)</p> <p>3b) Two of the following (1 pt - 0.5 pt each): wet/water; gray/blue-gray; rust/orange/red</p>
Reference to student material	<p>1) Soils and Land Use Study Guide, Soil Formation, Page 8. 2) Soils and Land Use Study Guide, Soils Common to All Regions, Page 39; and Basic Guide to Soil Orders 3) Soils and Land Use Study Guide, Soils Common to All Regions, Page 39; and Basic Guide to Soil Orders</p>
Directions for printing and laminating	N/A
Equipment supplied by Discipline	N/A
Direction for stop set-up	N/A
Directions for attendant	N/A

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STOP #

SOILS AND GEOLOGY

CODE
Do not
change
S – B

1) List one (1) of the main three (3) greenhouse gases. Then describe one (1) process that results in emission of that gas from soil. (1.5 pts)

5

2) To counteract greenhouse gas emissions, people can increase carbon sinks.

a) Describe what a carbon sink is. (1 pt)

b) Circle the soil from the list below that has been the best carbon sink as it developed. (0.5 pt)

dark crumbly soil

yellow sandy soil

blocky brown soil

gray soil containing white crystals

3) What do trees, perennial vegetation, and cover crops have in common for counteracting greenhouse gas emissions? (1 pt)

4) What environmental, economic, and/or societal benefits of wetlands or wet soils need to be considered before deciding if they should be drained? List two (2). (1 pt – 0.5 pt each)

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Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Difficult
Answer to question	<p>1) (1.5 pt – 0.5 for the gas, and 1 for the correct description) Carbon dioxide OR CO₂ – aerobic respiration by soil microorganisms OR respiration of plant roots OR aerobic decomposition of organic matter in or on the soil OR burning of plant litter or other organic matter on the soil surface Methane OR CH₄ – anaerobic respiration by soil microorganisms OR aerobic decomposition of organic matter in wet soil Nitrous Oxide OR N₂O – nitrification of ammonium to nitrate in soil OR denitrification of nitrate in wet soil OR anaerobic respiration of soil microorganisms when nitrate is present. 2a) a process that removes carbon dioxide from the atmosphere OR a process that stores carbon in a different form OR a place where carbon has been stored (1 pt) 2b) Dark crumbly soil (0.5 pt) 3) they all involve plant growth (photosynthesis) which takes CO₂ out of the air and part of it becomes solid organic matter (wood, fiber, leaves, stems, roots, etc.) which can be stored (1 pt for this or similar answer) 4) Two of the following (1 pt - 0.5 pt each) wildlife habitat source of water for livestock or other uses biodiversity (plant, animal or landscape) refugia for pollinators and predators of pests groundwater recharge flood mitigation by storing water capturing or filtering nutrients, sediments or contaminants preventing leaching or runoff of nutrients, sediment or contaminants prevent aerobic decomposition of organic matter aesthetic values Other reasonable answers relating to the values behind drainage OR keeping the place intact</p>
Reference to student material	<p>1) Soils and Land Use study guide: Climate Change and Agriculture - Agricultural GHGs - page 48 2) Soils and Land Use study guide: Soil Formation - page 10; Soil Components Page 13; Soils and Land Use study guide: Climate Change and Agriculture - REDUCING AGRICULTURAL EMISSIONS: Soils As Sinks for Carbon page 52 3) Soils and Land Use study guide: Climate Change and Agriculture - REDUCING AGRICULTURAL EMISSIONS: Soils As Sinks for Carbon page 52</p>

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	4) Soils and Land Use study guide: Climate Change and Agriculture - Agricultural GHGs - page 49 See also Soil Management Guide: Chapter 1 – Understanding Soil Landscapes – How were soils formed?; Chapter 11 – Greenhouse Gases in Agriculture
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

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STOP #

SOILS AND GEOLOGY

This question requires materials provided at the stop

CODE
Do not
change
S - C

1

- a) A farmer is looking to grow cereal crops, which have a high demand for nitrogen. What are two methods that the farmer can use to increase the nitrogen supply in the soil? (2 pts - 1 pt each)

5

- b) As part of the farmer's research, they took a soil sample (S-A) from the field in which they want to grow the cereal crops. Assuming that this sample is representative of the conditions across the entire field, will the cereal crops get enough nitrogen? Why? (2 pts)

- c) True/False: Indicate whether the statement is true (T) or false (F) by circling the correct answer. (1 pt - 0.5 pt each)

T F When nitrogen is applied to the soil, microorganisms convert it to the plant available form, nitrate (NO_3^-). Nitrate is not water soluble and is immobile in the soil.

T F If drinking water is contaminated with nitrate (NO_3^-), infants can develop a condition called 'Blue Baby Syndrome'.

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Table required?	Y
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	S-A: closed container of sand
Difficulty of question	Difficult
Answer to question	1a) Any two of the following: Addition of nitrogen/commercial fertilizer, addition of organic matter/manure, rotation with alfalfa or other crop with rhizobia (2 pts - 1 pt each) 1b) No, the crop will not get enough nitrogen. The sand soil sample, S-A, is very permeable and prone to nutrient leaching. (2 pts - 1 pt for No, 1 pt for why) 1c) F, T (1 pt - 0.5 pt each)
Reference to student material	1a) Soil and Land Use Document p. 23, 28, 32, 37; Soil Management Guide p 126 1b) Soil and Land Use Document p. 32 ; Soil Management Guide p. 53 1c) Soil and Land Use Document p 35, Soil Management Guide p 52-53
Directions for printing and laminating	N/A
Equipment supplied by Discipline	A closed container of sand.
Direction for stop set-up	N/A
Directions for attendant	N/A

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SOILS AND GEOLOGY

CODE
Do not
change
S – D

1) A sample of a Newdale clay loam taken from a depth of 0 to 15 cm has the following moisture content percentages:

Saturation: 42%

Field Capacity: 29%

Permanent Wilting Point: 12%

5

a) What is the percent available water holding capacity of this soil? Show your work. (1 pt)

b) True/False: Indicate whether the statement is true (T) or false (F) by circling the correct answer. (1 pt - 0.5 pt each)

T F A Red River heavy clay would have a lower percent available water holding capacity compared to the Newdale soil.

T F Plants can extract all the available water in the soil with equal ease.

2) You would like to determine the gravimetric water content of a Halboro loamy sand taken from your potato field (Note: this is a true story). The wet weight of the soil is 140 g. After oven drying the soil for 36 hours, it now weighs 133 g. What is the gravimetric soil moisture of this sample? Show your work. (1 pt)

3) List two reasons why it is important to know the gravimetric moisture content and/or the available water holding capacity of a soil. (2 pts)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Easy
Answer to question	1a) $29-12$ (0.5 pt) = 17% (0.5 pt). Must include unit. 1b) F (0.5 pt) F (0.5 pt) 2) $(140-133)/133*100$ (0.5 pt) = 5.2% (0.5 pt) Must include unit. 3) Any two of: determining if plants are water stressed, calculating irrigation requirements, determining the risk of groundwater contamination due to leaching, determining the risk of surface water contamination due to runoff. Other answers may be acceptable. (2 pts - 1 pt each)
Reference to student material	1) Soil Management Guide pp. 42-43 2) Soil Management Guide p. 45 3) Soil Management Guide p. 43
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

THEME

- 1) What two components define social-ecological sustainability projects? (2 pts)

*CODE
Do not
change
T - A*

5

- 2) The snow leopard project in the Kashmir region is an example of social-ecological sustainability. What were the three goals of this project that help the project remain sustainable? (3 pts - 1 pt each)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	<p>1) A sustainable project that involves socio-economic sustainability (human well being) (1 pt) and ecological sustainability (biodiversity conservation) (1 pt).</p> <p>2) All three of the following (3 pts - 1 pt each): Promotes coexistence between large predators and people; reduces livestock depredation losses; improves household incomes in environmentally friendly, socially responsible and economically viable ways.</p>
Reference to student material	TBD
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

THEME

CODE
Do not
change
T – B

- 1) List and describe the three (3) main types of habitat loss (3 pts - 1 pt each)

5

- 2) Humans are the main cause of habitat loss. Provide two (2) examples of things that individual people can do to try and reduce habitat loss and its effects. (2 pts - 1 pt each)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Easy
Answer to question	<p>1) Habitat destruction: Complete elimination of the habitat, damaged to a point where it cannot support the naturally occurring ecological communities (1 pt - 0.5 pts for "Habitat destruction", 0.5 pts for definition)</p> <p>Habitat degradation: Reduces the quality of the environment making it difficult for biota to thrive, disruption of ecosystem processes (1 pt - 0.5 pts for "Habitat degradation", 0.5 pts for definition)</p> <p>Habitat fragmentation: Large habitat areas split up into smaller sections or fragments that are often isolated from each other. (1 pt - 0.5 pts for "Habitat fragmentation", 0.5 pts for definition)</p> <p>2) Any 2 of the following (2 pts -1 pt each)</p> <p>Educate yourself and others, reduce pollution, protect significant areas like shorelines and wetlands, plant native vegetation, prevent the spread of invasive species, any other reasonable answer</p>
Reference to student material	TBD
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

THEME

Fill in the Blanks: Complete the sentences with the most appropriate words. Blanks may contain more than one word. (5 pts - 1 pt each)

*CODE
Do not
change
T - C*

5

- a) The first European settlers who arrived in North America believed that natural resources were _____.

- b) Because of this attitude, several species, including the passenger pigeon, became _____.

- c) Canada's first national park was _____ National Park. It was not created specifically to protect wildlife, but this became one of its functions.

- d) In the early 20th century, governments began to create laws to regulate hunting and fishing to ensure a sustainable future. The _____ Bird Treaty of 1916 between the US and Canada was the first international treaty for the protection of wildlife.

- e) While in the 19th century, hunting or fishing was the major threat to wildlife, in 21st century Canada, the loss of _____ is the major threat for many species.

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	a) unlimited (1 pt) b) extinct (1 pt) c) Banff (1 pt) d) Migratory (1 pt) e) habitat (1 pt)
Reference to student material	TBD
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

THEME

This question requires materials provided at the stop

*CODE
Do not
change
T - D*

- 1) Businesses can have a huge impact on the environment and how natural resources are used. Give three (3) reasons why a business might choose to reduce its environmental impact. (3 pts - 1 pt each)

5

- 2) Products that you buy at a store often have environmental labels or symbols on them. Use the figure labelled T-A to answer the questions below.

a) What is the name of symbol? What does it mean? (1 pt - 0.5 pts each)

b) What does FSC stand for? What does the symbol mean? (1 pt - 0.5 pts each)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	Y
Supervisor required?	Y
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	logos, labelled T-A
Difficulty of question	Medium
Answer to question	<p>1) Any three of the following (3 pts - 1 pt each): consumers want to support environmentally beneficial products, reducing use of natural resources can save the company money, company is required to by government regulations or laws, company wants to be ethical and "do the right thing", any other reasonable answer</p> <p>2) a) Recycling symbol or Mobius loop (0.5 pt), indicates that a product is recyclable or contains recycled material (0.5 pt) b) Forest Stewardship Council (0.5 pt), indicates that forest product comes from a sustainably managed forest (0.5 pt)</p>
Reference to student material	TBD
Directions for printing and laminating	Print and laminate figure labelled T-A, leave at the stop
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

THEME

*CODE
Do not
change
T - E*

5

1) Define "ecological integrity" as described by Parks Canada. (2 pts)

2) What are the 3 main indicators used by Parks Canada for assessing ecological integrity? (1.5 pts - 0.5 pts each)

3) List 3 possible characteristics of an environment or park that might have very poor ecological integrity. (1.5 pts - 0.5 pts each)

a) _____

b) _____

c) _____

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	N
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Easy
Answer to question	<p>1) "Ecosystems have integrity when they have their native components intact including: abiotic components, biodiversity, and ecosystem processes". (2 pts - 0.5 pt for "native components intact", 0.5 pts each for abiotic components, biodiversity and ecosystem processes.</p> <p>2) Biodiversity, ecosystem functions, stressors. (1.5 pts - 0.5 pts each)</p> <p>3) Any 3 of the following (1.5 pts - 0.5 pts each): Lack of biodiversity, pollution, over-use, invasive/alien species, decrease in native species, decrease in keystone species, habitat loss, habitat fragmentation, loss of large carnivores, air pollution, pesticides, overharvesting of forest or overuse of resources</p>
Reference to student material	TBD
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

2019 Manitoba Envirothon
Regional Field Test

Team #

STOP #

WILDLIFE ECOLOGY

This question requires materials provided at the stop

CODE
Do not
change
W - A

5

- 1) Identify the main wildlife species in the photographs labeled W-F and W-G. (1 pt - 0.5 pt ea)

W-F _____

W-G _____

- 2) Identify the SOCIAL ORGANIZATION being displayed in the image of W-F. (1 pt)

W-F _____

- 3) Identify the ADAPTIVE BEHAVIOUR being displayed in the image of W-G. (1 pt)

W-G _____

- 4) Camouflage is the set of methods of concealment that allows otherwise visible animals to remain unnoticed by blending in. There are two types of camouflage: Mimicry and Crypsis. These two types of camouflage are being displayed in picture W-H and W-I. IDENTIFY which type of camouflage is being displayed for each photo along with the definition of what each type is. (2 pts - 0.5 pt each).

W-H
Type of Camouflage: _____

Definition: _____

W-I
Type of Camouflage: _____

Definition: _____

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	Y
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	W-F Image of Elk Herd W-G Image of Hunting Pack of Wolves W-H Image of Cuddlesfish W-I Image of Stick Insect
Difficulty of question	Medium
Answer to question	1) W-F: Elk (0.5 pt) W-G: Grey Wolf or Timber Wolf (0.5 pt) 2) W-F: They are in a herd (1 pt) 3) W-G: They are hunting (1 pt) 4) W-H Type of Camouflage: Crypsis (0.5 pt) Definition: Crypsis is the type of camouflage where the animal means to be hidden. (0.5 pt) W-I Type of Camouflage: Mirnesis (0.5 pt) Definition: Mirnesis is the type of camouflage where an animal resembles something else in its environment. (0.5 pt)
Reference to student material	1) Training Videos/Training 2) Wildlife Document p 28 3) Wildlife Document p 28 4) Wildlife Document p 27-28
Directions for printing and laminating	Print images on a full page and label
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

WILDLIFE ECOLOGY

*CODE
Do not
change
W – B*

- 1) What is the definition of CARRYING CAPACITY? (0.5 pt)

- 2) What are three things that can happen if a species exceeds its carrying capacity? (3 pts - 1 pt each)
 - a)
 - b)
 - c)

- 3) Define CYCLIC POPULATIONS. Give one example of animals involved in this type of relationship. (1.5 pts)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	<p>1) The number of animals that an area can support without damage to the habitat or animals (0.5 pts)</p> <p>2) Any three of the following (3 pts - 1 pt each) severe depletion of resources; environmental deterioration; social stress; increased competition for food; possible starvation; greater exposure to parasites (leading to increased disease); predation; poor reproductive success; damage to the habitat</p> <p>3) Cyclic population - a boom and bust cycle where a prey population increases followed by the number of predators leading to a reduction in the prey population and less food for the predator. Predator populations will then decline and a balance may again be restored.</p> <p>Lynx and snowshoe hare (1.5 pts - 1 pt for definition, 0.5 pts for example)</p>
Reference to student material	<p>1) Wildlife Document pg 6</p> <p>2) Wildlife Document pg 6</p> <p>3) Wildlife Document pg 7</p>
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	

2019 Manitoba Envirothon
Regional Field Test

Team #

STOP #

WILDLIFE ECOLOGY

This question requires materials provided at the stop

1) Identify the five wildlife species labelled W-A, W-B, W-C, W-D, and W-E. (5 pts - 1 pt each)

W-A _____

W-B _____

W-C _____

W-D _____

W-E _____

CODE
Do not
change
W - C

5

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	Y
Supervisor required?	Y
Local feature required?	
Description of local feature	
Hands on question?	This question requires materials provided at the stop
List of equipment, props, and/or samples	W-A Wildlife Fur (TBD) W-B Wildlife Track (TBD) W-C Beaver Skull W-D and W-E Wildlife Scat x2 (TBD) Labels for each
Difficulty of question	Easy
Answer to question	1) W-A TBD W-B TBD W-C Beaver W-D TBD W-E TBD
Reference to student material	1) Wildlife Training Videos Fur: https://www.youtube.com/watch?v=pOd_IzIoCvo&t=43s Scat: https://www.youtube.com/watch?v=dUurGnK7oM4&t=82s Tracks: https://www.youtube.com/watch?v=KbltoRx9NB4&t=49s Dental: https://www.youtube.com/watch?v=cWzyRHFRKg&t=105s
Directions for printing and laminating	
Equipment supplied by Discipline	All scats, fur, skull, and track
Direction for stop set-up	Place on the table
Directions for attendant	

**2019 Manitoba Envirothon
Regional Field Test**

Team #

STOP #

WILDLIFE ECOLOGY

CODE
Do not
change
W – D

1) Define the term, 'Invasive Species' and give an example found in Manitoba. (1 pt)

2) Explain TWO (2) ways invasive species has the advantage over a native species.
Use specific examples in your explanation. (2 pts)

5

3) Define Biological Homogenization. (1 pt)

4) Why is Biological Homogenization undesirable for an ecosystem? (1 pt)

2019 Manitoba Envirothon Regional Field Test

Team #

Table required?	N
Supervisor required?	N
Local feature required?	
Description of local feature	
Hands on question?	
List of equipment, props, and/or samples	
Difficulty of question	Medium
Answer to question	<p>1) Invasive species are organisms, including plants, mammals, birds, amphibians, invertebrates, reptiles (lizards, snakes, turtles), and microorganisms that spread beyond their natural range into new locations. (0.5 pt) Provide example. (0.5 pt)</p> <p>2) Any TWO (2) of the following: Competition: invasive species can often out-compete native species for space, water, food, and other essential resources Predation: some invasive species cause native species to decline by being aggressive herbivores or predators. Pathogens and Parasites: often invasive species bring with them novel parasites or pathogens to a region. Sometimes the invasive species is a parasite itself and can affect population dynamics Hybridization: sometimes invasive species weaken the gene pool of the native species by interbreeding with them, a process called hybridization. Habitat alteration: invasive species may change the structure or composition of a habitat; invasive species make it unsuitable for other native species. (2 pts - 1 pt for reason, 1 pt for explanation)</p> <p>3) When different places in the world become more alike in their biology. (1 pt)</p> <p>4) Biological homogenization is undesirable because as it takes place, ecosystems often become less stable, (0.5 pt) and valuable biodiversity, or variety of life, is lost (0.5 pt). (1 pt)</p>
Reference to student material	<p>1) Wildlife Document p 40 2) Wildlife Document p 42 3) Wildlife Document p 41 4) Wildlife Document p 41</p>
Directions for printing and laminating	
Equipment supplied by Discipline	
Direction for stop set-up	
Directions for attendant	